Appendix A

Scoping Letters 2012-2015

US Army Corps of Engineers

DEPARTMENT OF TRANSPORTATION
111 GRAND AVENUE
P. O. BOX 23660
OAKLAND, CA 94623-0660
PHONE (510) 286-6053
FAX (510) 286-5559
TTY 711

Flex your power!
Be energy efficient!

October 18, 2012

Mr. David Dunlap
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3614

SCL101894
SCH#2012102032

Dear Mr. Dunlap:

The Upper Llagas Creek Flood Protection Project/Notice of Preparation

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the project referenced above. As the lead agency, the Santa Clara Valley Water District is responsible for all project mitigation, including any needed improvements to State highways. The project's fair share contribution, financing, scheduling, implementation responsibilities and lead agency monitoring should be fully discussed for all proposed mitigation measures. This information should also be presented in the Mitigation Monitoring and Reporting Plan of the environmental document.

Cultural Resources
Caltrans requires that a project environmental document include documentation of a current archaeological record search from the Northwest Information Center of the California Historical Resources Information System if construction activities are proposed within State right-of-way. Current record searches must be no more than five years old. Caltrans requires the records search, and if warranted, a cultural resource study by a qualified, professional archaeologist, and evidence of Native American consultation to ensure compliance with CEQA, Section 5024.5 and 5097 of the California Public Resources Code, and Volume 2 of Caltrans' Standard Environmental Reference (http://ser.dot.ca.gov). These requirements, including applicable mitigation, must be fulfilled before an encroachment permit can be issued for project-related work in State ROW; these requirements also apply to National Environmental Policy Act (NEPA) documents when there is a federal action on a project. Work subject to these requirements includes, but is not limited to: lane widening, channelization, auxiliary lanes, and/or modification of existing features such as slopes, drainage features, curbs, sidewalks and driveways within or adjacent to State ROW.

Bridges, Trestles, Culverts and Other Structures in Riparian Environments
Some project level activities may affect riparian flow patterns upstream of bridges, trestles, culverts or other structures for which Caltrans holds responsibility. Please ensure your project level environmental documents include hydrological studies to determine whether such impacts will occur, and to identify appropriate mitigation measures.

Dike and Levee Maintenance, Repair and Upgrade
Activities involving demolition, reinforcement or rehabilitation of dikes or levees on which transportation facilities are built may potentially affect State transportation facilities. Also, built features on top of dikes and levees may contribute additional engineering considerations related to weight loading or compaction. These factors must be addressed through geotechnical and hydrological studies conducted in coordination with Caltrans at the project level.

Habitat Restoration and Management
Project level activities related to habitat restoration and management should be done in coordination with local and regional Habitat Conservation Plans, and with Caltrans where our programs share stewardship responsibilities for habitats, species and/or migration routes.

Encroachment Permit
Please be advised that any work or traffic control that encroaches onto the State ROW requires an encroachment permit that is issued by Caltrans. To apply, a completed encroachment permit application, environmental documentation, and five (5) sets of plans clearly indicating State ROW must be submitted to the address below. Michael Condie, District Office Chief, Office of Permits, California Department of Transportation, District 4, P.O. Box 23660, Oakland, CA 94623-0660. Traffic-related mitigation measures should be incorporated into the construction plans prior to the encroachment permit process. See the website linked below for more information.
http://www.dot.ca.gov/hq/traffops/developserv/permits/

Should you have any questions regarding this letter, please contact Keith Wayne of my staff by telephone at (510) 286-5737, or by email at keith_wayne@dot.ca.gov.

Sincerely,

ERIK ALM, AICP
District Branch Chief
Local Development – Intergovernmental Review

c: Scott Morgan, State Clearinghouse

November 26, 2012

David Dunlap
Santa Clara Valley Water District
5750 Almaden Expressway San
Jose, CA 95118-3614 email:
ddunlap@valleywater.org

BY ELECTRONIC MAIL

CENTRAL COAST WATER BOARD COMMENTS ON THE OCTOBER 2012 NOTICE OF PREPARATION FOR THE UPPER LLAGAS CREEK FLOOD PROTECTION PROJECT DRAFT ENVIRONMENTAL IMPACT REPORT, SANTA CLARA COUNTY, FILE NUMBER 431012CQ1

Dear Mr. Dunlap:

Thank you for the opportunity to provide comments on the scope and content of the Draft Environmental Impact Report (DEIR) for the Upper Llagas Creek Flood Protection Project (Project). Central Coast Regional Water Quality Control Board (Central Coast Water Board) staff understands that the Santa Clara Valley Water District (District) proposes the Project to achieve the following objectives:

- Provide 100-year flood protection for urban areas of the City of Morgan Hill;
- Provide 10-year flood protection for the semi-urban area around East Little Llagas Creek downstream of Corralitos Creek; and
- Avoid induced flooding elsewhere on Llagas Creek.

The Central Coast Water Board is charged with the protection of the Waters of the State of California in the Central Coast Region. The Central Coast Water Board is a responsible agency under the California Environmental Quality Act (CEQA), and administers regulations established by the Federal Clean Water Act and the California Water Code (Porter-Cologne Water Quality Control Act). The Central Coast Water Board also administers regulations, plans, and policies established by the Central Coast Region Water Quality Control Plan and the State Water Resources Control Board to protect watersheds, their resources, and their beneficial uses. The Central Coast Water Board administers these regulations, in part, through issuance of water quality certifications under Clean Water Act (CWA) section 401. The Project proposes to discharge dredged or fill materials within Waters of the United States and Waters of the State and will require CWA section 401 water quality certification.

Central Coast Water Board staff understands that the Project, as proposed, involves the following:

- Deepening the bed and widening at least one bank of approximately 10.9 miles of West Little Llagas Creek, Llagas Creek, and East Little Llagas Creek (Reaches 4, 5, 6, 7B, and 14), with removal of all vegetation on the modified bed and bank(s);
- Altering hydraulic conditions in 1.1 miles of West Little Llagas Creek (Reach 8) by diverting flows into bypass tunnels and culverts;

- Abandoning approximately 1.5 miles of West Little Llagas Creek by diverting flows into a proposed bypass channel; and
- Altering hydraulic conditions in approximately 4 miles of East Little Llagas Creek as a result of diverting flows from West Little Llagas Creek.

As we stated in our August 23, 2012 comment letter on the Project 30% design, Central Coast Water Board staff does not find that the Project, as proposed, is protective of water quality and beneficial uses. Therefore Central Coast Water Board staff recommends that the Project DEIR address the following issues. Our August 23, 2012 comments are incorporated into this letter by reference.

Project Objectives

1. The Project includes significant environmental impact to a large portion of the Llagas Creek watershed, with the potential for permanent degradation of water quality and beneficial uses in the watershed, in order to achieve the flood protection levels identified in the Project objectives. As a result, Central Coast Water Board staff finds the Project objectives identify an unreasonably high level of flood protection for the urban areas of the City of Morgan Hill. Flooding has become a frequent occurrence in Morgan Hill due to land development practices which encroached on West Little Llagas Creek's historic floodplain, constricted the creek's historic flow path, and significantly increased runoff to the creek due to increased imperviousness. As such, controlling the flooding that has resulted from these large scale historic land development practices at the level proposed by the Project will likely result in unmitigable environmental impacts. However, it is possible to provide a level of flood protection that is significantly better than Morgan Hill currently experiences without creating these environmental impacts associated with 100-year flood protection. Central Coast Water Board staff recommends that the District identify a more reasonable objective for the Project, such as 50-year or 75-year flood protection for the urban areas of Morgan Hill.

2. The complex causes of flooding in the City of Morgan Hill and the extent of environmental impact associated with the Project require a more comprehensive approach than simply modifying stream channels to increase flow capacity. Such an approach fails to address the real causes of flooding in Morgan Hill. This approach also fails to avoid environmental impacts adequately because it places the "burden" of the solution entirely on the waterbodies. Much has been learned about developing more comprehensive and balanced solutions to flooding problems since the Project objectives were first formulated in 1968. As they are currently stated, the Project objectives prevent the Project from benefitting from that learning process and result in unnecessary environmental impacts. Central Coast Water Board staff recommends that the District adopt a Project objective such as the following: "Balance flood protection needs with environmental protection to provide a reasonable level of flood protection for the urban areas of the City of Morgan Hill."

3. A comprehensive and balanced solution to the flooding problems in Morgan Hill will require a cooperative effort involving the District, the City of Morgan Hill, Santa Clara County, property owners, and regulatory agencies. Therefore the DEIR should include a strategy for developing an advisory committee consisting of representatives from these and other relevant parties.

4. Where stream channels must be modified, the District should use channel designs that provide the following characteristics of healthy, functioning streams:

a. Preservation of existing stream alignments (e.g., West Little Llagas Creek instead of Reach 7A);
b. Preservation of existing vegetation (mature and emergent);
c. Preservation/restoration of floodplain connectivity;
d. Preservation/restoration of geomorphic functions (e.g., sediment transport, channel formation events, etc.);
e. Preservation/restoration of hydrologic functions that support habitat and beneficial uses (e.g., time of concentration, base flow);
f. Sufficient channel width to allow for robust, multi-level canopy riparian vegetation;
g. Adequate benches to support optimal riparian vegetation, at an elevation convenient to the water;
h. Minimizing or eliminating the use of rock slope protection (RSP);
i. Maximizing use of bridges instead of culverts, and of open-bottom culverts where bridges are infeasible;
j. Sizing culverts to avoid creating backwater effects or localized raising of the hydraulic grade line; and
k. Sinuosity and meander.

<u>Alternatives Analysis</u>

5. The District should thoroughly evaluate alternatives that provide a lesser degree of flood protection where doing so would reduce the environmental impacts of the Project.

6. The list of alternatives included in the Notice of Preparation (NOP) does not include alternatives which address the real causes of flooding. As a result, the list does not include alternatives capable of reducing environmental impacts by combining channel modifications with other approaches. The DEIR should include an alternatives analysis that examines the following approaches:
   - Providing a lower level of flood protection (e.g., 50-year): Central Coast Water Board staff finds that the Project's goal to provide 100-yr flood protection to development in a historic floodplain fails to balance flood control with environmental protection.
   - Floodplain restoration: Natural floodplains attenuate flood flows. Much of the area draining to reaches 7B and 8 was historic floodplain ("wet meadows," *South Santa Clara Valley Historical Ecological Study*, p. 168). Restoring floodplain capacity in this area through land acquisition and dedication would reduce the need for channel modifications. The Project should maximize avoidance of environmental impacts by restoring historic floodplains, floodplain connectivity, and natural flood attenuation capacity. Central Coast Water Board staff understands that this will involve hard decisions about land acquisition, but is reasonable and warranted given the degree of flood protection desired by the citizens of the City of Morgan Hill and the extent of environmental impacts resulting from the Project.
   - Runoff reduction: Development has increased imperviousness in areas historically identified as well-drained soils (*South Santa Clara Valley Historical Ecological Study*, p. 176). Increased imperviousness has significantly increased runoff to West Little Llagas Creek, exceeding its natural capacity and resulting in flooding. Measures to reduce runoff, such as retrofitting existing development or constructing off-channel storage, would reduce the need for channel modifications. The Project should maximize avoidance of environmental impacts by maximizing off-line (out of stream) modifications designed to store runoff and urban retrofits designed to reduce runoff before it enters the creek channel.

- Combination: Solutions which combine all of the above approaches could provide significant flood protection improvements over existing conditions, while significantly reducing the Project's environmental impacts.

7. The alternatives analysis appears to have been influenced by available funding sources and the type of flood protection improvements eligible for funding under each source. The DEIR should consider alternatives regardless of funding considerations in order to identify the least environmentally damaging alternative that is technically achievable. Financial feasibility should be considered only after identifying the least environmentally damaging alternative that is technically achievable.

8. The channel modifications proposed by the Project are linked to flow rate objectives. As a result, reducing the flow rate in a reach can reduce the channel modifications necessary to convey the flow. Therefore the DEIR should include a sensitivity analysis that identifies the extent to which proposed channel modifications could be reduced in each reach for given reductions in flow rate (e.g., How much could channel deepening activities be reduced in reach 7B if flow entering reach 7B is reduced 20%?). The sensitivity analysis should then be used to answer the following questions:
   - How much flow reduction is needed in reach 8 to avoid the need for bypass measures, or for deepening and/or widening reach 8?
   - How much flow reduction is needed in reaches 7B and 8 to avoid the need to deepen and/or widen reach 7B?
   - How much flow reduction is needed in reaches 7B and 8 to avoid the need for the bypass channel (reach 7A)?
   - How much flow reduction is needed in reaches 7B and 8 to avoid the need to deepen and/or widen reaches 5 and 6?
   - How much flow reduction is needed in reaches 7B and 8 to preserve areas of riparian vegetation that will be lost under the proposed Project?
   - How much flow reduction is needed in East Little Llagas Creek and Madrone Channel to avoid the need to deepen and/or widen reach 14?
   - How much flow reduction is needed to avoid the need to deepen and/or widen reach 4?

9. The DEIR should use the answers to the questions posed in Comment 8, above, to design alternatives using the approaches described in Comment 6.

<u>Models and Assumptions</u>

10. To enable a complete review of the Project's impacts and determination of whether the Project is the least environmentally damaging alternative that is technically feasible, the DEIR should explain and support the rationale and assumptions used to develop the Project.
    a. The DEIR should clearly explain and support the rationale for selecting 100-year flood protection for reaches 7B and 8.
    b. The DEIR should clearly explain and support the rationale for selecting 100-year flood protection for reach 7A. In addition, the DEIR should clearly explain whether this means there will be enough capacity in reach 7A to handle 100-yr flows from upstream (similar to the design objective for reaches 4, 5, and 6), or that 100-yr flood protection will be provided to the lands adjacent to reach 7A. If the latter, the DEIR should explain why the Project provides a higher degree of flood protection for this area than it does for similarly-developed lands adjacent to reach 14.

c. The Project includes significant modifications to reach 14 to provide 10-yr flood protection. The DEIR should clearly explain and support the rationale for selecting 10-year flood protection for reach 14. In addition, the DEIR should explain why such extensive modifications are needed, particularly considering that the Project diverts flow from West Little Llagas Creek (a tributary of East Little Llagas Creek) into the main stem of Llagas Creek.
d. The DEIR should clearly state whether flood protection objectives (i.e., 10-yr, 100-yr) are based on current or "built out" conditions. The Project should be designed only for current conditions, and local stakeholders should be expected to incorporate riparian corridor protections and post-construction stormwater management control measures that eliminate the need for subsequent channel modifications. The DEIR should also include a comparison between the 100-year design flow rate currently proposed and the design flow rate originally proposed in 1968. If the design flow rate has increased, the DEIR should clearly identify how the increase affects the impacts of the Project.
e. The DEIR should clearly explain the hydrologic model used to determine the 100-year and 10-year return period flows for each reach, including the assumptions made (e.g., rainfall, runoff coefficients, stage-discharge data, development conditions, etc.) and the rationale for each assumption. The DEIR should also explain how the hydrologic model was calibrated using empirical data, and when it was last calibrated.
f. The DEIR should clearly explain and support assumptions used in the hydraulic model to determine proposed channel dimensions (e.g., active channel width and depth, flowline elevation and slope, etc.). The DEIR should address at least the following:
    - Channel vegetation and roughness assumptions;
    - Features (such as existing culverts) that act as elevation controls; and
    - Features affecting the hydraulic grade line (e.g., flow constrictions).
g. The DEIR should clearly explain the objectives of the hydraulic model (e.g., to stabilize incision and sediment transport, to maximize revegetation in each reach, to facilitate fish passage, etc.), and the rationale and appropriateness of each objective.
h. The DEIR should clearly state and support the assumptions, policies, calculations, etc., which guide where and how much rock slope protection or other channel armoring is proposed. Use of RSP and other "hard" armoring methods must be limited to locations where design flow conditions make all other forms of bank stabilization infeasible.
i. The DEIR should clearly state and support the assumptions, policies, calculations, etc., which guide all design decisions, including, but not limited to, the width and number of maintenance/access roads, channel side slopes, channel alignments, and placement of grade controls and drop structures.

11. The DEIR should clearly state District, United States Army Corps of Engineers, and/or FEMA policies that influenced the objectives or design of the Project, including an explanation of the authority of each agency to set policy for the Project.

<u>Analysis of Environmental Impacts</u>

12. Llagas Creek is geomorphically unstable as a result of development and channelization activities over the last century. According to data collected by the District, the creek has down-cut approximately ten feet in the last 100 years. This downcutting threatens remaining historic riparian vegetation and hinders natural recruitment of riparian vegetation. In addition, the creek bed and lower banks are now located in soil strata that do not readily support healthy, robust, and multi-layered riparian vegetation. Data suggests that Llagas Creek geomorphology remains unstable, so these problems are likely to continue without

intervention. The dynamic nature of the Llagas Creek system makes it difficult to determine the impact of the Project on the future of Llagas Creek. Therefore the DEIR should contain an analysis that includes the following:

a. An assessment of geomorphic stability within the Llagas Creek watershed, and an assessment of how the Project will affect this stability (positively or negatively). The assessment should compare existing conditions, future conditions without the Project, and future conditions with the Project;
b. An assessment of sediment transport characteristics within the Llagas Creek watershed and the environmental functions and beneficial uses affected by these characteristics, and an assessment of how the Project will affect sediment transport and these functions and uses (positively or negatively). The assessment should compare existing conditions, future conditions without the Project, and future conditions with the Project;
c. An assessment of aquatic and riparian habitat within the Llagas Creek watershed and the environmental functions and beneficial uses supported by the habitat, and an assessment of how the Project will affect habitat functions and beneficial uses (positively or negatively). The assessment should compare existing conditions, future conditions without the Project, and future conditions with the Project;
d. An assessment of water quality and biotic conditions within the Llagas Creek watershed and the environmental functions and beneficial uses supported by these factors, and an assessment of how the Project will affect water quality and biotic conditions (positively or negatively). The assessment should compare existing conditions, future conditions without the Project, and future conditions with the Project; and
e. An assessment of wildlife within the Llagas Creek watershed, and an assessment of how the Project will affect wildlife (positively or negatively). The assessment should compare existing conditions, future conditions without the Project, and future conditions with the Project.

13. The long-term environmental impact of the Project is directly linked to the revegetation potential of the modified channels. However, the revegetation potential of the modified channels is uncertain due to the soil quality and groundwater access available at the proposed channel widths and depths. Therefore it is uncertain whether vegetation impacted by the Project could be replaced, or that the modified channels could support robust riparian vegetation. Central Coast Water Board staff will not be able to recommend water quality certification of the Project objectives or design until the revegetation potential is clear. The DEIR should fully analyze the revegetation potential of the modified channels, provide an analysis of habitat functions and beneficial uses that would be impacted, and compare these losses with the functions and beneficial uses that can be restored.

14. Central Coast Water Board staff understands that channel modification and alignment decisions are influenced, in part, by the desire to use existing constructed features. These features include existing culverts in reaches 7B and 8 and culverts constructed in the past along the anticipated alignment of proposed reach 7A. The project should be designed to achieve a minimum of environmental impact, rather than to match flowlines and cross sections of previously constructed features. The DEIR should identify how the use of each feature affects channel width, depth, and slope. In addition, the DEIR should compare the impact of using previously constructed features, replacing the features, and avoiding them altogether.

15. Lengthy tunnels and culverts can become habitat for roosting bats, which can be a significant source of bacteria to the Llagas Creek watershed. In light of the fact that Llagas Creek is already addressed by a bacteria Total Maximum Daily Load (TMDL), the DEIR

should identify and analyze the environmental impact of the bypass culverts and tunnel proposed in reach 8, and identify and propose mitigation for bats or any other potential new sources of bacteria. The Project must not contribute to Llagas Creek's impairment for bacteria.

16. The Project includes constructing, in the midst of active agricultural fields, a new channel directly connected to Llagas Creek. Agricultural fields are significant sources of nutrients, pesticides, and sediment, and Llagas Creek is already impaired for these pollutants, with nutrient and sediment TMDLs in place. The DEIR should identify and analyze the environmental impact of constructing and operating reach 7A on the nutrient, pesticide, and sediment conditions in Llagas Creek, and identify and propose mitigation for any new or potential new sources of these pollutants. The Project (and subsequent operation by the District) must not contribute to Llagas Creek's impairment for nutrients, pesticides, and sediment.

17. The Project includes intercepting West Little Llagas Creek at a point north of Watsonville Road and diverting it to Llagas Creek. West Little Llagas Creek currently flows into East Little Llagas Creek. The DEIR should identify and analyze the environmental impact of decreased flows on lower West Little Llagas Creek, Madrone Channel, and East Little Llagas Creek; the impact of increased flows in Llagas Creek; and the impact of constructing and operating the diversion channel itself.

<u>Restoration</u>

18. Projects of this scope provide opportunities to restore lost hydrologic and environmental functions and beneficial uses. Environmental impacts have accumulated in Llagas Creek watershed streams for over the last century as a result of development, flood protection improvement projects, and capacity maintenance efforts, resulting in degradation of water quality and beneficial uses. The Project should include measures designed to restore these lost functions and beneficial uses approaching historical conditions, rather than merely pre-project conditions. Therefore the DEIR should include a thorough evaluation of opportunities to provide better protection of water quality and beneficial uses than is provided by current conditions.

<u>Cumulative Impacts</u>

19. The analysis of cumulative impacts in the DEIR should include all channel modification work conducted in the Llagas Creek system by the District and others for the purpose of flood management, especially modifications made since 1973 associated with the Llagas Creek Watershed Project Plan and its subsequent iterations.

Thank you again for the opportunity to influence the scope and content of the DEIR. If we may clarify any of our comments or be of further assistance, please contact **Jon Rohrbough** at (805) 549-3458 or via email at jrohrbough@waterboards.ca.gov or Phil Hammer at (805) 549-3882.

Sincerely,

Phil Hammer
2012.11.26 13:07:27 -08'00'

for
Kenneth A. Harris, Jr.
Interim Executive Officer

S:\CEQA\Comment Letters\Santa Clara County\Upper Llagas Creek Flood Protection NOP_431012CQ1_final.doc

cc:

Luisa Valiela
US Environmental Protection Agency
Valiela.Luisa@epamail.epa.gov

Christopher Eng
US Army Corps of Engineers
Christopher.K.Eng@usace.army.mil

Terry Marks
US Army Corps of Engineers
Terry.L.Marks@usace.army.mil

Jon Ambrose
National Marine Fisheries Service
Jonathan.ambrose@noaa.gov

Doug Weinrich
US Fish and Wildlife Service
Douglas_Weinrich@fws.gov

Joseph Terry
US Fish and Wildlife Service
Joseph_Terry@fws.gov

Tami Schane
California Department of Fish and Game
tschane@dfg.ca.gov

Karl Bjarke
City of Morgan Hill
Karl.bjarke@morganhill.ca.gov

Jon Rohrbough
Central Coast Water Board
jrohrbough@waterboards.ca.gov

County of Santa Clara

Parks and Recreation Department

298 Garden Hill Drive
Los Gatos, California 95032-7669
(408) 355-2200 FAX 355-2290
Reservations (408) 355-2201
www.parkhere.org

November 1, 2012

David Dunlap
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose,CA 95118

Subject: Notice of Preparation for a Draft Subsequent Environmental Impact Report for the Upper llagas Creek Flood Protection Project

Dear Mr. Dunlap:

The County of Santa Clara Parks and Recreation Department (County Parks) is in receipt of a Notice of Preparation (NOP) for a Draft Subsequent Environmental Impact Report (DEIR) for the Upper Llagas Creek Flood Protection Project.

It is understood that the Llagas Creek Watershed Project Plan (LCWPP) was originally proposed by the Santa Clara Valley Water District (SCVWD) in 1968 and approved by three local sponsoring agencies, that included the County of Santa Clara,the State of California and U.S. Congress. Construction began in 1973 but halted in 1974 in order to re-evaluate potential environmental impacts, and subsequently, an EIR/EIS was completed in 1982 on a revised project. It is understood that the revised project subdivided the project area into 14 reaches, with reaches from Buena Vista Avenue downstream to the confluence of the Pajaro River completed between 1973 and 1994. The current project is designated as the Upper Llagas Creek Flood Protection Project,and Draft Subsequent EIR pertains to the remaining reaches (reach 4,5,6,7A,7B,8,and 14) along sections of Little Llagas Creek and Llagas Creek.

County Parks' concerns and comments are primarily focused on potential impacts to County parklands, park resources and recreational facilities, public access,and countywide trail routes relative to the *Santa Clara County Countywide Trails Master Plan Update (Countywide Trails Master Plan},* an element ofthe County of Santa Clara General Plan (1995-2010) adopted by the County of Santa Clara Board of Supervisors on November 14,1995.

Land Use & Policies - County

The DEIR should discuss and consider potential impacts to County parklands,including mitigation strategies/measures,park resources and recreational facilities, and countywide trails,including public access, relative to the Parks and Recreation Element of the County of Santa Clara General Plan (1990-2010) and the *Countywide Trails Master Plan* .

The *Countywide Trails Moster Plan* identifies the following regional trail routes within and adjacent to the project area which may be impacted by the proposed project.

- Regional Trail Route C25 *Main Street Connecting Trail* designated as on-street bicycle trail with parallel trail route; route within road right-of-way (ROW) for hiking, off-road cycling.
- Regional Trail Route Rl-A *Juan Bautista de Anza NHT (bicycle route)* designated as on-street bicycle trail within the road ROW for on-road cycling only.
- Regional Trail Route 55 *Juan Bautista de Anza NHT (Coyote Creek- Llagas sub-regional trail}* designated as trail within other public lands for hiking, off-road cycling, equestrian.
- Regional Trail Route 57 *Morgan Hill Cross Valley Sub-regional trail* designated as on-street bicycle trail with parallel trail route; route within the road ROW for hiking, off-road cycling.
- Regional Trail Route R3 *Benito Clara Trail* designated as trail within other public lands for hiking, off-road cycling, equestrian.
- Regional Trail Route C31 *Buena Vista Day Connector* designated as on"street bicycle trail with parallel trail route; route within ROW for hiking, on-road cycling, equestrian.

The County of Santa Clara (Parks and Recreation Department) owns property within the project area (Silveira property) that would be impacted by the project. As such, the DEIR should identify the County as a responsible agency and coordinate with County Parks on the development of the proposed flood protection designs and mitigation measures within this area. In addition, the DEIR should consider and address potential impacts, including project mitigation strategies, to the Silveira property.

Land Use & Policies- other agencies

The DEIR should consider and address adopted land use goals and policies for the regional/citywide trails system, and address proposed trail routes that have been approved by the City of Gilroy in their Parks and Recreation System Master Plan (2001).

The DEIR should consider and address adopted land use goals and policies, for regional/citywide trail routes that have been approved by the City of Morgan Hill in the City of Morgan Hill Bikeways Master Plan (2001), Draft Trails and Natural Resource Study, and Bikeways Master Plan Update (2008).

Hydrology

The DEIR should discuss and consider the project's impacts to the hydrology, riparian corridor and habitats, particularly in reaches where there are extensive segments of box culverts and to the riparian habitats in segments where maintenance roads are proposed on both sides ofthe creek.

In reach 7a where West Little Llagas Creek is proposed to be disconnected from main stream flows as a result of the proposed diversion channel, the DEIR should consider and address the short term and long term impacts to the hydrology, riparian corridor and habitat of West Little Llagas Creek as well as impacts downstream and upstream of the diversion, and to the hydrology and riparian habitat along the Silveira property.

Recreation

The DEIR should consider and address the goals, policies and recreational opportunities, including trails, within and adjacent to the project area, consistent with the Parks and Recreation chapter of the County of Santa Clara General Plan (1990-2010) and Countywide Trails Master Plan.

Non-motorized circulation within the project area should be analyzed in the context of potential connectivity with all nearby trail routes. Per Policy PR-TS 6.3 of the Parks and Recreation chapter of the County General Plan, public Improvement projects such as road widening, bridge construction and flood control projects that may impact existing or proposed trails should be designed to facilitate provisions of shared use. County Parks encourages SCVWD to incorporate planning of recreation facilities particularly trails and amenities for public access into the project early in the design development process.

County Parks is encouraged by SCVWD commitment to work with cities and the County to incorporate recreation opportunities such as creekside trails into the project, and would welcome the opportunity to work with SCVWD, cities and other agencies on the development of public trails within the project area.

County Parks looks forward to continued collaboration with SCVWD on this project. We thank you for the opportunity to respond to this NOP and request that our agency continues to receive timely information on the project. We look forward to reviewing the DEIR and other environmental documents when they become available. If you have any questions regarding these comments, please feel free to contact me at (408) 355-2235 or via email at Antoinette.Romeo@prk.sccgov.org.

Sincerely,

Antoinette Romeo

Antoinette Romeo

Park Planner III

Cc: Jane Mark, Senior Planner;
Tim Heffington, Senior Real Estate Agent;
Ian Champeny, Real Estate Agent

County of Santa Clara

Department of Planning and Development
Planning Office

county Government Center, East Wing, 7th Floor
70 west Hedding street
San Jose, California .951 10-1705
(408) 299-5770 FAX (408) 288-9198
www.sccplanning.org

November 6, 2012

Mr. David Dunlap
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118

RE: Comments regarding Notice of Preparation (NOP) of a Draft Environmental Impact Report (DEIR) for the Upper Llagas Creek Flood Protection Project

Dear Mr. Dunlap:

Please find enclosed comments from the County regarding the Notice of Preparation (NOP) of a Draft Environmental Impact Report (DEIR) for the Upper Llagas Creek Flood Protection Project. These include comments from Roads & Airports Dept., Parks & Recreation Dept., and Dept. of Environmental Health.

The attached comments include concerns the County has regarding traffic during construction, compliance with County Roads's Dept. future width line standards for bridge and road construction, impacts to recreational trails, and riparian corridors and associated habitat, and impacts to septic systems, groundwater, surface water, and perchlorate plume, and wells.

If you have any questions regarding coordination of comments on the NOP from the County, please contact Janice Spuller at (408) 573-2462, in Roads & Airports Dept. , Antoinette Romeo at (408) 355-2235 in Parks & Recreation Dept., or Scott Bourdon at (408) 918-1955 in Dept. of Environmental Health.

Sincerely,

Ignacio Gonzalez
Director of Planning and Development

cc:
Janice Spuller -Roads & Airports Dept.
Antoinette Romeo -Parks & Recreation Dept.
Scott Bourdon-Dept. of Environmental Health
Roland Velasco, Mike Wasserman - Board of Supervisors District 1
Sylvia Gallegos-Deputy County Executive, County Executive Office

County of Santa Clara

Roads and Airports Department

I01 Skyport Drive
san Jose. california 951 1Q-1302
(408) 573-2400

October 31,2012

David Dunlap
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118

SUBJECT:Notice of Preparation- The Upper Llagas Creek Flood Protection Project Draft Subsequent Environmental Impact Report

Deal' Mr. Dunlap:

The County of Santa Clara Roads and Airports Department is submitting the following comments regarding the preparation of an envir01rn1ental impact rep01t for the project cited above.

The following items should be included in the Draft Subsequent Enviromnental hnpact Report.

I. Provide a discussion of constrnction-related impacts on local roads and bridges and identifY mitigation measures for significant impacts. Potential impacts to consider include pavement degradation from construction vehicles, traffic from road closures and detours, and accommodating bicyclists through construction zones.

2. IdentifY impacts of project on existing road and bridges considering factors such as alignment, design, and height. IdentifY mitigation measures for significant impacts, including as applicable bridge replacements. Any bridge replacements and road modifications identified as mitigation measures must be consistent with County standards and the road's future width line.

Thank you for the oppmtunity to comment ou the NOP. If you have any questions about these comments, or require more information on the County's local roads and bridges, please contact me at 408-573-2462 or janice.spuller@rda.sccgov.org.

Sincer :s ,00!/, .
;; ·cvl-

Transpmtation Plam1er

c: MA, DC, AP, TP, NC

County of Santa Clara
Parks and Recreation Department

298 Garden Hill Drive
Los Gatos, California 95032-7669
(408) 355-2200 FAX 355-2290
Reservations (408) 355-2201
www.parkhere.org

November 1, 2012

David Dunlap
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118

Subject: Notice of Preparation for a Draft Subsequent Environmental Impact Report for the Upper Llagas Creek Flood Protection Project

Dear Mr. Dunlap:

The County of Santa Clara Parks and Recreation Department {County Parks) is in receipt of a Notice of Preparation {NOP) for a Draft Subsequent Environmental Impact Report (DEIR) for the Upper Llagas Creek Flood Protection Project.

It is understood that the Llagas Creek Watershed Project Plan {LCWPP) was originally proposed by the Santa Clara Valley Water District {SCVWD) in 1968 and approved by three local sponsoring agencies, that included the County of Santa Clara, the State of California and U.S. Congress. Construction began in 1973 but halted in 1974 in order to re-evaluate potential environmental impacts, and subsequently, an EIR/EIS was completed in 1982 on a revised project. It is understood that the revised project subdivided the project area into 14 reaches, with reaches from Buena Vista Avenue downstream to the confluence of the Pajaro River completed between 1973 and 1994. The current project is designated as the Upper Llagas Creek Flood Protection Project, and Draft Subsequent EIR pertains to the remaining reaches (reach 4, 5, 6, 7A, 7B, 8, and 14) along sections of Little Llagas Creek and Llagas Creek.

County Parks' concerns and comments are primarily focused on potential impacts to County parklands, park resources and recreational facilities, public access, and countywide trail routes relative to the *Santa Clara County Countywide Trails Master Plan Update {Countywide Trails Master Plan),* an element of the County of Santa Clara General Plan {1995-2010) adopted by the County of Santa Clara Board of Supervisors on November 14, 1995.

Land Use & Policies- County
The DEIR should discuss and consider potential impacts to County parklands, including mitigation strategies/measures, park resources and recreational facilities, and countywide trails, including public access, relative to the Parks and Recreation Element of the County of Santa Clara General Plan {1990-2010) and the *Countywide Trails Master Plan* .

The *Countywide Trails Master Plan* identifies the following regional trail routes within and adjacent to the project area which may be impacted by the proposed project.

- **Regional Trail Route C25** ***Main Street Connecting Trail*** designated as on-street bicycle trail with parallel trail route; route within road right-of-way (ROW) for hiking, off-road cycling.
- **Regional Trail Route Rl-A** ***Juan Bautista de Anza NHT {bicycle route)*** designated as on-street bicycle trail within the road ROW for on-road cycling only.
- **Regional Trail Route 55** ***Juan Bautista de Anza NHT (Coyote Creek- Llagas sub-regional trail)*** designated as trail within other public lands for hiking, off-road cycling, equestrian.
- **Regional Trail Route 57** ***Morgan Hill Cross Valley Sub-regional trail*** designated as on-street bicycle trail with parallel trail route; route within the road ROW for hiking, off-road cycling.
- **Regional Trail Route R3** ***Benito Clara Trail*** designated as trail within other public lands for hiking, off-road cycling, equestrian.
- **Regional Trail Route C31*****Buena Vista Day Connector*** designated as on-street bicycle trail with parallel trail route; route within ROW for hiking, on-road cycling, equestrian.

The County of Santa Clara (Parks and Recreation Department) owns property within the project area (Silveira property) that would be impacted by the project. As such, the DEIR should identify the County as a responsible agency and coordinate with County Parks on the development of the proposed flood protection designs and mitigation measures within this area. In addition, the DEIR should consider and address potential impacts, including project mitigation strategies, to the Silveira property.

Land Use & Policies – other agencies

The DEIR should consider and address adopted land use goals and policies for the regional/citywide trails system, and address proposed trail routes that have been approved by the City of Gilroy in their Parks and Recreation System Master Plan {2001).

The DEIR should consider and address adopted land use goals and policies, for regional/citywide trail routes that have been approved by the City of Morgan Hill in the City of Morgan Hill Bikeways Master Plan {2001), Draft Trails and Natural Resource Study, and Bikeways Master Plan Update (2008).

Hydrology

The DEIR should discuss and consider the project's impacts to the hydrology, riparian corridor and habitats, particularly in reaches where there are extensive segments of box culverts and to the riparian habitats in segments where maintenance roads are proposed on both sides of the creek.

In reach 7a where West Little Llagas Creek is proposed to be disconnected from main stream flows as a result of the proposed diversion channel, the DEIR should consider and address the short term and long term impacts to the hydrology, riparian corridor and habitat of West Little Llagas Creek as well as impacts downstream and upstream of the diversion, and to the hydrology and riparian habitat along the Silveira property.

Recreation

The DEIR should consider and address the goals, policies and recreational opportunities, including trails, within and adjacent to the project area, consistent with the Parks and Recreation chapter of the County of Santa Clara General Plan {1990-2010) and Countywide Trails Master Plan.

Non-motorized circulation within the project area should be analyzed in the context of potential connectivity with all nearby trail routes. Per Policy PR-TS 6.3 of the Parks and Recreation chapter of the County General Plan, public Improvement projects such a:s road widening, bridge construction and flood control projects that may impact existing or proposed trails should be designed to facilitate provisions of shared use. County Parks encourages SCVWD to incorporate planning of recreation facilities particularly trails and amenities for public access into the project early in the design development process.

County Parks is encouraged by SCVWD commitment to work with cities and the County to incorporate recreation opportunities such as creekside trails into the project, and would welcome the opportunity to work with SCVWD, cities and other agencies on the development of public trails within the project area.

County Parks looks forward to continued collaboration with SCVWD on this project. We thank you for the opportunity to respond to this NOP and request that our agency continues to receive timely information on the project. We look forward to reviewing the DEIR and other environmental documents when they become available. If you have any questions regarding these comments, please feel free to contact me at (408) 355-2235 or via email at Antoinette.Romeo@prk.sccgov.org.

Sincerely,

Antoinette Romeo

Antoinette Romeo

Park Planner Ill

Cc: **Jane Mark, Senior Planner;**
Tim Heffington,Senior Real Estate Agent;
Ian Champeny, Real Estate Agent

County of Santa Clara
Departmcnl of Environmental Health

1sss Gerger Drive. suit{· : oo
StlllJose. California DG1 1:::!-2711)
(·1-0H) U 18-3400
www.EIlinfo.org

November 6, 2012

Mr. David Dunlap
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118

Re: CEQA Referrals-SCVWD The Upper Llagas Creek Flood Project

Dear Mr. Dunlap:

This letter is in reference to the above subject project requesting our department to respond to the CEQA referrals.

For The Upper Llagas Creek Flood Protection Project, the Department of Enviromnental Health (DEH) would like to see the impact on existing onsite wastewater treatment systems (septic systems) and any impact on groundwater or surface water addressed in the EJR. Also, DEH would like more infom1ation on any effects on the perchlorate plume (or the mitigation thereof). Please also address any impacts on existing or proposed drinking water wells.

If you have any questions, please feel free to give me a call at (408) 918-1955 or email me at scott.bourdon@deh.sccgov.org. Thank you.

Sincerely,

Scott Bourd6, Director
Department of Enviromnental Health

cc: Colleen A. Oda, Plam1er Ill
Santa Clara County Planning Office, 70 W. Hedding St., E. Wing, 7th Floor, San Jose, CA 95110

State of California - The Natural Resources Agency
DEPARTMENT OF FISH AND GAME
Bay Delta Region
7329 Silverado Trail
Napa, CA 94558
(707) 944-5500
www.dfg.ca.gov

EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

November 9, 2012

Mr. David Dunlap
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118

Dear Mr. Dunlap:

Subject: Upper Llagas Creek Flood Protection Project, Notice of Preparation, SCH #2012102032, Santa Clara County

The Department of Fish and Game (DFG) has r.eviewed the Santa Clara Valley Water District's (District) Notice of Preparation (NOP) provided for the subject project, and we have the following recommendations for issues to be addressed in development of the California Environmental Quality Act (CEQA) document:

The CEQA document should describe how the flood design criteria were derived and why those criteria are appropriate for Upper Llagas Creek.

The NOP describes installation of a bypass channel in Reach 7A to bypass a 1.9-mile segment of West Little Llagas Creek, and installation of a weir and two bypass culverts in Reach 8 to bypass high flows. The CEQA document should describe how processes such as sediment transport, scouring of fines, minimization of channel vegetation encroachment, and introduction and transport of woody material will be supported with the bypassing of high flows typically associated with channel maintenance flows and channel forming flows.

The CEQA document should explain whether and how the proposed project will reduce maintenance needs in the project area and the justification for the number and size of maintenance roads included in the project.

The CEQA document should clearly define the impacts to vegetation, differentiating between impacts to native and non-native species, disclosing number, size distribution, and species identification of trees removed as a result of the project, and providing impacts to riparian vegetation in linear feet and percent canopy cover. In addition, the document should discuss what types of riparian vegetation the channel may have supported historically, and describe limitations of revegetation (due to soils, hydrology, etc.) and describe what type of riparian vegetation can reasonably be expected to be successful in replanting and restoration.

The CEQA document should clearly define potential project-related impacts to sensitive species, including but not limited to least Bell's vireo *(Vireo be/Iii pusillus),* South-Central California Coast steelhead *(Oncorhynchus* mykiss), California tiger salamander *(Ambystoma californiense),* California red-legged frog *(Rana aurora draytonil),* western pond turtle (Emys *marmorata),* burrowing owl *(Athene cunicularia),* yellow warbler *(Dendroica petechia),* and San Francisco dusky-footed woodrat *(Neotoma fuscipes annectens).*

The CEQA document should clearly describe whether there will be an increase or decrease in the length of stream that will be day-lighted as a result of this project. The document should provide clear justification for any reduction in day-lighted stream length (resulting from culverts, tunnel, etc.) and describe how this will be mitigated for in-kind.

The CEQA document should describe any net benefits of the project to native species, both listed and non-listed. Mitigation site(s) should be disclosed and as much information as possible should be provided that describes how specific mitigation will adequately compensate for project-related impacts.

DFG appreciates the opportunity to comment on the District's NOP for the Upper Llagas Creek Flood Protection Project. Questions regarding this letter and further coordination on this project should be directed to Ms. Tami Schane, Environmental Scientist, at (415) 831-4640; or Mr. Liam Davis, Senior Environmental Scientist, at (707) 944-5529.

Sincerely,

Scott Wilson

Scott Wilson
Acting Regional Manager
Bay Delta Region

cc: State Clearinghouse

United States Department of the Interior

Juan Bautista de Anza National Historic Trail
333 Bush Street, Suite 500
San Francisco, CA 94104

IN REPLY REFER TO:

OFFICIAL CORRESPONDENCE BY ELECTRONIC MAIL
NO HARD COPY TO FOLLOW

22 October, 2015

James Mazza
USACE San Francisco District
Regulatory Division
1455 Market Street
San Francisco, California 94103–1398
james.c.mazza@ usace.army.mil

Re: Environmental Impact Statement, Notice of Intent to Prepare for Upper Llagas Creek Flood Project in Santa Clara County, California

Dear Mr. Mazza:

The Juan Bautista de Anza National Historic Trail appreciates the opportunity to review the Environmental Impact Statement, Notice of Intent to Prepare for the proposed Upper Llagas Creek Flood Project in Santa Clara County, California. Our comments address potential impacts to the Juan Bautista de Anza National Historic Trail (Anza NHT), due to our responsibility to administer, coordinate, preserve and enhance this component of the National Trails System.

The National Park Service (NPS) has a special interest in ensuring the protection of the Juan Bautista de Anza National Historic Trail. Congress, under the National Trails System Act ([NTSA], 16 USC 1241 et. seq.), established the Juan Bautista de Anza National Historic Trail (Anza NHT) in 1990. The Act states that "*National historic trails shall have as their purpose the identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment.*" NPS as Administrator of the Anza NHT is charged with implementing this vision in collaboration with other federal, state, and local agency partners such as Santa Clara County Parks and the Santa Clara County Open Space Authority.

The project area is located in Coyote Valley within Santa Clara County, within, or less than four miles from the historic corridor travelled by the Anza expedition, and the Anza recreation retracement route (recreation trail) and auto tour route, as shown in Figure 1. This area provides recreation opportunities throughout the entirety of the valley and has been recognized with interpretive panels, certified interpretive sites (Coyote Valley Open Space Preserve), and for the natural landscape settings and agency connections to the native community (Ohlone peoples). The trails located along the ridgelines and within the riparian corridors valley offer high-quality recreation and opportunities for visitors to experience landscape settings similar to that which the Anza expedition party encountered. The Anza NHT hopes that these recreation opportunities will be protected and enhanced by the forthcoming flood control projects undertaken by the USACE.

The Juan Bautista de Anza National Historic Trail Comprehensive Management and Use Plan and Final EIS, April 1996 documents that the recreation trail within the project area are high potential segments. The Anza NHT is currently working with Santa Clara Parks to complete certification of the recreation trail segments identified as Anza Trail in the Santa Clara Trails Master Plan. This includes segments near the creeks and riparian areas near the project area (Figure 2).

In order to further the Anza NHT Comprehensive Use and Management Plan goal that:

> A recreational retracement route will be marked and interpreted. The trail will be achieved by linking, through a marking program, trails developed by federal, state, and local agencies, trail support groups, landowners, and others. The goal of the recreational trail is to provide a multiuse, non-motorized, off-road, continuous trail from Nogales to San Francisco and around the east bay of San Francisco within the historic corridor. Federal components and high potential segments will be key elements of this route. These segments will be linked with trails which parallel the historic route to provide the potential for a continuous recreational and commemorative trail (NPS 1996),

The Anza NHT supports further development of recreation opportunities as appropriate for the natural resources and flood protection protocols of these riparian corridors. Coordination should be conducted with the Anza NHT to ensure that impacts are properly identified and disclosed and that appropriate mitigation is proposed if necessary.

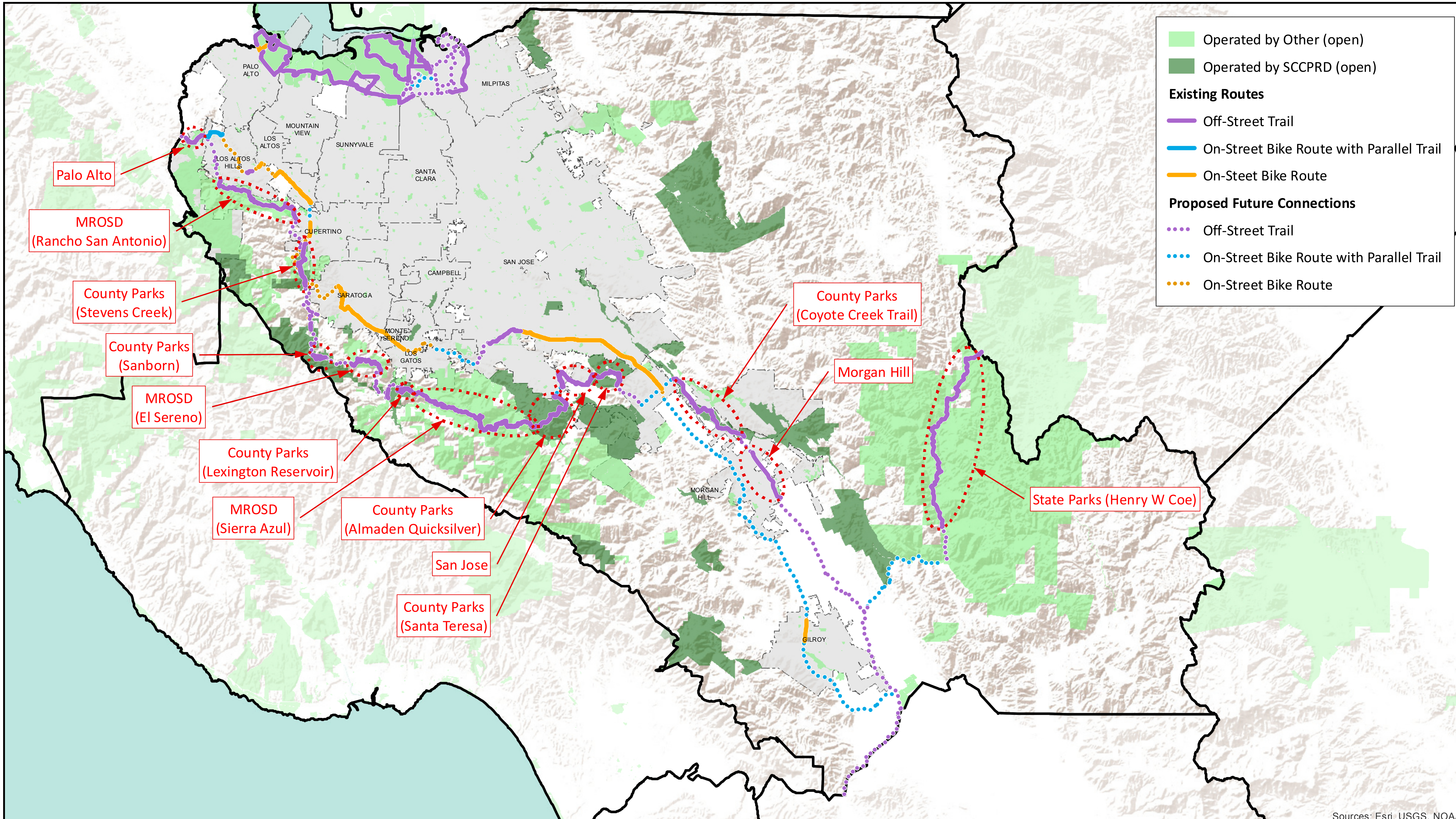
For any clarification of our comments on the Notice of Intent to Prepare or for further information relevant to the Anza Trail, please contact Naomi Torres, Superintendent, Anza NHT (415) 623-2340 (Naomi_torres@nps.gov) or BriAnna Weldon, Outdoor Recreation Planner (415) 623-2343 (brianna_weldon@nps.gov).

Sincerely,

Naomi L. Torres

Naomi L. Torres, Superintendent
Juan Bautista de Anza National Historic Trail

Historic Trail Corridor | Revised/Unofficial Corridor | Recreational Trail (Planned) | Recreational Trail (Existing) | Shapefile and KML Uploads | Recreational Trail (Under Review) | Photos (Approved) | Photos (Under Review) | Trail Resource (Approved) | Trail Resource (Under Review) | Map Notes



SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Juan Bautista de Anza Trail Status

Draft Aug 5, 2015

Lead Agencies for Complete Trail Segments

Created By: WF

Scale: 0 1.25 2.5 5 Miles

N

Appendix B

Stream Maintenance Program Best Management Practices

US Army Corps of Engineers

Table 2-12. BMPs Listings

A. SECTION A –Pre-Project Planning and General BMPs

General BMPs are applicable program-wide, for most routine SMP maintenance activities. These measures include standard construction practices and impact avoidance measures that will minimize potential environmental impacts. These BMPs will be implemented by the stream maintenance crew, as appropriate and as overseen by site managers, for all activities associated with the maintenance program. The majority of these BMPs are implemented prior to and during maintenance operations, though the level of activity varies depending on the work type.

Other General BMPs are conducted prior to implementing maintenance activities on site. This group of measures includes procedures to identify site or maintenance constraints, such as biological or cultural resource surveys which coincide with permit compliance requirements. Site design constraints for sediment and bank stabilization activities in particular are also identified as part of the pre-project planning process.

BMP Number	BMP Title	BMP Description
GEN-1	In-Channel Work Window	All ground-disturbing maintenance activities (i.e., sediment removal, bank stabilization, tree removal, and mechanized vegetation management) occurring in the channel (below bankfull) will take place between June 15 and October 15. Requests for work window extensions must be submitted to the regulatory agencies by October 1st, listing the creek names and reaches where a work extension will occur. Work extensions vary per work activity. The agencies will provide a single response within one week. Significant rainfall applies after October 15. An extension through December 31 may apply if the following requirements are met and regulatory agency approval is received: For ground-disturbing activities: ▪ Work may continue if no significant rainfall, defined as greater than 0.5 inches per 24 hours within a local watershed, is either forecasted[1] or observed. Following October 15th, maintenance work shall cease for the season if such a rain event is forecasted or observed. Sediment removal ▪ Extended Work Window: 1. Creeks supporting anadromous fish: An extended work window may occur from October 15 through October 31, or until local rainfall of 0.5 inches or greater falls within the subject watershed within a 24-hour period, whichever occurs first. 2. Creeks not supporting anadromous fish: An extended work window may occur from October 15 through November 30th, or until local rainfall of 0.5 inches or greater falls within the subject watershed within a 24-hour period, whichever occurs first. ▪ Extended Work Window in Lower Quality Areas: 1. Sediment removal work may occur until December 31. 2. Work will only occur on Berryessa Creek (0-88+80; 232+70-236+00; 284+30-288+00), Lower Silver Creek (Reach 3 between Stations 37+40 and 381+19), Thompson Creek (0+00-10+00), Canoas Creek (0+00-390+00), Ross Creek (0+00-86+30), Calabazas Creek (35+00-105+00), and San Tomas

[1] Weather Forecasts. No phase of the project may be started if that phase and its associated erosion control measures cannot be completed prior to the onset of a storm event if that construction phase may cause the introduction of sediments into the stream. Seventy-two-hour weather forecasts from the National Weather Service or other localized and more detailed weather forecast service will be consulted prior to start up of any phase of the project that may result in sediment runoff to a stream.

BMP Number	BMP Title	BMP Description
		Aquino Creek (80+00-100+00) ~~can continue~~ with the following conditions: o site conditions are dry and access for all construction equipment and vehicles will not impact waterways; and ~~o~~ all work will stop if any rainfall is forecast for the next 72 hour period. 3. Work may occur after a significant rainfall event but no later than December 31. 4. Sites must be maintained in a rapidly winterizable[2] state (implement control measures BMP GEN-20). Bank stabilization projects may continue until the approved date stated below. Prior to a forecasted significant rainfall event (0.5 in/24 hrs), all incomplete bank stabilization projects must be winterized. 1. In Creeks Supporting Anadromous Fish o An extended work window may occur until October 31st for bank stabilization projects that will be 50% complete by October 15th. 2. In Creeks Not Supporting Anadromous Fish o An extended work window may occur until November 30th for projects that will be 50% complete by October 15th or until significant rainfall. o An extended work window may occur until November 30th for new bank stabilization projects that will be completed in five (5) days or less, or until significant rainfall. ▪ Instream hand pruning and hand removal of vegetation will occur year round, except when: o Wheeled or tracked equipment needs to access the site by crossing a creek, ponded area, or secondary channel; or o Work occurs in streams that support steelhead. In these streams instream vegetation maintenance will cease on December 31 or when local rainfall greater than 0.5 inches is predicted within a 24-hour period of planned activities, whichever happens first. Modification and removal of instream large woody debris will occur at any time of the year, and as further described in the NMFS Biological Opinion.
GEN-2	Instream Herbicide Application Work Window	Instream herbicide applications will take place between June 15 and October 31 for streams with steelhead, and June 15 to December 31 for non-steelhead streams or until the first occurrence of any of the following conditions; whichever happens first: ▪ local rainfall greater than 0.5 inches is forecasted within a 24-hour period from planned application events; or ▪ when steelhead begin upmigrating and spawning in the 14 steelhead creeks, as determined by a qualified biologist (typically in November/December), o A qualified biologist will determine presence/absence of sensitive resources in designated herbicide use areas and develop site-specific control methods (including the use of approved herbicide and surfactants). Proposed herbicide use would be limited to the aquatic formulation of glyphosate (Rodeo or equal). Surfactant use would be limited to non-ionic products, such as Agri-dex, Competitor, or another brand name using the same ingredients. Any modifications to these materials would require review and approval by NMFS and CDFG.

[2] Winterization is the process to maintain work sites with the appropriate BMP's to prevent erosion, sediment transport, and protect water quality. Winterization occurs upon completion of bank repairs or on incomplete projects after October 15 and prior to the forecast of significant rainfall, 0.5 inches or greater of local watershed rainfall within 24 hours. Winterization shall be completed prior to the occurrence of such actual significant rainfall.

BMP Number	BMP Title	BMP Description
		o A qualified fisheries biologist will review proposed herbicide application methods and stream reaches. The fisheries biologist would conduct a pre-construction survey (and any other appropriate data research) to determine whether the proposed herbicide application is consistent with SMP approvals concerning biological resources and determine which BMPs would be instituted for work to proceed. In addition, herbicide application requirements are as follows: ▪ no direct application into water; ▪ herbicide application shall not occur when wind conditions may result in drift; ▪ herbicide shall only be applied after the surfactant has a "wet" appearance on the target plants in order to avoid run off; and ▪ where permitted, surfactants shall be added to the spray solution prior to application.
GEN-3	Avoid Exposing Soils with High Mercury Levels	Sediment removal and bank stabilization projects in portions of the Guadalupe River watershed affected by historic mercury mining may expose soils containing mercury. 1. In specified maintenance reaches in the Guadalupe River Basin, soils that are likely to be disturbed or excavated shall be tested for mercury (Hg). Soils shall be remediated if: a. disturbed or excavated soils exposed to streamflow below the elevation of the 2.33-year flow event exceed 1 ppm Hg; or b. disturbed or excavated soils above the 2.33-year flow level exceed 20 ppm Hg. 2. Remediation may be accomplished either by: a. treating the site so that contaminated soils excavated for the purpose of bank stabilization shall not be susceptible to erosion; or b. further excavating contaminated soils and replacing them with clean fill or other bank stabilization materials that are free from contaminants. c. Soils with mercury concentrations exceeding 20 mg/kg shall be removed and disposed of in a Class I landfill following established work practices and hazard control measures. Soils with mercury concentrations less than 20 mg/kg will remain at the project site. 3. To ensure worker safety during sediment removal and bank stabilization projects with elevated mercury concentrations in the exposed surfaces, personal protective equipment will be required during project construction to maintain exposure below levels established by the Occupational Safety and Health Agency (OSHA).

Biological Resources

GEN-4	Minimize the Area of Disturbance	To minimize impacts to natural resources, soil disturbance will be kept to the minimum footprint necessary to complete the maintenance operation.
GEN-5	Mitten Crab Control Measure	Sediment from the San Francisco Bay Watershed, including that for reuse, cannot be moved to areas any farther south than Coyote Creek Golf Drive in south San Jose, and the intersection of McKean and Casa Loma Roads.
GEN-6	Minimize Impacts to Nesting Birds via Site Assessments and Avoidance Measures	1. For activities occurring between January 15 and August 31, project areas will be checked by a qualified biologist or Designated Individuals (DI – for limited ground nesting species surveys) for nesting birds within 2 weeks prior to starting work. If a lapse in project-related work of 2 weeks or longer occurs, another focused survey will be conducted before project work can be reinitiated. 2. If nesting birds are found, a buffer will be established around the nest and maintained until the young have

BMP Number	BMP Title	BMP Description
		fledged. Appropriate buffer widths are 0.5 mile for bald and golden eagles; 250 feet for other raptors and the least Bell's vireo, herons, and egrets; 25 feet for ground-nesting non-raptors; and 50 feet for non-raptors nesting on trees, shrubs and structures. A qualified biologist may identify an alternative buffer based on a site specific-evaluation. No work within the buffer will occur without written approval from a qualified biologist, for as long as the nest is active. 3. All vegetation management, sediment reuse, road grading, or other SMP activities in or immediately adjacent to suitable California clapper rail or Alameda song sparrow nesting habitat, as determined by a qualified biologist, shall not be conducted prior to September 1 (the non-nesting season). 4. If a pre-activity survey in high-quality San Francisco common yellowthroat breeding habitat (as determined by a qualified biologist) identifies more singing male San Francisco common yellowthroats than active nests, then the inconspicuous nests of this species might have been missed. In that case, maintenance activities in that area shall be delayed until the San Francisco common yellowthroat non-breeding season (i.e., August 16–March 14). 5. The boundary of each buffer zone will be marked with fencing, flagging, or other easily identifiable marking if work will occur immediately outside the buffer zone. 6. All protective buffer zones will be maintained until the nest becomes inactive, as determined by a qualified biologist. 7. If monitoring shows that disturbance to actively nesting birds is occurring, buffer widths will be increased until monitoring shows that disturbance is no longer occurring. If this is not possible, work will cease in the area until young have fledged and the nest is no longer active.
GEN-6.5	Protection of Nesting Least Bell's Vireos	1. To the extent feasible, SMP activities within woody riparian habitat along portions of lower Llagas Creek downstream from Highway 152, the Pajaro River from Llagas Creek downstream, and lower Uvas/Carnadeo Creek downstream from Hecker Pass Road shall be scheduled to occur outside of the least Bell's vireo nesting season (March 15 – July 31). 2. For activities within woody riparian habitat along the aforementioned creek reaches that will occur between March 15 and July 31, any work will be preceded by a focused survey for least Bell's vireos. Pre-activity surveys will consist of two site visits, conducted on separate days within 14 days before the initiation of maintenance activities in the given area, with at least one of these surveys occurring within 7 days before the initiation of such activities. Surveys will be conducted between dawn and 11:00 a.m., during mild weather conditions (i.e., not during excessive cold, heat, wind, or rain), within all riparian habitat in and within 250 feet of any proposed maintenance location along these reaches. The surveys will be conducted by a qualified biologist who is familiar with the visual and auditory identification of this species. 3. To minimize impacts to nesting least Bell's vireos and other birds, the biologist will not initially be looking for Bell's vireo nests during these surveys. Rather, the biologist will look and listen for individual vireos. If a least Bell's vireo is detected, it will be observed to determine whether it is actively nesting. The biologist will note the nest location, or if finding the actual nest could result in excessive disturbance or risk damaging the nest, the biologist will determine the approximate location, based on observation of birds carrying nesting material, carrying food, or repeatedly visiting a certain area. 4. If an active nest is found, a minimum 250-foot no-activity buffer will be established around the nest. If a territorial male is found but no nest can be detected, then the approximate centroid of the bird's area of activity will be the point from which the buffer will be applied. The required buffer may be reduced in areas where

BMP Number	BMP Title	BMP Description
		dense riparian forest occurs between the construction activities and the active nest or where sufficient barriers or topographic relief exists to protect the nest from excessive noise or other disturbance. The biologist will coordinate with the USFWS and CDFG to evaluate exceptions to the minimum no-activity buffer distance on a case-by-case basis. 5. No work will occur within the buffer without verification by a biologist that the nest is inactive and until any fledged young are no longer dependent on adults for food.
GEN-7	Protection of Burrowing Owls	1. Work within 250 feet of an occupied burrow will be delayed until after the nesting season. 2. If suitable burrowing owl habitat is identified where mowing is proposed, or active burrows are found, they will be marked in such a way that the mower can identify the locations of such burrows. Mowing can then occur anywhere beyond the 250 foot buffer zone. Within the 250 foot buffer zone mowing may be done to within 10 feet of an active burrow provided there are~~is~~ no burrowing owls active on the surface. An on-site monitor will observe the area in front of the mower from a safe vantage point while it is in operation. In areas within 10 ft of active burrows the vegetation may be removed by hand (e.g., weed-whackers). All mowing and hand-removal of vegetation within 250 ft of a burrow will be done as quickly as possible to minimize disturbance of burrowing owls. 3. All markers will be removed once mowing is complete. 4. For burrow destruction work, all burrows within the 250-foot buffer zone around known, occupied burrows will be inspected with a burrow camera prior to destruction to ensure no entrapment of burrowing owls. Burrows that are difficult to inspect due to intricate subterranean configuration or depth will be inspected in stages where the uninspected section of the burrow will be protected while the previously inspected section is excavated. If maintenance activities will directly impact occupied burrows the District will consult with the DFG and FWS on establishing alternative burrows (including artificial burrows) and a process for removing owls from the active burrow. No burrowing owls will be evicted from burrows during the nesting season.
GEN-8	Protection of Sensitive Fauna Species from Herbicide Use	Approved herbicides and adjuvants may be applied in habitat areas for sensitive wildlife species (including steelhead, California red-legged frog, California tiger salamander, salt marsh harvest mouse, and Bay checkerspot butterfly); all applications will occur in accordance with federal and state regulations. For sprayable or dust formulations: when the air is calm or moving away from sensitive wildlife habitat, applications will commence on the side nearest the habitat and proceed away from the habitat. When air currents are moving toward habitat, applications will not be made within 200 yards by air or 40 yards by ground upwind from occupied habitat. However, these distances may be modified for the control of invasive species on salmonid streams if the following measures are implemented: ▪ A qualified biologist will determine presence/absence of sensitive resources in designated herbicide use areas and develop site-specific control methods (including the use of approved herbicide and surfactants). Proposed herbicide use would be limited to the aquatic formulation of glyphosate (Rodeo or equal). Surfactant use would be limited to non-ionic products, such as Agri-dex, Competitor, or another brand name using the same ingredients. Any modifications to these materials would require review and approval by NMFS and CDFG. ▪ A qualified fisheries biologist will review proposed herbicide application methods and stream reaches. The fisheries biologist would conduct a pre-construction survey (and any other appropriate data research) to determine whether the proposed herbicide application is consistent with SMP approvals concerning

BMP Number	BMP Title	BMP Description
		biological resources and determine which BMPs would be instituted for work to proceed.
GEN-9	Avoid Impacts to Special-Status Plant Species and Sensitive Natural Vegetation Communities	A qualified botanist will identify special status plant species and sensitive natural vegetation communities and clearly map or delineate them as needed in order to avoid and/or minimize disturbance, using the DFG protocols and the *CNPS Botanical Survey Guidelines* to formulate the following protocols: 1. A qualified botanist will use the GIS database, CNDDB, and/or other suitable tools to identify special status plants and sensitive natural vegetation communities located within or near work areas. 2. Surveys of areas identified as sensitive natural communities or suitable habitat for special status plant species will be conducted by a qualified botanist prior to commencement of work. 3. Surveys will be conducted during the appropriate time of the year to adequately identify special-status plants that could occur on the site of proposed maintenance activities. 4. The qualified botanist will ensure avoidance and/or minimize impacts by implementing one or more of the following, as appropriate, per the botanist's recommendation: a) Flag or otherwise delineate in the field the special status plant populations and/or sensitive natural community to be protected; b) Allow adequate buffers around plants or habitat; the location of the buffer zone will be shown on the maintenance design drawings and marked in the field with stakes and/or flagging in such a way that exclusion zones are visible to maintenance personnel without excessive disturbance of the sensitive habitat or population itself (e.g., from installation of fencing). c) Time construction or other activities during dormant and/or non-critical life cycle period; d) Store removed sediment off site; and e) Limit the operation of maintenance equipment to established roads whenever possible. 5. No herbicides, terrestrial or aquatic, will be used in areas identified as potential habitat for special status plant~~s~~ species or containing sensitive natural communities, until a qualified botanist has surveyed the area and determined the locations of special status plant species present. 6. If special status plant species or sensitive communities are present, then a qualified botanist will determine if a given type of vegetation management method is ecologically appropriate for a given area. Alternative strategies based on the botanist's recommendations will be coordinated with appropriate staff. 7. All impacts to sensitive natural communities and special status plants identified by the qualified botanist will be avoided and/or minimized
GEN-10	Avoid Impacts to Bay Checkerspot Butterfly and Associated Critical Habitat	1. Areas supporting Bay checkerspot larval host plants will be identified by a qualified botanist and protected from disturbance to the extent feasible, by establishing buffer zones around individual plants or populations. The size of the buffer will be determined by a qualified botanist; the actual distance will depend on the plant species potentially affected and the type of disturbance. No herbicide will be applied to the buffer area, and to the extent feasible, maintenance personnel and equipment will not operate within such areas. 2. Herbicides may be used in serpentine areas that do not contain Bay checkerspot butterfly larval host plants or sensitive plant species and habitat when approved by a qualified botanist and for the following maintenance purposes: a) To protect sensitive species and habitat; b) To manage for control of invasive and non-native plants; and/or c) To maintain access to a facility.
GEN-11	Protection of Salt Marsh	1. A District qualified biologist will conduct a desk audit to determine whether suitable Salt Marsh Harvest Mouse

BMP Number	BMP Title	BMP Description
	Harvest Mouse and California Clapper Rail	(SMHM) or California Clapper Rail (CCR) habitat is present in or adjacent to a maintenance activity. 2. Within 7 days prior to work within the range of the Salt Marsh Harvest Mouse (SMHM) or California Clapper Rail (CCR), as depicted on the District's GIS layers, the proposed project area will be surveyed by a qualified biologist to identify specific habitat areas. Surveyed areas will include work locations and access routes. 3. To minimize or avoid the loss of individuals, activities within or adjacent to California clapper rail and salt marsh harvest mouse habitat will not occur within two hours before or after extreme high tides (6.5 feet or above) when the marsh plain is inundated, because protective cover for those species is limited and activities could prevent them from reaching available cover. 4. Specific habitat areas are vegetated areas of cordgass (*Spartina* spp), marsh gumplant (*Grindelia* spp.), pickleweed (*Sarcocornia pacifica*), alkali heath, (*Frankenia* sp.), and other high marsh vegetation, brackish marsh reaches of creek with heavy accumulations of bulrush thatch (old stands), and high water refugia habitat that may include annual grasses, and shrubs immediately adjacent to channels. 5. Within the identified specific habitat areas, vegetation will be removed by hand from areas to be directly impacted by the work activities if possible (hand removal of vegetation in some channels may not be possible). 6. Prior to the initiation of work each day for all vegetation management work, ground or vegetation disturbance, operation of large equipment, grading, sediment removal, and bank stabilization work and prior to expanding the work area, if suitable habitat occurs within the immediate work area, a qualified biologist will conduct a pre-construction survey of all suitable habitat that may be directly or indirectly impacted by the day's activities (work area, access routes, staging areas). a. If during the initial daily survey or during work activities a CCR is observed within or immediately adjacent to the work area (50 feet), initiation of work will be delayed until the CCR leaves the work area. b. If during the initial daily survey or during work activities a SMHM or similar rodent is observed within or immediately adjacent to the work area (50 feet), initiation of work will be delayed until a *Site Specific Species Protection Form* can be developed and implemented by a qualified biologist to protect the SMHM or similar rodent is developed and implemented by the qualified biologist. Acceptable plan activities may include one or more of the following activities: 1) establishment of a buffer zone at least 50 feet in radius from the rodent; 2) ongoing active monitoring, 3) construction of silt fence barrier between maintenance work and location of the rodent, 4) delay of work activity until the qualified biologist can contact DFG and USFWS for additional direction. 7. Mowing using heavy equipment (tractors, boom mowers, rider mowers) will not be conducted in habitat areas or within 50 feet of habitat areas. If mowing with hand equipment is necessary within 50 feet of habitat areas, an on-site monitor will observe the area in front of the mower from a safe vantage point while it is in operation. If SMHM are detected within the area to be mown, no mowing will occur in that area. If CCR are detected within the area to be mown, the mowing will stop until the individual(s) have left the work area. 8. See ANI-2 for additional restrictions.
GEN-12	Protection of Special-Status Amphibian and Reptile Species	1. A District qualified biologist will conduct a desk audit to determine whether suitable special-status amphibian or reptile habitat is present in or adjacent to a maintenance activity. 2. If the District Wildlife or Fisheries Biologist determines that a special-status amphibian or reptile could occur in the activity area, a qualified biologist will conduct one daytime survey within a 7 day period preceding the onset

BMP Number	BMP Title	BMP Description
		of maintenance activities. a. If a special-status amphibian or reptile, or the eggs or larvae of a special status amphibian or reptile, are found within the activity area during a pre-activity survey or during project activities, the qualified biologist shall notify the project proponent about the special-status species and conduct the following work specific activities: i. For minor maintenance activities and for vegetation removal activities that will take less than 1 day, the qualified biologist shall conduct a special status species survey on the morning of and prior to the scheduled work. A. If no special status species is found, the work may proceed. B. If eggs or larvae of a special status species are found, a buffer will be established around the location of the eggs/larvae and work may proceed outside of the buffer zone. No work will occur within the buffer zone. Work within the buffer zone will be rescheduled until the time that eggs have hatched and/or larvae have metamorphosed. C. If an active western pond turtle nest is detected within the activity area, a 50-foot buffer zone around the nest will be established and maintained during the breeding and nesting season (April 1 – August 31). The buffer zone will remain in place until the young have left the nest, as determined by a qualified biologist. D. If adults or non-larval juveniles of a special status species are found, one of the following two procedures will be implemented: i. If, in the opinion of the qualified biologist, capture and removal of the individual to a safe place outside of the work area is less likely to result in adverse effects than leaving the individual in place and rescheduling the work (e.g., if the species could potentially hide and be missed during a follow-up survey), the individual will be captured and relocated by a qualified biologist (with USFWS and/or CDFG approval, depending on the listing status of the species in question), and work may proceed. ii. If, in the opinion of the qualified biologist, the individual is likely to leave the work area on its own, and work can be feasibly rescheduled, a buffer will be established around the location of the individual(s) and work may proceed outside of the buffer zone. No work will occur within the buffer zone. Work within the buffer zone will be rescheduled. ii. For minor maintenance and vegetation removal activities that will take more than 1 day, the qualified biologist shall conduct a special-status species survey on each morning of and prior to the scheduled work commencing. E. If eggs or larvae of a special status species are found, a buffer will be established around the location of the eggs/larvae and work may proceed outside of the buffer zone. No work will occur within the buffer zone. Work within the buffer zone will be rescheduled until the time that eggs have hatched and/or larvae have metamorphosed. F. If an active western pond turtle nest is detected within the activity area, a ~~25~~50 ft-buffer zone around the nest will be established and maintained during the breeding and nesting season (April 1 – August 31). The buffer zone will remain in place until the young have left the nest, as determined by a qualified biologist. G. If adults or non-larval juveniles of a special status species are found, the individual will be captured and relocated by a qualified biologist (with USFWS and/or CDFG approval,

BMP Number	BMP Title	BMP Description
		depending on the listing status of the species in question), and work may proceed. iii. For Sediment Removal and Bank Stabilization Projects the wildlife or fisheries biologist in cooperation with the project proponent shall complete a *Site Specific Species Protection Form for the project*. Elements of the form include: work rescheduling, training work crews, daily surveys, establishment of buffers and buffer fencing, on-site monitoring, habitat modification in advance of work activities, capture and relocation of individual special-status species, methods of documentation, and reporting of results. b. If no special status amphibian or reptile is found within the activity area during a pre-activity survey, the work may proceed. c. During animal conflict management activities, if special status species are found within a burrow proposed for destruction, a qualified biologist will determine an appropriate buffer distance around that burrow to ensure adequate protection of the habitat. The buffer area may include not destroying adjacent burrows as that may damage subterranean networks of the occupied burrow or produce substrate vibrations which could interfere with prey detection mechanisms. If two consecutive follow up surveys are conducted (spaced 30 days apart) in which the burrow is found to be unoccupied, work can proceed as planned. A naturally found back filled burrow known to have been inhabited by a special-status species will be presumed to still be occupied by that species and a clearly delineated buffer demarcation of the burrow area will be in place for the duration of nearby work activities. In rare instances in which destruction of the burrow is not avoidable during animal conflict management, the animal will be relocated to a safe burrow outside the impact area, with USFWS and/or CDFG approval, depending on the listing status of the species in question. A biologist will observe the relocated animal until it is certain that the animal is not in immediate danger of desiccation or predation.
GEN-13	Protection of Bat Colonies	1. A District Wildlife Biologist will conduct a desk audit to determine whether suitable habitat (appropriate roost trees or anthropogenic structures) is present for bat colonies within 100 feet of the work site, staging areas, or access routes. 2. If potential bat colony habitat is determined to be present, within two weeks prior to the onset of work activities a qualified biologist will conduct a survey to look for evidence of a bat use. If evidence is observed, or if potential roost sites are present in areas where evidence of bat use might not be detectable (such as a tree cavity), an evening survey and/or nocturnal acoustic survey may be necessary to determine if the bat colony is active and to identify the specific location of the bat colony. 3. If an active bat maternity colony is present then the qualified biologist will make the following determinations: a. The work can proceed without unduly disturbing the bat colony b. There is a need for a buffer zone to prevent disturbance to the bat colony, and implementation of the buffer zone (determined on a case-by-case basis by a qualified biologist) will reduce or eliminate the disturbance to an acceptable level. c. Work cannot proceed without unduly disturbing the bat colony; thus, the work will be postponed until after July 31. 4. If a non-breeding bat hibernaculum is found in a tree or structure that must be removed or physically disturbed, the qualified biologist will consult with DFG prior to initiating any removal or exclusion activities.
GEN-14	Protection of San Francisco Dusky-footed Woodrat	1. Prior to work within riparian, oak woodland, or coyote brush scrub habitat, or the removal of any oak trees outside these habitats, a District Wildlife Biologist will conduct a desk audit to determine whether woodrats

BMP Number	BMP Title	BMP Description
		could be present within suitable habitat for San Francisco dusky-footed woodrat or is known to be present in or adjacent to a maintenance activity site. 2. If the District Wildlife Biologist determines that no San Francisco dusky-footed woodrat habitat is present, or there is habitat present but will not be affected by the maintenance activity, then no further action is required. 3. If the District Wildlife Biologist determines that suitable San Francisco dusky-footed woodrat habitat is present and may be affected by the maintenance activity, a qualified biologist shall conduct a pre-activity survey within 2 weeks prior to the start of work to determine if woodrat nests are in, or within 5 feet of, the immediate activity area. a. If woodrat nests are present at the site and will be affected by the work activity area, the District Wildlife Biologist in cooperation with the project proponent will evaluate the site specific situation. The Wildlife Biologist will then develop a site specific woodrat management plan to first avoid and second minimize take or injury of the woodrat(s). The woodrat management plan may include: establishment of buffers zones, installation of buffer zone fences, relocation of the woodrat nest, removal of the woodrat nest, and/or construction of artificial nests. Consideration will be given to the number of woodrat nests that may be affected by the work activity and the number in the project vicinity that may not be affected.
GEN-15	Salvage Native Aquatic Vertebrates from Dewatered Channels	If fisheries or native aquatic vertebrates are present when cofferdams, water bypass structures, and silt barriers are to be installed, a fish and native aquatic vertebrate relocation plan shall be implemented to ensure that fish and native aquatic vertebrates are not stranded. Relocation efforts will be based on the District's Fish Relocation Guidelines. Streams that support a sensitive species (i.e. steelhead) will require a relocation effort and/ or initial onsite monitoring by a qualified biologist depending on seasonal conditions: 1. In non-tidal channels, where water is to be diverted, prior to the start of work or during the installation of water diversion structures, native aquatic vertebrates shall be captured in the work area and transferred to another reach as determined by a qualified biologist. Timing of work in streams that supports a significant number of amphibians will be delayed until metamorphosis occurs to minimize impacts to the resource. Capture and relocation of aquatic native vertebrates is not required at individual work sites when site conditions preclude reasonably effective operation of capture gear and equipment. 2. Aquatic invertebrates will not be transferred (other than incidental catches) because of their anticipated abundance and colonization after completion of the repair work.
GEN-15.5	Avoidance of Impacts on the San Joaquin Kit Fox	1. A qualified District biologist will conduct a desk audit to determine whether an SMP activity will occur in an area where the San Joaquin kit fox could potentially occur (i.e., roughly east of Frazier Lake Road and south of Bloomfield Avenue), and in potential habitat for the species. 2. If the District biologist determines that an SMP activity could occur in an area that could potentially support a kit fox, the SCVWD will implement applicable pre-activity surveys and other measures in accordance with the USFWS's *San Joaquin Kit Fox Survey Protocol for the Northern Range*, as follows: a) Conduct a preconstruction/pre-activity survey no less than 14 days and no more than 30 days prior to the beginning of project implementation. Surveys shall identify kit fox habitat features on the project site and evaluate use by kit fox and, if possible, and assess the potential impacts to the kit fox by the proposed activity. The status of all dens shall be determined and mapped in accordance with the survey protocol. b) If a natal/pupping den is discovered within the project area or within 200 feet of the project boundary,

BMP Number	BMP Title	BMP Description
		the USFWS shall be immediately notified. Disturbance to all San Joaquin kit fox dens should be avoided to the maximum extent possible. Destruction of any known or natal/pupping kit fox den would require take authorization from the USFWS. c) The project proponent will establish exclusion zones around the kit fox dens, if determined to be present. The configuration of the exclusion should have a radius measured outward from the entrance or cluster of entrances. The following radii are minima to be applied: ▪ Potential den: 50 feet ▪ Known den: 100 feet ▪ Natal/pupping den: Service must be contacted (occupied and unoccupied) ▪ Atypical den: 50 feet. 3. If take of the San Joaquin kit fox will occur, take authorization from the USFWS and CDFG will be necessary.

General Maintenance Practices

GEN-16	In-Channel Minor Activities	For in-channel minor work activities, work will be conducted from the top of the bank if access is available and there are flows in the channel.
GEN-17	Employee/Contractor Training	All appropriate District staff and contractors will receive annual training on Stream Maintenance Program BMPs. The training will also include an overview of special-status species identification and habitat requirements. District staff and contractors will receive fact sheets to assist with in-the-field identification of special-status species and their habitats.
GEN-18	Paperwork Required On-site	1. Copies of regulatory permits related to the Stream Maintenance Program will be kept on-site and available for review, if requested by regulatory personnel. 2. Copies of the Stream Maintenance Program Manual and this BMP Manual will be kept on-site.
GEN-19	Work Site Housekeeping	1. District employees and contractors will maintain the work site in neat and orderly conditions on a daily basis, and will leave the site in a neat, clean, and orderly condition when work is complete. 2. Slash, sawdust, cuttings, etc. will be removed to clear the site of vegetation debris. As needed, paved access roads and trails will be swept and cleared of any residual vegetation or dirt resulting from the maintenance activity. 3. For activities that last more than one day, materials or equipment left on the site overnight will be stored as inconspicuously as possible, and will be neatly arranged. Any materials and equipment left on the site overnight will be stored to avoid erosion, leaks, or other potential impacts to water quality (see BMPs GEN-24). 4. The District's maintenance crews are responsible for properly removing and disposing of all debris incurred as a result of construction within 72 hours of project completion. 5. All trash that is brought to a project site during maintenance activities (e.g., plastic water bottles, plastic lunch bags, cigarettes) will be collected at the site daily.
GEN-20	Erosion and Sediment Control Measures	1. Soils exposed due to maintenance activities will be seeded and stabilized using hydroseeding, straw placement, mulching, and/or erosion control fabric. These measures will be implemented such that the site is stabilized and water quality protected prior to significant rainfall. The channel bed and areas below the Ordinary High Water Mark (OHWM) are exempt from this BMP. 2. The preference for erosion control fabrics will be to consist of natural fibers; however, steeper slopes and areas that are highly erodible may require more structured erosion control methods. No non-porous fabric will

BMP Number	BMP Title	BMP Description
		be used as part of a permanent erosion control approach. Plastic sheeting may be used to temporarily protect a slope from runoff, but only if there are no indications that special-status species would be impacted by the application. 3. Erosion control measures will be installed according to manufacturer's specifications. 4. Appropriate measures include, but are not limited to, the following: o Silt Fences o Straw Bale Barriers o Brush or Rock Filters o Storm Drain Inlet Protection o Sediment Traps o Sediment Basins o Erosion Control Blankets and Mats o Soil Stabilization (i.e. tackified straw with seed, jute or geotextile blankets, etc.) o Wood chips o Straw mulch 5. All temporary construction-related erosion control methods shall be removed at the completion of the project (e.g. silt fences). 6. Surface barrier applications installed as a method of animal conflict management, such as chain link fencing, woven geotextiles, and other similar materials, will be installed no longer than 300 feet, with at least an equal amount of open area prior to another linear installation; and only on one side of levee slopes. Inboard and outboard areas will only have installations set in an alternating pattern, such that no inboard and outboard levee faces would have erosion control blankets along the same levee stationing.
GEN-21	Staging and Stockpiling of Materials	1. To protect on-site vegetation and water quality, staging areas should occur on access roads, surface streets, or other disturbed areas that are already compacted and only support ruderal vegetation. Similarly, all maintenance equipment and materials (e.g., road rock and project spoil) will be contained within the existing service roads, paved roads, or other pre-determined staging areas. 2. Building materials and other maintenance-related materials, including chemicals and sediment, will not be stockpiled or stored where they could spill into water bodies or storm drains. Materials will not be stockpiled longer than seven (7) calendar days. 3. No runoff from the staging areas may be allowed to enter water ways, including the creek channel or storm drains, without being subjected to adequate filtration (e.g., vegetated buffer, swale, hay wattles or bales, silt screens). 4. The discharge of decant water to water ways from any on-site temporary sediment stockpile or storage areas is prohibited. 5. Wet material removed from an isolated creek reach may be pulled to the side of the channel (within the channel and below top of bank) and allowed to naturally drain prior to removal from the channel. Pulled material will be removed from the channel prior to deactivation of the site or forecast of rain. 6. During the wet season, no stockpiled soils will remain exposed, unless surrounded by properly installed and maintained (i.e., per manufacturer specifications) silt fencing or other means of erosion control. During the dry season; exposed, dry stockpiles will be watered, enclosed, covered, or sprayed with non-toxic soil

BMP Number	BMP Title	BMP Description
		stabilizers (GEN-24). 7. All pipes, culverts, or similar structures stored at a site within sensitive species areas, for one or more overnight periods shall be securely capped prior to storage or inspected before the pipe is subsequently moved. If any potential special-status species are observed within a pipe, a District biologist shall be consulted on what steps should be taken to protect the species. If a District biologist is on-site, they may remove the special status species from the pipes and relocate to the nearest appropriate and unaffected habitat.
GEN-22	Sediment Transport	To prevent sediment-laden water from being released back into waterways during transport of spoils to disposal locations, truck beds will be lined with an impervious material (e.g., plastic), or the tailgate blocked with wattles, hay bales, or other appropriate filtration material. Trucks may then drain excess water by slightly tilting the loads and allowing the water to drain out through the applied filter, but only within the active project area of the creek where the sediment is being loaded into the trucks or within an identified vegetated area (swale) that is separated from the creek.
GEN-23	Stream Access	District personnel will use existing access ramps and roads to the extent feasible. If necessary to avoid large mature trees, native vegetation, or other significant habitat features, temporary access points will be constructed in a manner that minimizes impacts according to the following guidelines: 1. Temporary access points will be constructed as close to the work area as possible to minimize equipment transport 2. In considering channel access routes, slopes of greater than 20 percent will be avoided, if possible. 3. Any temporary fill used for access will be removed upon completion of the project and pre-project topography will be restored to the extent possible. 4. When temporary access is removed, disturbed areas will be revegetated or filled with compacted soil, seeded, and/or stabilized with erosion control fabric immediately after construction to prevent future erosion. 5. Personnel will use the appropriate equipment for the job that minimizes impacts and disturbance to the stream bottom. Appropriately-tired vehicles, either tracked or wheeled, will be used depending on the site and maintenance activity.
GEN-24	On-Site Hazardous Materials Management	1. An inventory of all hazardous materials used (and/or expected to be used) at the worksite and the end products that are produced (and/or expected to be produced) after their use will be maintained by the worksite manager. 2. As appropriate, containers will be properly labeled with a “Hazardous Waste” label and hazardous waste will be properly recycled or disposed of off-site. 3. Contact of chemicals with precipitation will be minimized by storing chemicals in watertight containers with appropriate secondary containment to prevent any spillage or leakage. 4. Quantities of toxic materials, such as equipment fuels and lubricants, will be stored with secondary containment that is capable of containing 110% of the primary container(s). 5. Petroleum products, chemicals, cement, fuels, lubricants, and non-storm drainage water or water contaminated with the aforementioned materials will not contact soil and not be allowed to enter surface waters or the storm drainage system. 6. All toxic materials, including waste disposal containers, will be covered when they are not in use, and located as far away as possible from a direct connection to the storm drainage system or surface water. 7. Sanitation facilities (e.g., portable toilets) will be placed outside of the creek channel and floodplain. Direct

BMP Number	BMP Title	BMP Description
		connections with soil, the storm drainage system, and surface waters will be avoided. 8. Sanitation facilities will be regularly cleaned and/or replaced, and inspected daily for leaks and spills.
GEN-25	Existing Hazardous Materials	If hazardous materials, such as oil, batteries or paint cans, are encountered at the maintenance sites, the District will carefully remove and dispose of them according to applicable regulatory requirements. District staff will wear proper protective gear and store the waste in appropriate hazardous waste containers until it can be disposed at a hazardous waste facility.
GEN-26	Spill Prevention and Response	The District will prevent the accidental release of chemicals, fuels, lubricants, and non-storm drainage water into channels following these measures: 1. District field personnel will be appropriately trained in spill prevention, hazardous material control, and clean up of accidental spills. 2. Equipment and materials for cleanup of spills will be available on site and spills and leaks will be cleaned up immediately and disposed of according to applicable regulatory requirements. 3. Field personnel will ensure that hazardous materials are properly handled and natural resources are protected by all reasonable means. 4. Spill prevention kits will always be in close proximity when using hazardous materials (e.g., at crew trucks and other logical locations). All field personnel will be advised of these locations. 5. District staff will routinely inspect the work site to verify that spill prevention and response measures are properly implemented and maintained. *Spill Response Measures:* For small spills on impervious surfaces, absorbent materials will be used to remove the spill, rather than hosing it down with water. For small spills on pervious surfaces such as soil, the spill will be excavated and properly disposed rather than burying it. Absorbent materials will be collected and disposed of properly and promptly. If a hazardous materials spill occurs that cannot be contained or cleaned up with the onsite materials, the onsite District field personnel will be responsible for immediately initiating an emergency response sequence by notifying the proper authorities (i.e., District Emergency Response (ER) Team and public fire and hazmat agencies) of the release; taking appropriate defensive steps from a safe distance to secure the site to minimize damage to people, environment, and property (PEP); and deferring all other response activities to public emergency response agencies and/or the District Emergency Response (ER) Team or District ER Contractor. Depending on the nature of the release, the District ER Team's actions will include: urgent (responding within 2 hours of notification) field response site reconnaissance, emergency sequence initiation, defensive containment, release control, incident command; or priority (non 2-hour) field response site reconnaissance and clean-up operations. If a "reportable" spill of petroleum products occurs, the District's Stream Maintenance Implementation Program Manager will be notified and action taken to contact the appropriate safety and cleanup crews. A reportable spill is defined as when: ▪ a film or sheen on, or discoloration of, the water surface or adjoining bank/shoreline is observed; or ▪ a sludge or emulsion is deposited beneath the surface of the water or adjoining banks/shorelines (40 Code of Federal Regulations 110); or when ▪ another violation of water quality standards is observed. A written description of the reportable release must be submitted to the appropriate Regional Water Quality Control

BMP Number	BMP Title	BMP Description
		Board and the California Department of Toxic Substances Control (DTSC). This submittal must contain a description of the release, including the type of material and an estimate of the amount spilled, the date of the release, an explanation of why the spill occurred, and a description of the steps taken to prevent and control future releases. If an appreciable spill has occurred, and results determine that project activities have adversely affected surface water or groundwater quality, a detailed analysis will be performed to the specifications of DTSC to identify the likely cause of contamination. This analysis will include recommendations for reducing or eliminating the source or mechanisms of contamination. Based on this analysis, the District or contractors will select and implement measures to control contamination, with a performance standard that surface and groundwater quality will be returned to baseline conditions. These measures will be subject to approval by the District, DTSC, and the Regional Water Quality Control Board.
GEN-27	Existing Hazardous Sites	Upon selection of maintenance project locations, the District will conduct a search for existing known contaminated sites, as part of its annual preparation of the Notice of Proposed Work (NPW), on the State Water Resource Control Board's GeoTracker Web site (http://www.geotracker.waterboards.ca.gov). The Geotracker search will only be performed for the District's ground disturbing activities. For any proposed ground disturbing maintenance sites located within 1,500 feet of any "open" sites where contamination has not been remediated, the District will contact the RWQCB case manager listed in the database. The District will work with the case manager to ensure maintenance activities would not affect cleanup or monitoring activities or threaten the public or environment.
GEN-28	Fire Prevention	1. All earthmoving and portable equipment with internal combustion engines will be equipped with spark arrestors. 2. During the high fire danger period (April 1–December 1), work crews will ~~: a) H~~have appropriate fire suppression equipment available at the work site.
GEN-29	Dust Management	The District will implement the Bay Area Air Quality Management District's (BAAQMD) required Dust Control Measures (http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20CEQA%20Guidelines%20May%202011.ashx?la=en). Current measures stipulated by the BAAQMD Guidelines include the following: 1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. 2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. 3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. 4. Water used to wash the various exposed surfaces (i.e., parking areas, staging areas, soil piles, graded areas, etc.) will not be allowed to enter the water way. 5. All vehicle speeds on unpaved roads shall be limited to 15 mph. 6. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. 7. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. 8. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's

BMP Number	BMP Title	BMP Description
		specifications. All equipment shall be checked by a certified visible emissions evaluator. 9. Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.
GEN-30	Vehicle and Equipment Maintenance	1. All vehicles and equipment will be kept clean. Excessive build-up of oil and grease will be prevented. 2. All equipment used in the creek channel will be inspected for leaks each day prior to initiation of work. Maintenance, repairs, or other necessary actions will be taken to prevent or repair leaks, prior to use. 3. Incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) will be checked for leaking oil and fluids. Vehicles or equipment visibly leaking operational fluids will not be allowed on-site. 4. No heavy equipment will operate in a live stream. This will not apply to activities for which no other option exists, such as sediment removal which cannot be conducted from top of bank, etc. In these cases, dewatering will be conducted as necessary, following the protocols in BMPs GEN-33 or GEN-34. 5. No equipment servicing will be done in the creek channel or immediate floodplain, unless equipment stationed in these locations cannot be readily relocated (i.e., pumps and generators). 6. If emergency repairs are required in the field, only those repairs necessary to move equipment to a more secure location, and that can be performed without releasing any material into the floodway or water, will be conducted in the channel or floodplain. 7. If necessary, all servicing of equipment done at the job site will be conducted in a designated, protected area to reduce threats to water quality from vehicle fluid spills. Designated areas will not directly connect to the ground, surface water, or the storm drain system. The service area will be clearly designated with berms, sandbags, or other barriers. Secondary containment, such as a drain pan, to catch spills or leaks will be used when removing or changing fluids. Fluids will be stored in appropriate containers with covers, and properly recycled or disposed of offsite.
GEN-31	Vehicle Cleaning	1. Equipment will be cleaned of any visible sediment or vegetation clumps before transferring and using in a different watershed to avoid spreading pathogens or exotic/invasive species. 2. Vehicle and equipment washing can occur on-site only as needed to prevent the spread of sediment, pathogens or exotic/invasive species. No runoff from vehicle or equipment washing is allowed to enter water bodies, including creek channels and storm drains, without being subjected to adequate filtration (e.g., vegetated buffers, straw wattles or bales, fiber rolls, and silt screens). The discharge of decant water from any on-site wash area to water bodies or to areas outside of the active project site is prohibited. Additional vehicle/equipment washing will occur at the approved wash area in the District's corporation yard.
GEN-32	Vehicle and Equipment Fueling	1. No fueling will be done in the channel (top-of-bank to top-of-bank) or immediate floodplain unless equipment stationed in these locations cannot be readily relocated (e.g., pumps and generators). 2. All off-site fueling sites (i.e., on access roads above the top-of-bank) will be equipped with secondary containment and avoid a direct connection to soil, surface water, or the storm drainage system. 3. For stationary equipment that must be fueled on-site, secondary containment, such as a drain pan or drop cloth, will be used to prevent accidental spills of fuels from reaching the soil, surface water, or the storm drain system.

BMP Number	BMP Title	BMP Description
Dewatering		
GEN-33	Dewatering for Non-Tidal Sites	When sediment removal and bank stabilization work area includes a flowing stream, the entire streamflow will be diverted around the work area by construction of a temporary dam and/or bypass. Where appropriate, stream flow diversions will occur via gravity driven systems. *A. Planning to avoid and minimize impacts to water quality and aquatic wildlife:* 1. For construction and monitoring of a stream flow bypass, the *Sediment Removal and Bank Stabilization Projects* checklist will be completed. 2. Recommendations by a qualified Fisheries Biologist to protect native fisheries and aquatic vertebrates will be incorporated into the bypass design. The recommendations may include but are not limited to: i. Screening the stream flow diversion source or pump to prevent entrainment of native fish or amphibian species. The screening dimensions will be appropriate to the species present. ii. Relocation of native aquatic vertebrates. This will include the methods to be used to capture and hold and move the aquatic vertebrates and a description of where the aquatic vertebrates will be relocated. 3. Depending on the channel configurations, sediment removal activities may occur where the flows are not bypassed around the work site as long as a berm is left between the work area and stream flows to minimize water quality impacts during excavation activities. The berm between the work and the live channel will be wide enough to prevent introduction of turbid water from the cell into the live channel. *B. Construction*: 1. The construction of facilities will be based on the water bypass plan. 2. Coffer dams will be installed both upstream and downstream of the work area to minimize impacts or the distance necessary to accomplish effective passive systems. 3. In streams where water may enter the construction site from downstream (reverse flow) additional coffer dams (downstream) may be necessary. When multiple coffer dams are constructed, the upstream dam will be constructed first. 4. Instream cofferdams will only be built from materials such as sandbags, earth fill, clean gravel, or rubber bladders which will cause little or no siltation or turbidity. 5. Plastic sheeting will be placed over k-rails, timbers, and earth fill to minimize water seepage into and out of the maintenance areas. The plastic sheets will be firmly anchored, using sandbags, to the streambed to minimize water seepage. 6. When pumping is necessary to dewater a work site, a temporary siltation basin and/or use of silt bags may be required to prevent sediment from re-entering the wetted channel. Pump intakes will be screened to prevent harm to aquatic wildlife. 7. If necessary to prevent erosion an energy dissipater will be constructed at the discharge point. 8. Timing of flow diversions will be coordinated with the completion of the dam structure to facilitate not drying up the downstream creek area and to minimize dry back conditions. *C. Implementation*: 1. Water flows downstream of the project site will be maintained to prevent stranding aquatic vertebrates.

BMP Number	BMP Title	BMP Description
		2. Water diverted around work sites and water detained by coffer dams will be protected from maintenance activity-related pollutants, such as soils, equipment lubricants or fuels. 3. The *Fish Relocation Guidelines* will be implemented to ensure that fish and other aquatic vertebrates are not stranded during construction and implementation of channel dewatering. a) Native aquatic vertebrates shall be captured in the work area and transferred to another reach as determined by a qualified biologist. Timing of work in streams that supports a significant number of amphibians will be delayed until metamorphosis occurs to minimize impacts to the resource. Capture and relocation of aquatic native vertebrates is not required at individual work sites when site conditions preclude reasonably effective operation of capture gear and equipment. b) Aquatic invertebrates will not be transferred (other than incidental catches) because of their anticipated abundance and colonization after completion of the repair work. 4. Filtration devices (silt bags attached to the end of discharge hoses and pipes to remove sediment from discharged water) or settling basins will be provided as necessary at discharge sites to ensure that the turbidity of discharged water is not visibly more turbid than the water in the channel upstream of the maintenance site. If increases in turbidity are observed, additional measures will be implemented such as a larger settling basin or additional filtration. If increases in turbidity persist, the District's Stream Maintenance Program Implementation Project Manager will be alerted since turbidity measurements may be required. 5. Water remaining in the work area will be removed by evaporation, seepage, or pumping. When pumping is required to dewater a site, the decanted water will be discharged with water bypassed around the site or in a separate erosion control – energy dissipation area/vegetated swale. The turbidity of discharged water will not be visibly more turbid than the receiving water. *Deconstruction*: 1. When maintenance is completed, the flow diversion structure will be removed as soon as possible. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to downstream habitat. 2. Removal will normally proceed from downstream in an upstream direction. 3. When diversion structures are removed, the ponded water will be directed back into the low-flow channel in a phased manner to minimize erosion and downstream water quality impacts. Normal flows will be restored. 4. The area disturbed by flow bypass mechanisms will be restored to the pre-project condition at the completion of the project (to the extent practical). This may include, but is not limited to, recontouring the area and planting of riparian vegetation.

BMP Number	BMP Title	BMP Description
GEN-34	Dewatering in Tidal Work Areas	For tidal areas, a downstream cofferdam will be constructed to prevent the work area from being inundated by tidal flows. 1. Installation of cofferdams and fish exclusion measures will be installed at low tide when the channel and project site are at their driest. 2. It is preferable to not use any bypass pipes when work is being conducted on one side of the channel, if~~s~~ isolated by the cofferdam, and flows can continue on the other side of the creek channel without entering the project area. 3. If downstream flows cannot be diverted around the project site, the creek waters will be transmitted around the site through cofferdam bypass pipes. Waters discharged through tidal cofferdam bypass pipes will not exceed 50 NTUs over the background levels of the tidal waters into which they are discharged. 4. Cofferdams in tidal areas may be made from earthen or gravel material. If earth is used, the downstream and upstream faces will be covered by a protected covering (e.g., plastic or fabric) if needed to minimize erosion. A protected covering or sheeting will be placed on the water side of an earthen coffer dam to protect water quality. 5. When maintenance is completed, the cofferdams and bypass pipes will be removed as soon as possible but no more than 72 hours after work is completed. Flows will be restored at a reduced velocity to minimize erosion, turbidity, or harm to downstream habitat.
GEN-35	Pump/Generator Operations and Maintenance	When needed to assist in channel dewatering, pumps and generators will be maintained and operated in a manner that minimizes impacts to water quality and aquatic species. 1. Pumps and generators will be maintained according to manufacturers' specifications to regulate flows to prevent dryback or washout conditions. 2. Pumps will be operated and monitored to prevent low water conditions, which could pump muddy bottom water, or high water conditions, which creates ponding. 3. All pump intakes will be screened. Pumps in steelhead creeks will be screened according to NMFS criteria (http://www.swr.noaa.gov/sr/fishscrn.pdf) to prevent entrainment of steelhead.
Public Safety		
GEN-36	Public Outreach	The public will be informed of stream maintenance work prior to the start of work as part of the preparation of the NPW for all projects in the NPW: 1. Each spring, a newspaper notice will be published with information on the NPW work sites, approximate work dates, and contact information. 2. Neighborhood Work Notices will be distributed as part of the NPW preparation prior to the start of work. 3. Local governments (cities and County) will be notified of scheduled maintenance work. The NPW will be submitted to the public works departments, local fire districts, and the District's Flood Protection and Watershed Advisory Committees. 4. The District will post specific information on individual maintenance projects on the Stream Maintenance Web site: (http://valleywater.org/EkContent.aspx?id=379&terms=stream+maintenance) 5. For high profile projects, at the District's discretion, signs will be posted in the neighborhood to notify the public at least one week in advance of maintenance schedules, trail closures, and road/lane closures as necessary and as possible. Signage used at work sites will include contact information for lodging comments and/or complaints regarding the maintenance activities.
GEN-37	Implement Public Safety	The District will implement public safety measures during maintenance as follows:

BMP Number	BMP Title	BMP Description
	Measures	1. Construction signs will be posted at job sites warning the public of construction work and to exercise caution, as appropriate to public accessed areas. 2. Where work is proposed adjacent to a recreational trail, warning signs will be posted several feet beyond the limits of work. Signs will also be posted if trails will be temporarily closed. 3. If needed, a lane will be temporarily closed to allow for trucks to pull into and out of access points to the work site. 4. Temporary fencing, either the orange safety type or chain link, will be installed above repair sites on bank stabilization projects. 5. When necessary, District or contracted staff will provide traffic control and site security.
GEN-38	Minimize Noise Disturbances to Residential Areas	The District will implement maintenance practices that minimize disturbances to residential areas surrounding work sites. 1. With the exception of emergencies, work will be conducted during normal working hours. Maintenance activities in residential areas will not occur on Saturdays, Sundays, or District observed holidays except during emergencies, or with approval by the local jurisdiction and advance notification of surrounding residents. 2. Vehicles, generators and heavy equipment will be equipped with adequate mufflers. 3. Idling of vehicles will be prohibited beyond 5 minutes unless operation of the engine is required to operate a necessary system such as a power take-off (PTO).
GEN-39	Planning for Pedestrians, Traffic Flow, and Safety Measures	1. Work will be staged and conducted in a manner that maintains two-way traffic flow on public roadways in the vicinity of the work site. If temporary lane closures are necessary, they will be coordinated with the appropriate jurisdictional agency and scheduled to occur outside of peak traffic hours (7:00 – 10:00 a.m. and 3:00 – 6:00 p.m.) to the maximum extent practicable. Any lane closures will include advance warning signage, a detour route and flaggers in both directions. When work is conducted on public roads and may have the potential to affect traffic flow, work will be coordinated with local emergency service providers as necessary to ensure that emergency vehicle access and response is not impeded. 2. Bicycle and pedestrian facility closures will be scheduled outside of peak traffic hours (7:00 – 10:00 a.m. and 3:00 – 6:00 p.m.) to the maximum extent practicable. 3. Public transit access and routes will be maintained in the vicinity of the work site. If public transit will be affected by temporary road closures and require detours, affected transit authorities will be consulted and kept informed of project activities. 4. Adequate parking will be provided or designated public parking areas will be used for maintenance-related vehicles not in use through the maintenance period. 5. Access to driveways and private roads will be maintained. If brief periods of maintenance would temporarily block access, property owners will be notified prior to maintenance activities.

BMP Number	BMP Title	BMP Description
Cultural Resources		
GEN-40	Discovery of Cultural Remains or Historic or Paleontological Artifacts	Work in areas where remains or artifacts are found will be restricted or stopped until proper protocols are met. 1. Work at the location of the find will halt immediately within 50 feet of the find. A “no work” zone shall be established utilizing appropriate flagging to delineate the boundary of this zone, which shall measure at least 50 feet in all directions from the find. 2. The District shall retain the services of a Consulting Archaeologist or Paleontologist, who shall visit the discovery site as soon as practicable, and perform minor hand-excavation to describe the archaeological or paleontological resources present and assess the amount of disturbance. 3. The Consulting Archaeologist shall provide to the District and the Corps, at a minimum, written and digital-photographic documentation of all observed materials, utilizing the guidelines for evaluating archaeological resources for the California Register of Historic Places (CRHP) and National Register of Historic Places (NRHP). Based on the assessment, the District and Corps shall identify the CEQA and Section 106 cultural-resources compliance procedure to be implemented. 4. If the find appears to not meet the CRHP or NRHP criteria of significance, and the Corps archaeologist concurs with the Consulting Archaeologist’s conclusions, construction shall continue while monitored by the Consulting Archaeologist. The authorized maintenance work shall resume at the discovery site only after the District has retained a Consulting Archaeologist to monitor and the Watershed Manager has received notification from the Corps to continue work. 5. If the find appears significant, avoidance of additional impacts is the preferred alternative. The Consulting Archaeologist shall determine if adverse impacts to the resources can be avoided. 6. When avoidance is not practical (e.g., maintenance activities cannot be deferred or they must be completed to satisfy the SMP objective), the District shall develop an Action Plan and submit it to the Corps within 48 hours of Consulting Archaeologist’s evaluation of the discovery. The action Plan may be submitted via e-mail to ~~(~~rstradford@spd.usace.army.mil~~)~~. The Action Plan is synonymous with a data-recovery plan. It shall be prepared in accordance with the current professional standards and State guidelines for reporting the results of the work, and shall describe the services of a Native American Consultant and a proposal for curation of cultural materials recovered from a non-grave context. 7. The recovery effort will be detailed in a report prepared by the archaeologist in accordance with current archaeological standards. Any non-grave artifacts will be placed with an appropriate repository. 8. The Consulting Paleontologist will meet the Society for Vertebrate Paleontology’s criteria for a “qualified professional paleontologist” (Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995). 9. The paleontologist will follow the Society for Vertebrate Paleontology’s guidelines for treatment of the artifact. Treatment may include preparation and recovery of fossil materials for an appropriate museum or university collection, and may include preparation of a report describing the finds. The District will be responsible for ensuring that paleontologist’s recommendations are implemented. 10. In the event of discovery of human remains (or the find consists of bones suspected to be human), the field crew supervisor shall take immediate steps to secure and protect such remains from vandalism during periods when work crews are absent.) 11. Immediately notify the Santa Clara County Coroner and provide any information that identify the remains as Native American. If the remains are determined to be from a prehistoric Native American, or determined to be a

BMP Number	BMP Title	BMP Description
		Native American from the ethnographic period, the Coroner shall contact the Native American Heritage Commission (NAHC) within 24 hours of being notified of the remains. The NAHC then designates and notifies within 24 hours a Most Likely Descendant (MLD). The MLD has 24 hours to consult and provide recommendations for the treatment or disposition, with proper dignity, of the human remains and grave goods. 12. Preservation in situ is the preferred option. Human remains shall be preserved in situ if continuation of the maintenance work, as determined by the Consulting Archaeologist and MLD, will not cause further damage to the remains. The remains and artifacts shall be documented and the find location carefully backfilled (with protective geo-fabric if desirable) and recorded in District project files. 13. Human remains or cultural items exposed during maintenance that cannot be protected from further damage shall be exhumed by the Consulting Archaeologist at the discretion of the MLD and reburied with the concurrence of the MLD in a place mutually agreed upon by all parties.
GEN-41	Review of Projects with Native Soil	A cultural resources specialist will conduct a review and evaluation of those sites that would involve disturbance / excavation of native soil previously undisturbed by contemporary human activities to determine their potential for affecting significant cultural resources. The evaluation of the potential to disturb cultural resources will be based on an initial review of archival information provided by the California Historical Resources System/Northwest Information Center (CHRIS/NWIC) in regard to the project area based on a 0.25 mile search radius. It is recommended that this initial archival review be completed by a professional archaeologist who will be able to view confidential site location data and literature to arrive at a preliminary sensitivity determination. If necessary, a further archival record search and literature review (including a review of the Sacred Lands Inventory of the Native American Heritage Commission); and a field inventory of the project area will be conducted to determine the presence/absence of surface cultural materials associated with either prehistoric or historic occupation. The results along with any mitigation and/or management recommendations would be presented in an appropriate report format and include any necessary maps, figures, and correspondence with interested parties. A summary table indicating appropriate management actions (e.g., monitoring during construction, presence/absence testing for subsurface resources; data recovery, etc.) will be developed for each project site reviewed. The management actions will be implemented on site to avoid significant effects to cultural resources.

BMP Number	BMP Title	BMP Description
Utilities		
GEN-42	Investigation of Utility Line Locations	An evaluation of the locations of utility lines that could be affected by maintenance activities will be conducted annually as part of the preparation of the Notice of Proposed Work (NPW). Utilities will be avoided as much as possible. For maintenance areas with the potential for adverse effects on utility services, the following measures shall be implemented: 1. Utility excavation or encroachment permits shall be required from the appropriate agencies. These permits include measures to minimize utility disruption. The District and its contractors shall comply with permit conditions. Such conditions shall be included in construction contract specifications. 2. Utility locations shall be verified through a field survey (potholing) and use of the Underground Service Alert services. 3. Detailed specifications shall be prepared as part of the design plans to include procedures for the excavation, support, and/or fill of areas around utility cables and pipelines. All affected utility services shall be notified of the District's maintenance plans and schedule. Arrangements shall be made with these entities regarding protection, relocation, or temporary disconnection of services. 4. Residents and businesses in the project area shall be notified of planned utility service disruption 2 to 4 days in advance, in conformance with state standards. 5. Disconnected cables and lines shall be reconnected promptly.

B. SECTION B – Sediment Removal BMPs

This group of BMPs is intended to be implemented specifically during sediment removal activities to avoid potential impacts on biological resources.

BMP Number	BMP Title	BMP Description
SED-1	Groundwater Management	If high levels of groundwater (i.e., visible water) are encountered during excavations in a work area, the water will be pumped out of the work site or left within the work area if the work activity is not causing water quality degradation in a live stream. Water Quality monitoring would need to occur. If necessary to protect water quality, the extracted water will be discharged into specifically constructed infiltration basins, holding ponds, or areas with vegetation to remove sediment prior to the water re-entering a creek. Water discharged into vegetated areas or swales will be pumped in a manner that will not create erosion around vegetation.
SED-2	Prevent Scour Downstream of Sediment Removal	Sediment removal sites in the transport zone on alluvial fans may cause increased scour downstream if they experience scouring flows or rapid sediment accumulation after maintenance. After sediment removal, the channel will be graded so that the transition between the existing channel both upstream and downstream of the maintenance area is smooth and continuous between the maintained and non-maintained areas and does not present a sudden vertical transition (wall of sediment) or other blockage that could erode once flows are restored to the channel.
SED-3	Restore Channel Features	Low-flow channels within non-tidal streams will be contoured to facilitate fish passage and will emulate the pre-construction conditions as closely as possible, within the finished channel topography.
SED-4	Berm Bypass	Where sediment removal is accomplished without a bypass by removing alternating cells, the berm between the

BMP Number	BMP Title	BMP Description
		work and the live channel will be wide enough to prevent introduction of turbid water from the cell into the live channel.

C. SECTION C – Vegetation Management BMPs

These BMPs provide specific and detailed guidance on the variety of vegetation management procedures implemented by the District. BMPs for the following maintenance techniques are included: tree pruning, tree removal, plant removal, woody debris management, herbicide application, mowing, discing, flaming, and grazing. Practices will be implemented by fully trained and qualified field crews.

BMP Number	BMP Title	BMP Description
VEG-1	Minimize Local Erosion Increase from In-channel Vegetation Removal	To minimize the potential effect of localized erosion, the toe of the bank will be protected by leaving vegetation to the maximum extent possible and consistent with the maintenance guidelines or original design requirements.
VEG-2	Non-native Invasive Plant Removal	Invasive species (e.g. cape ivy [*Delairea odorata/Senecio mikanoides]*, arundo [*Arundo donax*]) will be disposed of in a manner that will not contribute to the further spread of the species. Cape ivy removed during a project shall be bagged and disposed of in a landfill. Arundo canes will be prevented from floating downstream or otherwise entering the creek or waterway.
VEG-3	Use Appropriate Equipment for Instream Removal	When using heavy equipment to cut or remove instream vegetation, low ground pressure equipment, such as tracked wheels will be utilized to reduce impacts to the streambed.
VEG-4	Use Flamers with Caution	1. A fire extinguisher, water supply and other appropriate fire suppression equipment will always be kept close to the work site in case of an emergency. 2. Propane tanks will be checked for leaks and proper functioning prior to and proceeding use of flaming equipment. The propane tank will be treated as a hazardous material.
VEG-5	Conduct Flaming During Appropriate Weather and Seasonal Conditions	Flamers will not be used during periods of high fire danger or in areas where fuel or climate conditions could accidentally ignite a fire.
VEG-6	Standard Grazing Procedures	1. Vegetation and areas to be preserved will be fenced off to exclude grazing animals. 2. Grazing animals will be excluded from stream channels, using fencing or other barriers.

D. SECTION D – Bank Stabilization BMPs

These BMPs provide additional guidance during implementation of bank stabilization projects to avoid impacts on biological and cultural resources. Review of the Post-Project Restoration BMPs in Section F is recommended because those measures will be implemented after bank stabilization projects are complete. The BMPs included in this section are implemented by the field crew and site manager.

BMP Number	BMP Title	BMP Description
BANK-1	Bank Stabilization Design to Prevent Erosion Downstream	To further prevent potential downstream erosion impacts due to bank stabilization, the site design will be adjusted to provide proactive protection of vulnerable areas within the reach of the worksite. Such measures include, but are not limited to, appropriately keyed-in coir logs, riparian planting, strategic placement of rock, and flow deflectors. Bank stabilization will include appropriate transition designs upstream and downstream of the work site to prevent potential erosion impacts.
BANK-2	Concrete Use Near Waterways	Concrete that has not been cured is alkaline and can increase the pH of the water.; fFresh concrete will be isolated until it no longer poses a threat to water quality using the following appropriate measures: 1. Wet sacked concrete will be excluded from the wetted channel for a period of two weeks after installation. During that time, the wet sacked concrete will be kept moist (such as covering with wet carpet) and runoff from the wet sacked concrete will not be allowed to enter a live stream. 2. Poured concrete will be excluded from the wetted channel for a period of two weeks after it is poured. During that time, the poured concrete will be kept moist, and runoff from the wet concrete will not be allowed to enter a live stream. Commercial sealants (e.g., Deep Seal, Elasto-Deck Reservoir Grade) may be applied to the poured concrete surface where difficulty in excluding water flow for a long period may occur. If a sealant is used, water will be excluded from the site until the sealant is dry. 3. Dry sacked concrete will not be used in any channel. 4. An area outside of the channel and floodplain will be designated to clean out concrete transit vehicles.
BANK-3	Bank Stabilization Post-Construction Maintenance	The District may maintain or repair bank stabilization projects that are less than 2 years old that are damaged by winter flows. The District will notify the regulatory agencies 24 hours prior to beginning the work and the work will be reported as part of the Post-Construction Report submitted by January 15 of each year or if necessary, the subsequent year. Appropriate BMPs will be applied during maintenance repairs.

E. SECTION E – Post-Project Restoration BMPs

These BMPs will be implemented, as appropriate, on all sites that involve ground disturbance.

BMP Number	BMP Title	BMP Description
REVEG-1	Seeding	Sites where maintenance activities result in exposed soil will be stabilized to prevent erosion. Disturbed areas shall be seeded with native seed as soon as is appropriate after maintenance activities are complete. An erosion control seed mix may be applied to exposed soils, and down to the ordinary high water mark (OHWM). 1. The seed mix should consist of California native grasses (e.g., *Hordeum brachyantherum*, *Elymus glaucus*, and *Vulpia microstachyes*) or annual, sterile seed mix. 2. Temporary earthen access roads may be seeded when site and horticultural conditions are suitable, or have other appropriate erosion control measures in place (GEN-20).
REVEG-2	Planting Material	Revegetation and replacement plantings will consist of locally collected native species. Species selection will be based on surveys of natural areas on the same creek that have a similar ecological setting and/or as appropriate

BMP Number	BMP Title	BMP Description
		for the site location.

F. SECTION F – Management of Animal Damage Conflict BMPs

Methods of animal management included in the SMP are avoidance, biological controls, physical alterations, habitat alterations, and lethal controls. Of all these methods, implementation of lethal controls has the highest potential for environmental and biological impacts. Therefore, the animal management BMPs provided in this section focus on lethal controls. The application area for lethal controls will be identified during the annual planning process (see the Biological Resource Planning BMPs) and guided as directed by wildlife biologists. Species habitat areas are defined by the District's GIS species mapping, updated CNDDB and known local biological information and are included in the SMP Update Subsequent EIR.

BMP Number	BMP Title	BMP Description
ANI-1	Avoid Redistribution of Rodenticides	Carcass surveys will be conducted periodically when acute poisons and first generation anticoagulants are used. The frequency of the carcass surveys will be specific to the type of rodenticide used, to minimize secondary poisoning impacts: • Acute toxins – Daily carcass surveys, beginning the first day after application until the end of the baiting period for acute toxins used above-ground. • Anticoagulants - Within 7 days of installation of first generation anticoagulant bait, and weekly thereafter. Anytime a carcass is found, daily carcass surveys will begin for as long as carcasses are found until no carcasses are found during a daily survey. Once no carcasses are found, carcass surveys will return to the weekly carcass survey timeline maximum from the date of initial installation of an anticoagulant bait station. To verify that the frequency of carcass surveys is adequate, a biologist will conduct daily carcass surveys 2 times per year over one baiting cycle. Based on the results of these surveys, the timing of carcass surveys will be adjusted if necessary. Any spilled bait will be cleaned up immediately.
ANI-2	Prevent Harm to the Salt Marsh Harvest Mouse and California Clapper Rail	1. No rodenticides or fumigants will be used within the range of the SMHM or CCR as identified on District range maps. 2. Methods of rodent control within SMHM or CCR habitat will be limited to live trapping. All live traps shall have openings measuring no smaller than 2 inches by 1 inch to allow any SMHM that inadvertently enter the trap to easily escape. All traps will be placed outside of pickleweed areas and above the high tide line.
ANI-3	Burrowing Owl, Bald Eagle and Golden Eagle Buffer Zone	Per the California Department of Fish and Game's 2008 *Guidance for Burrowing Owl Conservation*, a 656-yard buffer will be established around known burrowing owl locations where no rodenticides or fumigants (including smoke bombs) will be used. A 0.5-mile buffer will be established around known bald eagle and golden eagle nesting locations where no rodenticides will be used.
ANI-4	Animal Control in Sensitive Amphibian Habitat	1. Fumigants will not be used within the habitat areas of special status amphibians. 2. The use of bait stations within the potential habitat areas of California red-legged frog, California tiger

BMP Number	BMP Title	BMP Description
		salamander, or foothill yellow-legged frog will be limited to bait stations specifically designed to prevent entry by these species. 3. Any live traps will allow California red-legged frogs, California tiger salamanders, or foothill yellow-legged frogs to safely exit (e.g., by having openings measuring no smaller than 2 inches by 1 inch).
ANI-5	Slurry Mixture near Waterways	All slurry type mixes used to fill rodent burrows will be prevented from entering any waterway by using appropriate erosion control methods and according to the manufacturer's specifications. If the creek bed is dry or has been dewatered, any material that has entered the channel will be removed.

G. SECTION G – Use of Pesticides

Pesticides may be used for vegetation management or control of animal damage.

BMP Number	BMP Title	BMP Description
HM-4	Posting and Notification for Pesticide Use	Posting of areas where pesticides are used will be performed in compliance with District Policy Ad-8.2 Pesticide Use as follows: 1. Posting will be performed in compliance with the label requirements of the product being applied. 2. In addition, posting will be provided for any products applied in areas used by the public for recreational purposes, or those areas readily accessible to the public, regardless of whether the label requires such notification. In doing this, the District ensures that exposure risk is minimized further by adopting practices that go beyond the product label requirements. (The posting method may be modified to avoid destruction of bait stations or scattering of rodenticide.) 3. These postings will notify staff and the general public of the date and time of application, the product's active ingredients, and common name, and the time of allowable re-entry into the treated area. 4. Signs will not be removed until after the end of the specified re-entry interval. 5. Right-to-know literature on the product will be made available to anyone in the area during the re-entry period. 6. A District staff contact phone number will be posted on the sign, including a cellular phone number. 7. Notification of pesticide activities will be made as required by law. Also, the District will maintain records of neighbors with specific needs relative to notification before treatment of an adjacent area so that such needs are met.

Source: Data compiled by Horizon Water and Environment in 2011

This Page Intentionally Left Blank

Appendix C

Comprehensive Best Management Practices

Upper Llagas Creek Project

US Army Corps of Engineers

C.1 Upper Llagas Creek Project Comprehensive Best Management Practices (BMP) List

Air Quality	
AQ-1 **Use Dust Control Measures for Soil Disturbing Activities**	The following Bay Area Air Quality Management District's (BAAQMD) Dust Control Measures will be implemented: 1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. 2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. 3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. 4. Water used to wash the various exposed surfaces (i.e., parking areas, staging areas, soil piles, graded areas, etc.) will not be allowed to enter waterways. 5. All vehicle speeds on unpaved roads shall be limited to 15 mph. 6. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. 7. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. 8. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator. 9. Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.
AQ-4 **Avoid Stockpiling Potentially Odorous Materials**	Materials with decaying organic material will be handled in a manner that avoids impacting sensitive receptors. 1. Avoid stockpiling potentially odorous materials within 1,000 feet of residential areas or other odor sensitive land uses. Where appropriate, odorous stockpiles will be disposed of at an appropriate landfill.
Biological Resources	
BI-3 **Minimize Impacts to Steelhead**	Steelhead migrate upstream during the winter months to lay eggs. Eggs remain in the gravels for several weeks. Fry emerge from the gravel and may spend up to a year in local streams before migrating to the ocean. To avoid and minimize impacts to salmonids, routine use of vehicles and equipment in live salmonid streams will be avoided between January 1 and June 15.

Source: Santa Clara Valley Water District (SCVWD) 2013

Biological Resources	
BI-4 **Minimize Access Impacts**	Existing access ramps and roads will be utilized to the extent feasible. If necessary to avoid large mature trees, native vegetation, or other significant habitat features, temporary access points will be constructed in a manner that minimizes impacts according to the following guidelines: 1. Temporary access points will be constructed as close to the work area as possible 2. In considering channel access routes, slopes of greater than 20 percent will be avoided, if possible. 3. Any temporary fill used for access will be removed upon completion of the project and pre-project topography will be restored to the extent possible. 4. When temporary access is removed, disturbed areas will be revegetated or filled with compacted soil, seeded, and/or stabilized with erosion control fabric immediately after construction to minimize future erosion.
BI-5 **Remove Temporary Fills as Appropriate**	Temporary fills, such as for diversion structures or cofferdams, will be removed upon finishing the work. The creek channels and banks will be re-contoured to match pre-construction conditions to the extent possible. Low-flow channels within non-tidal streams will be contoured to facilitate fish passage and will emulate the preconstruction conditions as closely as possible, within the finished channel topography.
BI-6 **Minimize Adverse Effects of Pesticides on Non-target Species**	Pesticides will be handled, stored, transported, and used in a manner that minimizes negative environmental effects on non-target species and sensitive habitats. This includes all rodenticides, insecticides, herbicides, algaecides, and fungicides. The proposed project plan for handling, storing, transporting and using pesticides must be reviewed and approved by <u>both</u> of the following subject matter experts: 1. District's Pest Control Advisor (a State-certified Qualified Applicator) – the plan will be reviewed, and modified as deemed appropriate, for compliance with: District policy, label restrictions and any advisories published by the California Department of Pesticide Regulation, the Santa Clara County Division of Agriculture, and the U.S. EPA bulletin *Protecting Endangered Species, Interim Measures for Use of Pesticides in Santa Clara County* (USEPA 2000). 2. Qualified District Biologist (as defined in EMAP-30264) – the plan will be reviewed, and modified as deemed appropriate, for compliance with: District policy, approved environmental review documents, project permits, and avoidance of all known listed (Threatened or Endangered) and sensitive species. Information sources for determination of all known locations of species that may be harmed by pesticides include the District's GIS system and California Natural Diversity Database (CNDDB). Either the District's Pest Control Advisor or the Qualified District Biologist may modify the proposed pesticide plan, such as establishing buffer areas or prohibiting the use of pesticides outright, based on site-specific data, current regulatory requirements, and District policy. The purchase of all pesticides must be approved by the District's Pest Control Advisor to ensure compliance with the District's *Control and Oversight of Pesticide Use* policy and appropriate regulatory agency reporting requirements.

Source: Santa Clara Valley Water District (SCVWD) 2013

Biological Resources	
BI-8 **Avoid Impacts to Nesting Migratory Birds**	1. For activities occurring between January 15 and August 31, project areas will be checked by a qualified biologist for nesting birds within two weeks of starting work. If a lapse in project-related work of two weeks or longer occurs, another focused survey will be conducted before project work can be reinitiated. 2. If nesting birds are found, a buffer will be established around the nest and maintained until the young have fledged. Appropriate buffer widths are 0.5 mile for bald and golden eagles; 250 feet for other raptors and the least Bell's vireo, herons, and egrets; 25 feet for ground-nesting non-raptors; and 50 feet for non-raptors nesting on trees, shrubs and structures. A qualified biologist may identify an alternative buffer based on a site-specific evaluation. No work within the buffer will occur without written approval from a qualified biologist, for as long as the nest is active. 3. The boundary of each buffer zone will be marked with fencing, flagging, or other easily identifiable marking if work will occur immediately outside the buffer zone. 4. All protective buffer zones will be inspected daily if work is adjacent to the buffer to ensure the buffer is not violated. Each buffer zone will be maintained until the nest becomes inactive, as determined by a qualified biologist. 5. If monitoring shows that disturbance to actively nesting birds is occurring, the biologist will require increased buffer widths until monitoring shows that disturbance is no longer occurring. If this is not possible, work will cease in the area until young have fledged and the nest is no longer active as determined by a qualified biologist.
BI-9 **Avoid Impacts to Nesting Migratory Birds from Pending Construction**	Nesting exclusion devices may be installed to prevent potential establishment or occurrence of nests in areas where construction activities would occur. All nesting exclusion devices will be maintained throughout the nesting season or until completion of work in an area makes the devices unnecessary. All exclusion devices will be removed and disposed of when work in the area is complete.
BI-10 **Minimize Impacts to Vegetation from Clearing and Trimming**	Vegetation to be trimmed or cleared will be evaluated by a qualified vegetation specialist or qualified biologist prior to impacts; and, the qualified vegetation specialist or qualified biologist recommendations will be followed. Cutting vegetation will be limited to the minimum length, width, and height necessary while conforming to International Society of Arboriculture (ISA) pruning standards. No trees with a 6-inch or greater diameter at breast height will be removed; and, no branches greater than 4" diameter will be removed. Woody vegetation (i.e. native trees and shrubs) which require pruning for equipment access, construction operations, etc, shall be pruned correctly such that health status is maintained and no post-construction impacts accrue. Woody vegetation will be pruned consistent with <u>all</u> <u>three</u> of the following complementary guidance or their updates: 1. 'BEST MANAGEMENT PRACTICES, TREE PRUNING' 2008, INTERNATIONAL SOCIETY OF ARBORICULTURE; and 2. American National Standards Institute (ANSI) A300 (Part 1) – 2008 PRUNING; and 3. ANSI Z133.1, 2008, SAFTEY REQUIREMENTS. Woody material (including live leaning trees, dead trees, tree trunks, large limbs, and stumps) will be retained on site, unless it is threatening a structure or impedes access, in which case it must moved to a less threatening position.

Source: Santa Clara Valley Water District (SCVWD) 2013

Biological Resources	
BI-11 **Minimize Root Impacts to Woody Vegetation**	Construction activities, including cut and fill, will be minimized to the extent practicable within the root zones of existing woody vegetation to remain post project. In general, root extent can be estimated as 2-3 times canopy radius, but vary depending on slope and soil conditions. To the extent practicable, construction setbacks will be calculated using all of the following: 1. Tree DBH (diameter at breast height); and 2. a multiplier of 1.25. The product is reported in feet as the radial distance in feet around the trunk inside which no construction activities are to occur. Example: a 12 inch dbh tree X 1.25 = 15 foot radial construction setback. If soil encroachment must occur in 33% or more of this area, the tree should be evaluated for removal. Additionally, mulching the root zone will be employed to provide root protection from unavoidable equipment traffic during construction, specifically: 1. Use 6 inches minimum depth of wood chips; or, 2. 4 inches minimum depth of ¾-inch (or greater) gravel. Both may remain in place after work if approved by a qualified biologist or vegetation specialist.
BI-13 **Choose Local Ecotypes Of Native Plants and Appropriate Erosion-Control Seed Mixes**	Whenever native species are prescribed for installation the following steps will be taken by a qualified biologist or vegetation specialist: 1. Evaluate whether the plant species currently grows wild in Santa Clara County; and, 2. If so, the qualified biologist or vegetation specialist will determine if any need to be local natives, i.e. grown from propagules collected in the same or adjacent watershed, and as close to the project site as feasible. Also, consult a qualified biologist or vegetation specialist to determine which seeding option is ecologically appropriate and effective, specifically: 1. For areas that are disturbed, an erosion control seed mix may be used consistent with the SCVWD Guidelines and Standards for Land Use Near Streams, Design Guide 5, 'Temporary Erosion Control Options.' 2. In areas with remnant native plants, the qualified biologist or vegetation specialist may choose an abiotic application instead, such as an erosion control blanket or seedless hydro-mulch and tackifier to facilitate passive revegetation of local native species. 3. Temporary earthen access roads may be seeded when site and horticultural conditions are suitable. 4. If a gravel or wood mulch has been used to prevent soil compaction per BI-11, this material may be left in place [if ecologically appropriate] instead of seeding. Seed selection shall be ecologically appropriate as determined by a qualified biologist, per *Guidelines and Standards for Land Use Near Streams, Design Guide 2: Use of Local Native Species*.
BI-15 **Restore Riffle/Pool Configuration of Channel Bottom**	The channel bottom shall be re-graded the at the end of the work project to as close to original conditions as possible. In salmonid streams, restore pool and riffle configurations to emulate pre-project instream conditions, taking into account channel morphological features (i.e. slope), which affects riffle/pool sequence.

Source: Santa Clara Valley Water District (SCVWD) 2013

Biological Resources	
BI-16 **Avoid Animal Entry and Entrapment**	All pipes, hoses, or similar structures less than 12 inches diameter will be closed or covered to prevent animal entry. All construction pipes, culverts, or similar structures, greater than 2-inches diameter, stored at a construction site overnight, will be inspected thoroughly for wildlife by a qualified biologist or properly trained construction personnel before the pipe is buried, capped, used, or moved. If inspection indicates presence of sensitive or state- or federally-listed species inside stored materials or equipment, work on those materials will cease until a qualified biologist determines the appropriate course of action. To prevent entrapment of animals, all excavations, steep-walled holes or trenches more than 6-inches deep will be secured against animal entry at the close of each day. Any of the following measures may be employed, depending on the size of the hole and method feasibility: 1. Hole to be securely covered (no gaps) with plywood, or similar materials, at the close of each working day, or any time the opening will be left unattended for more than one hour; or 2. In the absence of covers, the excavation will be provided with escape ramps constructed of earth or untreated wood, sloped no steeper than 2:1, and located no farther than 15 feet apart; or 3. In situations where escape ramps are infeasible, the hole or trench will be surrounded by filter fabric fencing or a similar barrier with the bottom edge buried to prevent entry.
BI-17 **Minimize Predator-Attraction Effects on Wildlife**	Remove trash daily from the worksite to avoid attracting potential predators to the site.
Cultural Resources	
CU-2 **Stop Work and Report if Archaeological Artifacts are Found**	Work in areas where archaeological artifacts are found will be restricted or stopped until proper protocols are met. Work at the location of the find will halt immediately within 50 feet of the find. A “no work” zone shall be established utilizing appropriate flagging to delineate the boundary of this zone. A Consulting Archaeologist will visit the discovery site as soon as practicable for identification and evaluation pursuant to Section 21083.2 of the Public Resources Code and Section 15126.4 of the California Code of Regulations. If the archaeologist determines that the artifact is not significant, construction may resume. If the archaeologist determines that the artifact is significant, the archaeologist will determine if the artifact can be avoided and, if so, will detail avoidance procedures. If the artifact cannot be avoided, the archaeologist will develop within 48 hours an Action Plan which will include provisions to minimize impacts and, if required, a Data Recovery Plan for recovery of artifacts in accordance with Public Resources Code Section 21083.2 and Section 15126.4 of the CEQA Guidelines.
CU-3 **Stop Work and Report if Burial Remains are Found**	Work in areas where any burial site is found will be restricted or stopped until proper protocols are met. Upon discovering any burial site as evidenced by human skeletal remains, the County Coroner will be immediately notified and the field crew supervisor shall take immediate steps to secure and protect such remains from vandalism during periods when work crews are absent. No further excavation or disturbance within 30 feet of the site or any nearby area reasonably suspected to overlie adjacent remains may be made except as authorized by the County Coroner, California Native American Heritage Commission, and/or the County Coordinator of Indian Affairs.
Hazards & Hazardous Materials	
HM-1 **Comply with All Pesticide Application Restrictions and Policies**	Pesticide products are to be used only after an assessment has been made regarding environmental, economic, and public health aspects of each of the alternatives by the District’s Pest Control Advisor (PCA). All pesticide use will be consistent with approved product specifications. Applications will be made by, or under the direct supervision of, State Certified applicators under the direction of, or in a manner approved by the PCA. Refer to Q751D02, Control and Oversight of Pesticide Use.

Source: Santa Clara Valley Water District (SCVWD) 2013

Hazards & Hazardous Materials	
HM-3 **Minimize Use of Pesticides**	In all cases, where some form of pest control is deemed necessary by the PCA; evaluate alternative pest control methods and pesticides. Refer to Q751D02: *Control and Oversight of Pesticide Use*.
HM-4 **Post Areas Where Pesticides Will Be Used**	Posting of areas where pesticides are to be used shall be performed in compliance with Q751D02: *Control and Oversight of Pesticide Use.* Posting shall be performed in compliance with the label requirements of the product being applied. In addition, the District shall provide posting for any products applied in areas used by the public for recreational purposes, and areas readily accessible to the public, regardless of whether the label requires such notification (the posting method may be modified to avoid destruction of bait stations or scattering of rodenticide), including: 1. Sign postings shall notify staff and the general public of the date and time of application; the product's active ingredients, and common name; and, the time of allowable re-entry into the treated area. 2. A District staff contact phone number shall be posted on the sign. 3. Signs shall not be removed until after the end of the specified re-entry interval. 4. Right-to-know literature on the product shall be made available upon request to anyone in the area. Notification will take into account neighbors with specific needs prior to treatment of an adjacent area to ensure such needs are met. Such requests are maintained by the District under Q751D02.
HM-5 **Comply with All Pesticide Usage Requirements**	All projects that propose ongoing use of pesticides will comply with all provisions of Q751D02: *Control and Oversight of Pesticide Use*, including, but not necessarily limited to the following: 1. All pest control methods will be performed only after a written Pest Control Recommendation for use has been prepared by the District's PCA in accordance with requirements of the California Food and Agricultural Code. F751D01 – *Pest Control Recommendation & Spray Operators Report* will be completed for each pesticide application.
HM-7 **Comply with Restrictions on Herbicide Use in Upland Areas**	Consistent with provisions of Q751D02: *Control and Oversight of Pesticide Use,* application of pre emergence (residual) herbicides to upland areas will not be made within 72 hours of predicted significant rainfall. Predicted significant rainfall for the purposes of this BMP will be described as local rainfall greater than 0.5 inch in a 24-hour period with greater than a 50% probability of precipitation according to the National Weather Service.
HM-8 **Comply with Restrictions on Herbicide Use in Aquatic Areas**	Consistent with provisions of Q751D02: *Control and Oversight of Pesticide Use,* only herbicides and surfactants registered for aquatic use will be applied within the banks of channels within 20 feet of any water present. Furthermore, aquatic herbicide use will be limited to June 15th through October 31st with an extension through December 31 or until the first occurrence of any of the following conditions; whichever happens first: 1. local rainfall greater than 0.5 inches is forecasted within a 24-hour period from planned application events according to the National Weather Service; or 2. when steelhead begin upmigrating and spawning in the 14 steelhead creeks, as determined by a qualified biologist (typically in November/December) If rain is forecast then application of aquatic herbicide will be rescheduled.
HM-9 **Limit Vehicle and Equipment Cleaning to Appropriate Locations**	Vehicles may be washed only at approved areas. No washing of vehicles will occur at job sites.

Source: Santa Clara Valley Water District (SCVWD) 2013

Hazards & Hazardous Materials	
HM-10 **Ensure Proper Vehicle and Equipment Fueling and Maintenance**	No fueling or servicing will be done in a waterway or immediate flood plain, unless equipment stationed in these locations is not readily relocated (i.e., pumps, generators). 1. For stationary equipment that must be fueled or serviced on-site, containment will be provided in such a manner that any accidental spill will not be able to come in direct contact with soil, surface water, or the storm drainage system. 2. All fueling or servicing done at the job site will provide containment to the degree that any spill will be unable to enter any waterway or damage riparian vegetation. 3. All vehicles and equipment will be kept clean. Excessive build-up of oil and grease will be prevented. 4. All equipment used in the creek channel will be inspected for leaks each day prior to initiation of work. Maintenance, repairs, or other necessary actions will be taken to prevent or repair leaks, prior to use. If emergency repairs are required in the field, only those repairs necessary to move equipment to a more secure location will be done in a channel or flood plain.
HM-12 **Ensure Proper Hazardous Materials Management**	Measures will be implemented to ensure that hazardous materials are properly handled and the quality of water resources is protected by all reasonable means. 1. Prior to entering the work site, all field personnel will know how to respond when toxic materials are discovered. 2. Contact of chemicals with precipitation will be minimized by storing chemicals in watertight containers with appropriate secondary containment to prevent any spillage or leakage. 3. Petroleum products, chemicals, cement, fuels, lubricants, and non-storm drainage water or water contaminated with the aforementioned materials will not contact soil and not be allowed to enter surface waters or the storm drainage system. 4. All toxic materials, including waste disposal containers, will be covered when they are not in use, and located as far away as possible from a direct connection to the storm drainage system or surface water. 5. Quantities of toxic materials, such as equipment fuels and lubricants, will be stored with secondary containment that is capable of containing 110% of the primary container(s). 6. The discharge of any hazardous or non-hazardous waste as defined in Division 2, Subdivision 1, Chapter 2 of the California Code of Regulations will be conducted in accordance with applicable State and federal regulations. In the event of any hazardous material emergencies or spills, personnel will call the Chemical Emergencies/Spills Hotline at 1-800-510-5151.
HM-13 **Utilize Spill Prevention Measures**	Prevent the accidental release of chemicals, fuels, lubricants, and non-storm drainage water following these measures: 1. Field personnel will be appropriately trained in spill prevention, hazardous material control, and clean up of accidental spills; 2. Equipment and materials for cleanup of spills will be available on site, and spills and leaks will be cleaned up immediately and disposed of according to applicable regulatory requirements; 3. Field personnel will ensure that hazardous materials are properly handled and natural resources are protected by all reasonable means; 4. Spill prevention kits will always be in close proximity when using hazardous materials (e.g., at crew trucks and other logical locations), and all field personnel will be advised of these locations; and, 5. The work site will be routinely inspected to verify that spill prevention and response measures are properly implemented and maintained.

Source: Santa Clara Valley Water District (SCVWD) 2013

Hazards & Hazardous Materials	
HM-14 **Incorporate Fire Prevention Measures**	1. All earthmoving and portable equipment with internal combustion engines will be equipped with spark arrestors. 2. During the high fire danger period (April 1–December 1), work crews will have appropriate fire suppression equipment available at the work site. 3. An extinguisher shall be available at the project site at all times when welding or other repair activities that can generate sparks (such as metal grinding) is occurring. Smoking shall be prohibited except in designated staging areas and at least 20 feet from any combustible chemicals or vegetation.
HM-17 **Comply with BAAQMD Regulations for Naturally Occurring Asbestos**	The District will implement BAAQMD dust control measures and notification requirements when working in serpentine soils. The District will implement BAAQMD dust control measures and notification requirements when working in serpentine soils.
Hydrology/Water Quality	
WQ-1 **Conduct Work from Top of Bank**	For work activities that will occur in the channel, work will be conducted from the top of the bank if access is available and there are flows in the channel.
WQ-2 **Evaluate Use of Wheel and Track Mounted Vehicles in Stream Bottoms**	Field personnel will use the appropriate equipment for the job that minimizes disturbance to the stream bottom. Appropriately tired vehicles, either tracked or wheeled, will be used depending on the situation. Tracked vehicles (bulldozers, loaders) may cause scarification. Wheeled vehicles may cause compaction. Heavy equipment will not operate in the live stream.
WQ-3 **Limit Impact of Pump and Generator Operation and Maintenance**	Pumps and generators will be maintained and operated in a manner that minimizes impacts to water quality and aquatic species. 1. Pumps and generators will be maintained according to manufacturers' specifications to regulate flows to prevent dry-back or washout conditions. 2. Pumps will be operated and monitored to prevent low water conditions, which could pump muddy bottom water, or high water conditions, which creates ponding. 3. Pump intakes will be screened to prevent uptake of fish and other vertebrates. Pumps in steelhead creeks will be screened according to NMFS criteria. Sufficient back-up pumps and generators will be onsite to replace defective or damaged pumps and generators.

Source: Santa Clara Valley Water District (SCVWD) 2013

Hydrology/Water Quality	
WQ-4 **Limit Impacts of Sediments on Water Quality**	Sediments will be stored and transported in a manner that minimizes water quality impacts. 1. Wet sediments may be stockpiled outside of a live stream or may be stockpiled within a dewatered stream so water can drain or evaporate before removal. 2. This measure applies to saturated, not damp, sediments and depends upon the availability of a stockpile site. 3. For those stockpiles located outside the channel, water draining from them will not be allowed to flow back into the creek or into local storm drains that enter the creek, unless water quality protection measures recommended by the RWQCB are implemented. 4. Trucks may be lined with an impervious material (e.g. plastic), or the tail gate blocked with dry dirt or hay bales, for example, or trucks may drain excess water by slightly tilting their loads and allowing the water to drain out through a filter, but only within the active project area of the creek where the sediment is being loaded into the trucks or within an identified vegetated area (swale) that is separated from the creek. Water will not drain directly into channels (outside of the work area) or onto public streets without providing water quality control measures. Streets will be cleared of mud and/or dirt by street sweeping (with a vacuum-powered street sweeper), as necessary, and not by hosing down the street.
WQ-5 **Limit Impacts From Staging and Stockpiling Materials**	1. To protect on-site vegetation and water quality, staging areas should occur on access roads, surface streets, or other disturbed areas that are already compacted and only support ruderal vegetation. Similarly, all equipment and materials (e.g., road rock and project spoil) will be contained within the existing service roads, paved roads, or other pre-determined staging areas. 2. Building materials and other project-related materials, including chemicals and sediment, will not be stockpiled or stored where they could spill into water bodies or storm drains. 3. No runoff from the staging areas may be allowed to enter water ways, including the creek channel or storm drains, without being subjected to adequate filtration (e.g., vegetated buffer, swale, hay wattles or bales, silt screens). 4. The discharge of decant water to water ways from any on-site temporary sediment stockpile or storage areas is prohibited. 5. During the wet season, no stockpiled soils will remain exposed, unless surrounded by properly installed and maintained silt fencing or other means of erosion control. During the dry season; exposed, dry stockpiles will be watered, enclosed, covered, or sprayed with non-toxic soil stabilizers.
WQ-6 **Stabilize Construction Entrances and Exits**	Measures will be implemented to minimize soil from being tracked onto streets near work sites: 1. Methods used to prevent mud from being tracked out of work sites onto roadways include installing a layer of geotextile mat, followed by a 4-inch thick layer of 1 to 3-inch diameter gravel on unsurfaced access roads. Access will be provided as close to the work area as possible, using existing ramps where available and planning work site access so as to minimize disturbance to the water body bed and banks, and the surrounding land uses.
WQ-9 **Minimize Erosion from Removal of In-channel Vegetation**	In-channel vegetation removal may result in increased local erosion due to increased flow velocity. To minimize the effect, the toe of the bank will be protected by leaving vegetation to the maximum extent practicable consistent with design requirements.

Source: Santa Clara Valley Water District (SCVWD) 2013

Hydrology/Water Quality	
WQ-10 **Limit Impact of Concrete Near Waterways**	Concrete that has not been cured is alkaline and can increase the pH of the water; fresh concrete will be isolated until it no longer poses a threat to water quality using the following appropriate measures: 1. Wet sacked concrete will be excluded from the wetted channel for a period of two weeks after installation. During that time, the wet sacked concrete will be kept moist (such as covering with wet carpet) and runoff from the wet sacked concrete will not be allowed to enter a live stream. 2. Poured concrete will be excluded from the wetted channel for a period of two weeks after it is poured. During that time, the poured concrete will be kept moist, and runoff from the wet concrete will not be allowed to enter a live stream. Commercial sealants (e.g., Deep Seal, Elasto-Deck Reservoir Grade) may be applied to the poured concrete surface where difficulty in excluding water flow for a long period may occur. If a sealant is used, water will be excluded from the site until the sealant is dry. 3. Dry sacked concrete will not be used in any channel. An area outside of the channel and floodplain will be designated to clean out concrete transit vehicles.

Source: Santa Clara Valley Water District (SCVWD) 2013

Hydrology/Water Quality	
WQ-12 **Isolate Work in Non-tidal Sites With Use of Diversion of Bypass**	When work in a flowing stream is unavoidable, the entire streamflow will be diverted around the work area by a barrier. Construction of the barrier will normally begin in the upstream area and continue in a downstream direction, and the flow will be diverted only when construction of the diversion is completed. Where appropriate, the diversion will occur via gravity flow around or through the work site using temporary culverts. If necessary, stream flow may be pumped around the work site using pumps and screened intake hoses. When pumping is necessary to dewater a work site, a temporary siltation basin and/or use of silt bags may be required to prevent sediment from re-entering the wetted channel discharge sites to ensure that the turbidity of discharged water is not visibly more turbid than the water in the channel upstream of the site. If increases in turbidity are observed, additional measures will be implemented. Sumps or basins also may be used to collect water, where appropriate (e.g., in channels with low flows). Recommendations by a qualified Fisheries Biologist to protect native fisheries and aquatic vertebrates will be incorporated into the bypass design. The recommendations may include but are not limited to: 1. Screening the stream flow diversion source or pump to prevent entrainment of native fish or amphibian species. The screening dimensions will be appropriate to the species present; 2. Relocation of native aquatic vertebrates will include a plan specifying the methods to be used to capture, hold and move the aquatic vertebrates, as well as a description of where the aquatic vertebrates will be relocated; and, 3. Timing work in streams that support a significant number of amphibians until after metamorphosis occurs. Instream cofferdams will be built only from materials such as sandbags, clean gravel, or rubber bladders, which will cause little or no siltation or turbidity. Plastic sheeting will be placed over k-rails, timbers, and earthen fill to minimize water seepage into, and out of, the work areas. The plastic sheets will be firmly anchored, using sandbags, to the streambed to minimize water seepage. If necessary to prevent erosion, an energy dissipater will be constructed at the discharge point. Timing of flow diversions will be coordinated with the completion of the dam structure to avoid drying up the downstream creek area. Water remaining in the work area will be removed by evaporation, seepage, or pumping. When pumping is required to dewater a site, the decanted water will be discharged with water bypassed around the site or in a separate erosion control – energy dissipation area/vegetated swale. The turbidity of discharged water will not be visibly more turbid than the receiving water. Diversions will maintain ambient stream flows below the diversion, and waters discharged below the project site will not be diminished or degraded by the diversion. Coffer dams will be installed both upstream and downstream to minimize the distance necessary to accomplish effective passive systems, not more than 100 feet from the extent of the work areas. In-channel berms that only deflect water to one side of the channel during sediment removal may be constructed of channel material. When work is completed, the flow diversion structure will be removed as soon as possible. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to downstream habitat, as follows: > All water will be discharged in a non-erosive manner (e.g., gravel or vegetated bars, on hay bales, on plastic, on concrete, or in storm drains when equipped with filtering devices, etc.); > Normally, removal will proceed from downstream in an upstream direction; > When diversion structures are removed, the ponded water will be directed back into the low-flow channel in a phased manner to minimize erosion and downstream water quality impacts. Normal flows will be restored; and, > The area disturbed by flow bypass mechanisms will be restored to the pre-project condition at the completion of the project (to the extent practical). This may include, but is not limited to, re-contouring the area and planting of site appropriate vegetation.

Source: Santa Clara Valley Water District (SCVWD) 2013

Hydrology/Water Quality	
WQ-14 **Use Seeding for Erosion Contro, Weed Suppression, and Site Improvement**	Disturbed areas shall be seeded with native seed as soon as is appropriate after activities are complete. An erosion control seed mix will be applied to exposed soils down to the ordinary high water mark in streams. 1. The seed mix should consist of California native grasses, (for example *Hordeum brachyantherum*; *Elymus glaucus*; and annual *Vulpia microstachyes*) or annual, sterile hybrid seed mix (e.g., *Regreen*™, a wheat x wheatgrass hybrid). 2. Temporary earthen access roads may be seeded when site and horticultural conditions are suitable, or have other appropriate erosion control measures in place.
WQ-15 **Manage Exposed Groundwater at Work Sites**	If high levels of groundwater in a work area are encountered, the water will be pumped out of the work site. If necessary to protect water quality, the water will be directed into specifically constructed infiltration basins, into holding ponds, or onto areas with vegetation to remove sediment prior to the water re-entering a receiving water body. Water pumped into vegetated areas will be pumped in a manner that will not create erosion around vegetation.
WQ-18 **Maintain Clean Conditions at Work Sites**	The work site, areas adjacent to the work site, and access roads will be maintained in an orderly condition, free and clear from debris and discarded materials on a daily basis. Personnel will not sweep, grade, or flush surplus materials, rubbish, debris, or dust into storm drains or waterways. For activities that last more than one day, materials or equipment left on the site overnight will be stored as inconspicuously as possible, and will be neatly arranged. Any materials and equipment left on the site overnight will be stored to avoid erosion, leaks, or other potential impacts to water quality Upon completion of work, all building materials, debris, unused materials, concrete forms, and other construction-related materials will be removed from the work site.
WQ-40 **Prevent Water Pollution**	Oily, greasy, or sediment laden substances or other material that originate from the project operations and may degrade the quality of surface water or adversely affect aquatic life, fish, or wildlife will not be allowed to enter, or be placed where they may later enter, any waterway. 1. The project will not increase the turbidity of any watercourse flowing past the construction site by taking all necessary precautions to limit the increase in turbidity as follows: 2. where natural turbidity is between 0 and 50 Nephelometric Turbidity Units (NTU), increases will not exceed 5 percent; 3. where natural turbidity is greater than 50 NTU, increases will not exceed 10 percent; 4. where the receiving water body is a dry creek bed or storm drain, waters in excess of 50 NTU will not be discharged from the project. Water turbidity changes will be monitored. The discharge water measurements will be made at the point where the discharge water exits the water control system for tidal sites and 100 feet downstream of the discharge point for non-tidal sites. Natural watercourse turbidity measurements will be made in the receiving water 100 feet upstream of the discharge site. Natural watercourse turbidity measurements will be made prior to initiation of project discharges, preferably at least 2 days prior to commencement of operations.

Source: Santa Clara Valley Water District (SCVWD) 2013

Hydrology/Water Quality	
WQ-41 **Prevent Stormwater Pollution**	1. Soils exposed due to project activities will be seeded and stabilized using hydroseeding, straw placement, mulching, and/or erosion control fabric. These measures will be implemented such that the site is stabilized and water quality protected prior to significant rainfall. In creeks, the channel bed and areas below the Ordinary High Water Mark are exempt from this BMP. 2. The preference for erosion control fabrics will be to consist of natural fibers; however, steeper slopes and areas that are highly erodible may require more structured erosion control methods. No non-porous fabric will be used as part of a permanent erosion control approach. Plastic sheeting may be used to temporarily protect a slope from runoff, but only if there are no indications that special-status species would be impacted by the application. 3. Erosion control measures will be installed according to manufacturer's specifications. 4. Appropriate measures include, but are not limited to, the following: – Silt Fences – Straw Bale Barriers – Brush or Rock Filters – Storm Drain Inlet Protection – Sediment Traps – Sediment Basins – Erosion Control Blankets and Mats – Soil Stabilization (i.e. tackified straw with seed, jute or geotextile blankets, etc.) – Straw mulch 5. All temporary construction-related erosion control methods shall be removed at the completion of the project (e.g. silt fences). Surface barrier applications installed as a method of animal conflict management, such as chain link fencing, woven geotextiles, and other similar materials, will be installed no longer than 300 feet, with at least an equal amount of open area prior to another linear installation.
WQ-42 **Manage Sanitary/ Septic Waste**	Temporary sanitary facilities will be located on jobs that last multiple days in compliance with California Division of Occupational Safety and Health (Cal/OSHA) regulation 8 CCR 1526. All temporary sanitary facilities will be located where overflow or spillage will not enter a watercourse directly (overbank) or indirectly (through a storm drain).
Noise	
NO-1 **Minimize Noise Pollution**	Noise produced by construction activities will not exceed the applicable local noise ordinance standards.
NO-2 **Minimize Noise Disturbances to Residential Neighborhoods**	The District will implement practices that minimize disturbances to residential neighborhoods surrounding work sites. In general, work will be conducted during normal working hours. Extending weekday hours and working weekends may be necessary to complete some projects. 1. Internal combustion engines will be equipped with adequate mufflers. 2. Excessive idling of vehicles will be prohibited. 3. All construction equipment will be equipped with manufacture's standard noise control devices. 4. The arrival and departure of trucks hauling material will be limited to the hours of construction. The use of jake brakes is prohibited in residential areas.

Source: Santa Clara Valley Water District (SCVWD) 2013

Transportation/Traffic	
TR-1 **Incorporate Public Safety Measures**	Fences, barriers, lights, flagging, guards, and signs will be installed as determined appropriate by the public agency having jurisdiction, to give adequate warning to the public of the construction and of any dangerous condition to be encountered as a result thereof.
TR-2 **Minimize Impacts on Traffic, Bicycles and Pedestrians**	1. Work will be staged and conducted in a manner that maintains two-way traffic flow on public roadways in the vicinity of the work site. If temporary lane closures are necessary, they will be coordinated with the appropriate jurisdictional agency and scheduled to occur outside of peak traffic hours (7:00 – 10:00 a.m. and 3:00 – 6:00 p.m.) to the maximum extent practicable. Any lane closures will include advance warning signage, a detour route and flaggers in both directions. When work is conducted on public roads and may have the potential to affect traffic flow, work will be coordinated with local emergency service providers as necessary to ensure that emergency vehicle access and response is not impeded. 2. Bicycle and pedestrian facility closures will be scheduled outside of peak traffic hours (7:00 – 10:00 a.m. and 3:00 – 6:00 p.m.) to the maximum extent practicable. 3. Public transit access and routes will be maintained in the vicinity of the work site. If public transit will be affected by temporary road closures and require detours, affected transit authorities will be consulted and kept informed of project activities. 4. Adequate parking will be provided in designated staging areas. Access to driveways and private roads will be maintained. If brief periods of project activity would temporarily block access, property owners will be notified prior to work activities.

Source: Santa Clara Valley Water District (SCVWD) 2013

Appendix D

Resource Agency Coordination

US Army Corps of Engineers

CDFW Comments for 65% Design				
1	Tami Schane	Specs - pg 12-8	12.05.03 Hydraulic Design Criteria - please reference and utilize the California Salmonid Stream Habitat Restoration Manual for fish passage criteria.	District staff has been using the California Salmonid Stream Habitat Restoration Manual for design particularly Part XII.
2	Tami Schane	GC-1	The Type 1 and Type 2 grade control structures do not appear to contain a low flow notch. This could be problematic for fish passage.	The grade control structures comply with the hydraulic design criteria specified in the California Salmonid Stream Habitat Restoration Manual and the hydraulic drop height also complies with published guidelines (CDFG-2002) and NOAA 2001 for passage of steelhead. This information will be submitted to the agencies upon completion of the 90% design.
3	Tami Schane	GC-1	The boulders located at the top of the grade control structures measure 12"-18" in diameter. Are these big enough and how was that size determined to be appropriate?	Yes, the boulders are big enough and were sized based on channel velocity and channel configuration.
4	Tami Schane	GC-1	In the section details for the grade control structures, it is stated that interstices will be filled with streambed fill. Please ensure that those interstices are packed in well with water or they may not stay in place.	Stability depends on the size of the rock, the interlocking of the rock, as well as shape of the structure. District staff will ensure that the rock is appropriately sized given the configuration of the grade control structure.
5	Tami Schane	GC-12	Fish passage details refer to Pg GC-15, which could not be found in the design plans.	Yes, you are correct the design sheet GC 12 incorrectly labels details so GC 15 will be revised.
6	Tami Schane	ISC-29	What is the existing structure at station 426?	This is the temporary grade control structure which provides channel stability between Phase 1 and Phase 2 of construction.
7	Tami Schane	ISC-71	Would it make sense to add LWD structures just upstream of the existing RSP at the bend in the creek to slow the water down? Or just downstream of the RSP on the opposite bank to ensure that opposite bank isn't scouring out as a result of the water hitting the RSP?	District staff will pass this information along to the design consultant for consideration into the 90% design.
8	Tami Schane	GISC-2	Cables should be anchored within the boulders to a depth of 10"-12" (shown as 6" in the details).	The anchoring techniques cited in the CDFG restoration manual for Polyester Resin Adhesive provide guidelines on depth into the rock "and should be approximately 10 inches deep". District Project team will change the depth within the plans to reflect a depth recommendations of 8-10 inches on the larger rock.
9	Tami Schane	General Comment	Although the use of single root wad structures may be appropriate in certain locations, CDFW recommends the use of spider log structures and rootwad, log and boulder combinations rather than single root wad structures spread through the creek (see California Salmonid Stream Habitat Restoration Manual Pgs VII-27 and VII-28).	Thank you. District staff has passed this information along to the design consultant and it will be considered into the 90% design.

CDFW Comments for 65% Design				
10	Tami Schane	General Comment	Please describe the intended function of the LWD structures for this project, which is located in a creek that tends to go dry very early in the season.	The major objective for the LWD in the perennial reach (Reach 6) is to provide cover by enhancing rearing habitat for steelhead by increasing the diversity of cover in the form of scoured pools and turbulence. Other native fish and possibly western pond turtles (basking) will also benefit from the increased complexity. The major objective for the LWD in Reaches 4 and 5 (ephemeral reaches) is to provide velocity refuge for up-out migrating steelhead. There may be ancillary benefits for native fish when the stream is wet by the increase in complexity.
8	Tami Schane	General Comment	Please ensure that placement of the LWD structures at the V weirs is closer to where the pool would develop to ensure adequate cover is provided.	Yes, District Project team will ensure placement provides cover.
9	Tami Schane	General Comment	Please explain the intended purpose of the divider logs.	Divide logs are installed typically mid-channel to provide a visual barrier adjacent to spawning areas. District staff has directed the consultant to replace divide logs with velocity refuge structures in Reaches 4 and 5 and leave them only in the perennial reach above San Martin Ave. in Reach 6.
11	Tami Schane	General Comment	Please ensure that when removing trees and reusing for LWD structures, that they should be adequate length (minimum 5'-6' in length).	District staff typically fells the tree for use in LWD structures in lengths of approximately 20 foot increments- depending on the design of the structure the wood will be cut to fit.
12	Tami Schane	General Comment	Hardwoods and conifers are best for LWD structures. Porous species such as sycamore do not hold up well for these purposes and are likely to fail.	Thank you. District staff has installed LWD in the County and understands that hardwood is most appropriate.
13	Tami Schane	General Comment	It does not appear from the plans that the culverts are natural-bottomed? How will fish passage be addressed at culverts?	Can you please provide clarity on which culvert you are referring to for fish passage?
14	Tami Schane	General Comment	CDFW recommends considering the use of boulder wing deflectors rather than log wing deflectors, as they will last longer.	District staff will pass this information along to the design consultant for consideration into the 90% design.
15	Tami Schane	General Comment	Please describe how the project will affect fish passage at a wide variety of flows.	Are you referring to steelhead passage or localized movements of native fish within the watershed?
16	Tami Schane	General Comment	Please refer to the Project Specific Information for Streamlining Fisheries Engineering Review (attached in email) for information that should be considered when designing projects in salmonid habitat.	District staff is aware of the checklist and this information is available. Would CDFW like to provide a timeline for CDFW engineers to review the design plans? District staff will provide this information in the format of the checklist for ease of review.

CDFW Comments for 65% Design				
17	Tami Schane	General Comment	Looking at the tree removal sheets and revegetation sheets, it appears that quite a few sycamores are being removed throughout the project, but are only being replanted in Reach 6. How will this adequately mitigate the impacts of the loss of sycamore woodland, which is considered to be a sensitive habitat by CDFW?	The hydrology and soils have dictated where Sycamores can successfully grow within the project limits. Reach 6, 7a and Lake Silveira (mitigation parcel) are currently the only locations where Sycamores are believed to be able to survive given the limitations of the site. Planting for Sycamore is planned for the Lake Silveira site and possibly 7a which was not part of the 65% plans. District staff is currently writing a proposal which will be sent to all agency staff on propagation of Sycamores for the Upper Llagas Project which should offset the losses to this sensitive habitat type. District staff did request that CDFW provide some information regarding an acceptable distance for collection of propagules during the August 2 Resource Agency Update and would greatly appreciate if CDFW would provide that direction.

USFWS COMMENTS FOR CONTRACT SPECIFICATIONS				
1	USFWS	18-12	Section 18.07.01 A. Suggest the following changes: The Contractor shall carry out all activities in a manner consistent with the Migratory Bird Permit Memorandums (Appendix B, issued by the U.S. Fish and Wildlife Service dated April 15, 2003 and June 5, 2009. Except as may be noted elsewhere...regardless of the presence of eggs or young; whereas inactive nests or partially-built nests.... The red text is additional. A copy of the June 5, 2009 memorandum is attached.	Concur. Project team will make that change.
2	USFWS	18-12	Section 18.07.02 A Scope of Work. Suggest the following: The Contractor shall be aware of migratory bird nesting seasons and variability; monitor the project site; perform preventative and deterrence measures to prevent birds from nesting in compliance with the provisions of the Migratory Bird Treaty Act and applicable State laws; preserve and protect...;establish new protective buffer zones around established nests....	That is our standard and will make the suggested changes.

USFWS COMMENTS FOR CONTRACT SPECIFICATIONS

3	USFWS	18-13	Section 18.07.01 B. Suggest the following changes: Prior to the District releasing the site to the Contractor, the Engineer, Contractor, and Contractor Biologist shall assess….	Concur. Project team will make that change.
4	USFWS	18-14	Section 18.07.04 A General Nesting Season. Suggest the following: The nesting season in the project area is generally to be from February 1st through August 31st. However, annual variation in climate conditions can alter these periods by several weeks. The Contractor Biologist should notify the Engineers of any nesting season variations observed on-site. [Maybe this should be the Contractor instead of Contractor Biologist?]	Concur. Project team will make that change.
5	USFWS	18-14	Section 18.07.05 A. Migratory Bird Surveys. The Contractor and Contractor Biologist shall perform migratory bird and nest surveys prior to any project-related activity that could pose the potential to affect migratory birds or active nests.	Concur. Project team will make that change.
6	USFWS	18-14	Section 18.07.06 C Protective Buffer Zones. Suggest the following: The Contractor shall monitor protective buffer zone operations periodically throughout each work day during construction.	Concur. Project team will make that change.
7	USFWS	18-15	Section 18.07.06 C Protective Buffer Zones, bullet 5. Change the 20- and 50-foot buffers to 80-foot in the first sentence. Insert the following sentence after the second full sentence (ending with egrets). If eagles are present within 1/4 mile of the work area, the Contractor and Engineers should contact the U.S. Fish and Wildlife Service and California Department of Fish and Wildlife for further consultation.	Regarding "if eagles are present or nesting", can you please provide clarity? Eagles have been noted as nesting in the nearby Anderson Reservoir and eagles have been cited within the Llagas Watershed.
8	USFWS	18-15	Section 18.07.07 A & B Installation and Maintenance of Exclusion Devices. Insert the word generally prior to the reference of nesting and non-nesting seasons. (i.e..,(generally February 1 through August 31)	Concur. Project team will make that change.
9	USFWS	18-17	Section 18.08. Other Wildlife and Fish Species. We just want to note that there is no mention of federally-listed species in Section 18. California red-legged frog, least Bell's vireo, and California tiger salamander.	This section is not typically written until permits are acquired for project activities. This is just a placeholder. Comment noted and all biological requirements will be put into the final contract specifications. District staff will insert all biologic requirements into the final specifications.

USFWS COMMENTS FOR CONTRACT SPECIFICATIONS				
10			The comments above apply to both Phase 1 and Phase 2 Specifications Documents	Thank you, Project team appreciates the feedback.

USFWS COMMENTS FOR DESIGN DOCUMENTS FOR IMPACT ASSESSMENTS		
Page	**Upper Llagas Creek Flood Protection Project 65% Design Habitat Impact Analysis Technical Memorandum**	**SCVWD Response**

USFWS COMMENTS FOR DESIGN DOCUMENTS FOR IMPACT ASSESSMENTS		
5	Quantifications of Impacts Section, Second Paragraph, it States: "Native PSS (shrub-scrub) vegetation under trees to be saved was mapped in the field if grading is proposed under those trees' canopies. If the understory was herbaceous vegetation or non-native PSS, no impacts were assigned. However, if native PSS would be removed by grading, the area of native PSS was considered impacted." The Service believes that understory non-native PSS provides habitat for different species of wildlife and therefore its loss should be considered an impact. In addition, the Service would like the total acreage of impacted PSS understory that will be removed identifies.	Project team agrees that non-native PSS does provide habitat for some wildlife species, but some non-native plants are more innocuous than others. The dominant non-native PSS species on this project, particularly Himalayan blackberry and giant reed (which make up the vast majority of the non-native PSS) have a negative impact on the overall wildlife functions and values and that removal of these species followed by revegetation with native herbaceous species will result in a net ecological benefit to the Llagas Creek riparian corridor. Removal will help to minimize the continued spread of these non-native species and reduce competition with native species. The total acreage of giant reed and Himalayan blackberry, which constitutes approximately 90% of all non-native PSS understory, totals approximately 0.18 ac. Data on the surface area of the other non-native PSS understory species was not collected, but we would estimate it at 10% or approximately 0.018 acres of the surface area. If this value were doubled to 0.036 acres to ensure that all non-native understory is more than accounted for, the total area of non-native PSS understory would be 0.216 ac.
6 & 7	**Table 2 and Table 3.** The totals for Native Riparian Forest and Native Riparian Scrub-shrub (17.49 ac) do not match the total shown in Table 3 (17.48 ac). There is a similar discrepancy with Non-native Riparian Forest and Non-native Riparian Scrub-shrub. Both are likely rounding errors.	Yes, these are rounding errors. To ensure all potential impacts are accounted for, District staff will use the larger impact values in its assessment of impacts and development of associated mitigation.
7	**Table 3, 2nd footnote.** It is not clear why "In most cases" sycamore woodland is a subset of PFO.	PFO is defined in the CAR as woody plant growth averaging over 20 feet in height along the stream corridor. In all cases where sycamore woodland is growing along the stream corridor it is considered a subset of PFO. However, there are instances where sycamore woodland is growing well outside of the bed and banks of the Llagas Creek riparian corridor and as a result it is not considered PFO and would therefore not be a subset of PFO.

USFWS COMMENTS FOR DESIGN DOCUMENTS FOR IMPACT ASSESSMENTS		
8 & 9	**Pages 8-9,** Mitigation Ratios section, first paragraph, it states: "Mitigation ratios for impacts to riparian habitat proposed in the CAR will be used per consultation between SCVWD and regulatory agencies. Per the CAR, mitigation ratios for PFO and PSS habitat impacts range from 1.5:1 to 1.7:1 depending on the reach (USFWS 2003b). These ratios will be reduced 40% for impacts to non-native PFO and P55 and 33% for impacts to native PSS under PFO canopy that has been saved." Please clarify why these mitigation ratios are reduced by 40% for impacts to non-native PFO and PSS, and by 33% for impacts to native PSS under PFO canopy that has been saved.	Per previous guidance provided by the resource agencies, District staff is utilizing the habitat mitigation approach that is described in the CAR to the extent feasible. The HEP analysis that the CAR is based on reduces the Habitat Suitability Index of impacted vegetation by 40% when the majority of the plant canopy closure (cover) is made up of non-native species. Therefore, we utilized that 40% reduction in our adjustment of mitigation ratios for non-native PFO and PSS. Independent of the CAR directive as just described, the Project design team considered habitat values for native PSS under PFO canopy, and proposes that a 33% reduction in mitigation ratios would reflect that fact that only understory was removed, compared with areas where both overstory and understory were removed.
	Upper Llagas Creek Flood Protection - Project Update	**SCVWD Response**
	The service has no comments specific to this document.	Ok, thank you for your review.
	Upper Llagas Creek Flood Protection Project: Inclusion of Bat Evaluations into Environmental Documents	**SCVWD Response**
	The service has no comments specific to this document.	Ok, thank you for your review.
	Upper Llagas Creek Flood Protection Project Habitat Restoration Planting Palette, Species Composition, and Spacing Technical Memorandum	**SCVWD Response**
	The Service has no specific comments to this document.	Ok, thank you for your review.

USFWS COMMENTS FOR DESIGN DOCUMENTS FOR IMPACT ASSESSMENTS		
	Upper Llagas Creek Flood Protection Project- Revegetation Acreage and Planting Polygon Refinement Technical Memorandum	**SCVWD Response**
	The Service has no specific comments to this document.	Ok, thank you for your review.
	Upper Llagas Creek FFP- Reach 7A Detention Basin Analysis	**SCVWD Response**
	The Service has no specific comments to this document.	Ok, thank you for your review.

CCRWQCB Comments for 65% Design for Upper Llagas Creek

1	CCRWQCB	General Comment	Central Coast Water Board staff provided comments on the 30% design to the District on August 23, 2012. Central Coast Water Board staff met with District staff on March 14, 2013, to reiterate and discuss our comments on the 30% design that had not been adequately addressed in the District's January 24, 2013 response to our comments on the 30% design. To date Central Coast Water Board staff has not received the District's response to the issues we raised in the April 18, 2013 meeting, nor have the issues been incorporated into the 65% design plans.	Please refer to the Project design team's responses to both your July 15, 2013 and August 1, 2013 letters for responses to the Central Coast Water Board's earlier Project comments.
2	CCRWQCB	General Comment	Since the District has not yet responded to all of our earlier comments, all of our earlier comments are incorporated by reference.	Agreed. It is the Project team's desire to review all comments, provide responses, and incorporate the applicable comments/responses into the design.
3	CCRWQCB	General Comment	Since many of Central Coast Water Board's earlier comments on the Project relate to the hydrologic model and assumptions on which the design is based, and since the District has not yet responded to all of our earlier comments or incorporated them into the Project design, it is possible that the final Project design may vary significantly from the 65% design plans. This uncertainty makes review of the 65% design difficult and potentially irrelevant. The District should resolve the hydrologic model and incorporate resulting changes into the design before continuing with design development. The District should provide additional review opportunities after the design has been modified to incorporate the District's responses to all CCRWQCB comments.	Please refer to the Project design team's responses to both your July 15, 2013 (response to question 1a, 1b, 1c) and August 1, 2013 letters for responses to the Central Coast Water Board's earlier Project comments.
4	CCRWQCB	General Comment	The Project hydrologic model still has not been modified to appropriately. The model must be adjusted to include only runoff from existing development, rather than from development associated with 2050 build-out conditions. The model must also be adjusted to account for onsite runoff detention and retention. The City of Morgan Hill has been requiring post-construction stormwater controls for all new development for many years. As a result, the 1% runoff rate from many developed areas in Morgan Hill is substantially less than the 1% runoff rate without such post-construction runoff controls.	Please refer to the Project design team's responses to both your July 15, 2013 (responses to question 1a and 1b) and August 1, 2013 letters for responses to the Central Coast Water Board's earlier Project comments.

CCRWQCB Comments for 65% Design for Upper Llagas Creek

5	CCRWQCB	General Comment	The Project has still not incorporated alternative approaches to flood protection which would reduce the Project's impacts on stream channels. In particular, the Project has still not incorporated off-channel or near-channel detention and/or retention storage. Such storage could significantly reduce the design flow rate, and therefore significantly reduce the channel modifications needed to convey the design flow rate. Review of aerial photographs of Morgan Hill indicate undeveloped land within the City that could be used in this way to reduce the design flow rate within the stream channels. In addition, numerous plan sheets (e.g., D-13, D-34 through D-37, D-40, D-45 through D-48, D-53, D-54, D-75 through D-77, D-79 through D-89, et. al.) indicate undeveloped land adjacent to the proposed channel modifications that could be acquired by the District and modified for use as floodplain storage, further reducing the downstream flow rate and thus the need for downstream channel modifications. The District must as demonstrate that all less environmentally damaging alternatives have been fully explored. The District's alternatives analysis should include explanation of why rejected alternatives were rejected.	Please refer to the Project design team's responses to both your July 15, 2013 (response to question 1c) and August 1, 2013 letters for responses to the Central Coast Water Board's earlier Project comments.
6	CCRWQCB	General Comment	The District has still not conducted updated environmental review for the proposed project. Given the project design changes since 1982, the issues raised in earlier CCRWQCB comments which have not yet been addressed or incorporated into the design, and the uncertainty about revegetation potential, 65% plan review seems extremely premature. We need to have the environmental analysis **before** evaluating the design.	The Project team is to issue the Draft EIR/EA in December 2013 which will include all the environmental analysis you are seeking. The Project team has tried to provide these supporting documents/reports/memorandums, etc. to the Resources Agencies as they have become final.
7	CCRWQCB	D-11, D-12, D-17, D-18, D-20, D-24, D-29, D-30, et. al.	The 65% plans indicate that the Project will use existing bridges and crossings without modifying them. However, it is unclear whether the existing bridges and crossings are able to convey the design flow rate without significant hydraulic effects, such as head loss, increased erosion potential, and increased need for hardscape. What are the hydraulic consequences of using each existing bridge and crossing, and to what extent does retaining each existing bridge and crossing increase other environmental impacts, such as creating the need for more modified channels to compensate for head losses? What are the backwater effects of each existing bridge and crossing? To what extent would replacing the bridges reduce these impacts?	Please refer to the Project design team's responses to both your July 15, 2013 (response to question 1d) and August 1, 2013 letters for responses to the Central Coast Water Board's earlier Project comments.

CCRWQCB Comments for 65% Design for Upper Llagas Creek

8	CCRWQCB	D-55, D-57, D-65 through D-67, D-69, D-72, et. al.	The plans indicate several locations where existing trees on the bank are proposed for removal in favor of a bench nearer the bankfull channel. Since the revegetation potential of the benches is not fully known, it is not known whether the bench in these locations will provide higher-quality habitat than the existing trees. Benches must be considered on a case-by-case basis. Where the revegetation potential of the bench equals or exceeds the habitat value of existing vegetation to be removed—or the revegetation potential of upper bank areas—and the District is willing to vegetate the bench in order to achieve this potential, benches are preferred. Otherwise, the bench should be removed so that the stream channel is nearer to the existing vegetation and/or planting area on the upper banks.	Agreed. The Project team agrees with this philosophy and analysis for considering benches. This analysis is and has been performed, while maintaining the geomorphology bankfull channel design.
9	CCRWQCB	General Comment	Modifying the Project's hydrologic model and providing off-channel and near-channel storage as described above may result in lower design flow rates, reducing the extent of channel modification needed to convey the design flow rate. Any reduction in the need for channel modification should be used to optimize revegetation of the channel in one or more of the following ways: a) Retaining the design width of channels and increasing vegetation type or thickness within the channels (e.g., bench and bank areas) where the habitat restoration potential within the channel equals or exceeds the habitat value of existing vegetation and the habitat restoration potential of upper bank areas; or b) Reducing the design width of channels where the habitat restoration potential within the channels (e.g., bench and bank areas) is less than the habitat value of existing vegetation and the habitat restoration potential of upper bank areas.	Please refer to the Project design team's responses to both your July 15, 2013 (response to question 1c) and August 1, 2013 letters for responses to the Central Coast Water Board's earlier Project comments.
10	CCRWQCB	L-21	The 65% design includes planting plans consisting of "blanket" vegetation layers overlaid on the Project footprint. These blanket layers do not appear to account for uncertainty with respect to the revegetation potential of these areas. In addition, planting decisions require explanation: What criteria guided selection of each vegetation type to plant in each area? Which of the other vegetation types would also be viable? Which vegetation type would add the most environmental value? If another vegetation type would add more environmental value than the selected type in any location, why was it rejected? What is the roughness objective for each channel reach, and how does the selected vegetation type meet that objective?	The vegetation polygons (i.e. vegetation layers) are a GIS tool to graphically represent what vegetation types were proposed for planting within the project footprint. The layers were not just laid on the plans but a significant amount of work went into developing locations and types of planting material. What criteria guided selection of each vegetation type to plant in each area? The criteria that guided selection was a copulation of data collection efforts for project development 1) Evaluate existing vegetation-existing species composition informs which species have the best potential given current conditions 2) hydrology 3) Soil conditions 4) channel roughness and flood protection constraints 5) plant growth potential 6) plant growth requirements 7) propagule source and

CCRWQCB Comments for 65% Design for Upper Llagas Creek

				commercial availability. Which of the other vegetation types would also be viable? I am unclear how to answer this question-what is the "other vegetation types"? Which vegetation type would add the most environmental value? Plants provide the basic physical structure for most wildlife habitats so the most environmental value question is open to some degree of interpretation. For the purposes of planning for this project, the vegetation types with the greatest wildlife value in the Llagas watershed are plant communities which are locally endemic to the area for which the native wildlife have evolved. Additionally, for greater "value" a mosaic of habitat types are preferential and they should be self-sustaining which require very little human intervention to manage. If another vegetation type would add more environmental value than the selected type in any location, why was it rejected? I am unclear as to what other vegetation types the author refers but the District has favored rarer habitat types in the planning process. Wetland habitats are rare in this watershed owing to the changed hydrology on the valley floor where once wet meadows were interspersed with drier grasslands. Reach 7 is now under consideration for favoring this habitat type over upland plantings which is a more prolific in the watershed. Additionally, the creation of the mosaic of wetlands (Lake Silveira) adjacent to riparian would add much needed biodiversity to this watershed. What is the roughness objective for each channel reach, and how does the selected vegetation type meet that objective? This information is outlined in the Upper Llagas Creek Flood Protection Project Habitat Restoration Planting Palette, Species Composition and Spacing Technical Memorandum previously provided to all resource agency staff. This information will also be provided in the EIR.
11	CCRWQCB	L-21	There does not appear to be a planting plan for reach 7B	The Reach 7b Planting Plan will be developed as the Project design advances. However, due to the limited available Project r/w due to urban development along both banks, a geomorphology bankfull design, the Reach 7b revegetation will be limited in scope in order to provide 1% protection.
12	CCRWQCB	General Comment	It is not clear how channel meander will be achieved. The 65% plan seems to include only requirements for the radius of curvature for meander in each reach. Will actual meander design be incorporated into the Project plans or left to the contractor in the field? What is the plan for agency review of the channel meander plans?	Meander geometry is most often expressed as a function of bankful width. The meanders were evaluated as part of the project planning (Recommended Bankfull Geometries for Flood Protection Channel Design Upper Llagas Creek Santa Clara County) and appear to remain from the pre-agricultural valley floor, before Llagas Creek was locally straightened, and incident flows were modified by

CCRWQCB Comments for 65% Design for Upper Llagas Creek

				construction of Chesbro Dam. Diameters of 350 feet (radius of 175 feet) have been calculated to show that numerous self-formed curves have radii in the range of 120 to 200 feet, implying that the pre-agricultural bankfull width through much of Reach 4 ranged between 50 and 65 feet. Stable bankfull widths under current flows may be slightly less, due primarily to peak attenuation at Chesbro. While other factors also influence stable bank widths, the District does not plan to deviate from the radius of curvature and subsequent meander length which currently exists since this is the natural condition. Since the plan is to match existing conditions (i.e. keep meanders) there is no specific meander design and subsequent no plan for agency review. The Bankfull report was previously provided to all agency staff.
13	CCRWQCB	D-26	A new crossings proposed to be constructed in proposed reach 7A. According to plan sheet C-35, the crossing will consist of a triple box culvert. This design will potentially result in significantly higher head losses and other hydraulic effects than would result from constructing a bridge in this location. In addition, a bridge would allow greater habitat continuity and wildlife passage. Why was a culvert chosen for this location rather than a bridge? What are the hydraulic consequences (in terms of head loss, increased erosion potential, and increased need for hardscape) of the proposed culvert? Please reevaluate this crossing, modify if possible, and provide analysis demonstrating the thought process which led to the ultimate design.	Please refer to the Project design team's responses to both your July 15, 2013 (response to question 1d) and August 1, 2013 letters for responses to the Central Coast Water Board's earlier Project comments.
14	CCRWQCB	Plan sheets D-22, D-66, D-67, D-69, D-89, et. al	The plans indicate several locations where modifying the channel alignment in these locations could result in preservation of more of the native trees. Please reevaluate these locations, modify if possible, and provide analysis demonstrating the thought process which led to the ultimate design at each location.	Agreed. The Project team has reviewed the Project design to avoid and preserve as many native trees as is possible for the entire length of the approximate 13 mile long Project. These locations will be re-evaluated again.
15	CCRWQCB	D-27, D-59, D-71, et. al.	While channel meander is a vital habitat function, increasing the radius of the proposed bends between STA 443+00 and STA 446+00 and between STA 202+00 and 209+00 and may result in less erosion and less need for hardscape. Please reevaluate these bends, modify if possible, and provide analysis demonstrating the thought process which led to the ultimate design for each location.	See response to question 12.

CCRWQCB Comments for 65% Design for Upper Llagas Creek

16	CCRWQCB	D-28	There appears to be a hydraulic “bottle-neck” between STA 435+00 and STA 444+00 as a result of avoiding the commercial development north of the channel. This bottle-neck has the potential to increase head loss, erosion, and the need for hardscape at this location. What are the hydraulic consequences of avoiding the commercial development? What options were explored to avoid this bottle-neck? Please reevaluate this bottle-neck, modify if possible, and provide analysis demonstrating the thought process which led to the ultimate design.	Actually, this location is the Reach 7a confluence with the main stem of Upper Llagas Creek. This location is actually where the additional "bowtie" parcel and the triangular parcel (sycamore plantings) are being purchase to enhance the higher value habitat, take advantage of better soils and higher groundwater, and continuity with the Lake Silveira Mitigation plantings. Please refer to future design drawings and the upcoming Draft EIR/EA to be released for public review in December 2013 for additional details of this location.
17	CCRWQCB	D-55	The plan preserves the existing stream alignment as the south channel, but then leaves it so narrow by the grading that it is nearly closed. What is the thinking here? What alternatives were explored? Please reevaluate this location, modify if possible, and provide analysis demonstrating the thought process which led to the ultimate design.	Please refer to Sheet PP-55 for the design of the confluence with Reach 14. To avoid erosion potentials which are typical at creek confluences, this confluence area is being widened and an island to exist near the center of the confluence for habitat.
18	CCRWQCB	D-56	Why are the sycamore trees located southwest of the proposed channel at STA 225+00 proposed for removal? Please reevaluate this location, modify if possible, and provide analysis demonstrating the thought process which led to the ultimate design.	Agreed. The Project team has reviewed the Project design to avoid and preserve as many native trees, especially sycamores, as is possible for the entire length of the approximate 13 mile long Project. Please refer to sheet PP-56 for the unavoidable Project impacts to these existing sycamores. If the channel is moved to the west, additional sycamores would potentially be impacted.
19	CCRWQCB	D-62, D-72, D-89, et. al.	How can storm drain outfalls and other points of discharge to the proposed channel be redesigned to avoid or reduce the use of hardscape? Please reevaluate these locations, modify if possible, and provide analysis demonstrating the thought process which led to the ultimate design at each location.	The Project team will evaluate the possibility of reducing the use of hardscape at storm drain outfall locations. However, to protect from bank scour at the storm drain discharge location, thus minimizing water quality issues, some minor form of hardscape will be needed at these various discharge points.
20	CCRWQCB	D-68	Why is the existing channel being abandoned between STA 136+00 and STA 145+00? Please reevaluate this location, modify if possible, and provide analysis demonstrating the thought process which led to the ultimate design.	The channel is not being abandoned. The original PL-566 project had this portion of the channel abandoned and filled in. However, the Project team has decided to use the existing channel for split flows with an island to be created and vegetated (increase roughness) to provide enhanced habitat.

CCRWQCB Comments for 65% Design for Upper Llagas Creek				
21	CCRWQCB	D-71	Where will the low-flow channel be placed? There is an established bench between STA 112+00 and STA 118+00—why does the design ignore it and plow right through it? Please reevaluate this location, modify if possible, and provide analysis demonstrating the thought process which led to the ultimate design.	The lower portion of Reach 4 has been very difficult hydraulically to size for "no induced flooding", while maintaining a geomorphology bankfull channel design and maximizing roughness. Please refer to the Project design team's responses to both your July 15, 2013 and August 1, 2013 (response to question 4i) letters for responses to the Central Coast Water Board's earlier Project comments.
22	CCRWQCB	D-73	Would widening the proposed channel in a southwesterly direction reduce the potential for erosion and the need for hardscape at the Buena Vista Avenue crossing? Please reevaluate this location, modify if possible, and provide analysis demonstrating the thought process which led to the ultimate design.	Currently, the only hardscape planned for the existing Buena Vista Avenue bridge is at the channel invert, under the bridge to protect the existing bridge abutments from scour, which, if allowed to occur, could potentially damage the bridge structure or cause it's failure/collapse.
23	CCRWQCB	D-41, D-47, D-70, et. al.	The plans show a cross-hatched pattern that does not appear to be explained in the Legend. Please provide an explanation.	Agree. These are areas at top of bank that will not be impacted by Project excavation. The plans will be updated to address your comment and define the cross-hatched pattern.
24	CCRWQCB	various	The need for all proposed RSP and other hardscape must be demonstrated through hydraulic analysis. The analysis must show that all less-impacting bank stabilization methods, including channel realignment, were evaluated found to be inadequate, and must provide the reasons each method was rejected.	Agree. The Project team would prefer installing RSP at only those locations absolutely necessary based on the velocities expected through the hydraulic analysis. The Project team's preference is to avoid having to pay the added Project costs associated with purchasing and installing RSP, if not absolutely necessary.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
1a.	The Project design must be based on current development conditions, rather than development conditions presumed to exist at some future date.	The Project hydrology was based on 2050 conditions. Per your request, District staff has done analysis to compare the 2006 to 2050 conditions. There is a minor difference between the 2006 flows and the 2050 flows as described in the District memorandum titled, "Upper Llagas Creek Flood Protection Project - Detention Basin Analysis Using 2006 Hydrologic Data", dated November 6, 2013, and also described in the additional information to the March 14, 2013 meeting notes.
1b.	The Project design must be treat all development that has occurred since the City of Morgan Hill's adoption of stormwater detention requirements for new development (c. 1980) as having runoff conditions in compliance with the City's requirements. It is the City's responsibility to ensure that development since that time has implemented and maintained stormwater detention features achieving the City's requirements.	As mentioned in the additional information provided to the March 14, 2013 meeting notes, City of Morgan Hill has had a policy in place since 1980 requiring new developments to have their own retention pond system in place to contain the 100-year event. District staff has contacted the City of Morgan Hill to obtain information regarding these systems. While the intent of the policy was to reduce the runoff, there appears to be no regulation for post construction performance of these features or required maintenance of constructed elements. It is not possible for District staff to know this information and without regulatory processes in place to enforce post construction monitoring and maintenance. Obtaining this information now is onerous and may provide little in the way of usable information to reduce Project limits. Since the existing conditions demonstrates that even with these features in place since 1980, there still continues to be often and extensive flooding within the City of Morgan Hill. In regards to City of Morgan Hill developments, District staff (Community Projects Review Unit) has years of correspondences with the City of Morgan Hill urging for stormwater detention facilities, but District did not and does not have enforcement authority to require such facilities. The tracking and compliance of constructed features built after 2012, due to the CCRWQCB Post Construction Stormwater Management Requirements for Development Projects in the Central Coast Region, will be easier to manage into the future.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
1c.	The Project design must incorporate additional off-channel and floodplain storage wherever feasible. The Central Coast Water Board understands that this will require cooperation between the District and other project stakeholders, but exploring and developing storage options which reduce the Project design flow is an essential element of impact avoidance and eventual Central Coast Water Board approval of the Project.	District previously provided two studies on off-channel and floodplain storage - City of Morgan Hill study prepared in 1981 and another study prepared by the District in 1997. In summary from the studies, the upstream flows were not significant enough that detaining these flows by constructing a detention facility would not prevent downstream inflows from causing flooding. Downstream in-creek modifications would still need to be constructed to meet Project objectives. Therefore, construction of an upstream detention facility was eliminated as an alternative because it could not avoid the need for creek modifications and associated environmental impacts. The Project team has studied and adopted a tunnel alternative to avoid impacts to the existing creek and its habitat within Reach 8. Per your request, District completed an additional off-stream detention facility analysis at Reach 7A which was previously provided. The issues regarding off-stream detention were determined to be: • A detention facility constructed in Reach 7A to capture all upstream Project flow increase would only be slightly less in size (2006 vs. 2050) and would still result in the need for downstream modifications, thus resulting in similar environmental impacts to the recommended design; • This large a detention facility would have inherent issues with operation and maintenance, species entrainment, public safety, mosquito abatement, and potential water quality issues; • A smaller detention facility could be constructed in Reach 7A, which could allow for increased channel roughness downstream. However, such a facility would not eliminate the need for downstream modifications, and existing soil conditions in Reaches 4, 5 and 6 are nutrient deficient and likely would not support an increase in plant density over what is proposed. The District's revegetation strategy is to maximize vegetation given the

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
		soil and water constraints within the project limits. If plant density is increased, the nutrient content in the soils and lack of available surface and groundwater may not support this increased density, thus vegetation would never reach its desired habitat potential; • A detention facility constructed to capture upstream flows to avoid induced flooding in the downstream reaches of 4, 5, and 6 would not address the incision issue within Llagas Creek as identified in the Stable Channel Design and Sediment Impact Assessment Report (Noble Consultants, Inc.; Northwest Hydraulic Consultants) completed in 2008 for the USACE and confirmed in the Recommended Bankfull Geometries For Flood Protection Channel Design Report (Senter, Hecht, Strudley, & Richmond) completed in 2012 for the District. • A detention facility within Reach 7A would interfere with planned mitigation in the lower section of Reach 7A (the bowtie parcel), which is currently under development with the Lake Silveira design. It would be environmentally beneficial to take advantage of the better soil quality and higher groundwater to plant mesic riparian vegetation. This mitigation element will provide connectivity to the higher quality habitats within the Lake Silveira parcel and upstream reaches. • A total detention facility footprint of 150+ acres in size is not practical, would face its own environmental issues, and would likely not receive favorable public support. As the CCRWQCB stated at the March 14, 2013 meeting, widening the bank 5 feet doesn't necessarily have less impact than widening the bank 30 feet. District staff analysis has shown that it is not possible to practically store the volume of water necessary upstream that would eliminate the need for downstream creek widening.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
1d.	Where channel capacity to convey the Project design flow is reduced by channel constrictions, these channel constrictions must be removed or reduced.	There is only one location, approximate location Station 449+00, where an entirely new crossing is proposed to be constructed. At Station 449+00, a triple cell box culvert creek crossing is proposed to continue to allow the land owner (farmers) to maintain access to their entire property that will be split as a result of the Project. To construct a clear span bridge at this location for a private crossing, that will be used intermittently, would cost millions and may be considered a mis-use of public funds. There are several other locations, Edes Ct., Cosmo Ave, etc. where an existing box culvert crossing exists along the creek. The proposed Project will install additional box culverts at these crossings to accommodate the proposed creek widening upstream and downstream. It is in the District's best interest, to not have constrictions in the creek, as constrictions increase flow velocities, which lead to channel erosion and downstream sediment deposition that will result in additional creek maintenance at a significant cost to the District (public). These crossings have been designed to accommodate the creek widening without significantly increasing flow velocities to erosive conditions, head loss, and backwater conditions where hydraulic capacity is compromised.
1e.	Design flow reductions achieved through elements (a) through (d), above, must be incorporated into the design to reduce channel impacts, where possible, and to optimize channel revegetation conditions where reducing impacts is not possible.	As discussed at the last Resource Agency meeting on June 25, 2013, the appropriate plant palette has been chosen for the soil conditions throughout the Project and vegetation replacement has been maximized based on soil and hydrology conditions. District staff is proposing different methods to optimize channel revegetation. The proposed Project will result in a geomorphically stable channel and improved sediment transport. There is a tunnel that will preserve the existing creek within the City of Morgan Hill and thus will avoid impacts to the existing creek. District staff has avoided higher quality vegetation where possible by alternating roads and only doing work to one side of the creek where practical. District staff has added infill planting areas to the Project revegetation design by removing trash and debris on the opposite bank where work is to take place to maximize revegetation opportunities and provide greater opportunities for ecological and creek enhancements. District staff has also increased woody debris features to enhance habitat within the creek.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
1f.	Revegetation/roughness increases resulting from element (e) above must be implemented in accordance with the best habitat potential. Where the best conditions exist at bench level, channel width should be maximized in order to maximize bench area; but where the best conditions exist at top of bank, channel width should be decreased in order to maximize planting area at the top of bank.	District staff has worked with the Design and Revegetation consultants to evaluate opportunities where to maximize planting areas while still maintaining the delicate balance of maintaining hydrologic capacity and a geomorphically stable channel.
2a.	The comparison between 2006 and 2050 development conditions mentioned above indicates a design flow of 2,093 cfs in West Little Llagas Creek downstream of Edmundson Creek. This is identical to the design flow at this location posited in the 2012 hydraulic report for the 30% Project design and in the 2003 U.S. Army Corps of Engineers hydraulic study for the project. Therefore it is impossible that the June 28, 2013 model incorporates all of the elements listed in Issue No. 1, since Central	Please refer to District staff prior response to your Question 1a from your July 15, 2013 letter.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
	Coast Water Board staff has raised those elements with District staff only in the last several months (March 14, 2013, and subsequently).	
2b.	The Reach 7A Detention Basin Analysis prepared by District staff, dated June 20, 2013, uses the same design flow (2,093 cfs) in calculating the storage volume needed at Monterey Road to avoid flooding along West Little Llagas Creek and avoid induced flooding in reach 6 of Llagas Creek. As a result, it is impossible that this analysis incorporates all of the elements listed in Issue No. 1.	Please refer to District staff prior response to your Question 1c from your July 15, 2013 letter.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
3a.	To date District staff has considered two detention pond alternatives. The first, described in West Little Llagas Creek Detention Pond Study and Flood Protection Measures (May, 1997), indicated that a 15-acre pond located south of Llagas Road could reduce the peak flow entering reach 8 by 353 cfs (p. 13). The second alternative, described in the Reach 7A Detention Basin Analysis, determined that a 1,170 acre-foot basin would be needed south of Watsonville Road to avoid any induced flooding downstream. However, a smaller basin would still provide some reduction in design flow that could be used to optimize revegetation (roughness) within the modified channel footprints downstream.	Please refer to District staff prior response to your Question 1c from your July 15, 2013 letter.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
3b.	Review of aerial photographs of the City of Morgan Hill indicates additional areas of undeveloped land within the City and near reaches 4, 5, 6, and 14 that could be used for detention storage to reduce peak design flows. Numerous plan sheets in the 65% design plan set ((e.g., D-13, D-34 through D-37, D-40, D-45 through D-48, D-53, D-54, D-75 through D-77, D-79 through D-89, et. al.) also indicate undeveloped land adjacent to the proposed channel modifications that could be acquired by the District and modified for use as floodplain storage to attenuate peak flows.	Please refer to District staff prior response to your Question 1c from your July 15, 2013 letter. In addition, District staff is concerned with fish entrainment at detention facilities within Reaches 4, 5, and 6 as this area is designated critical habitat for SCCC-steelhead by NMFS. Fish & Wildlife has expressed a similar concern of fish entrainment.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
4	The 65% design plans continue to indicate that the Project will use existing culverts and crossings, some of which appear undersized. In addition, the Project includes construction of a new crossing near station 449+00, consisting of three parallel box culverts rather than a bridge which would span the entire channel and avoid obstructing and constricting flow at this location. In addition, bridges provide superior habitat potential and wildlife passage, and can require less long-term sediment and vegetation maintenance.	Please refer to District staff prior response to your Question 1d from your July 15, 2013 letter. The geomorphology analysis completed provides for locations where sediment is to drop out (i.e. confluence of Reaches 4, 5, 14). The O&M document will state where these locations are, the frequency of maintenance, and the trigger (i.e. quantity of sediment to be removed when flood protection is compromised) for when this maintenance will take place.
Comment	**Central Coast Regional Water Quality Control Board Comment (August 1, 2013 Letter)**	**SCVWD Response**
1	CCRWQCB staff has no comments on this memorandum at this time.	Ok, thank you for your review.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
2a.	The impact analysis was based on the Project *Fish and Wildlife Coordination Act Report* CAR), which was prepared using the Habitat Evaluation Procedure (HEP) conducted by USACE and CDFW to assess impacts to fish and wildlife resources. Therefore, it is unclear that the impact analysis covers all waters of the State or fully identifies and evaluates all impacts to water quality and beneficial uses caused by the Project.	The CAR is intended to provide early recommendations for conservation of fish and wildlife species. Impacts to waters of the state and water quality and beneficial uses will be in the EIR/EA.
2b.	The "perennial emergent marsh" designation refers to wetland habitats within USACE jurisdiction. Are there any wetland areas outside of USACE jurisdiction that could potentially be impacted by the Project?	There are no impacts to wetlands outside of USACE jurisdiction.
2c.	According to the memorandum, the "riparian scrub-shrub" (PSS) designation includes species that are in early developmental stages of habitat designated as "riparian forest" (PFO) (p. 2). How will this	The PSS designation does come from the CAR and refers to "woody plant growth averaging 20 feet or less in height along the stream corridor. Scrub-shrub along the stream is generally an early succession stage of riparian forest." The Forest habitat type has a higher species diversity even though it includes the same shrub species as the scrub palette but it also includes a variety of riparian tree species. The PSS will be tracked via the planting polygons and success criteria will be established in coordination with the agencies.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
	"early developmental stage" PFO be tracked and mitigated? Early developmental stage PFO habitat must be treated as PFO, not as PSS (see Comment No. 3.g, below).	
2d.	The memorandum states that the mitigation ratios are taken from the CAR and were confirmed "per consultation with regulatory agencies" (p. 9). When did this consultation occur? Was CCRWQCB staff involved? CCRWQCB staff has commented previously on the replanting/mitigation approach for the Project. If mitigation ratios are still based on the CAR, it is unlikely that the District has incorporated all CCRWQCB staff comments.	District staff has coordinated with resource agency staff, including CCRWQCB and did note during the 30% design meeting on August 2, 2012 that we would be following the 2003 revised CAR. The agencies in attendance did agree to allow the CAR to be the guidance document for mitigation. However, District's staff approach to revegetation is to simply maximize plantings and habitat values at each channel section taking into account the hydraulic constraints, soil types, and subsurface water conditions. The accounting and impact analysis is secondary in the planning effort and the District staff believes that maximizing habitat values by creating a self-sustaining system to improve beneficial uses is the acceptable approach for which the CCRWQCB endorses.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
2e.	The mitigation ratios identified in the memorandum range from 1.5:1 to 1.7:1 for permanent impacts to PFO and PSS, reduced by 40% for impacts to non-native PFO and PSS, and by 33% for impacts to native PSS under PFO canopy that will remain. These mitigation ratios do not appear adequate. CCRWQCB requires mitigation of permanent impacts to riparian habitat at a minimum ratio of 2:1, with higher ratios for higher-quality habitat. For instance, the typical mitigation ratio for native species greater than 24" dbh is 10:1. In addition, CCRWQCB expects mitigation at a minimum ratio of 2:1 for all lost habitat functions and beneficial uses. Therefore it is not appropriate to reduce mitigation for impacts to PSS just because it is under PFO canopy that is not being impacted.	District staff will make that change to remove the 40 and 33% reduction respectively during the next iteration of analysis. However, District staff has asked all the agencies to consider out-of kind mitigation in the form of invasive species control to bring the ratios up since we believe that the invasive species are contributing to the decline of the existing riparian structure and homogenizing habitats. District staff will work with resource agency staff in the coming months to discuss the particulars.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
2f.	Please clarify the Project's revegetation objective for sycamore woodland. The memorandum cites conclusions from the development of the Santa Clara Valley Habitat Conservation Plan which appear to disagree with statements in the Planting Palette and Planting Polygon memoranda. CCRWQCB staff expects sycamore woodland restoration in Project areas wherever site conditions are capable of supporting it.	The revegetation objective is to maximize planting of Sycamores where soil and hydrology are appropriate. This means Lake Silveira mitigation area, Reach 6, and Reach 7a. The Project team agrees with the CCRWQCB expectation to plant sycamore woodland in all applicable Project areas where favorable site conditions exist to support them. District staff also understands the value of this important vegetative community. Therefore, we plan to propose an academic evaluation to advance the science of vegetative propagation of local stock of Sycamores to make up for any deficiency in mitigation ratios for this vegetation type. District staff will present a formal proposal to the agencies in coming months. Additionally, District staff is undertaking additional avoidance and minimization approaches to further attempt to avoid impacts to the native Sycamore as the Project design evolves.
3a.	The memorandum mentions the following documents on p. 3: • Upper Llagas Creek Stormwater Improvements Project Preliminary Delineation of Wetlands and Other Waters (2013); • Upper Llagas Creek Baseline Biological Resources Report (2012); • Upper Llagas Creek Riparian Corridor Assessment (2012); and • Draft Phase 2 Technical Memorandum (2012) When will these documents be	SCVWD staff apologizes for inadvertently not including the subject documents in the last submittal. Sorry for any inconvenience that occurred as a result of this oversight. The subject documents are included in this latest submittal. Please note the corrected name for the one report: Upper Llagas Creek Project Preliminary Delineation of Wetlands and Other Waters, Santa Clara County, California (2013)

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
	provided to regulatory agencies? It is difficult to conduct a complete evaluation of the channel designs and documents received to-date without this additional information.	
3b.	The memorandum states that channel geometry and hydrologic/hydraulic modeling inform planting locations. However, these models have not yet been adjusted in response to previous CCRWQCB comments. Therefore replanting plans will likely need to be revised.	The revegetation planning documents are iterative and will be revised several more times before Project design completion.
3c.	The memorandum states that soil restrictions will control replanting possibilities (p. 4). However, District consultants stated at the 65% design meeting that revegetation will be optimized through the use of soil amendments. Please reconcile	District staff is investigating the use of soil amendments to better improve initial growing conditions (i.e. nutrient availability) for the revegetation plantings. More information regarding this approach will be presented to resource agency staff at the next Project update meeting. However, given that this watershed is lacking also in available water, all conditions must be taken into account to ensure that what is planted will be self-sufficient and sustainable.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
	these two statements.	
3d.	The plant size potential and planting density requirements provided in Table 1 for Reach 7 do not appear to be sufficiently diverse. How will these requirements be incorporated into the Project? Also, the density requirements are per linear foot. How will these densities be reflected in planting areas of varying width?	Table 1: The CAR had a very simplistic recommendation for Reach 7 which is what Table 1 reflects. If you note what was proposed in Reach 7 (Table 5), this reflects more vertical and horizontal complexity (i.e. diversity of structure). However, recent data collection efforts has revealed high groundwater is expected in Reach 7a during normal and above normal precipitation years. This new information has prompted the Project team to rethink the revegetation strategy within this area to take advantage of the high groundwater opportunities. Upland habitat is more prolific in this watershed than is wetland habitats since the watershed does not have perennial tributaries on the valley floor. To minimize long term maintenance to maintain Channel hydraulic capacity in Reach 7a and to maximize habitat values for wetlands, the new approach would allow for growth and colonization of wetland habitats to occur on the channel invert while planting trees at the top of bank. This would eliminate the upland habitats which were planned on the new banks of the channel. To specifically answer your question regarding density with varying widths - The proposed area first is converted to square footage. The second step is to determine what kind of spacing is required for successful establishment. Then, the on center spacing are divided into the square footage of your planting area to produce the number of plants needed. To add additional plant types, subtract the number of plants already occupying space.
3e.	Table 2 identifies Reaches 7A and 7B as having some of the best soil and hydrology conditions in the Project area. Please see Comment No. 4.g,	Reach 7a, south of Middle Avenue, is planned for mesic riparian plantings to connect to the higher quality habitat of Lake Silveira.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
	below.	
3f.	The vegetation types assumed for typical channel cross-sections shown in Attachment 3 are inconsistent with the vegetation types indicated in the planting polygons in some locations.	Agreed, District staff will work with our consultants to rectify this inconsistency during the next iteration of Project design plans.
3g.	The memorandum does not appear to account for the statement made in the *65% Design Habitat Impact Analysis Technical Memorandum* that the "riparian scrub-shrub" (PSS) designation includes areas that are early developmental stages of habitat designated as "riparian forest" (PFO) (see Comment No. 2.c, above). None of the PSS subtypes described in the memorandum appear consistent with PFO species. Therefore how will this early developmental stage PFO be tracked separately from PSS vegetation types? In addition, it must be replaced with PFO, not PSS.	The PSS designation in the CAR is related to habitat values and is described as "woody species under 20 feet". Therefore, the plant palette was selected for those species that could achieve this target. Or alternatively, PFO is woody species over 20 feet in height. The CAR and the subsequent plant palette was intended to increase the vertical and horizontal complexity of the existing riparian corridor making it contiguous with the higher quality upstream habitats. The PSS will be mapped as such and monitored with requisite success criteria. If the CCRWQCB has suggested changes to the planting palette, we will certainly take them into consideration.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
4a.	The memorandum states that the District will claim 25% more area for mitigation than is planted, since the mature canopy will extend beyond the planting area. Combined with the low mitigation ratios proposed, this would reduce the mitigation ratio for permanent impacts to riparian habitat to little more than 1:1, which is not acceptable. CCRWQCB staff has not encountered such a proposal before. How is the District defining "planting area"—as only the area enclosed by panting holes, as though a string were wrapped around the stems/trunks and only the area within the string is counted?	The impacts are calculated using high resolution aerial imagery in which the total canopy is calculated as impacts. Presuming that the trees grow to their full potential, it is not unreasonable to assume 25% increase over the planting area (which your analogy works for description) for which the trees will provide canopy. This is matching the impact assessment methodology with the revegetation potential and is not an attempt to reduce payment for impacts.
4b.	The first goal of the replanting plan should be to optimize riparian vegetation within Project sites. The second goal should be to provide mitigation at appropriate ratios for impacted habitat that cannot be provided through optimal replanting of Project areas.	Agreed. The Project team shares these goals and this has been the approach employed during development of design and revegetation planning.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
4c.	The memorandum states that topsoil in replanting areas will be excavated, stockpiled, and reused. The District should excavate and stockpile all usable topsoil, not just topsoil located in future replanting areas, for use in the replanting areas.	Agreed.
4d.	The memorandum states that the replanting polygons rely heavily on the mitigation requirements in the CAR (p. 3). What are these mitigation requirements? They are not clear in the CAR. In addition, recommendations 8, 10, 17, and 24 suggest that PSS can be planted as mitigation/replacement for PFO. This is not acceptable. Impacted PFO must be replaced with PFO.	The mitigation recommendations for planting locations, type and densities came from the CAR. The Project team understands your concerns regarding the PFO category and to date we have maximized planting to the extent feasible given the site conditions. The Project team will ensure your comment is fully addressed in the next iteration of impacts and revegetation.
4e.	Table 2 should be linked explicitly to Table 2 of the 65% Design Impact Analysis and to mitigation ratios in order to relate the size of replanting areas to the quantity of impact. CCRWQCB staff cannot evaluate the adequacy of the	Agreed. The Project team will do as you suggest for the next iteration of impacts.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
	replanting/mitigation plan until this is done.	
4f.	CCRWQCB staff notes that the impact analysis is not complete. When will it be completed, and how will the results be reported to regulatory agencies?	The impact analysis should be completed in January 2014. Once the analysis is completed, it will be disseminated to resource agency staff for their review and comments.
4g.	The replanting plan for upper Reach 7A includes only grass floodway. The memorandum states that this is because backwater caused by hydraulic conditions between Middle Avenue and Watsonville Road require that the WSEL be kept below 320 feet at the bifurcation of West Little Llagas Creek. •What is the cause of the backwater	The Project team hydraulic engineers quickly determined that Elevation 320 near West Little Llagas Creek was a Project control point. A water surface above Elevation 320 would require levees and/or floodwalls, which have some other inherent objectionable issues. At this control point, there is existing development along both sides of the existing creek that restricts widening. This location is also a control point due to existing topography, low top of bank elevations relative to channel invert. Design team hydraulic engineers looked at lowering the channel invert, but this flatter profile gradient caused an unacceptable rise in the water surface elevation (above El. 320) and lowering the invert was not possible given the r/w constraints at this particular location. Reach 7a was initially modeled to be fully vegetated from Monterey Road upstream to West Little Llagas Creek. However, the increased roughness from the proposed plantings between Middle Avenue and West Little Llagas

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
	condition? How can it be remedied so that Reach 7A can be fully vegetated? •What other solutions have been considered, such as widening the channel, so that Reach 7A can be fully vegetated? Since the District is designing Reach 7A from scratch, and the channel is not constrained by encroaching	Creek caused the water surface elevation at the control (West Little Llagas Creek) to rise above El. 320. The channel geometry and associated roughness was the cause for this backwater condition. The Project team looked at a vegetation strategy of very limited (sparsely) plantings from Monterey Road to Watsonville Road, but instead decided to eliminate these limited plantings upstream of Middle Avenue to focus our mitigation towards the higher quality habitats of Lake Silveira, adjacent Reach 7a ("triangular" parcel and "bowtie" area), and along the mainstem of Llagas Creek. Hydraulic modeling showed the closer the plantings (roughness increased) were proposed to the control point, the more sensitive this increase in channel roughness was to adversely impacting the water surface at the El. 320 control point. As suggested in your comment, the Project could purchase additional r/w between Middle Avenue and

	development, CCRWQCB staff expects the District to design the reach in such a way that it can be fully vegetated to the extent feasible according to soil and hydrology conditions (see Comment No. 3.e, above).	Watsonville Road which would allow for some additional plantings within this portion of Reach 7a. However, the plantings would be limited without possibly having to replace the existing Watsonville Avenue and Middle Avenue bridges with much larger bridges. In addition, the existing constraints in r/w (development along both sides of the creek) between Watsonville Avenue and West Little Llagas Creek (control point) would still need to be overcome (possibly buying adjacent homes) to completely allow Reach 7a to be fully vegetated. Reach 7a, south of Middle Avenue, is planned for mesic riparian plantings to connect to the higher quality habitat of Lake Silveira and the surrounding areas to be planted. The "bowtie" parcel was not included in the 65% plans and that will be fully vegetated with mesic riparian plantings to take advantage of the higher quality soils and higher groundwater. In addition, a large "triangular shaped" parcel has been identified to be acquired for the Project within Reach 7a for planting Sycamores because of it's proximity/continuity to Lake Silveira, existing soil conditions, and typically high groundwater availability . This triangular shaped parcel (several acres in size), immediately north and adjacent to Lake Silveira, will be graded to an optimum bench elevation, and fully vegetated with Sycamores.
4h.	Attachment 1 states that West Little Llagas Creek will be lined with concrete or riprap between STA 425+00 and 428+00. This does not appear to be represented in the 65% design plans, and has not been justified by engineering analysis.	The Project team believes you are referring to Llagas Creek between approximately STA 425+00 and STA 428+00. This location is at the existing Monterey Road Bridge and existing UPRR bridge. The riprap is proposed at this location to protect the existing Bridge abutments. Protection of these two existing bridge structures is a Project requirement of Caltrans and UPRR.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
4i.	The memorandum identifies many areas within channels where revegetation will be limited to grasses. • If this habitat type is necessitated by hydraulic conditions, the District should (i) reduce design flows as much as possible through the methods described in Comment No. 5.a below and through incorporation of off-channel and floodplain storage wherever feasible; (ii) increase the allowable roughness in channels to the maximum that can convey the reduced design flows; and (iii) revegetate with a planting pallet that optimizes riparian habitat consistent with the site conditions. • If grasses are preferred in order to reduce maintenance, the District should (i) follow the same steps identified in the previous sentence, and (ii) identify a vegetation palette that balances environmental benefits with maintenance needs. (For instance, scattered single-stem	Please refer to District staff prior response to your Question 1c from your July 15, 2013 letter to address detention facilities. Grasses are not preferred to reduce maintenance. Maintenance efforts to maintain only grass revegation (eliminate voluntary trees and shrubs) takes similar efforts as maintaining a revegetated bank with trees to a specific not-to-exceed roughness and removing fallen trees, etc. What makes the Upper Llagas Creek Project different in many respects from other SCVWD projects is the Reach 4, Reach 5, and Reach 6 objective of "no induced flooding". Most SCVWD flood protection projects simply are designed for the 1% level of protection. Upper Llagas is not, which has required much effort on the part of the Project hydraulic engineers to balance channel geometry, avoidance of homes/structures, avoidance of native heritage trees, channel roughness, all without inducing flooding to the surrounding community. For example, if the Reach 6 channel is widened to provide greater protection than exists their now, then the downstream reaches would have to be sized even greater as to not induce flooding. The more and more you go downstream, the more difficult it becomes to avoid inducing flooding, because the flow (Q) is increasing rapidly from the lack of overbank flooding.

	trees may provide greater habitat function than grassland, with lower maintenance than scrub.) Please also see Comment No. 5.c, below.	

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
4j.	The memorandum states that shade- and drought-tolerant riparian species will be planted in locations where they would be shaded or out-competed for water by existing Eucalyptus stands. Where competition from non-natives reduces the viability of PFO/PSS, the non-natives should be removed and replaced with native species. Where the non-natives provide current habitat value, the replanting plan should consider both short-term and long-term objectives (e.g., planting a fast-growing "shrub" species for short-term habitat replacement, and a "forest" species that will outgrow and shade-out the scrub species over time). At the very least, the non-natives should be thinned to allow optimal planting of native riparian species, and removed as the native plants become established and provide habitat functions.	Agreed. District staff concurs with this approach but typically mitigation is required for removal of non-native trees and not all resource agencies agree with such an approach. All agencies would have to agree with the strategy and not require additional mitigation for this to be considered as a strategy to move forward.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
4k.	In some places, the text in the memorandum is inconsistent with the polygons shown in the figures. For instance, for Reach 4 the memorandum describes forest in canopy gaps and on banks downslope to mid-bank, with scrub below forest and streamside scrub below scrub and on active channel banks; Figures 2.11 through 2.13 depict grassland on the in-channel benches; and Attachment 1 describes forest on banks and benches between STA 450+00 to 468+00.	Agreed, District staff will work with our consultants to rectify this inconsistency during the next iteration of Project design plans.
4l.	CCRWQCB staff notes that the replanting analysis is not complete. When will it be completed, and how will the results be provided to regulatory agencies?	The replanting analysis should be completed in January 2014. Once the analysis is completed, it will be disseminated to resource agency staff for their review and comments.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
5a.	The analysis is based on a design flow of 2,093 cfs in West Little Llagas Creek at Watsonville Road. This is identical to the design flow at this location posited in the 2012 hydraulic report for the 30% Project design and in the 2003 U.S. Army Corps of Engineers hydraulic study for the project. Therefore the analysis does not incorporate all of CCRWQCB staff's previous comments that the Project design must incorporate at least the following elements (please see the July 12, 2012 Design Considerations memorandum from CCRWQCB staff): • The Project design must be based on current development conditions, rather than development conditions presumed to exist at some future date. • The Project design must treat all development that has occurred since the City of Morgan Hill's adoption of stormwater detention requirements for new development	Please refer to District staff prior responses to your Question 1a, 1b, and 1c from your July 15, 2013 letter.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
	(c. 1980) as having runoff conditions in compliance with the City's requirements. It is the City's responsibility to ensure that development since that time has implemented and maintained stormwater detention features achieving the City's requirements.	

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
5b.	On March 14, 2013, District staff stated that the Project will increase peak flow downstream of Monterey Road by 5%, or approximately 600 cfs, due to improvements in Reaches 7 and 8. On June 28, 2013, District staff revised this statement, indicating that peak flow downstream of Monterey Road will increase by 50%, or approximately 1,000 cfs. However, the analysis states that the capacity of the existing West Little Llagas Creek channel is only 80 cfs. Since a 50% increase over 80 cfs is only 40 cfs, please provide further explanation of the hydraulic model and the current and design flows in West Little Llagas Creek in the vicinity of Watsonville Road.	Please refer to District staff prior response to your Question 1c from your July 15, 2013 letter. Per your request, District staff has done analysis to compare the 2006 to 2050 conditions. There is a minor difference between the 2006 flows and the 2050 flows as described in the District memorandum titled, "Upper Llagas Creek Flood Protection Project - Detention Basin Analysis Using 2006 Hydrologic Data", dated November 6, 2013, and also described in the additional information to the March 14, 2013 meeting notes.

CCRWQCB Comments for 65% Design for Upper Llagas Creek		
5c.	The analysis does not fully evaluate alternatives which would provide smaller (incremental) decreases in design flow. While such smaller decreases would not significantly reduce project impacts, they might enable the preservation of additional existing mature vegetation. In addition, smaller decreases could be translated into increased roughness allowances in downstream channels, which would improve the post-project habitat benefits of the project. CCRWQCB staff expects the District to incorporate design flow reductions achieved through implementation of the elements described in Comment No. 5.a above to reduce Project impacts, and to optimize channel revegetation.	The hydraulics is not the only reason for limiting the channel roughness, but instead the lack of soil nutrients and available water. A Project objective is to install successful self-sustaining vegetation. According to Project team hydraulic engineers, a 5% reduction in flow due to a smaller detention facility would not noticeably increase the channel roughness downstream. The hydraulic model may allow you to add a very slight increase in roughness (i.e. .06 to .065), but how densely vegetation is planted to achieve this channel roughness and ultimately to maintain this roughness to a .065 instead of .06 is very subjective and within this 5% variance. Larger, significant size detention facilities could change your downstream roughness enough to make a difference, but please refer District staff prior response to your Question 1c from your July 15, 2013 letter for the inherent issues with detention facilities analyzed for this Project.
6a.	How will the District report on the monitoring program described in the memorandum?	Typically, mitigation and monitoring programs are required to submit annual reports to resource agency staff to describe the progress of the revegetation and established success criteria milestones.
7a.	CCRWQCB staff has no comments on this assessment at this time.	Ok, thank you for your review.

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Central Coast Regional Water Quality Control Board

October 25, 2013 **BY ELECTRONIC MAIL**

Sunshine Julian
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118
Email: svjulian@valleywater.org

Christopher Eng
United States Army Corps of Engineers
San Francisco District
1455 Market Street, 15th Floor
San Francisco, CA 94103
Email: Christopher.K.Eng@usace.army.mil

Karl Bjarke
Director of Public Works / City Engineer
City of Morgan Hill
17575 Peak Avenue
Morgan Hill, CA 95037
Email: karl.bjarke@morganhill.ca.gov

Dear Ms. Julian, Mr. Eng, and Mr. Bjarke:

CRITERIA FOR DEMONSTRATING MINIMIZATION AND MITIGATION OF IMPACTS TO WATERS OF THE STATE, UPPER LLAGAS CREEK FLOOD PROTECTION PROJECT, SANTA CLARA COUNTY

The Upper Llagas Creek Flood Protection Project (Project) proposes significant impacts to Waters of the State in southern Santa Clara County in order to provide improved flood protection in the City of Morgan Hill (City) and surrounding areas. The Project will require Clean Water Act Section 401 Water Quality Certification (401 Certification) from the Central Coast Regional Water Quality Control Board (Central Coast Water Board). In order to receive 401 Certification from the Central Coast Water Board, the Project must demonstrate minimization and mitigation of impacts to water quality and beneficial uses of Waters of the State. The purpose of this letter is to communicate the criteria Central Coast Water Board staff plans to use to evaluate the Project's minimization and mitigation of impacts to Waters of the State. These criteria must be addressed for Central Coast Water Board staff to recommend 401 Certification of the Project. You are receiving this letter because Central Coast Water Board staff anticipates that satisfying these criteria will require cooperation between key Project proponents and stakeholders.

Central Coast Water Board staff has previously provided comments on the Project to the Santa Clara Valley Water District (District) explaining many of the criteria described in this letter that must be addressed for Central Coast Water Board staff to recommend 401 Certification of the

Project. The District has responded to some of our previous comments and has incorporated some minimization and mitigation features into the Project. This letter reiterates and provides some further clarification and comments on the criteria that have not yet been fully addressed by the Project design. Central Coast Water Board staff maintains that all the comments and requests for information, previously sent to the District, are still relevant and must be addressed for Central Coast Water Board staff to recommend 401 Certification of the Project.

The following list identifies the comment letters and memoranda previously sent that contain the specific details related to the criteria.

- 30% Design Review, Comment Letter, dated August 23, 2012, signed by Watershed Planning and Protection Section Manager, Lisa H. McCann, for Interim Executive Officer, Kenneth A. Harris. (Provided comments on the 30% Project design.)
- Topics for Discussion, Staff Memorandum via email, dated September 19, 2012, from staff Water Resource Control Engineer, P.E., Jon Rohrbough. (Identified issues that required resolution prior to Central Coast Water Board approval of the Project.)
- Notice of Preparation Review, Comment Letter, dated November 26, 2012, signed by Phillip Hammer, Water Quality Certification Program Manager, for Kenneth A. Harris, Interim Executive Officer. (Provided comments on the Notice of Preparation of a Draft Environmental Impact Report for the Project.)
- 65% Design Review, Staff Comment Email, dated May 16, 2013, from Water Resource Control Engineer, P.E., Jon Rohrbough. (Provided comments on the 65% Project design.)
- Reiteration of Design Considerations, Staff Memorandum, via email, dated July 12, 2013, from Water Resource Control Engineer, P. E., Jon Rohrbough. (Reiterated issues that still required resolution prior to Central Coast Water Board approval.)
- Comments on Technical Support Documents, Staff Memorandum, via email, dated August 1, 2013, from Water Resource Control Engineer, P.E., Jon Rohrbough. (Provided comments on six technical support memoranda associated with the 65% Project design.)

The following sections of this letter describe the criteria.

Minimization

1. Accuracy of the hydraulic model. Project design flow rates must be based on actual stormwater runoff conditions within the City in order to prevent unnecessary Project impacts.
   a. Project design must be based on existing conditions rather than potential land uses and rough estimates. Earlier stages of Project design assumed 2050 build-out conditions in the City as the starting point for the hydraulic model, or determined runoff on the basis of general land use characteristics (e.g., the average percentage of impervious area for a particular zoning classification). Instead, the hydraulic model must be based on current conditions and actual land cover.
   b. Project design must account for all existing privately-owned runoff-reduction measures. According to the City's 2002 Storm Drainage System Master Plan, the City has implemented several measures since 1982 to reduce stormwater runoff from new developments within the City. Since the City's population grew from 18,050 to 37,882 between 1982 and 2010, this means that a significant percentage of the City's stormwater runoff is detained or retained before discharge to southern Santa Clara

County streams. The hydraulic model must incorporate into Project design runoff-reduction measures and actual stormwater discharge rate and time of concentration information for each area developed since 1982.

c. Project design must account for all existing City-owned and/or operated detention facilities. Areas within the City that are served by regional detention facilities must be modeled using the discharge rate and time of concentration characteristics of the regional facility.

2. Incorporation of additional off-channel and floodplain storage. Reducing Project design flows reduces Project impacts by allowing increased vegetation roughness in Project channels. Therefore constructing new facilities to retain/detain runoff from currently developed areas, and modifying vacant parcels adjacent to Project channels to increase floodplain storage, are essential elements of impact minimization. The Project must demonstrate that Project proponents and stakeholders have fully evaluated and identified opportunities for additional detention and floodplain storage.

3. Removal or reduction of channel constrictions. Bridges, crossings, and changes in channel width can cause channel constrictions. Channel constrictions reduce flow capacity and increase head loss and turbulence in channels, requiring more extensive channel modifications elsewhere, channel armoring, or reduction of vegetation within the transition zone. Therefore removing or reducing channel constrictions is an essential element of minimizing Project impacts. The Project must demonstrate that Project proponents and stakeholders have fully evaluated and identified opportunities for reduction or elimination of channel constrictions.

4. Avoidance of new channel constrictions. All new bridges and other crossings must be designed so that transition zones are capable of supporting the same vegetation and habitat that can be supported upstream and downstream of the transition zone.

5. Removal or reduction of hardscape. The Project must minimize the use of hardscape channel treatments such as concrete and RSP. All proposed use of hardscape treatments must be justified through engineering analysis (e.g., shear stress assessment) that demonstrates softscape treatments and alternative channel alignments cannot achieve channel stability goals. For softscape methods involving vegetation to provide stabilization, the analysis must assume mature vegetation.

6. Preservation of the West Little Llagas Creek channel. The Project must preserve beneficial uses, including flow regimes, habitat, and water quality, in West Little Llagas Creek between the proposed Reach 7A diversion and the confluence with Madrone Channel east of US 101.

7. Verification that stormwater detention facilities are functioning as designed. Privately-owned and City owned and operated detention facilities were designed to achieve specific numeric flow reduction objectives intended to reduce flooding within the City. As such, facilities that function as designed reduce project impacts by reducing Project design flows. Therefore verifying that all stormwater detention facilities in the City are functioning as designed is an essential element of minimizing Project impacts.

8. Preservation of beneficial uses and habitat in tributary streams. The Project involves lowering the invert of Project channels. This lowering has the potential to impact tributary

streams by altering their hydraulics, causing the tributary streams to flow more swiftly and/or dry up more quickly following rain events. The Project must demonstrate avoidance of impacts to tributary streams. Where impacts are unavoidable, the Project must demonstrate minimization and mitigation of impacts.

9. Protection of water quality. Llagas Creek is currently impaired for nutrients, pesticides, and sediment. Agricultural fields are significant sources of these pollutants to Llagas Creek. The Proposed Project includes constructing a new channel (Reach 7A) in the midst of agricultural fields, directly connecting them to Llagas Creek. Therefore the design of Reach 7A must include measures to ensure that the new channel will not contribute to these impairments in Llagas Creek by receiving and transporting untreated runoff and irrigation tailwater from agricultural lands.

Mitigation

1. Demonstration that post-project waterbody functions that support beneficial uses will meet or improve upon pre-project functions. The Project must protect, restore, and enhance water quality and beneficial uses of waters of the State. Due to the scope and severity of environmental impacts associated with the Project, the Project must clearly demonstrate that post-project waterbody functions that support beneficial uses will be at least equal or better than pre-project functions in all affected channels, considering the full range of beneficial uses and waterbody functions. Affected channels include not only channels where work is proposed, but also downstream channels and channels affected by the diversion of flow from West Little Llagas Creek (i.e., West Little Llagas Creek from the vicinity of Watsonville Road to US 101 and East Little Llagas Creek from West Little Llagas Creek to Reach 14).

2. Optimization of revegetation and habitat development. The Project must optimize replacement and restoration of habitat and beneficial uses in the following ways:
   a. Central Coast Water Board staff expects that implementing the minimization measures described above will result in reduced Project design flow rates. This “gain” must be used to increase roughness in Project channels to optimize revegetation and riparian and aquatic habitat. “Optimal revegetation” means the habitat type that supports the most beneficial uses and is best suited to a particular location given soil quality and moisture conditions. Where possible and optimal, proposed revegetation habitat types must be upgraded (e.g., from Riparian Scrub to Riparian Forest).
   b. Revegetation must be implemented according to the best habitat potential. Where the best conditions exist at bench level, channel width should be maximized to maximize bench area; but where the best conditions exist at the top of bank, channel/bench width should be decreased in order to maximize planting area at the top of bank.
   c. Hydraulic conditions resulting in the proposal to revegetate Reach 7A as a grass-lined channel must be remedied so that Reach 7A can be optimally vegetated based on soil and moisture conditions.
   d. Where competition from non-natives reduces the viability of optimal revegetated riparian habitat, the non-natives should be removed and replaced with native species. Where the non-natives provide current habitat value, the replanting plan should consider both short-term and long-term objectives (e.g., planting a fast-growing “shrub” species for short-term habitat replacement, and a “forest” species that will outgrow and shade-out the scrub species over time). At the very least, the non-natives should be thinned to allow optimal planting of native riparian species, and removed as the native plants become established and provide habitat functions.

3. Restoration of streambed habitat. The Project must restore and enhance optimal streambed habitat in Project channels, including meander, low-flow channel, channel complexity, riffles and pools, large woody debris, and streambed material (sediments and gravels) supporting beneficial uses.

4. Offsite mitigation. To date it is still unclear whether restoration of Project channels and restoration activities associated with Lake Silviera will fully mitigate for all Project impacts. Therefore additional offsite mitigation may be required. Project proponents and stakeholders must identify potential mitigation areas and mitigation plans that are capable of mitigating beneficial use impacts by the Project. Central Coast Water Board staff cannot recommend 401 Certification for the Project unless mitigation plans clearly indicate how the Project will fully mitigate beneficial use impacts.

Information Demonstrating Minimization and Mitigation

Central Coast Water Board staff cannot issue a 401 Certification for this Project without information that addresses all the criteria above. This information is necessary so staff can determine that the Project minimizes and mitigates impacts to water quality and beneficial uses of Waters of the State. At a minimum, the District should provide the information listed below so that Central Coast Water Board staff can determine minimization according to minimization criteria 1.b, above. This information to address minimization criteria 1.b., above, serves as an example of the type of information the District should provide to demonstrate minimization and mitigation of Project impacts to meet the other criteria above.

Information to determine accurate modeling of privately-owned runoff-reduction measures (per minimization criteria 1.b, above)

- The effective date and specific stormwater control requirements of each stormwater control measure approved by the City since 1982;
- A list of all new developments constructed within the City since 1982, and the specific stormwater control requirements (e.g., post-development peak discharge rate must not exceed the 10-year pre-development peak discharge rate) to which each new development was subject;
- An engineering estimate of the current expected stormwater discharge flow rate from each new development constructed since 1982, in a form that can be quantitatively compared with the specific stormwater control requirements applicable to each new development and which can be incorporated into the Project hydraulic model (i.e., 100-year discharge rate and time of concentration); and
- A map indicating the location and boundaries of each new development constructed within the City since 1982.

Project and Application Schedule

Central Coast Water Board staff requires the information requested in this letter and an adequate response to our previous comments in order to determine the Project's suitability for 401 Certification. Central Coast Water Board staff needs to receive this information such that staff has adequate time for comprehensive review and analysis of the information. Without the required information and adequate time to review it, Central Coast Water Board staff may not be able to condition the Project without causing delays in the Project schedule.

To facilitate Central Coast Water Board staff's review of information and issuance of a 401 Certification, please provide a complete Project schedule that includes the following:

- Dates when the District will submit information and responses to comments to address the criteria for Central Coast Water Board staff to recommend 401 Certification of the Project (as discussed in this letter and previous letters and memorandum),
- Dates when the District will issue Project CEQA documents,
- Dates when the District will submit the application for 401 Certification for this Project.

Upon receipt of the Project schedule, Central Coast Water Board staff will be able to indicate whether the schedule provides sufficient time for review and analysis of information and timely issuance of the 401 Certification.

Central Coast Water Board staff would like to meet with representatives from each of your agencies together to discuss the criteria described in this letter, and will be contacting you soon for the purpose of arranging such a meeting. Central Coast Water Board staff encourages cooperation between Project proponents and stakeholders to achieve and demonstrate minimization and mitigation of Project impacts, and to facilitate 401 Certification of the Project.

If you have questions please contact **Jon Rohrbough** at (805) 549-3458 or via email at Jon.Rohrbough@waterboards.ca.gov, or Phil Hammer at (805) 549-3882.

Sincerely,

Kenneth A. Harris, Jr.
Executive Officer

S:\Seniors\Shared\401\Projects\Santa Clara\Upper Llagas Creek\Communications\Stakeholder Letter_Upper Llagas Creek Flood Protection_final.doc

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

January 16, 2014

In response reply to:
151422SWR02SR6450

Sunshine Ventura
Melissa Moore
Santa Clara Valley Water District
5760 Almaden Expressway
San Jose, California 95118

Dear Ms. Ventura and Ms. Moore:

This letter is in response to a November 18, 2013, verbal request by the Santa Clara Valley Water District (District) to NOAA's National Marine Fisheries Service (NMFS) to provide comments on the November, 2013, draft of the Lake Silveira Restoration Project Development Report (Report). The Report is a proposed mitigation component of the Llagas Creek Flood Control Project currently under design by the District. Llagas Creek is a tributary in the upper Pajaro River Watershed near the cities of Gilroy and Morgan Hill in Santa Clara County, California. Populations of federally threatened South-Central California Coast (S-CCC) Distinct Population Segment (DPS) steelhead (*Oncorhynchus mykiss*) are present in Llagas Creek. This letter serves as technical assistance to the District regarding design of the Lake Silveira Restoration Project and potential adverse impacts to S-CCC steelhead and their critical habitat.

Lake Silveira is not a natural lake; rather it is an off-channel impoundment created when a levee separating Llagas Creek from an abandoned gravel pit was breached, causing water from Llagas Creek to flood the pit. Today, all water from Llagas Creek flows through the gravel pit and discharges further downstream through an additional breach at the lower end of the pit. The consequent impoundment created habitat conditions unsuitable for steelhead due to significant increases in water temperatures and conditions suitable for some steelhead predators. Over 1,700 feet of natural channel north of the gravel pit (*aka* Silveira Lake) is abandoned, and NMFS believes capture and redirection of stream flow through the pit has resulted in significant adverse impacts to water quality (*e.g.,* water temperature and turbidity). Nonetheless, Silveira Lake now contains wetland and riparian habitats beneficial for other wildlife species, including the western pond turtle.

Ideally, the preferred alternative for steelhead and their habitat in this reach of Llagas Creek would be removal of the levee separating the historical channel and the unauthorized impoundment (*aka* Silveira Lake). This could be accomplished by using existing levee material to fill in the impoundment as a method to restore a once seasonally inundated floodplain mosaic dominated by sycamore-oak woodland communities. However, considering habitat needs for all existing native aquatic species and perceived aesthetic values for the surrounding community, NMFS is open to alternatives achieving multiple objectives. Achieving these objectives should occur with minimal detriment to steelhead or their designated critical habitat. Steelhead are the only known federal or state listed species in the project area.

NMFS, the District, and their consultants discussed specific aspects of the Report during a conference call on December 18, 2013. Based on that discussion, it is our understanding the primary reason for maintaining some surface flow from Llagas Creek to Lake Silveira is to maintain and enhance water column circulation and abate poor water quality conditions during the dry season (primarily water temperature and turbidity) and reduce flood potential during winter and spring. NMFS recommends the District consider the following issues before moving forward with the current conceptual design:

1) Can water column circulation in the lake be maintained during summer months using methods other than a surface flow diversion into the impoundment at the upstream end (inlet)?

2) Would an inflow of one cubic foot per second (cfs) (or less) adequately circulate a three-acre body of water with depths up to approximately 10 feet?

3) Are methods available for reducing discharge of warm and turbid water to Llagas Creek (*e.g.,* low point, or bottom discharges) from the impoundment and how feasible are these methods?

4) Do any native species within the impoundment require improved circulation or are they readily adapted to backwater habitats with relatively poor circulation (*e.g.*, western pond turtle)?

5) Has the District considered an alternative that includes the construction of an elevated sill at the location of the lake inlet that would allow high winter flows to spill into the lake while allowing lower flows to pass down the natural channel? We believe this would eliminate the adverse impacts (*i.e.*, water quality) of a flow-through system during the dry season and significantly reduce the likelihood of entrainment during the steelhead migration seasons.

In addition, we offer the following specific comments:

a. Page 2, #3 – Reducing suitable habitat for non-native predatory fish. While true, this also reduces the availability of suitable habitat for native warm water species such as Sacramento blackfish, Sacramento pikeminnow, and hitch, species whose historic habitat in the Pajaro River watershed has been reduced in quantity and or quality. NMFS understands and appreciates the aesthetic value of the lake/wetland habitat for other wildlife species and is hopeful a design can be incorporated meeting the range of objectives identified. In particular, objectives maximizing the value of the historical channel as rearing habitat for juvenile steelhead are of high priority to NMFS.

b. Page 5 - Flow Split *and* Page 6 Drawbacks: Splitting stream flow, particularly during spring-fall period in dry years, will reduce quality and quantity of rearing habitat in this reach, which is near the downstream extent of suitable habitat for rearing. This is a concern because juvenile steelhead feed on drifting insects. The quantity and quality of this prey source is directly correlated with volume and velocity of flowing water. Further reducing stream flow in this area will likely be detrimental to overall steelhead carrying capacity. Additionally, stated improvements to water quality flowing through the created wetlands may be overstated, particularly in regard to benefits for rearing steelhead. We believe maximizing flow of water at suitable temperatures over suitable substrates through the historical channel would provide a greater net benefit to the steelhead fishery than the proposed split-flow design.

c. Page 6 – Drawbacks: The second bullet acknowledges a flow splitting structure "poses maintenance challenges." We share this concern as the primary reason for not moving forward with the proposed design. We believe unknown consequences to steelhead could occur if maintenance of the structure is not implemented in a timely manner. The project should be designed to minimize future maintenance to the maximum extent practicable.

d. Page 8 – Design Elements: The second bullet states "(d)uring extremely dry periods when releases from Chesbro Reservoir are < three cfs, direct a majority/all of the flows to the wetland." This is also repeated at the bottom of Page 9 (Wetland Inlet Channel Design). During the conference call, it was noted the above statement was inaccurate and will be removed or changed. NMFS reiterates during such conditions, and assuming the proposed designs were implemented, the contrary should occur. Under conditions when flows are < 3cfs, all flow should be directed into the historical channel.

e. Page 8 – Design Elements, third bullet: If an inlet structure is not included, an elevated sill could be added to the levee at the inlet location allowing high flows to split between the lake and historical channel, thus reducing flood risk. Incorporation of an armored sill, designed to pass high flood flows through the lake, is a preferable design to the current split, low-flow channel proposal. A sill, designed to pass high water, would involve considerably less maintenance while still achieving the goal of minimizing flood risk to adjacent infrastructure. Additionally, this design significantly reduces the likelihood of adult, smolt, and juvenile steelhead entrainment into the lake, particularly during spring smolt outmigration. Finally, maintaining the lakes existing outlet connection to Llagas Creek would provide steelhead smolts, potentially entrained into the lake during high flows, a route downstream. This design may also provide access to the lake for other native species throughout the year.

f. Page 8 – Bank Stabilization: If this occurs, we question the need to plant willows in a reach historically dominated by sycamore alluvial woodland. As noted, willows will require maintenance (see page 10), something the District has expressed a desire to minimize. Willows are also likely to recruit on their own as long as water is available. Use of root wads, log jams, or appropriately sized boulder clusters, is recommended.

g. Page 9 – Wetland Inlet Channel Design: This section describes use/need of a notched redwood log to regulate stream flows into the abandoned gravel pit (see comment "d" above and "h" below) particularly during years when flows are <3 cfs. An additional concern is sediment deposition may occur at the upstream end of the rock ramp (similar to the problems at the Evelyn Fish ladder on Stevens Creek, Santa Clara County, California). Without constant sediment maintenance, this could adversely affect the performance of the split channel design and ultimately, the quality of steelhead rearing further downstream.

h. Page 10 –Wetland Inlet Channel Design: Current design elements (*i.e.*, log and rock weir elevations) suggest, during periods of low flow, the lake would be prioritized to receive up to 1 cfs and, once flows exceeded 1 cfs, they would be split between the lake and historical channel. The entire weir design appears to be predicated on the lake receiving the preponderance of stream flow during very dry years. If this assumption is accurate, NMFS does not support the design. We believe substantially more benefits to steelhead and their habitat will occur if flows are prioritized into the historical stream channel, particularly during low flow conditions.

i. Page 12 – 2.5 Water Quality: The document notes turbidity "appears to be inorganic"; suggesting turbidity in the project area is sediment or mineral based. Is this an assumption or are there data to support this? Annually, turbidity levels in Llagas Creek upstream of Lake Silveira gradually increase and are in fact "organic," originating from the releases of biologically rich hypolimnion waters in Chesbro Reservoir. (This is also the case in Uvas Reservoir – see Casagrande 2010). Once the reservoir water column fully mixes in summer, the clarity of the hypolimnion declines rapidly, resulting in release of biologically turbid "lake water" into Llagas Creek. Some of this turbidity declines with increasing distance downstream. In Lake Silveira, turbid conditions are further exacerbated from increased solar interaction (large, open surface area) resulting in higher phytoplankton and algal production (shallow ponds by nature are generally turbid). Carp (and potentially wind) can further increase turbidity levels in the lake (inorganically) by mixing fine sediments off the shallow bottom.

   This section goes on to describe benefits the expanded emergent marsh lake will have on improving water quality by removing nutrients and other pollutants. While vegetation will filter out some pollutants and absorb some of the nutrient load, this could be a neutral point due to the increased productivity and turbidity caused by the nutrient loading itself (*i.e.*, eutrophication).

j. Pages 16-31: NMFS supports the goals of increasing sycamore-oak riparian woodland on the floodplains and terraces, creating a greater mosaic of wetland communities within the lake bed, and reducing invasive Himalayan blackberry and bullfrog populations. Furthermore, we support and encourage expansion of invasive species removal efforts by the SCVWD throughout both Llagas and Uvas creeks into the future.

Thank you for the opportunity to comment on the Report. Comments in this letter highlight some of our more significant concerns over assumptions and conclusions presented in the Report and should not be viewed as comprehensive of all aspects of this project or the Llagas Creek

Flood Control Project. As the project design progresses, additional concerns, not addressed in this letter, may arise.

If you have questions or concerns regarding this letter please contact either Jonathan Ambrose at (707) 575-6091 or Joel Casagrande at (707) 575-6016.

Sincerely,

for

Irma Lagomarsino
Assistant Regional Administrator
California Coastal Area Office

cc: Tami Shane, CDFW, Yountville, CA
Michelle Leicester, CDFW, Yountville, CA
Jon Rohrbough, RWQCB, San Luis Obispo, CA
Amber Aguilera, USFWS, Sacramento, CA
Joseph Terry, USFWS, Sacramento, CA

Literature Cited

Casagrande, J. 2010. Distribution, abundance, growth and habitat use of steelhead in Uvas Creek, California. Master's Thesis. San José State University. 174 pp.

United States Department of the Interior

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

In Reply Refer To:
08ESMF00-2013-CPA-0011

AUG 5 2013

Chris Eng
Environmental Planning Section
U.S. Army Corps of Engineers
1455 Market Street, Suite 15661
San Francisco, California 94103-1398

Dear Mr. Eng:

We appreciate the opportunity to comment on the following documents: the June 20, 2013, Upper Llagas Creek Flood Protection- Project Update; the February 6, 2013, Upper Llagas Creek Flood Protection Project: Inclusion of Bat Evaluations into Environmental Documents; the June 17, 2013, Upper Llagas Creek Flood Protection Project 65% Design Habitat Impact Analysis Technical Memorandum; the March 21, 2013, (revised June 6, 2013) Upper Llagas Creek Flood Protection Project Habitat Restoration Planting Palette, Species Composition, and Spacing Technical Memorandum; the April 5, 2013 (revised June 6, 2013) Upper Llagas Creek Flood Protection Project- Revegetation Acreage and Planting Polygon Refinement Technical Memorandum; and the June 20, 2013, Upper Llagas Creek FFP- Reach 7A Detention Basin Analysis. These documents were received by the U.S. Fish and Wildlife Service (Service) on June 27, 2013. Our comments are also based on a review of the May 2003, Revised Draft Fish and Wildlife Coordination Act Report (revised draft FWCA) for the Llagas Creek Flood Control Project.

The Service has participated to the extent possible in development of the Upper Llagas Creek Flood Protection Project (Project) by attending various workshops, briefings, and providing comments and draft documents on the draft plan over the past decade. We look forward to continuing to participate in the planning process.

Upper Llagas Creek Flood Protection- Project Update

The Service has no comments specific to this document.

Upper Llagas Creek Flood Protection Project: Inclusion of Bat Evaluations into Environmental Documents

The Service has no comments specific to this document.

Upper Llagas Creek Flood Protection Project 65% Design Habitat Impact Analysis Technical Memorandum

Page 5, Quantification of Impacts section, second paragraph, it states:

> "Native PSS (shrub-scrub) vegetation under trees to be saved was mapped in the field if grading is proposed under those trees' canopies. If the understory was herbaceous vegetation or non-native PSS, no impacts were assigned. However, if native PSS would be removed by grading, the area of native PSS was considered impacted."

The Service believes that understory non-native PSS provides habitat for different species of wildlife and therefore its loss should be considered an impact. In addition, the Service would like the total acreage of impacted PSS understory that will be removed identified.

Pages 6-7, Table 2 and Table 3.

The totals for Native Riparian Forest and Native Riparian Scrub-shrub (17.49 ac) do not match the total shown in Table 3 (17.48 ac). There is a similar discrepancy with Non-native Riparian Forest and Non-native Riparian Scrub-shrub. Both are likely rounding errors.

Page 7, Table 3, 2nd footnote.

It is not clear why "In most cases" sycamore woodland is a subset of PFO.

Pages 8-9, Mitigation Ratios section, first paragraph, it states:

> "Mitigation ratios for impacts to riparian habitat proposed in the CAR will be used per consultation between SCVWD and regulatory agencies. Per the CAR, mitigation ratios for PFO and PSS habitat impacts range from 1.5:1 to 1.7:1 depending on the reach (USFWS 2003b). These ratios will be reduced 40% for impacts to non-native PFO and PSS and 33% for impacts to native PSS under PFO canopy that has been saved."

Please clarify why these mitigation ratios are reduced by 40% for impacts to non-native PFO and PSS, and by 33% for impacts to native PSS under PFO canopy that has been saved.

Upper Llagas Creek Flood Protection Project Habitat Restoration Planting Palette, Species Composition, and Spacing Technical Memorandum

The Service has no specific comments to this document. We do agree with the proposed design approach to maximize revegetation at each channel section, appropriate to the channel location, soil conditions and subsurface water conditions.

Upper Llagas Creek Flood Protection Project-Revegetation Acreage and Planting Polygon Refinement Technical Memorandum

The Service has no specific comments to this document. One item we will be interested in seeing in the future is what the overall mitigation acreage to be claimed is expected to be and how it corresponds to the mitigation ratios presented in the CAR. The footnote for Table2 (pg. 4) indicates that the overall mitigation claimed may be 20-25% higher than the acreage shown in Table 2.

Upper Llagas Creek FFP- Reach 7A Detention Basin Analysis

The Service has no comments specific to this document.

The Service does not have specific guidance regarding *Arundo* removal. Enclosed you will find a pamphlet titled Arundo- Streamside Invader which provides a list of agencies and groups to contact for more information on *Arundo*.

We look forward to working with the Corps and the Santa Clara Valley Water District on the planning effort and development of the Upper Llagas Creek Flood Protection Project. If you have any questions regarding these comments please contact Amber Aguilera, Fish and Wildlife Biologist or Doug Weinrich, Chief, Habitat Conservation Division at (916) 414-6600.

Sincerely,

Daniel Welsh
Acting Field Supervisor

Enclosure

cc:
Melissa Moore, Santa Clara Valley Water District, San Jose, California

Central Coast Regional
Water Quality Control Board

CALIFORNIA Water Boards

Upper Llagas Creek Flood Protection Project
Interagency Pre-401 Certification Meeting
February 11, 2014
Santa Clara Valley Water District, Room A-143
1:00 – 4:00

1:00 **Introductions**
Michael Martin, Melissa Moore, Sunshine Julian, Scott Ferensi, Liang Su (SCVWD); Kark Bjarke, Charlie Ha (MH)

1:05 **Background and Review of Agenda**
- Project must demonstrate minimization and mitigation of impacts to waters. WB sent 10/25/13 letter identifying criteria WB will use to evaluate minimization and minimization. Purpose of meeting is to discuss those criteria; see value in interagency discussion

1:10 **1. Water Board, District, and City of Morgan Hill Project Objectives**
District Objectives
- 1% protection in urban Morgan Hill, 10% protection in reach 14, no induced flooding
- Stabilize channels
- Provide habitat replacement that: (i) achieves hydraulic objectives; (ii) suits (and maximizes the potential of, subject to hydraulic limitations) site conditions; and (iii) reduces need for subsequent maintenance; and (iv) develop self-sustaining riparian corridor

City
- Achieve 1% flood protection in urban Morgan Hill (WLLC watershed)

Water Board
- Preserve or replace (and improve) waterbody function, WQ, habitat, and BUs
- Maximize revegetation potential through minimization
  - Accurately model existing conditions
  - Reduce design flows (through use of storage, etc.)
- Accumulate incremental gains achieved through minimization measures
- Optimize revegetation and habitat development (most beneficial placement)

1:30 **2. Water Board Criteria for Demonstrating Minimization and Mitigation of Impacts and Information Demonstrating Minimization and Mitigation** (prioritized from 10/25/2013 Water Board letter; see attached)

a) Optimization of post-project revegetation and habitat development
   - WB's objective is for project design to accumulate incremental gains through minimization measures, and translate accumulated gains into optimization of revegetation and habitat development & most beneficial placement of revegetation

b) Accuracy of the hydraulic model
   - District verified that current models are based on 2006 conditions (with impervious areas measured from on aerial photographs; 1-foot deep flooding in streets during 100-yr events; overbanking in unimproved areas; and channel designs in each reach based on the correct flow condition (10-yr vs. 100-yr)

c) Consideration of existing private and municipally-operated detention storage

- WB noted that the Morgan Hill 2002 Master Plan identifies 44 basins; and states that basins achieving attenuation (difference between inflow and outflow) ≥ 3 cfs is significant. While individually these basins might not be significant, their cumulative effect may be significant for Q and time-of-concentration. In addition, more basins have been built since 2002. Together, they affect Q and time-of-concentration for a potentially large impervious area.
- City staff noted that basins are designed for 25-yr events; only P310 and P425 were designed for the 100-yr event. Since the 2002 Master Plan, only Butterfield basin was designed for the 100-yr event; many basins designed for 25-yr condition are in the Reach 14 watershed and may have a significant effect there.
- WB isn't comfortable throwing out the others before determining whether they affect quantity or timing of the peak. More work is needed to address basins—either by incorporating them into the model or demonstrating that they don't have a significant effect on quantity or time-of-concentration of peak (design) flows.
- District will look at cumulative effect of the basins and see if they are significant. District must demonstrate they don't significantly alter the project.

d) Assessing potential for additional off-channel and floodplain storage
   - Fish entrainment is a huge concern for fisheries agencies; screens would be required, and they may not be able to pass water fast enough to serve a flood control project. Project is adding instream complexity (LWD, etc.)
   - District understood "off-channel" as equivalent to floodplain storage. WB pointed out that that "off-channel" refers to providing additional detention/retention to runoff before it enters the channel. District/City is willing to look into the potential for creating additional off-channel storage
   - City is concerned about how to move forward—what can be done within the timeframe of the design that WB would be happy with? District believes first step is to start looking at the large outfalls. District will analyze urban "watersheds" with outfalls≥ 36", looking for the potential for creating additional detention/retention in the watersheds

e) Preserving water quality, habitat, and beneficial uses in West Little Llagas Creek
   - This topic was tabled for a later conversation.
   - The District has additional studies on WLLC impacts (biotic investigation, proposed mitigation for hydrologic modifications) and will send them to WB.
   - District: "What are WB expectations for mitigation for hydrologic modifications? WB: "We go back to beneficial uses—what uses are being impacted, and will mitigation replace them?" District would like some guidance; WB doesn't have a precedent to offer as an example. Further discussion is needed.

f) Meeting or improving upon pre-project waterbody functions
   - This topic was tabled for a later conversation

g) Invasive species control as a mitigation measure
   - District has had the impression that WB is opposed to removing invasives all at once, based on comment "Mitigation 2.d" from 10/25/13 letter. District noted that phasing invasive species removal is difficult, so District discourages it. In addition, fisheries agencies support invasive species removal.
   - WB clarified the referenced comment. WB supports invasive species removal as well, but has some concerns about temporal losses when invasives provide habitat functions that are not quickly replaced by native habitat.

h) Future development policies
   - City asked if WB has concerns about how the area adjacent to Reach 7A will be developed post-project. City will implementing PCRs for all new development, which will improve the type of development.

- WB's role will be to enforce the PCRS; new development will need to handle its own stormwater runoff

2:40 **2. Water Board Criteria for Demonstrating Minimization and Mitigation of Impacts and Information Demonstrating Minimization and Mitigation** (cont.)

- District made the following points:
  - Historical ecology study and work in Reach 3 indicate that this watershed doesn't support a multi-tiered riparian corridor.
  - Soil testing did provide answers to some questions: (1) there isn't enough topsoil for forest; (2) there is a (universal) problem with densic soils. District is looking at amendments to assist establishment, but doesn't want to fertilize, etc., because it isn't sustainable
- WB does not expect District to "push" an unnatural habitat condition, though some areas could support higher-value habitat (e.g., RPO) than existed historically
- District is not at the point where it can't do more, but it's unlikely there's more that will produce large improvements; it's more likely the that the increase wouldn't be an increase in planting density, but in letting vegetation grow out more between maintenance cycles, or in increasing instream complexity; District wants self-regenerating habitats

3:30 **3. Response to Water Board Comments**

- WB has provided many different "sets" of comments, and there are many different "tracks" of comments and responses currently in process. WB hasn't had time yet to evaluate all responses (e.g., District responses to comments on 65% Design), and needs to confirm that District has responded to all comments.
- This topic was tabled for a later conversation.

3:40 **4. Project Schedule**

- District will be Submitting pre-application to Corps, and the project is on the agenda for pre-app meeting on 3/12. District will be submitting permit applications around the end March.
- EIR comments are due 3/20 (EIR doesn't have much detail about post-project); this will be covered in the MMP (to agencies at the end of March).

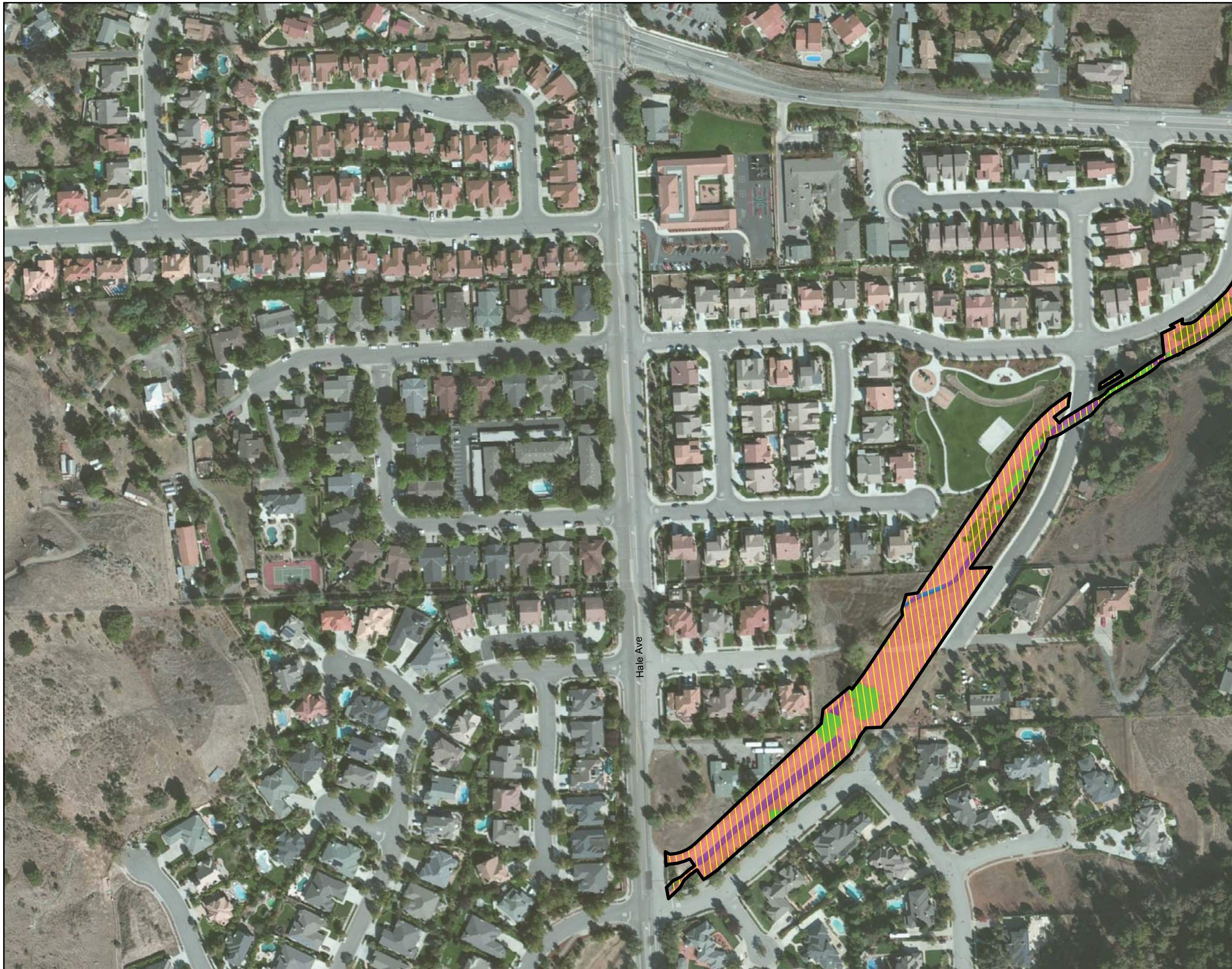
3:50 **5. Next Steps and Wrap-up**

- **District will look at cumulative effect of the other basins in the City and see if they are significant. District must demonstrate they don't significantly alter the project.**
- **District will analyze urban "watersheds" with outfalls ≥ 36", looking for the potential for creating additional detention/retention in the these areas**
- **District will send additional studies on WLLC impacts (biotic investigation, proposed mitigation for hydrologic modifications)**
- **District would like some guidance for mitigation for modifications to WLLC. Since WB doesn't have a precedent, the District will send a proposal**

Appendix E

Impacts to Vegetation Types and Habitats for the Tunnel Alternative (Applicant's Proposed Action)

US Army Corps of Engineers.



Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 1 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

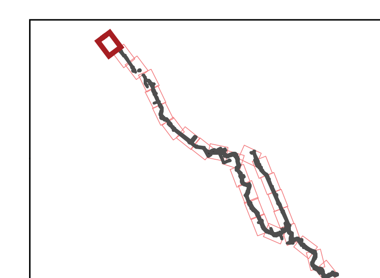
Other Habitat Types

Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

0 125 250
Scale in Feet



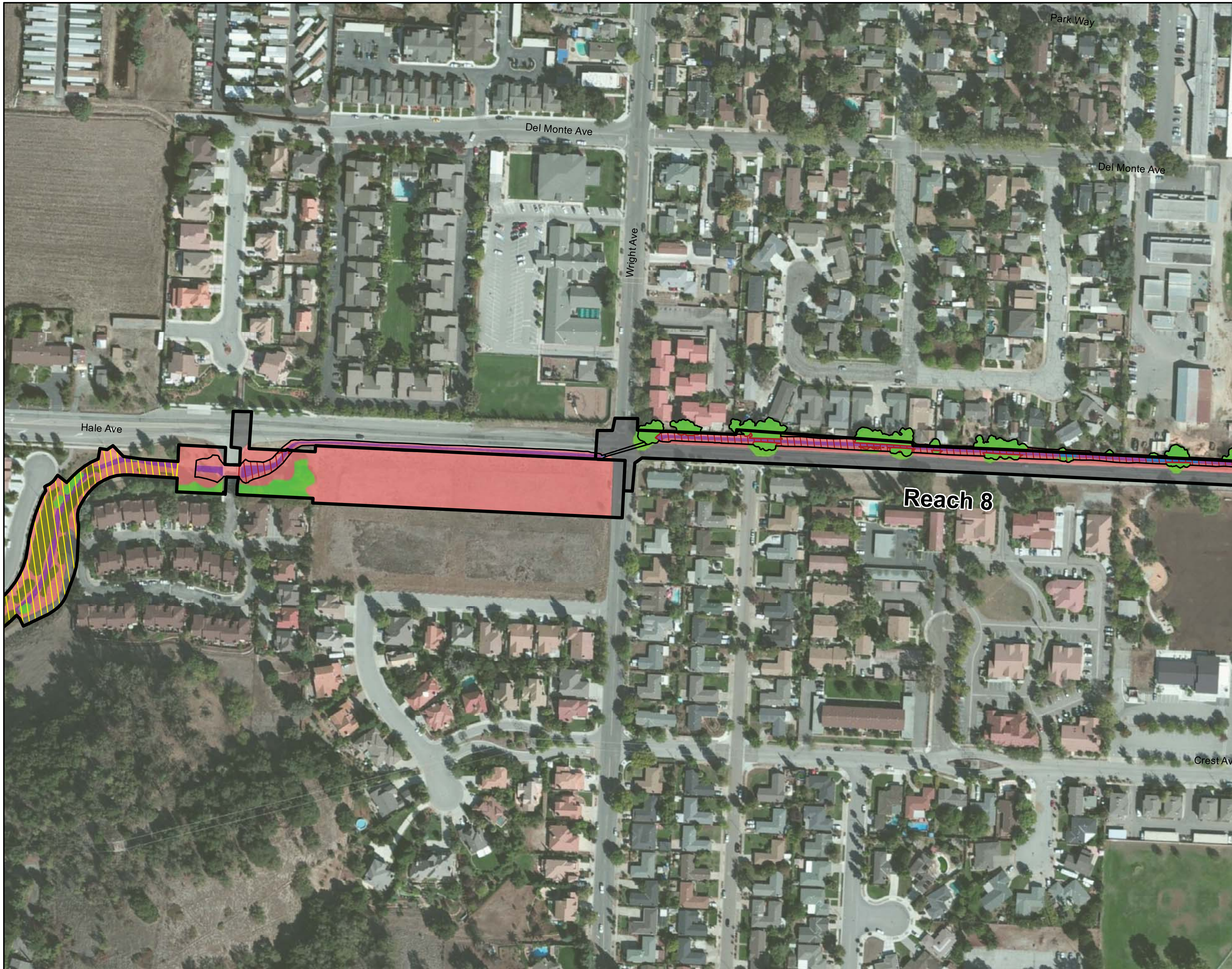
Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 2 of 25



Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

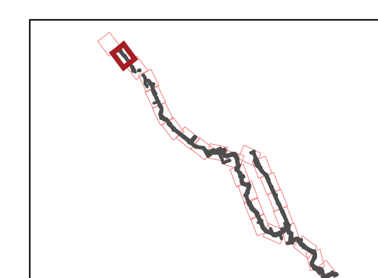
Other Habitat Types

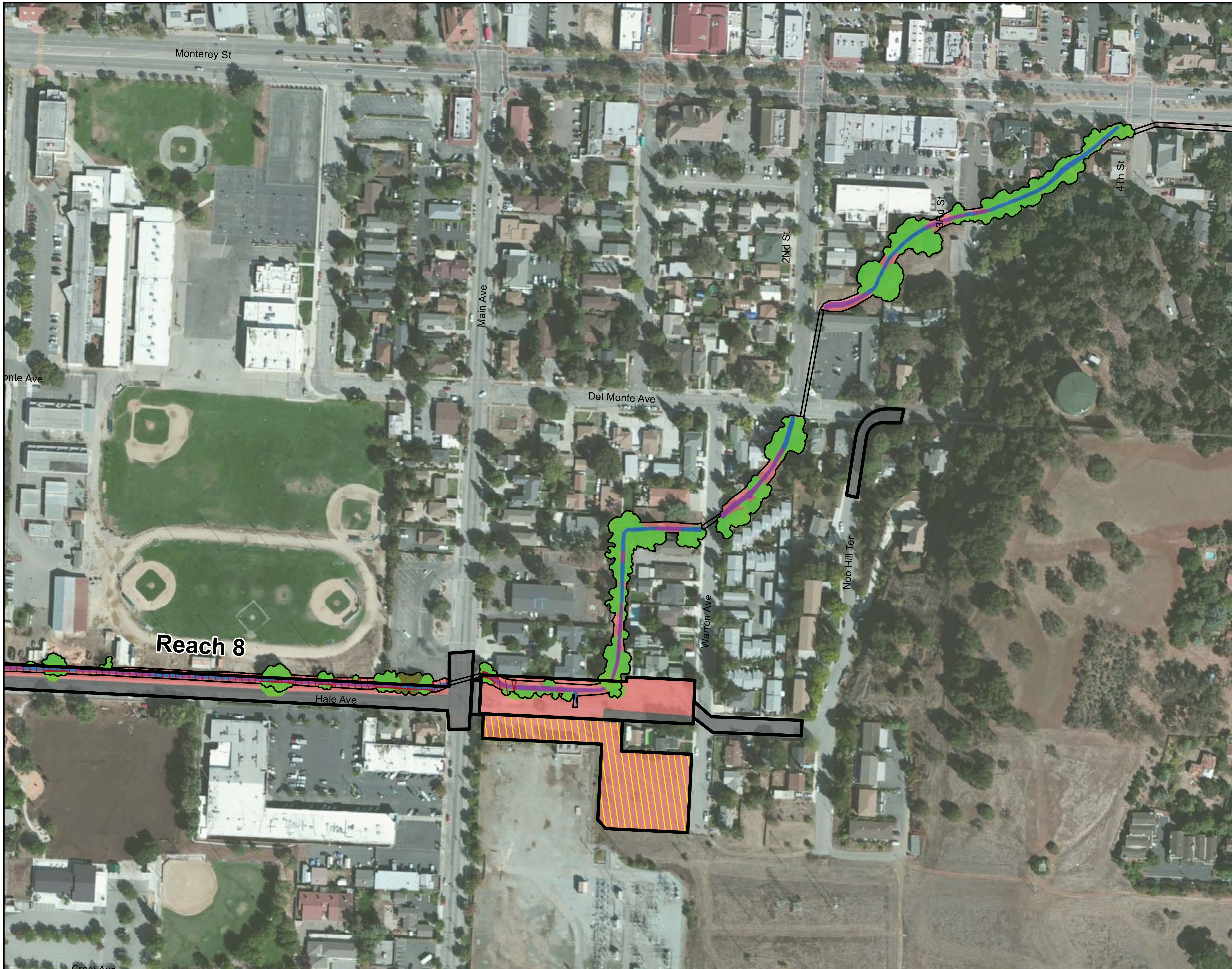
Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 3 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

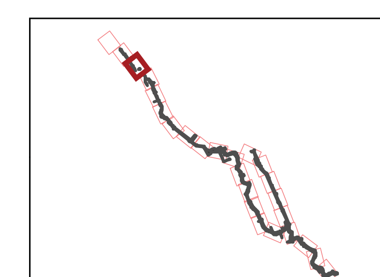
Other Habitat Types

Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

0 125 250
Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 4 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

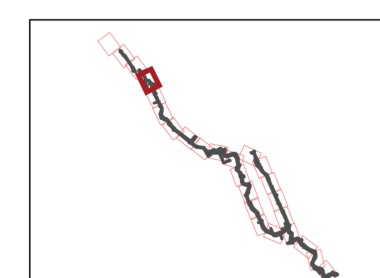
Other Habitat Types

Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

0 125 250
Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

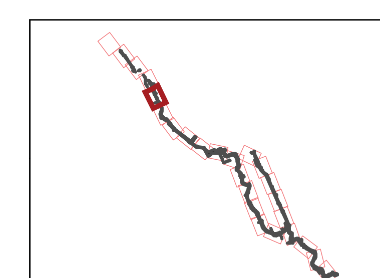
Other Habitat Types

Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

0 125 250
Scale in Feet



Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 6 of 25

Legend

- Reach Break
- Project Footprint
- CDFW Jurisdiction Boundary
- Temporary Impact
- Permanent Impacts

CAR Habitat Types

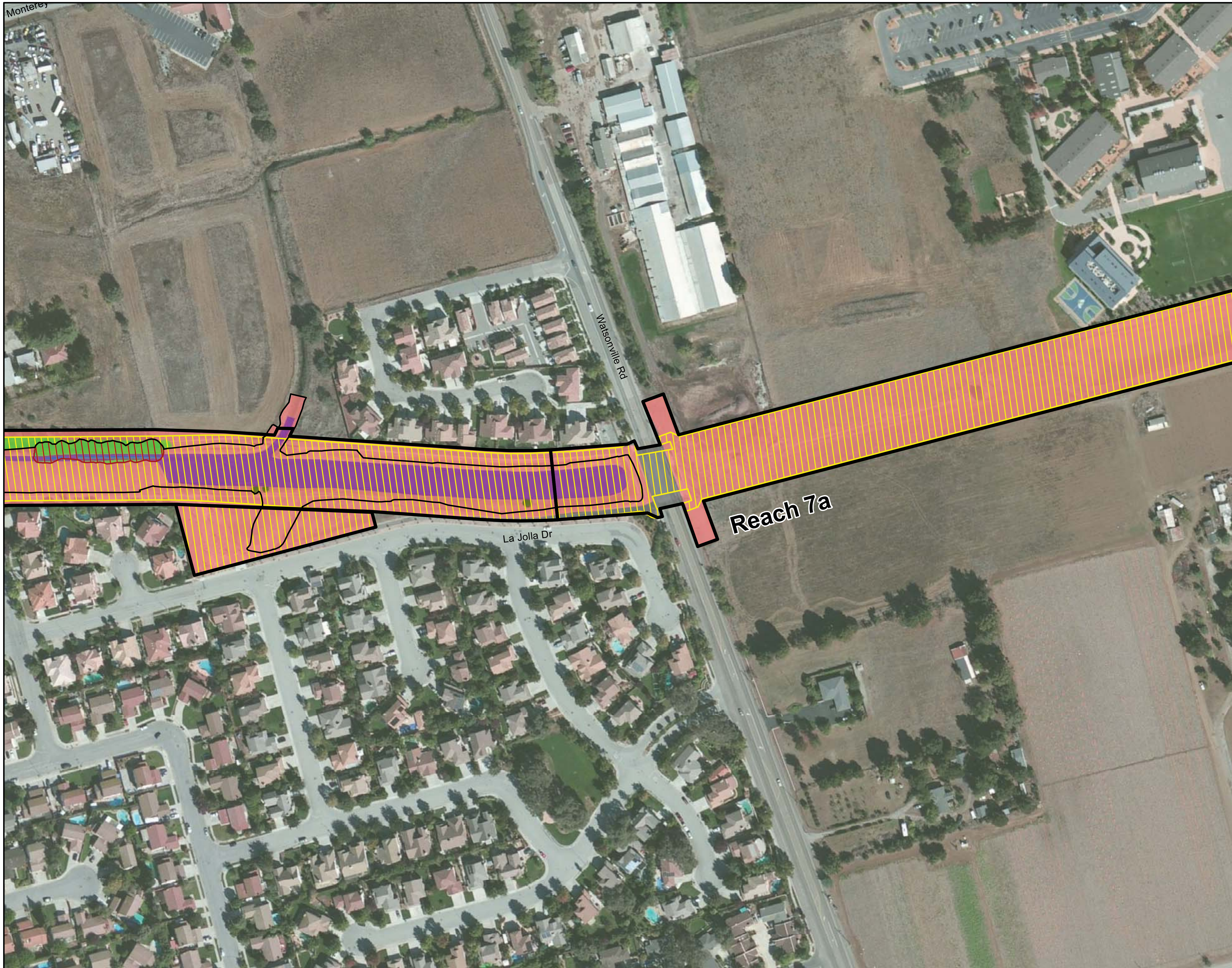
- Riparian Forest (PFO)
- Riparian Scrub-shrub (PSS)
- Perennial Emergent Marsh (PEM)
- Upland Herbaceous (U/H)

Other Habitat Types

- Aquatic
- Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

0 125 250
Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 7 of 25

Legend

- Reach Break
- Project Footprint
- CDFW Jurisdiction Boundary
- Temporary Impact
- Permanent Impacts

CAR Habitat Types

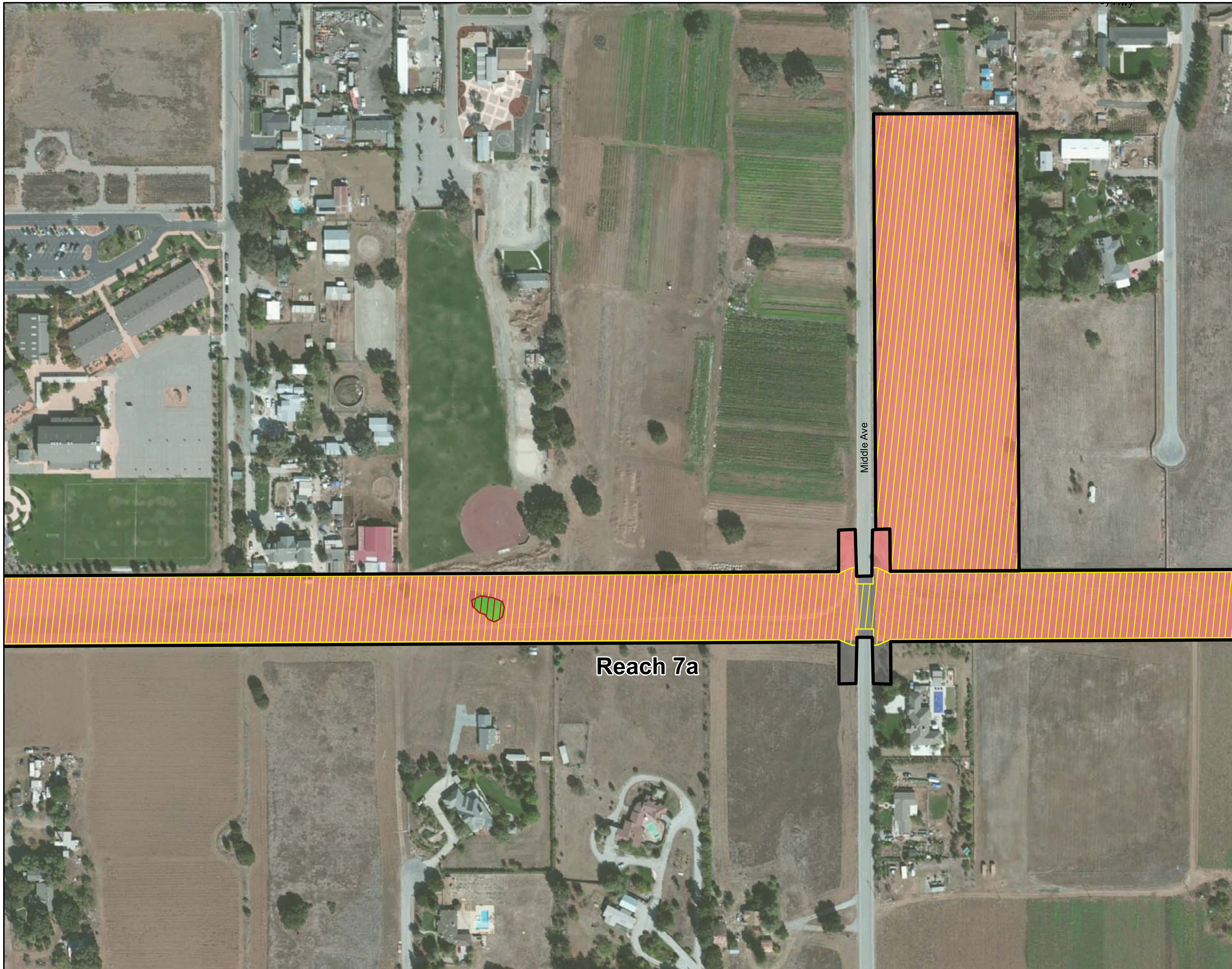
- Riparian Forest (PFO)
- Riparian Scrub-shrub (PSS)
- Perennial Emergent Marsh (PEM)
- Upland Herbaceous (U/H)

Other Habitat Types

- Aquatic
- Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

0 125 250
Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

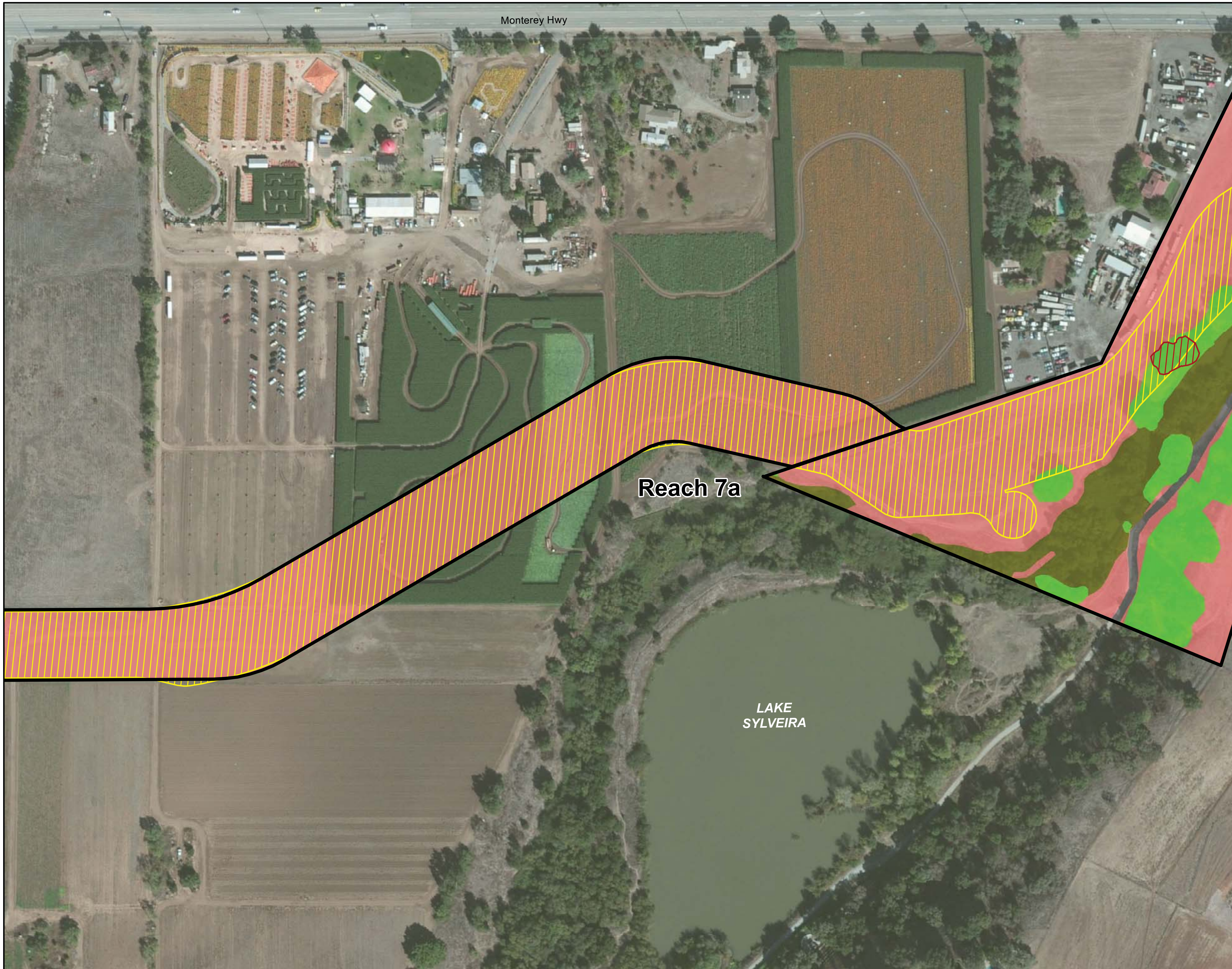
Other Habitat Types

Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

0 125 250
Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 9 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

Aquatic

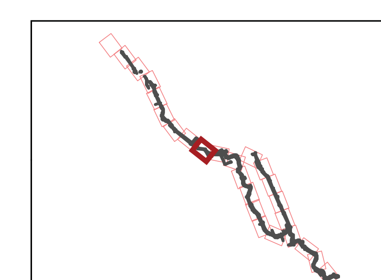
Developed

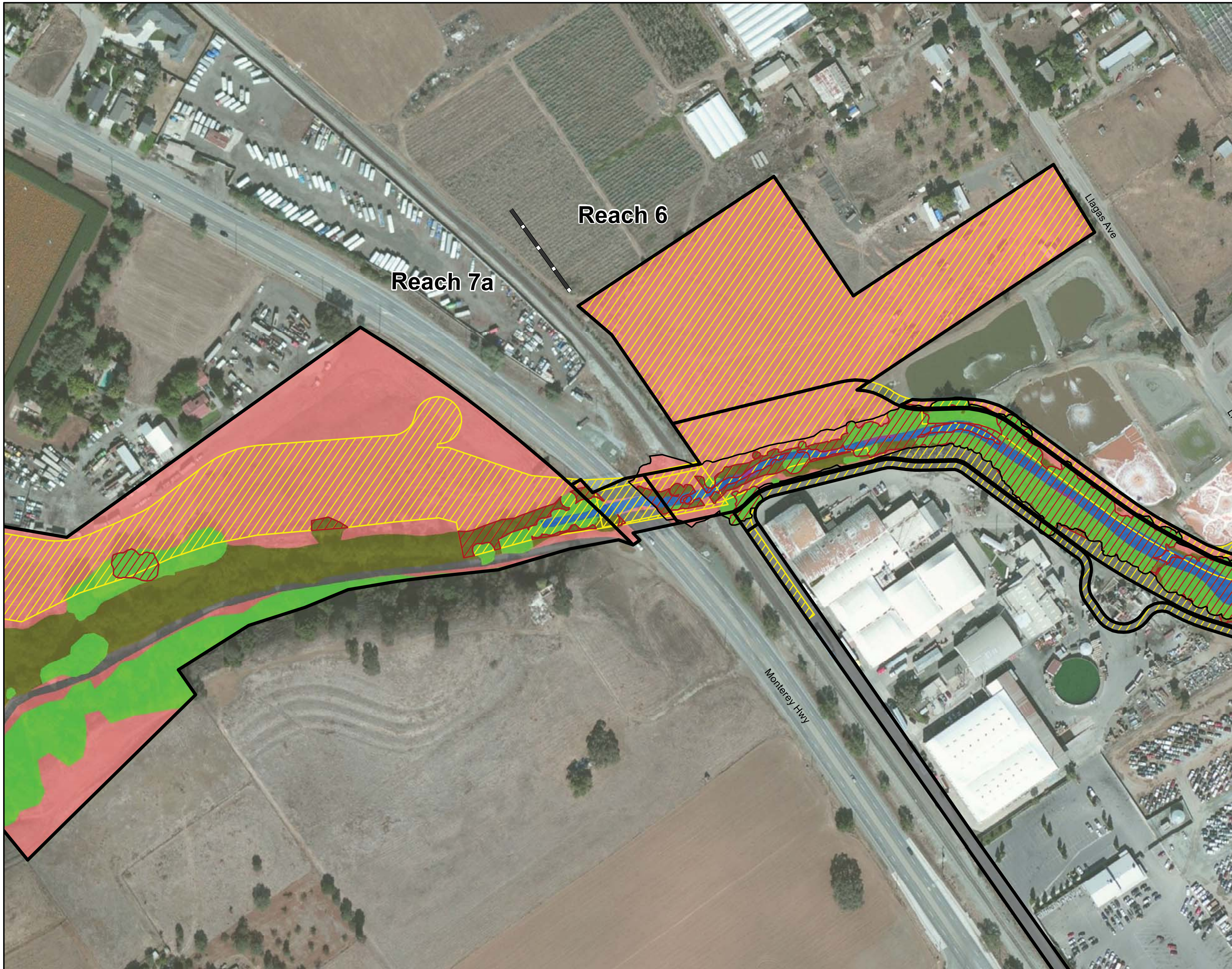
Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250

Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 10 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

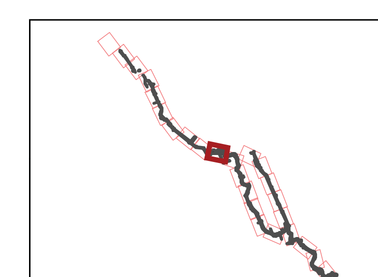
Aquatic

Developed

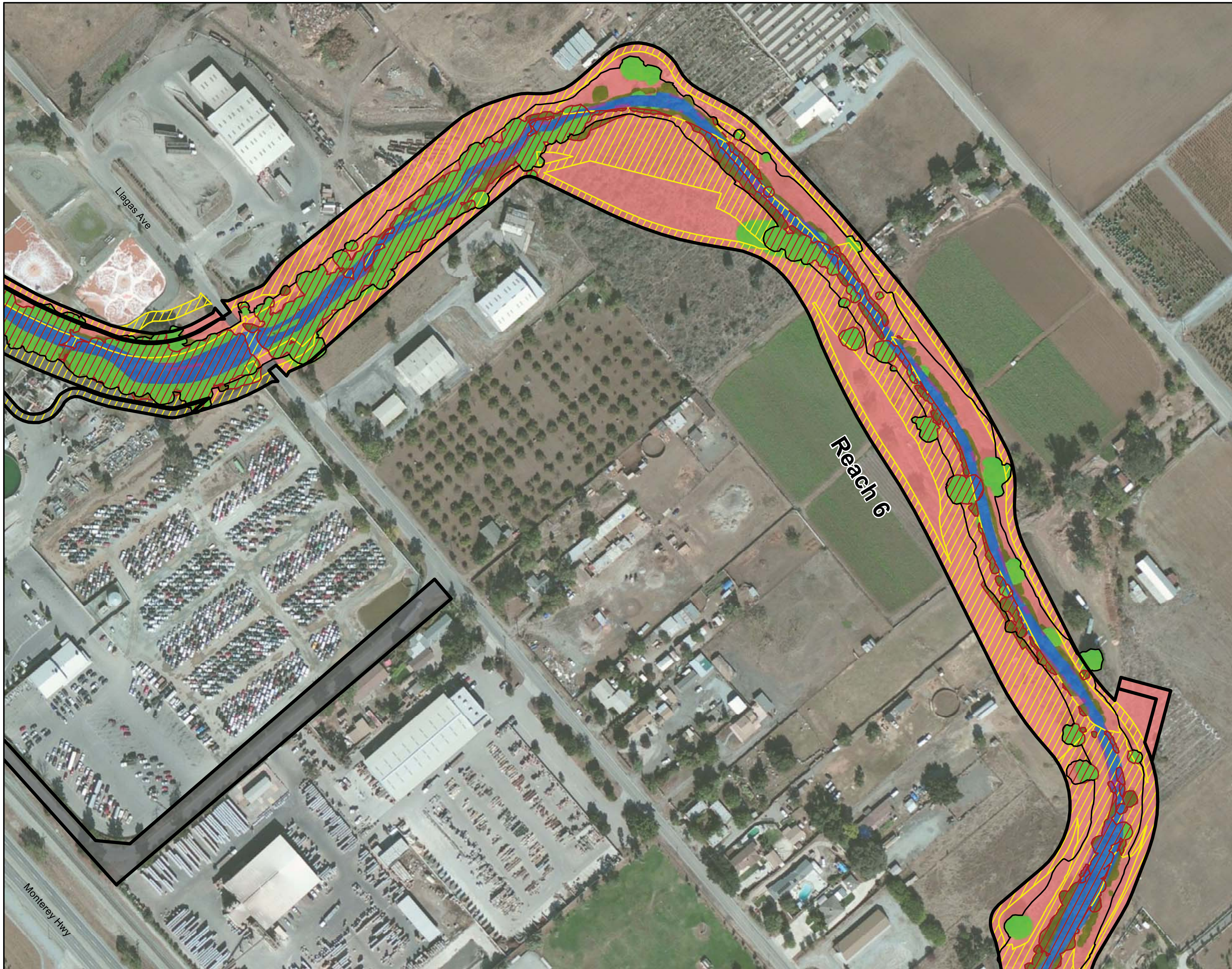
Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250
Scale in Feet



Cardno ENTRIX



Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 11 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

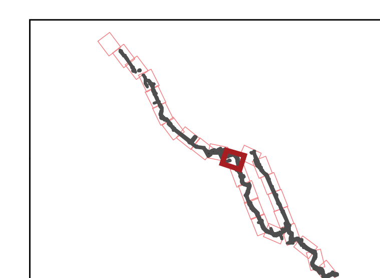
Aquatic

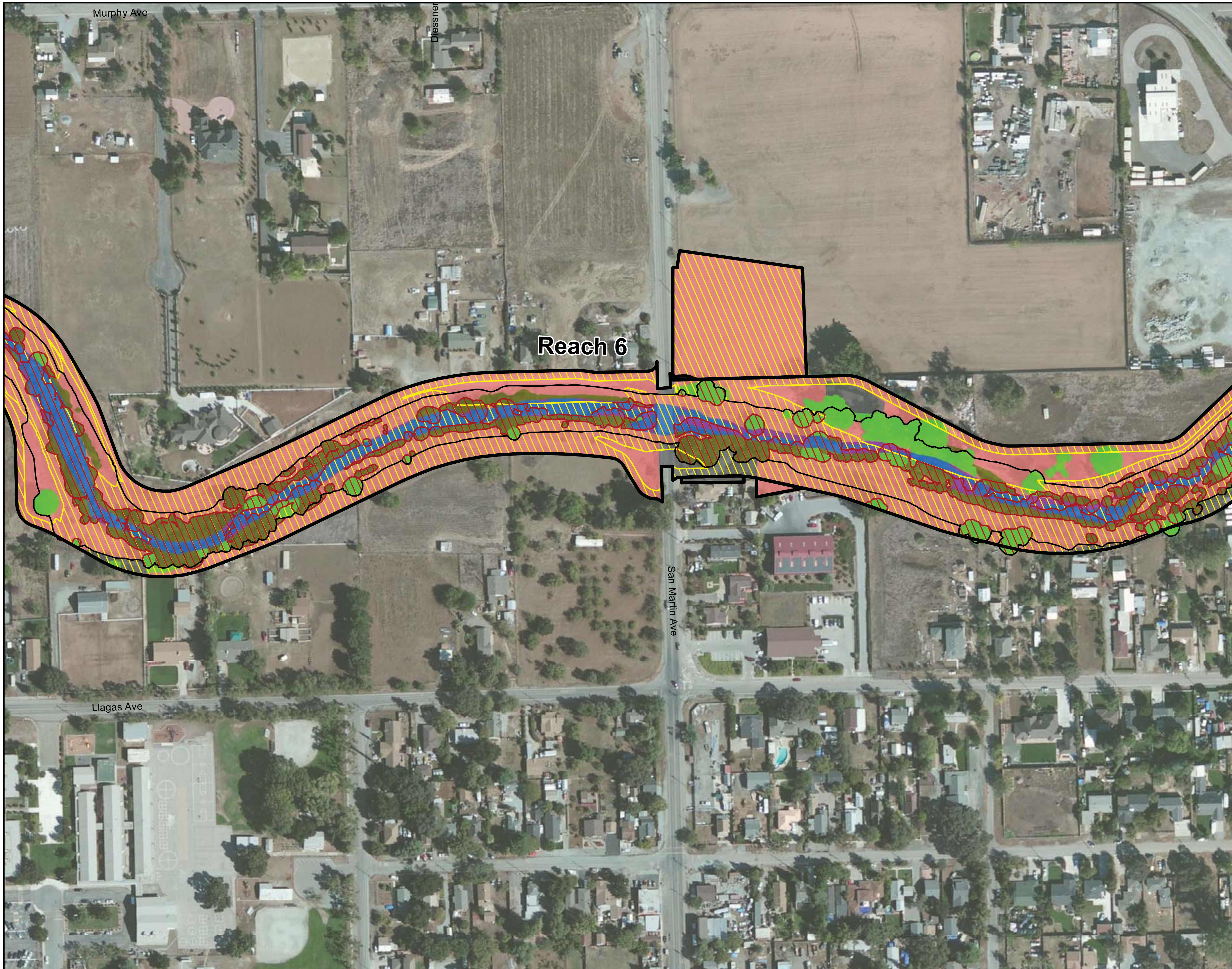
Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 12 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

0 125 250
Scale in Feet

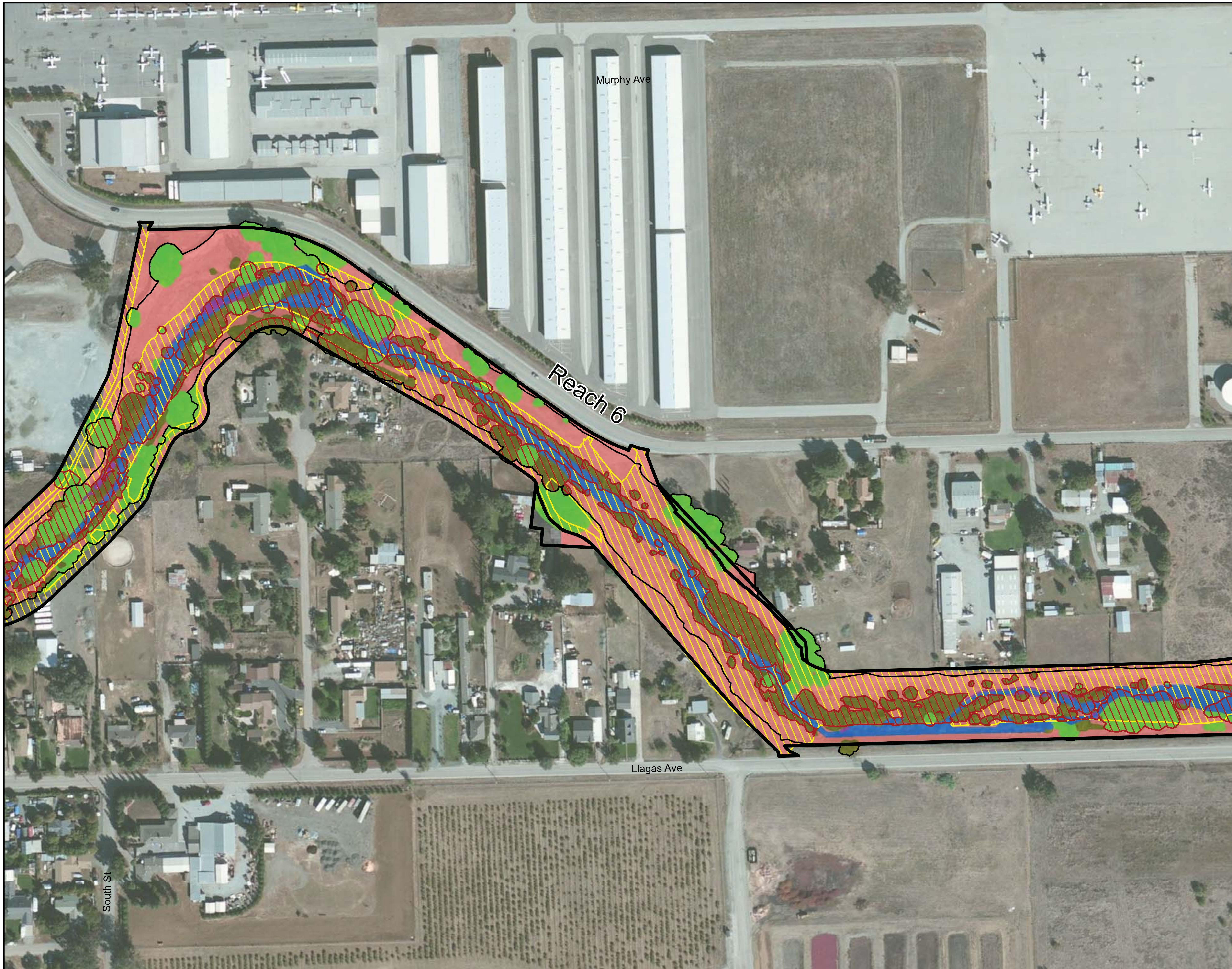
Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 13 of 25



Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

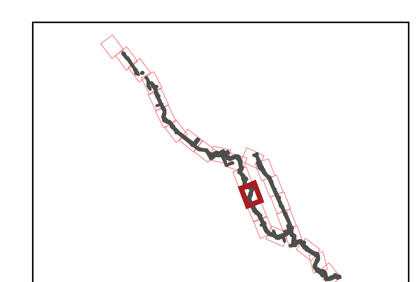
Aquatic

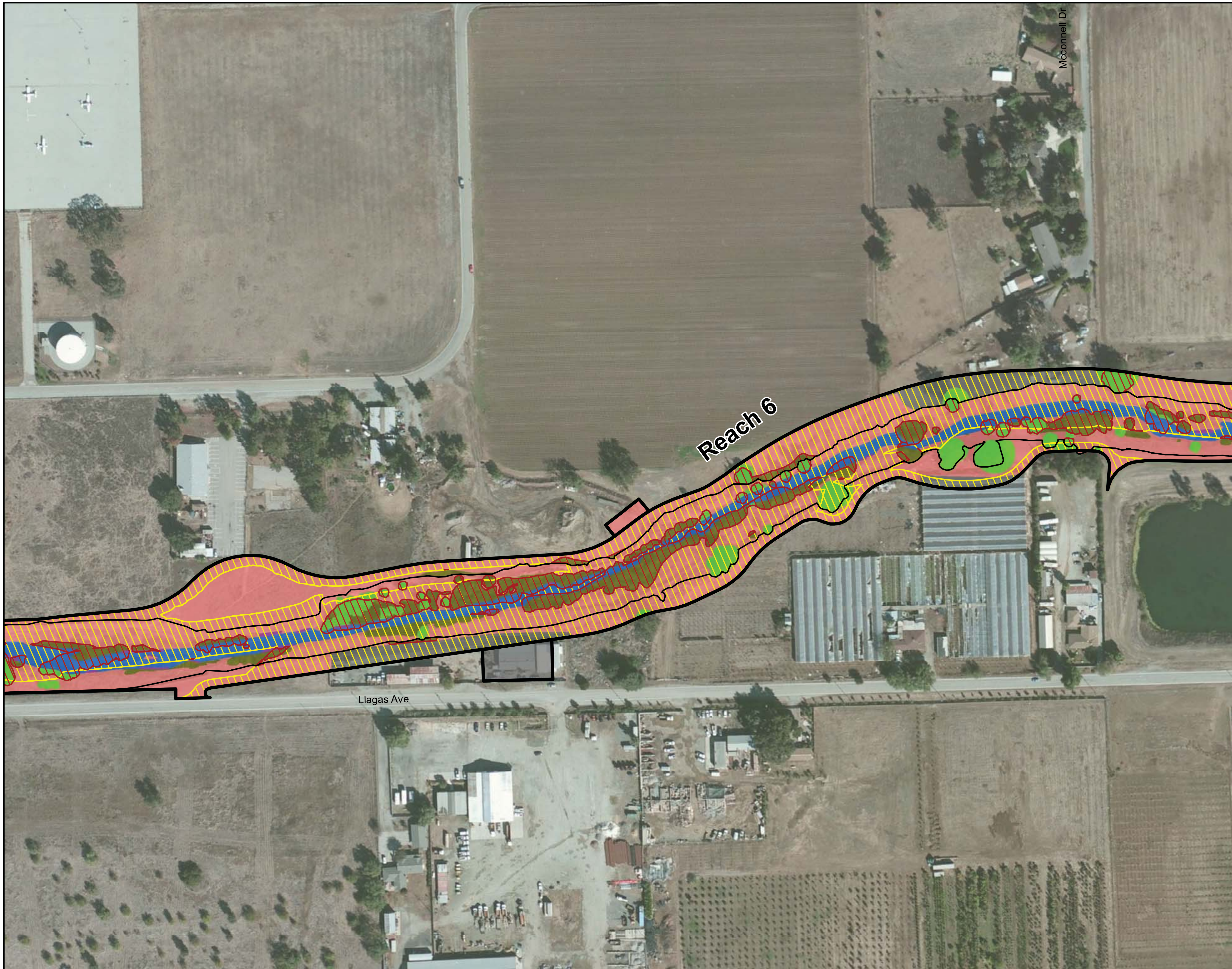
Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 14 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

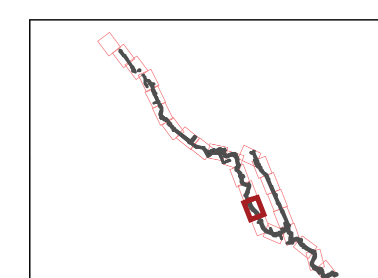
Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250
Scale in Feet

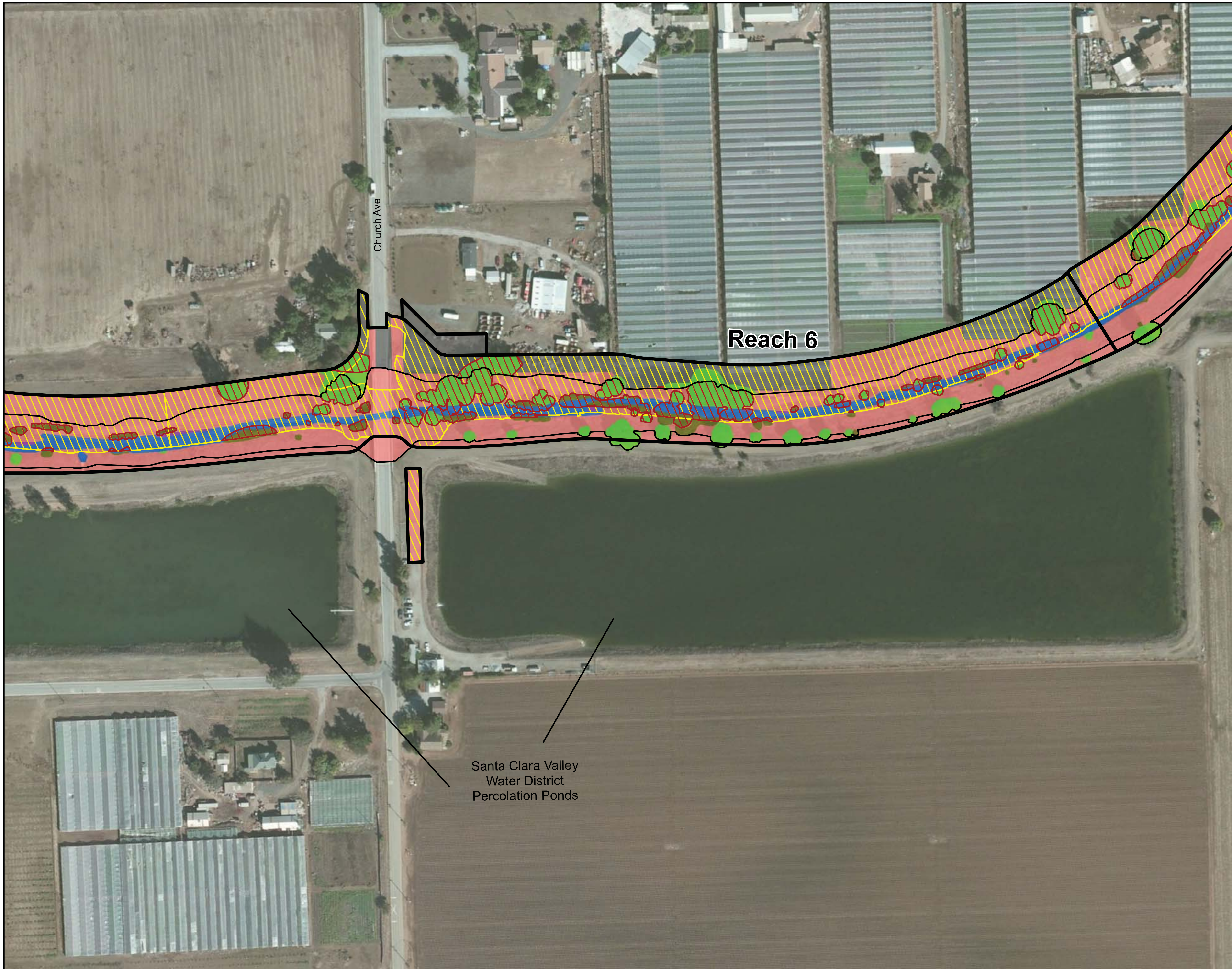


Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area



Legend

- Reach Break
- Project Footprint
- CDFW Jurisdiction Boundary
- Temporary Impact
- Permanent Impacts

CAR Habitat Types

- Riparian Forest (PFO)
- Riparian Scrub-shrub (PSS)
- Perennial Emergent Marsh (PEM)
- Upland Herbaceous (U/H)

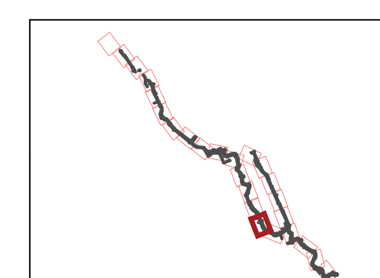
Other Habitat Types

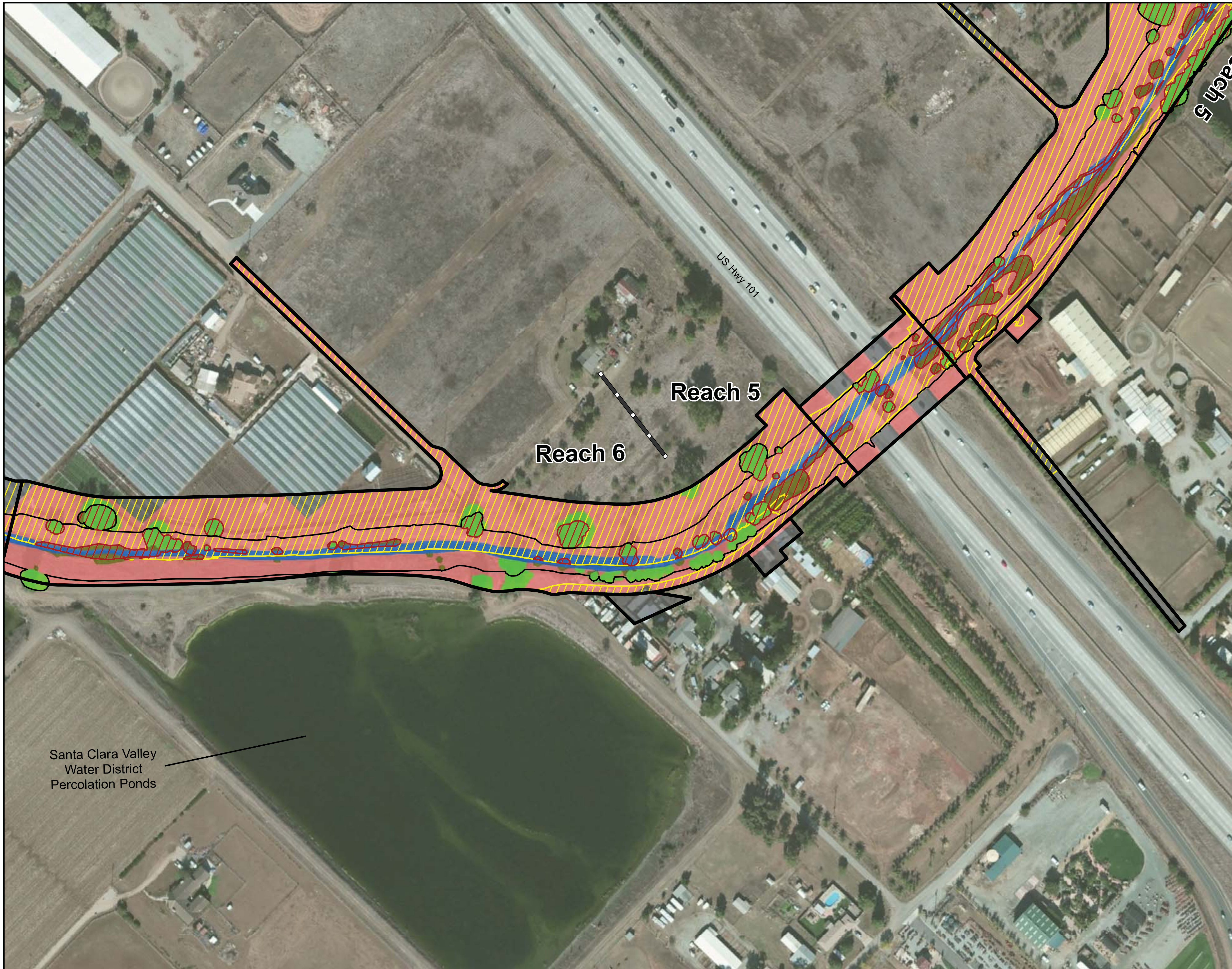
- Aquatic
- Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 16 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

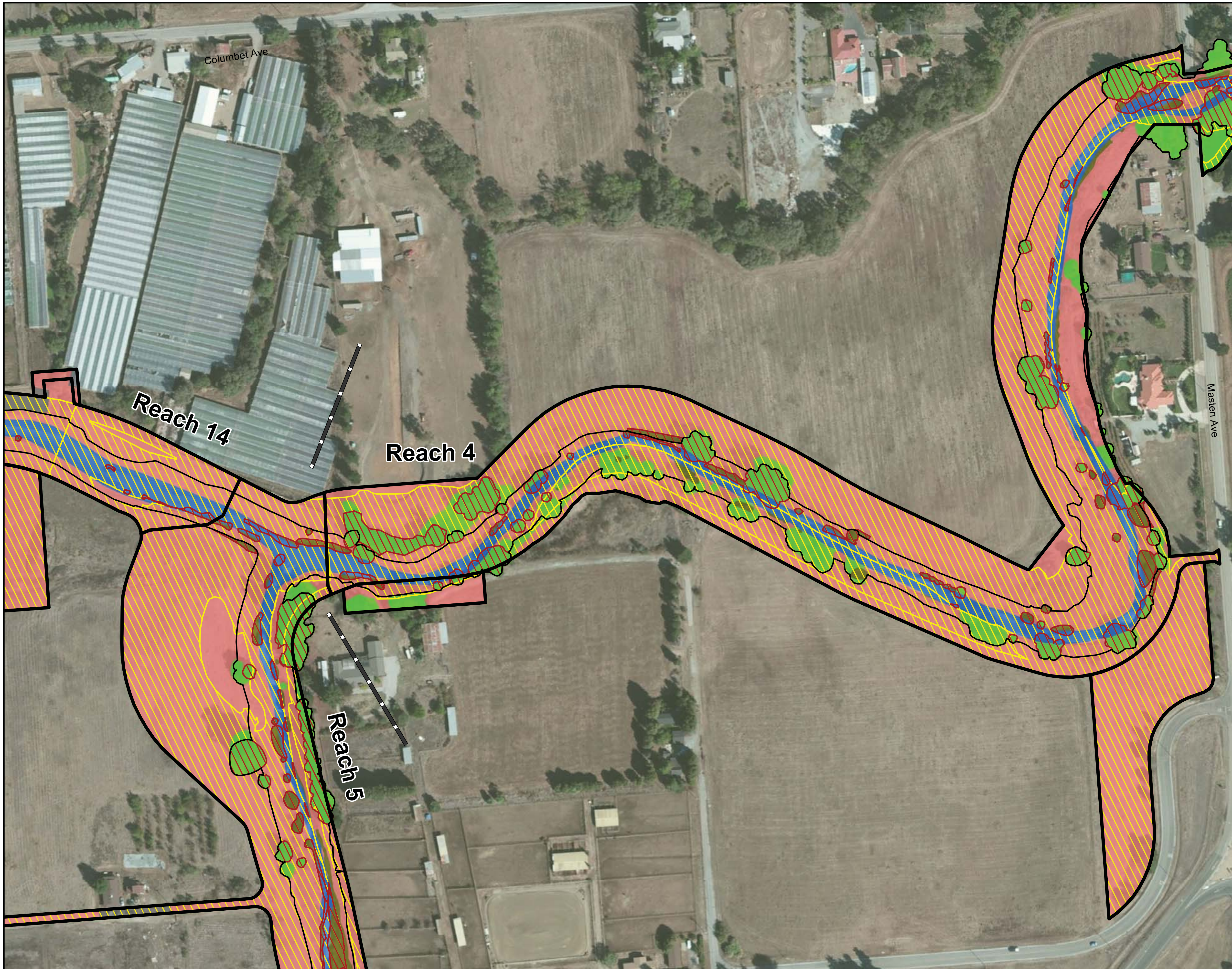
Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250
Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 17 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

Aquatic

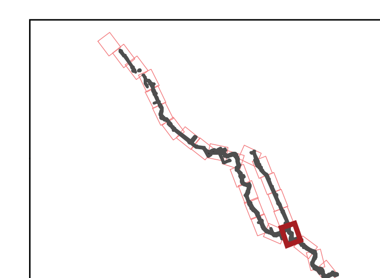
Developed

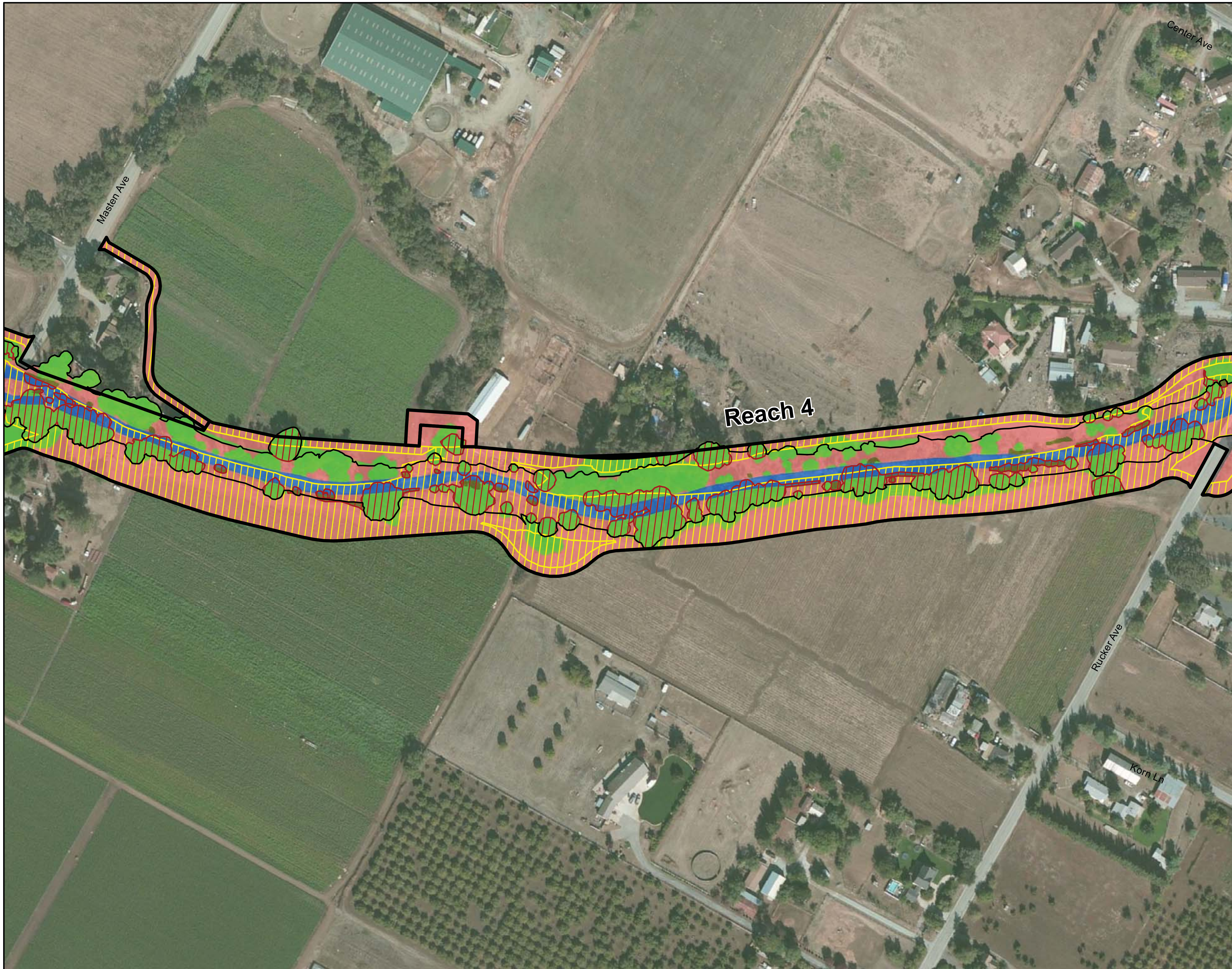
Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250

Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 18 of 25

Legend

- Reach Break
- Project Footprint
- CDFW Jurisdiction Boundary
- Temporary Impact
- Permanent Impacts

CAR Habitat Types

- Riparian Forest (PFO)
- Riparian Scrub-shrub (PSS)
- Perennial Emergent Marsh (PEM)
- Upland Herbaceous (U/H)

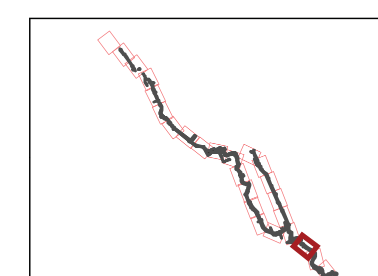
Other Habitat Types

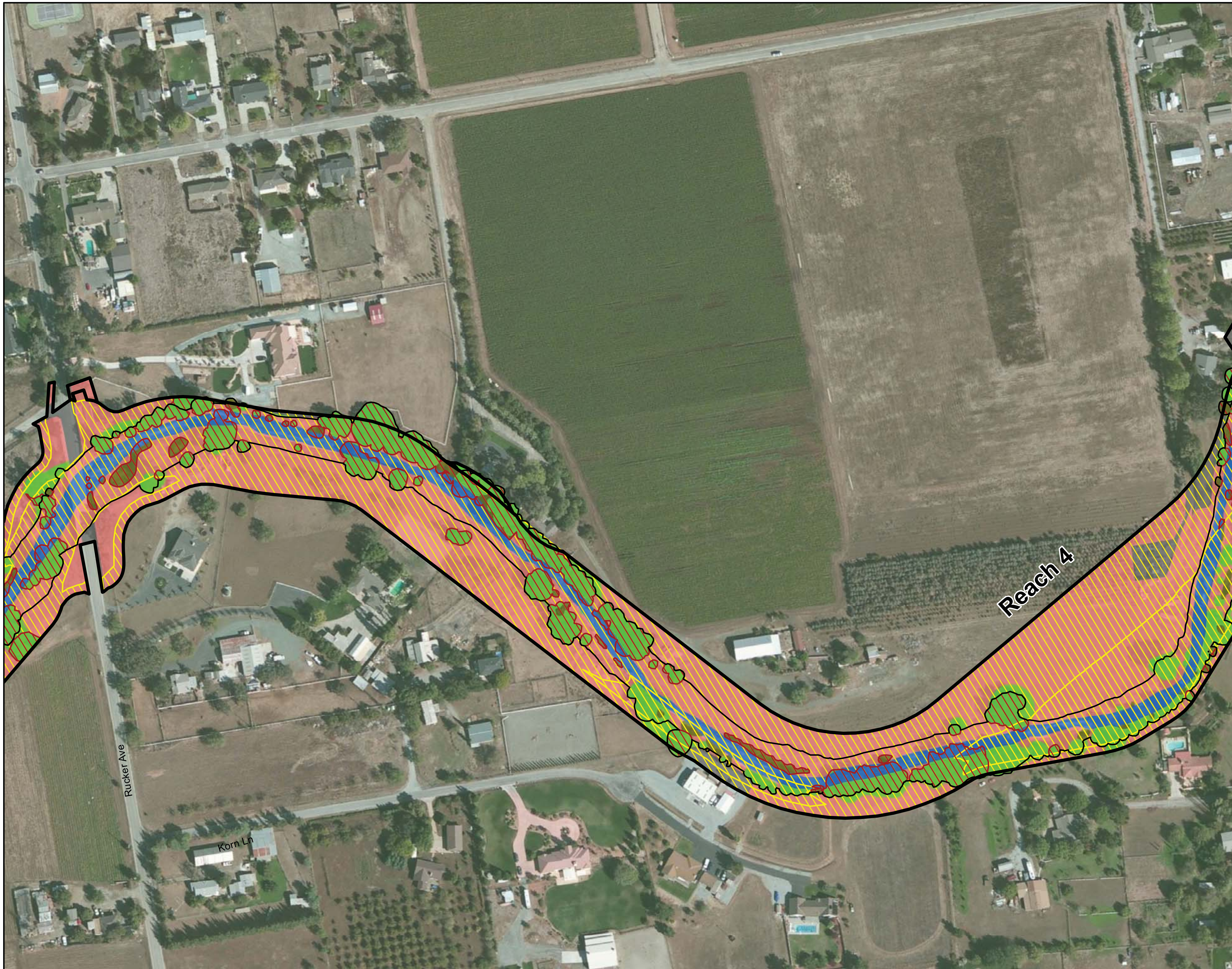
- Aquatic
- Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 19 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

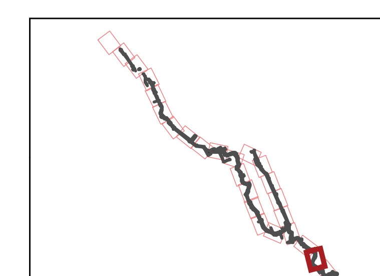
Aquatic

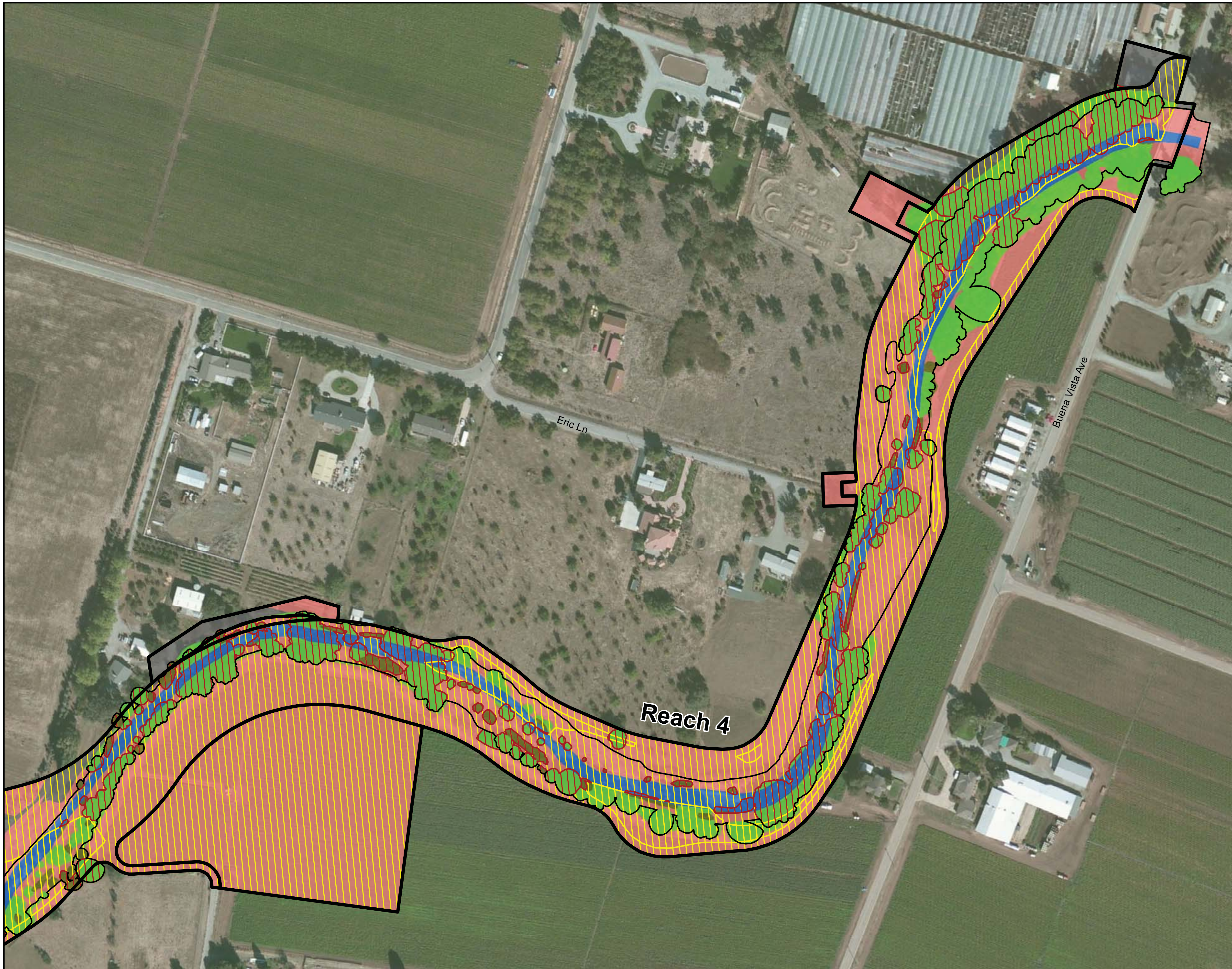
Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 20 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

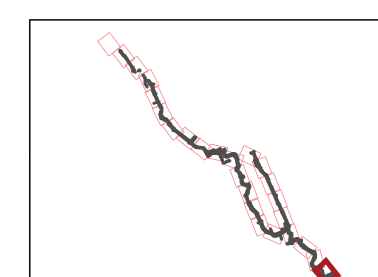
Other Habitat Types

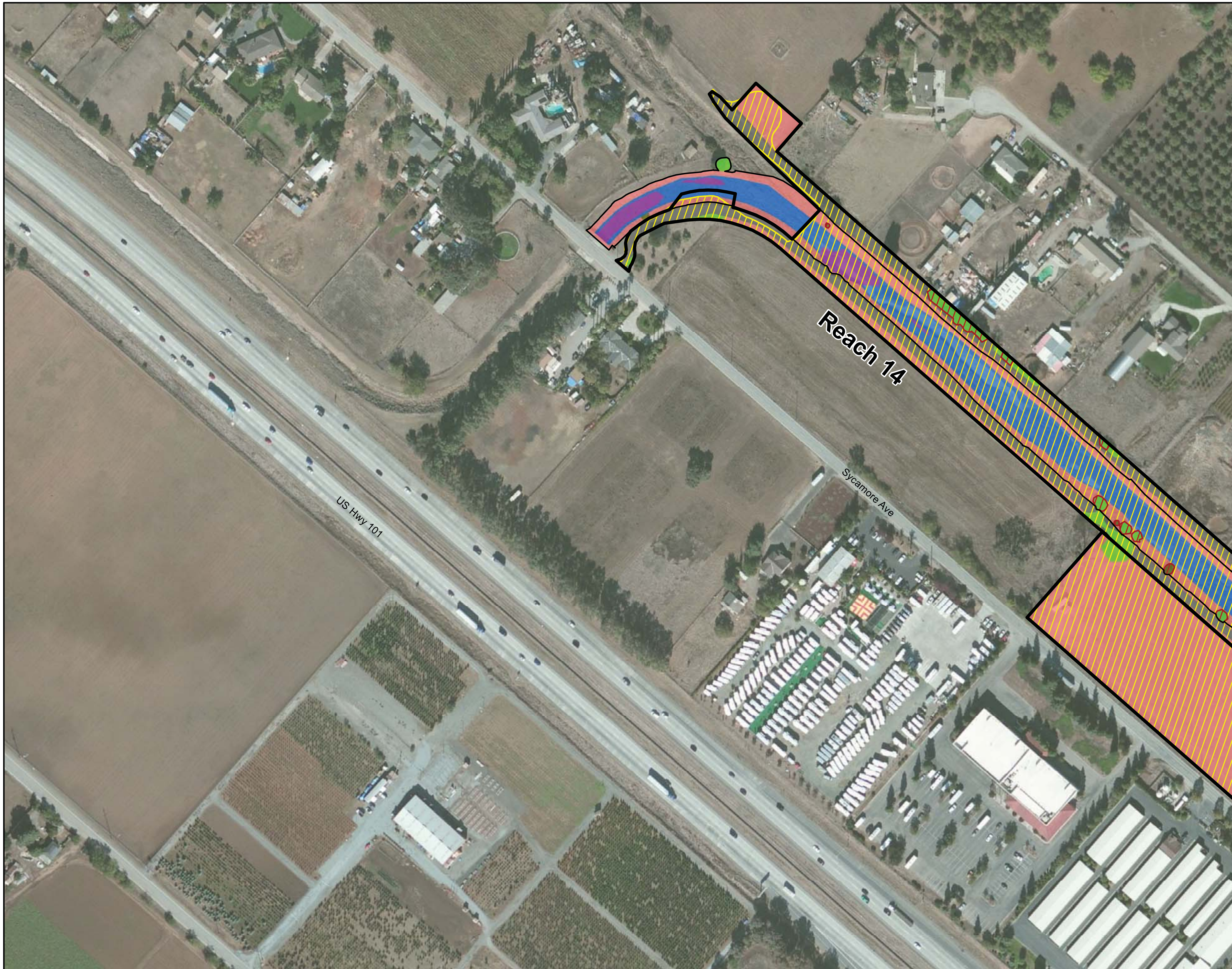
Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 21 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

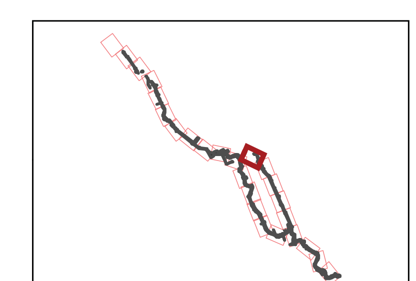
Aquatic

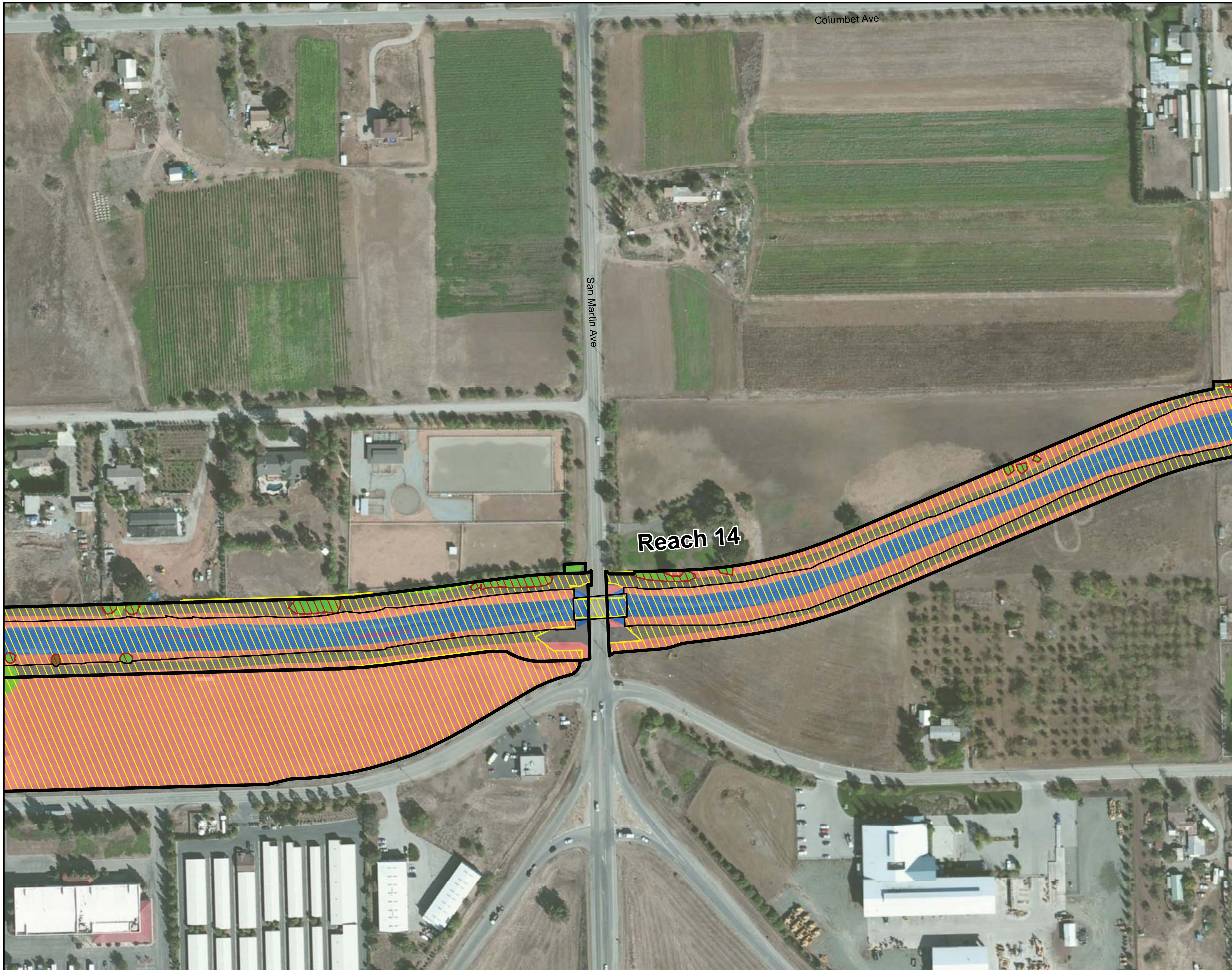
Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 22 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

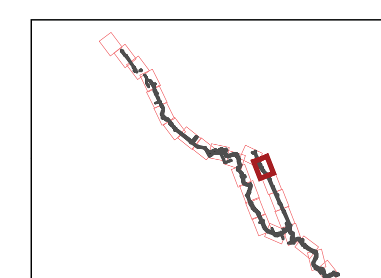
Upland Herbaceous (U/H)

Other Habitat Types

Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013



Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 23 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

Aquatic

Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

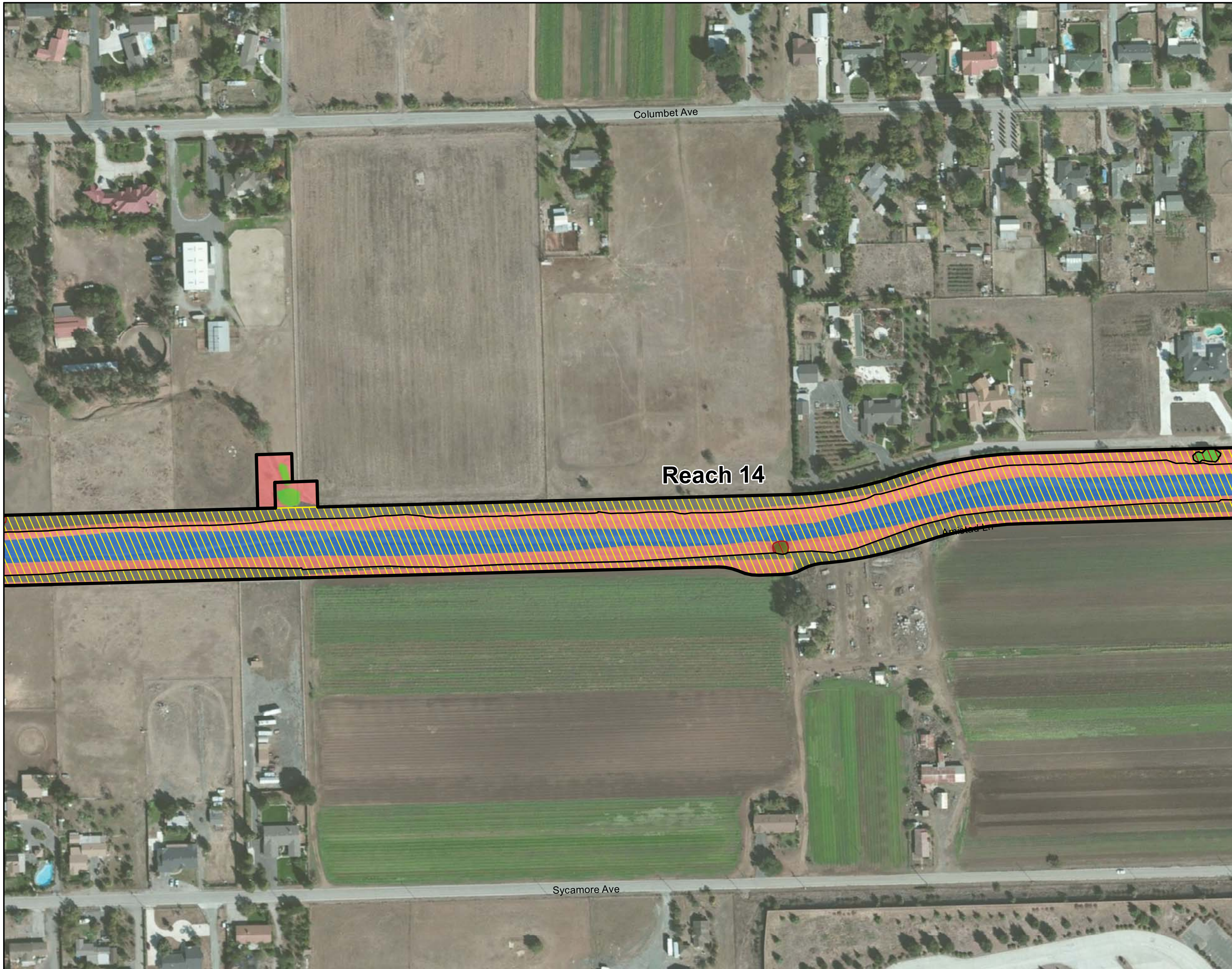
Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 24 of 25



Legend

- Reach Break
- Project Footprint
- CDFW Jurisdiction Boundary
- Temporary Impact
- Permanent Impacts

CAR Habitat Types

- Riparian Forest (PFO)
- Riparian Scrub-shrub (PSS)
- Perennial Emergent Marsh (PEM)
- Upland Herbaceous (U/H)

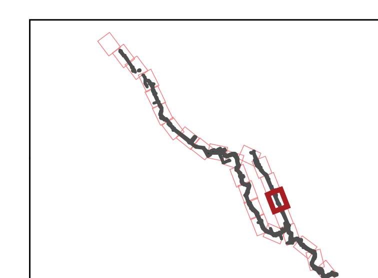
Other Habitat Types

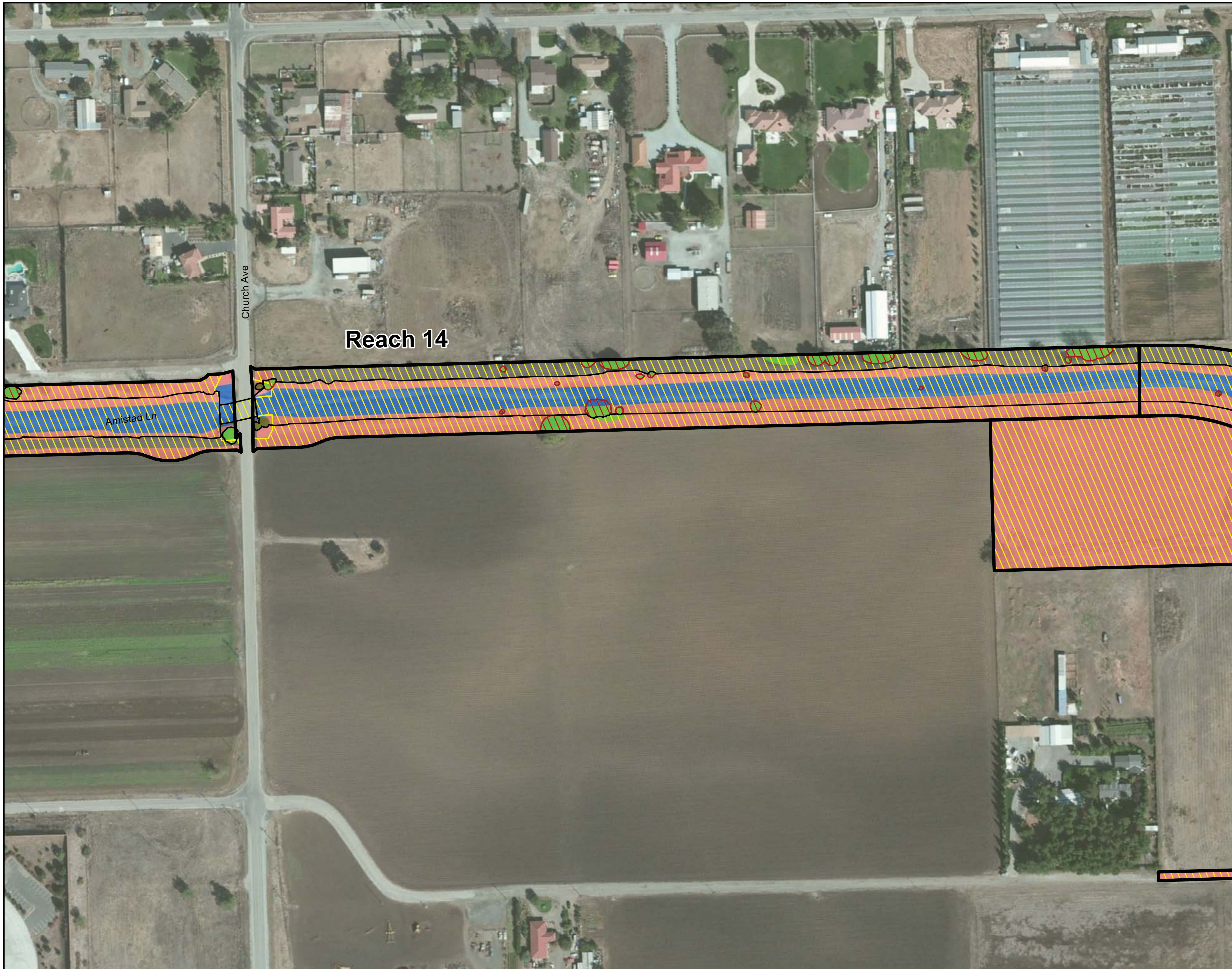
- Aquatic
- Developed

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix E

Impacts to Vegetation Types and Habitats for the Study Area

Map 25 of 25

Legend

Reach Break

Project Footprint

CDFW Jurisdiction Boundary

Temporary Impact

Permanent Impacts

CAR Habitat Types

Riparian Forest (PFO)

Riparian Scrub-shrub (PSS)

Perennial Emergent Marsh (PEM)

Upland Herbaceous (U/H)

Other Habitat Types

Aquatic

Developed

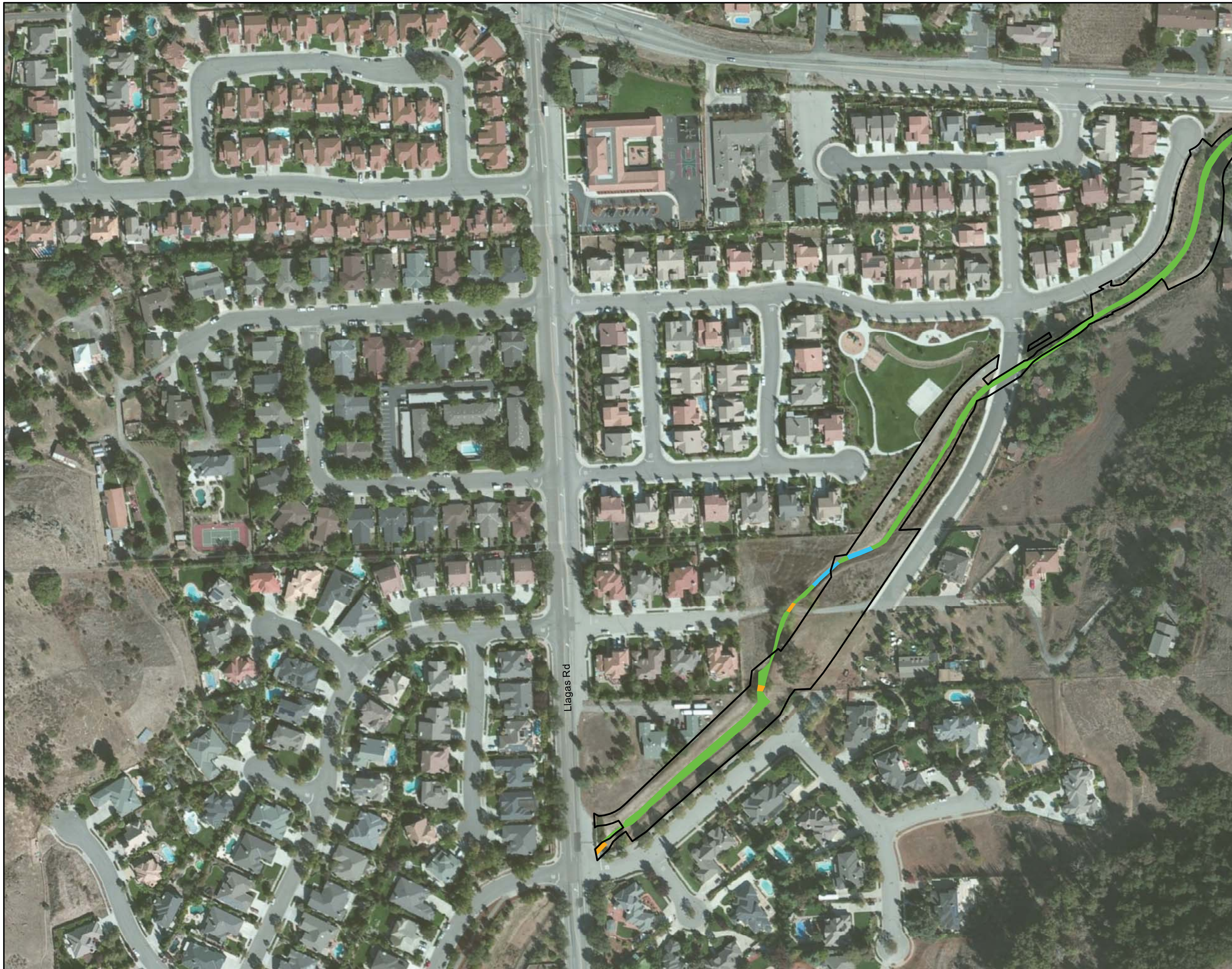
Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a and Cardno ENTRIX, 2013

0 125 250
Scale in Feet

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

US Army Corps of Engineers.



Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 1 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US
Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

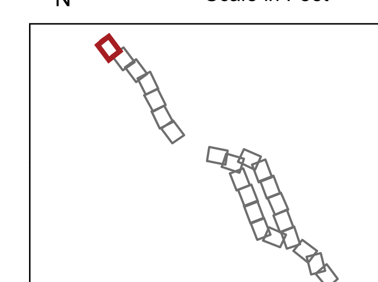
Sensitive Habitat

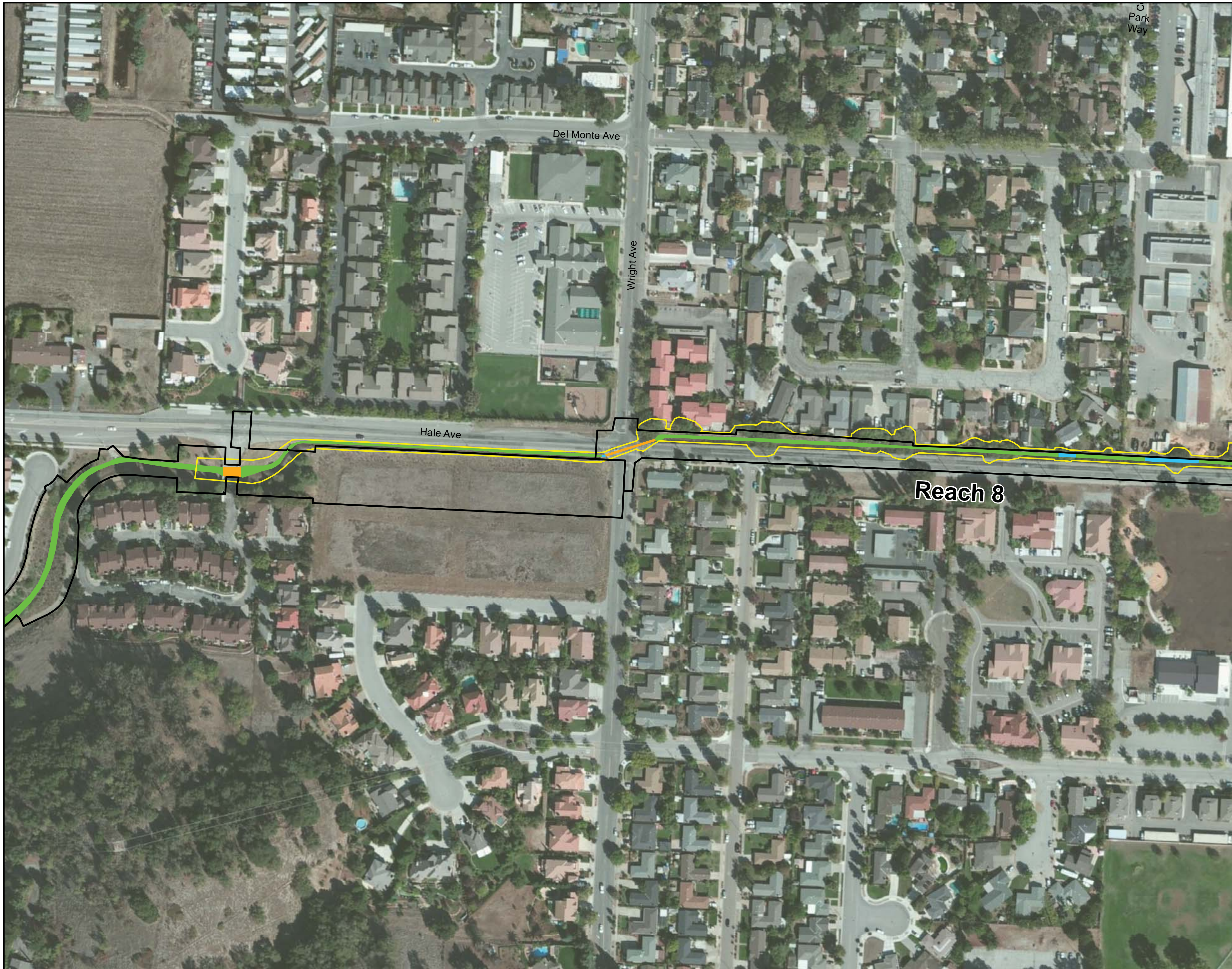
California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 2 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250

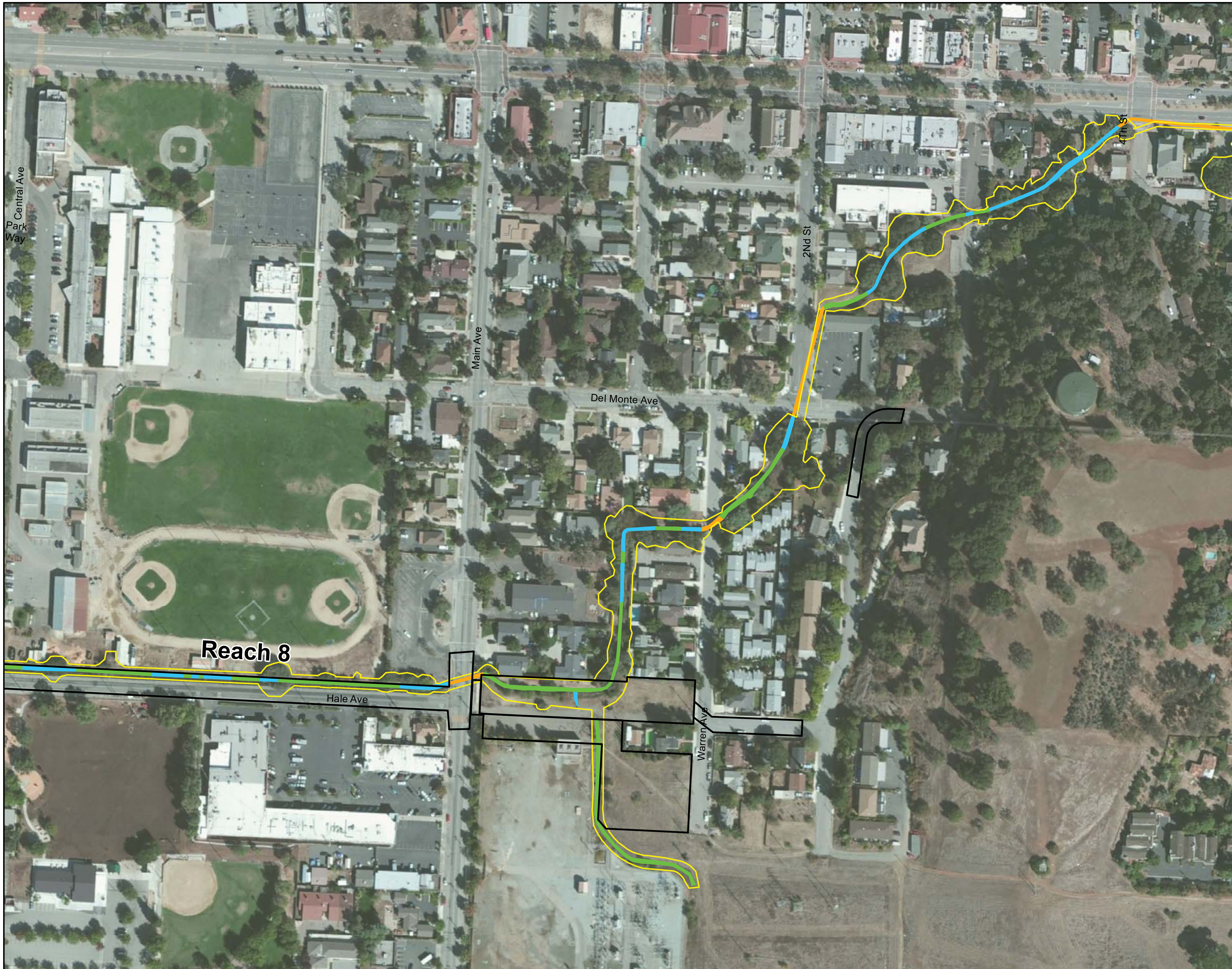
Scale in Feet

Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland



Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US
Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

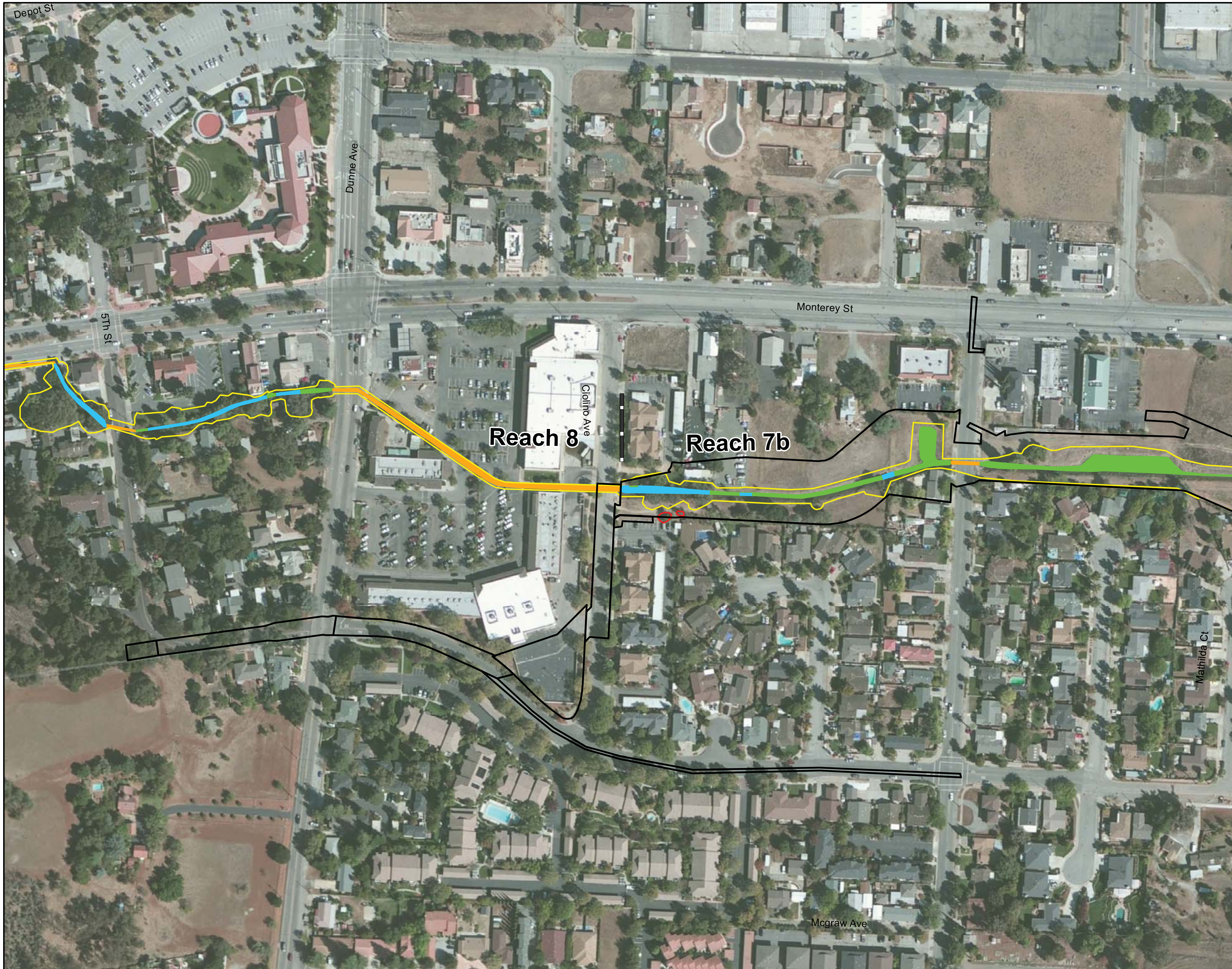
Sensitive Habitat

California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 4 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US
Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

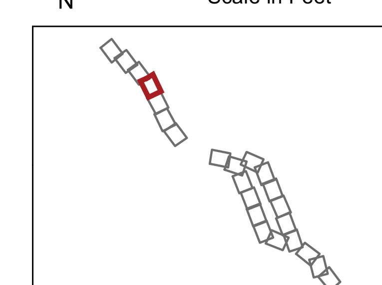
Sensitive Habitat

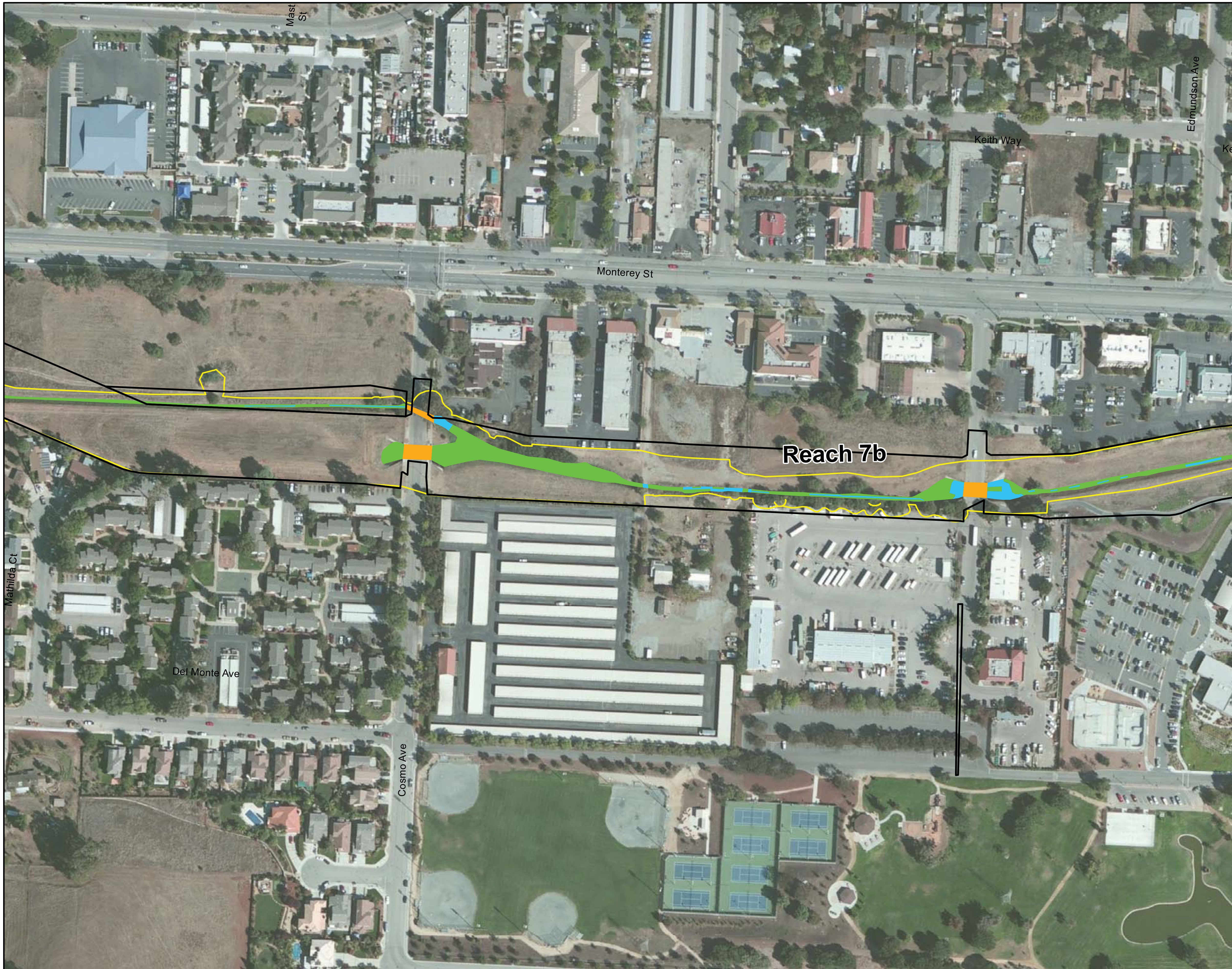
California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 5 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US
Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

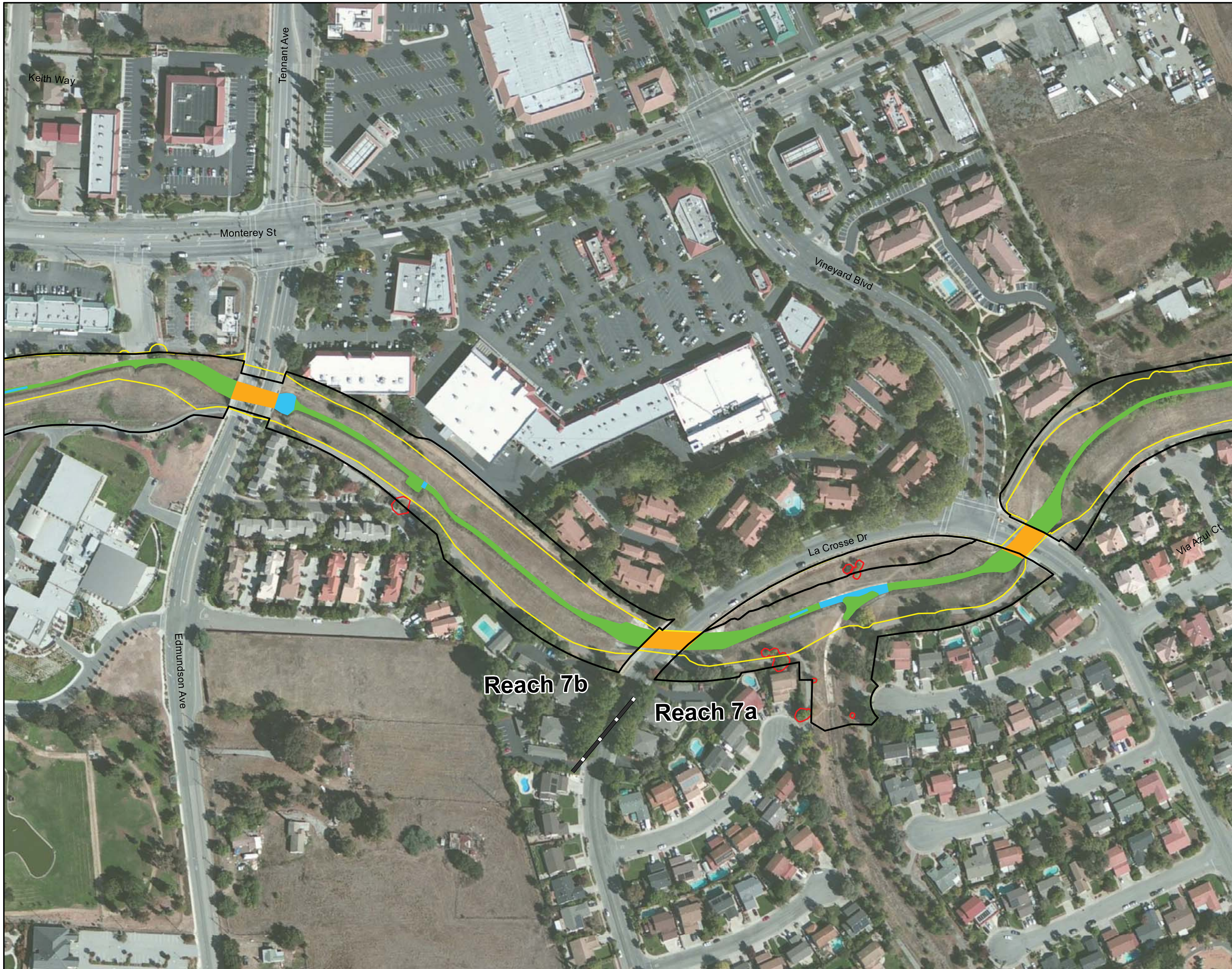
Sensitive Habitat

California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 6 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US
Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

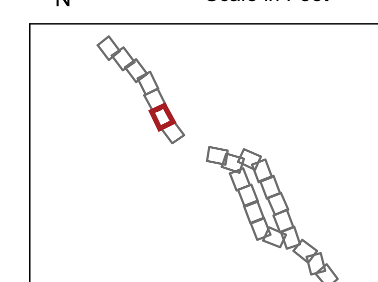
Sensitive Habitat

California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 7 of 23

Legend

- Reach Break
- Delineation Study Area
- Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

- Culverts
- Intermittent Streams
- Perennial Streams
- Pond

Wetland Waters

- Perennial Marsh
- Seasonal Wetland

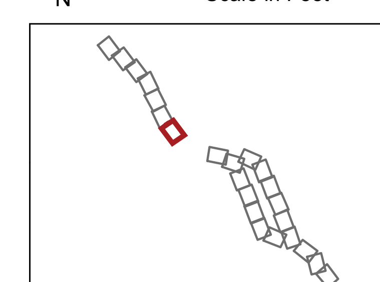
Sensitive Habitat

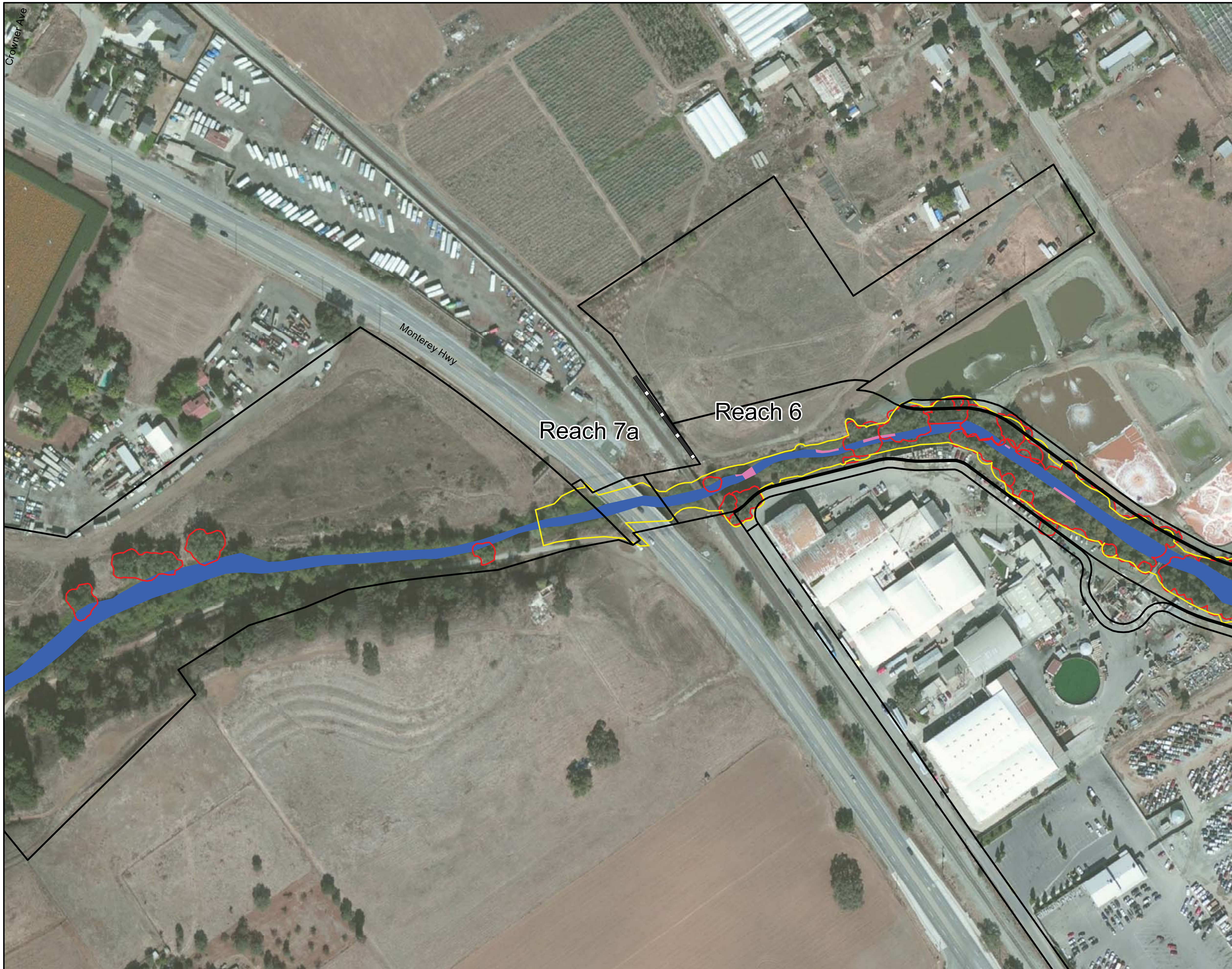
- California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 8 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US
Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

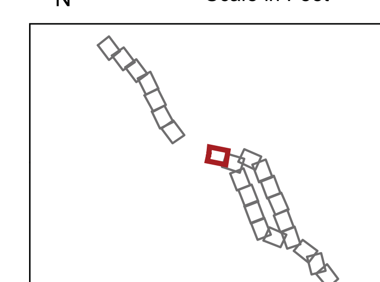
Sensitive Habitat

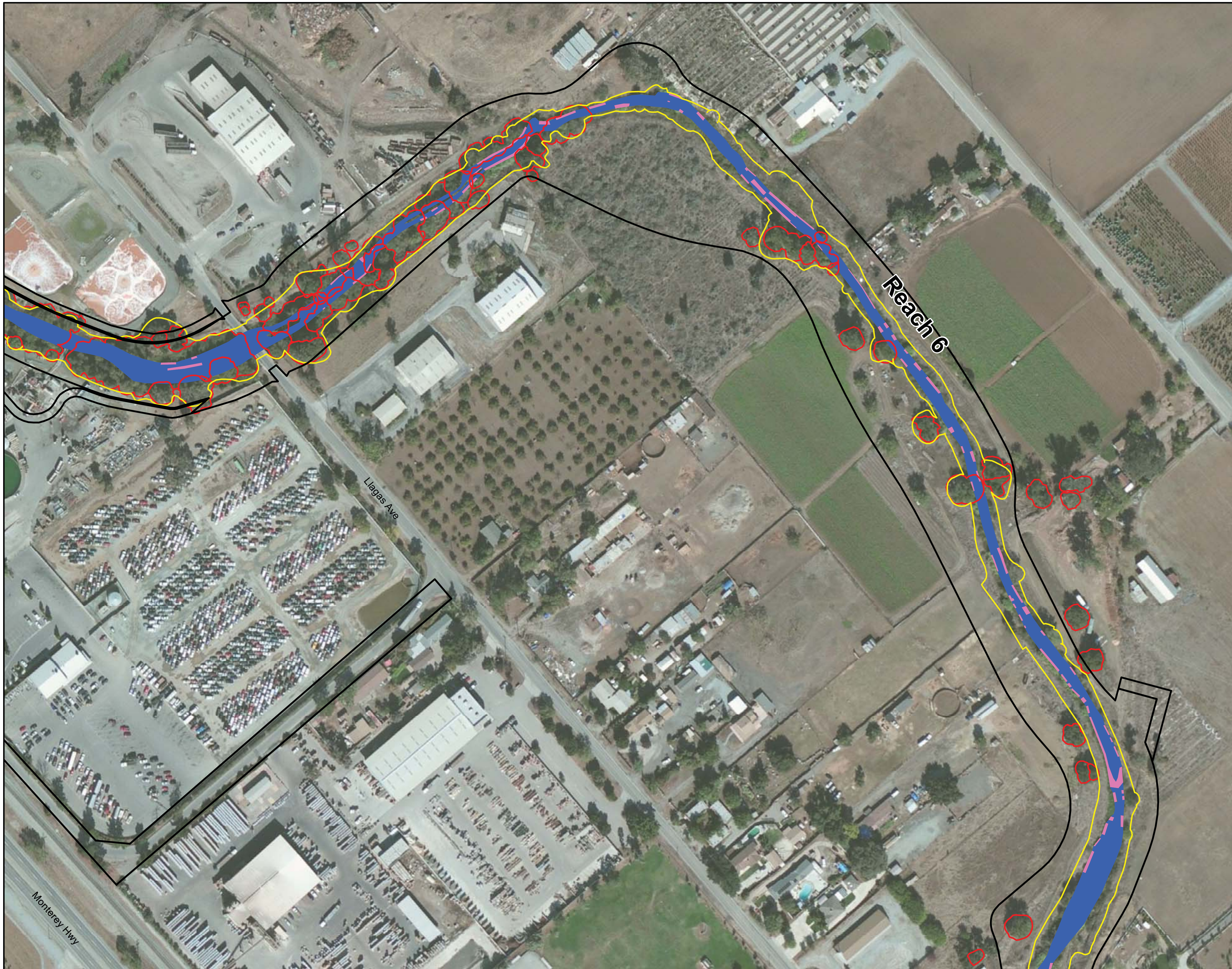
California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 9 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

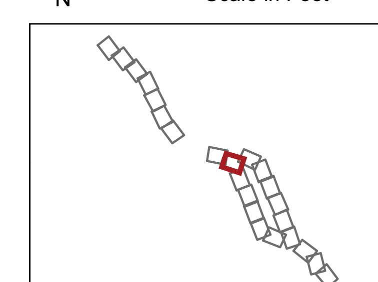
California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250

Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US
Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

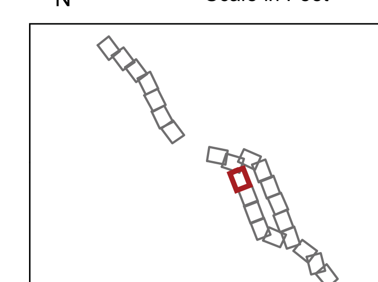
California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250

Scale in Feet



Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 11 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

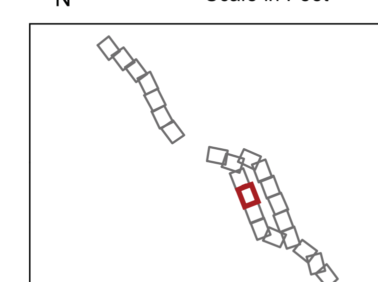
California Sycamore Woodland

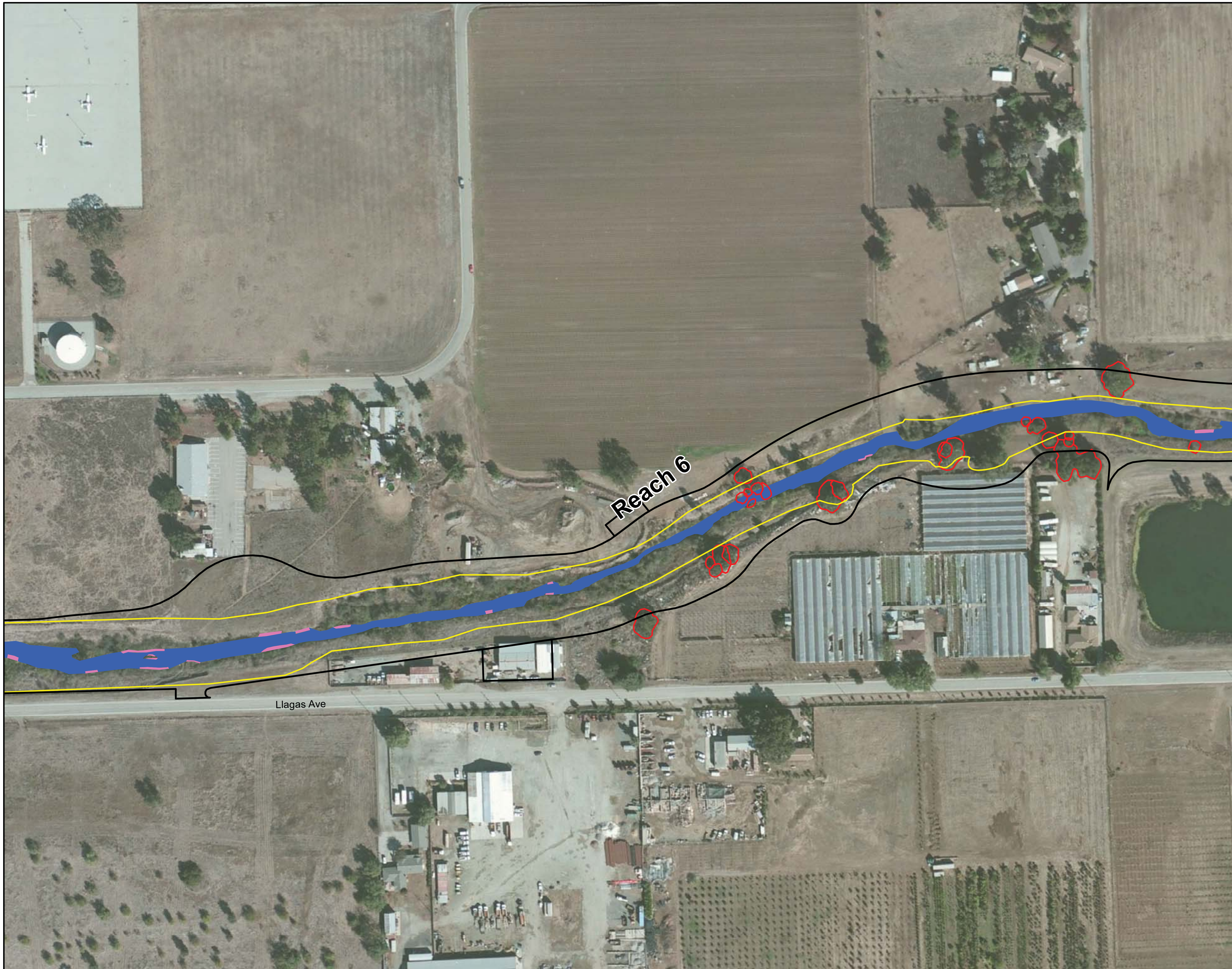
Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250

Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 12 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250

Scale in Feet

Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 13 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250

Scale in Feet

Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 14 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US
Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet

Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 15 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

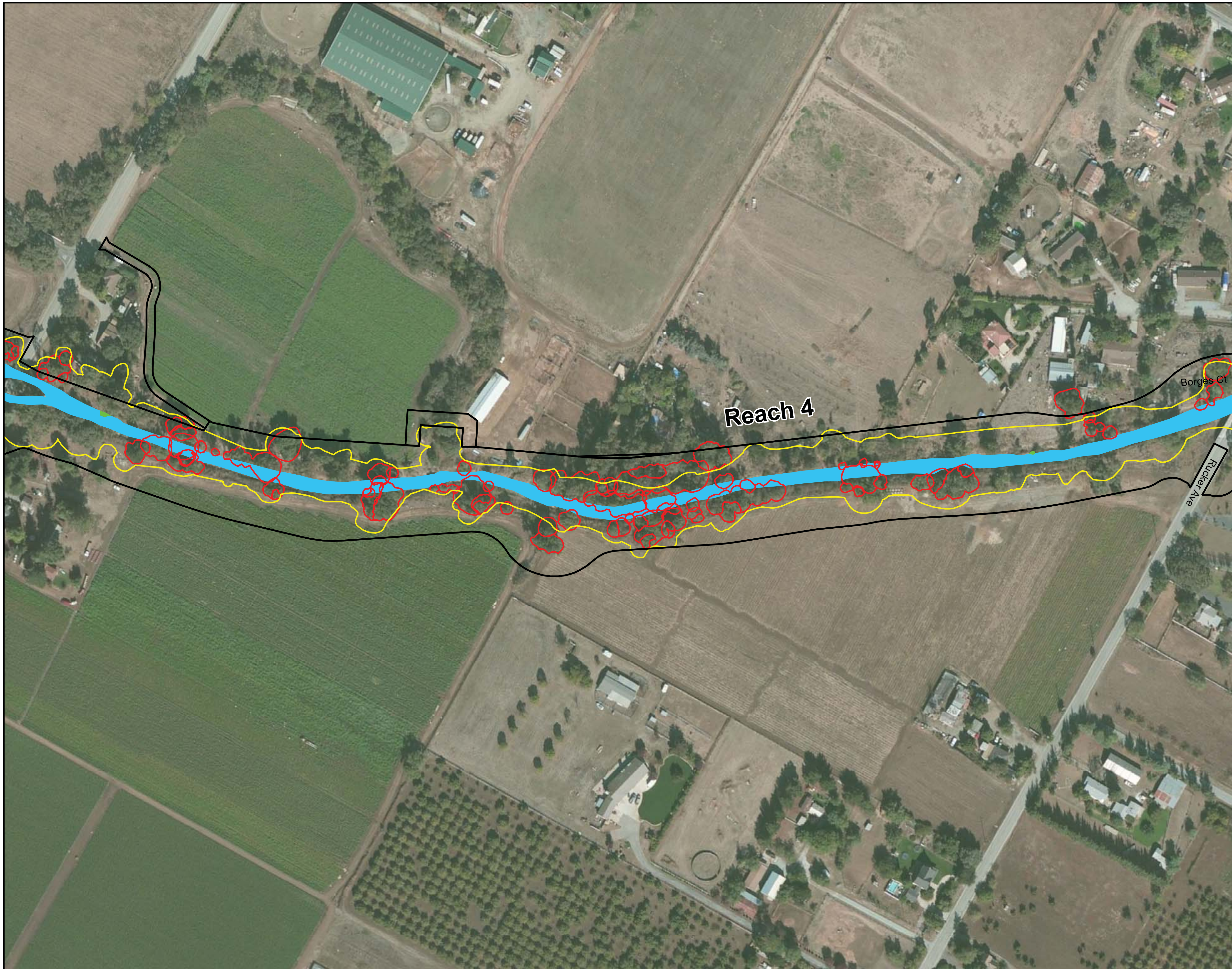
California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250

Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 16 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

California Sycamore Woodland

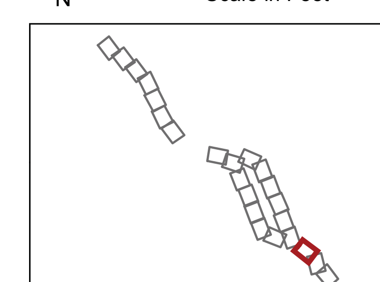
Imagery: Microsoft, 05/12/2010

Source: HT Harvey, 2013a

N

0 125 250

Scale in Feet



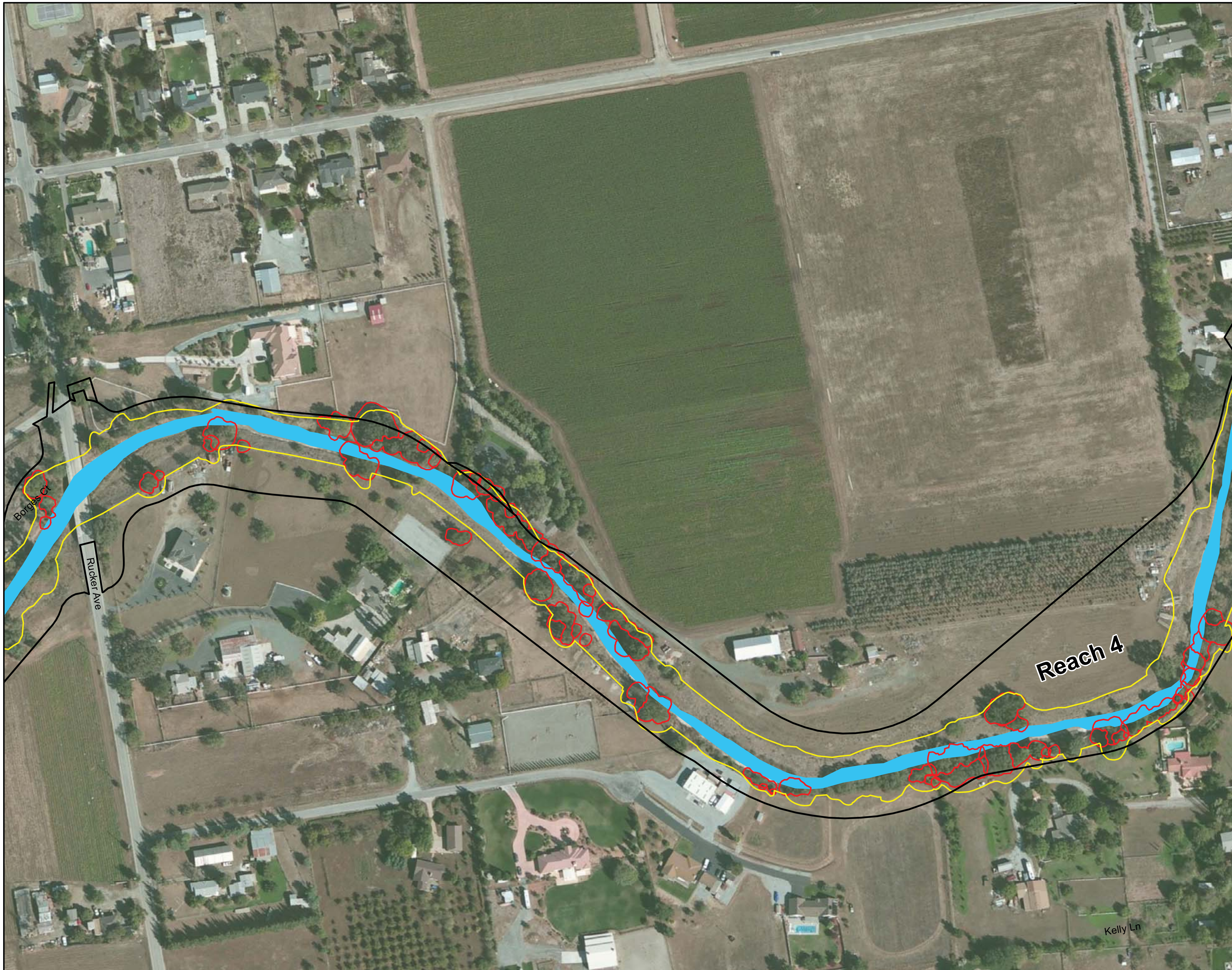
Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 17 of 23



Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

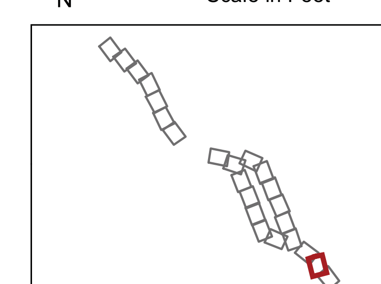
California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250

Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US
Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

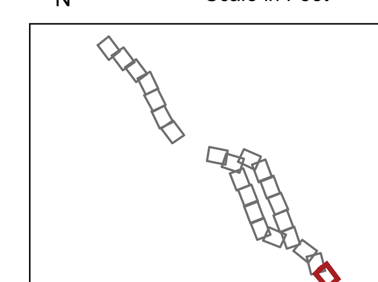
Sensitive Habitat

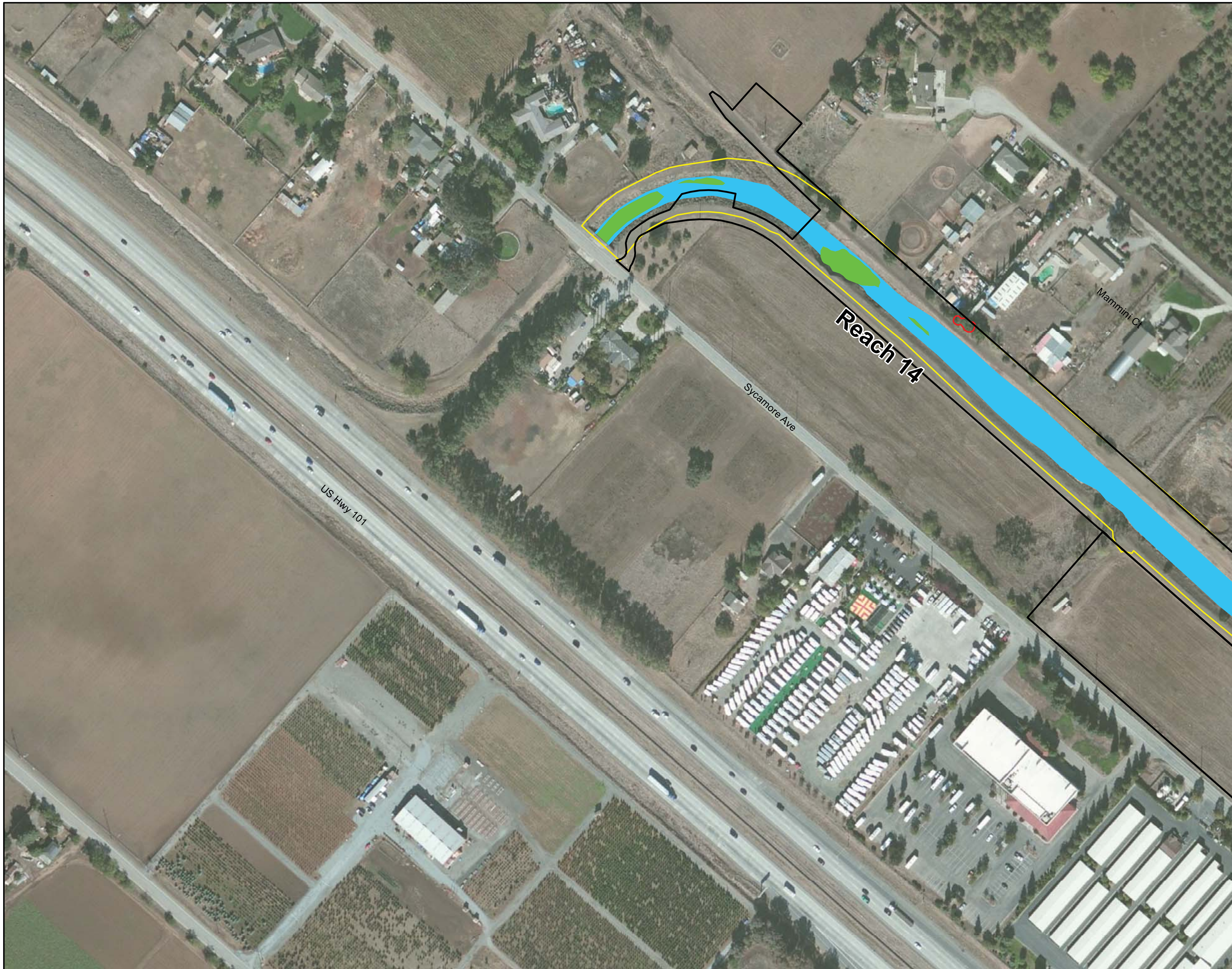
California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 19 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

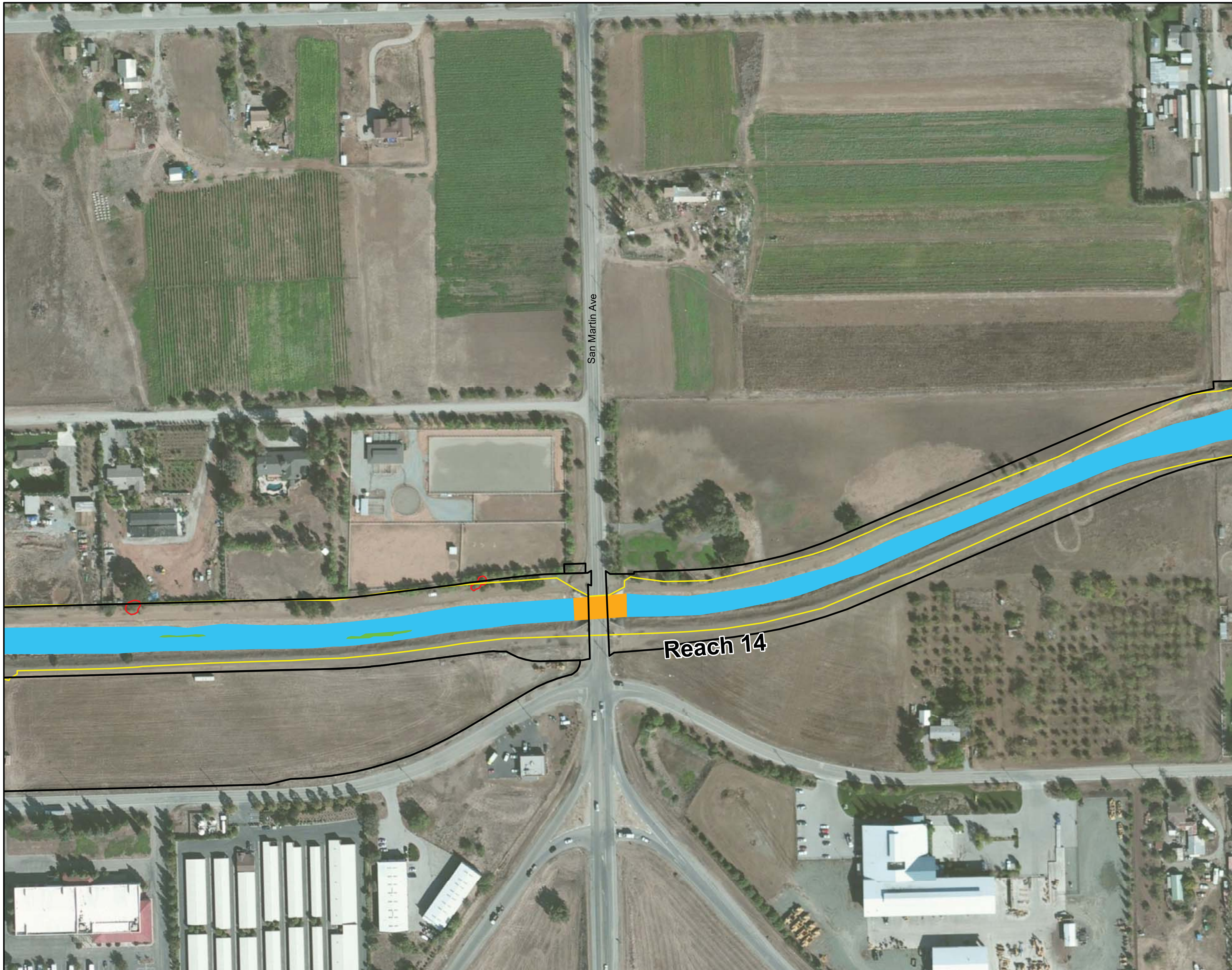
Sensitive Habitat

California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 20 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

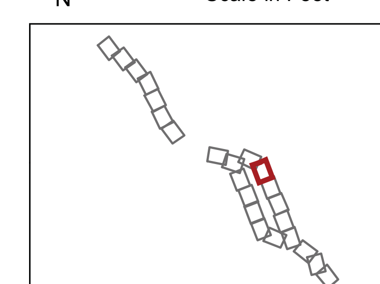
Sensitive Habitat

California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet



Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 21 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US
Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

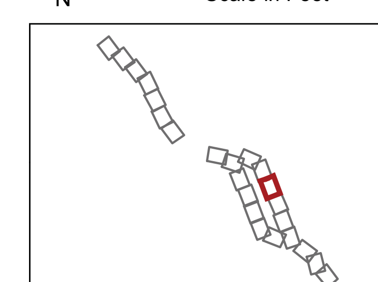
Sensitive Habitat

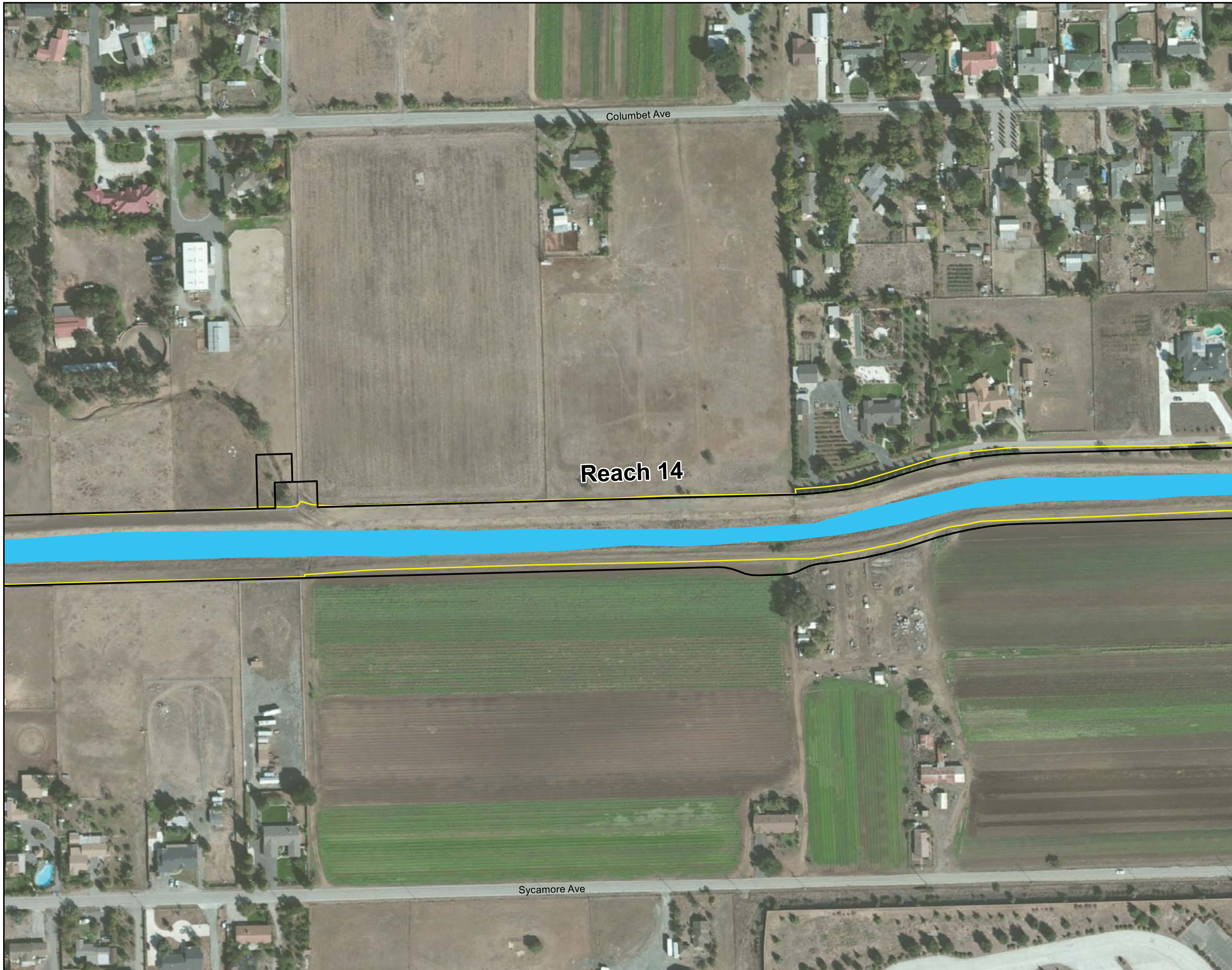
California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet





Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250
Scale in Feet

Cardno ENTRIX

Upper Llagas Creek Project

Appendix F

Potential Jurisdictional Waters and California Sycamore Woodland

Map 23 of 23

Legend

Reach Break

Delineation Study Area

Project Study Area

USACE Jurisdictional Waters of the US

Non-wetland Waters

Culverts

Intermittent Streams

Perennial Streams

Pond

Wetland Waters

Perennial Marsh

Seasonal Wetland

Sensitive Habitat

California Sycamore Woodland

Imagery: Microsoft, 05/12/2010
Source: HT Harvey, 2013a

N

0 125 250

Scale in Feet

Appendix G

Special-status Plant Species Potentially Occurring in the Project Vicinity

US Army Corps of Engineers

G.1 Special-status Plant Species Potentially Occurring in the Project Vicinity

Common Name *Scientific Name*	Status		General Habitat Requirement and Blooming Period	Potential to Occur in the Study Area
	State	Federal		
Bent-flowered fiddleneck (*Amsinckia lunaris*)	1B	None	Annual herb that occurs in coastal bluff scrub, cismontane woodlands and valley and foothill grasslands at elevations from 3-500 meters. Blooms: March-June	Unlikely to occur; closest CNDDB occurrence is >10 miles from the Tunnel Alternative Project Area.
Anderson's manzanita (*Arctostaphylos andersonii*)	1B	None	Evergreen shrub that occurs in openings and edges of broadleafed upland forest, chaparral, and north coast coniferous forest at elevations from 60-760 meters. Blooms: Nov – May	Unlikely to occur; closest CNDDB occurrence is >5 miles from the Tunnel Alternative Project Area.
Hooker's manzanita (*Arctostaphylos hookeri* ssp. *hookeri*)	1B	None	Evergreen shrub that occurs in closed-cone coniferous forest, chaparral, cismontane woodland, and coastal scrub in sandy soil and sandstone outcrops at elevations from 85-536 meters. Blooms: Jan – Jun	Unlikely to occur; closest CNDDB occurrence is >10 miles from the Tunnel Alternative Project Area.
Pajaro manzanita (*Arctostaphylos pajaroensis*)	1B	None	Evergreen shrub that occurs in chaparral in sandy soils at elevations from 30-760 meters. BLOOM: DEC – MAR	Unlikely to occur; suitable habitat is not present in the study area.
Kings Mountain manzanita (*Arctostaphylos regismontana*)	1B	None	Evergreen shrub that occurs at granitic or sandstone sites in broadleafed upland forest, chaparral, and North Coast coniferous forest at elevations from 305-730 meters. Blooms: JAN – APR	Unlikely to occur; suitable habitat is not present in the study area and this species is known from higher elevations than elevations in the study area.
San Joaquin spearscale (*Atriplex joaquiniana*)	1B	None	Annual herb that occurs in chenopod scrub, meadows and seeps, playas, and valley and foothill grassland on alkaline substrates at elevations from 1-835 meters. Blooms: APR – OCT	Unlikely to occur; suitable habitat is not present in the study area.
Big-scale balsamroot (*Balsamorhiza macrolepis* var*. macrolepis*)	1B	None	Perennial herb that occurs in chaparral, cismontane woodland, valley and foothill grassland, sometimes serpentinite, at elevations from 90-1555 meters. Blooms: MAR – JUN	Potential to occur in the study area in Grassland or various woodland habitats. Closest CNDDB occurrence is approximately 2.6 miles from the Tunnel Alternative Project Area.

Common Name *Scientific Name*	Status State	Status Federal	General Habitat Requirement and Blooming Period	Potential to Occur in the Study Area
Round-leaved filaree (*California macrophylla*)	1B	None	Annual herb that occurs in cismontane woodland, valley and foothill grassland on clay soils at elevations from 15-1,200 meters. Blooms: MAR – MAY	Unlikely to occur; closest CNDDB occurrence is >10 miles from the Tunnel Alternative Project Area.
Santa Cruz Mountains pussypaws (*Calyptridium parryi* var. *hesseae*)	1B	None	Annual herb that occurs in sandy or gravelly soil in openings of chaparral and cismontane woodland at elevations from 305-1530 meters. Blooms: MAY – AUG	Unlikely to occur; closest CNDDB occurrence is >5 miles from the Tunnel Alternative Project Area and this species is known from higher elevations than elevations in the study area.
Chaparral harebell (*Campanula exigua*)	1B	None	Annual herb that occurs in chaparral (rocky, usually serpentinite) habitats at elevations from 275-1250 meters. Blooms: MAY – JUN	Unlikely to occur; suitable habitat is not present in the study area.
Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*)	CT, 1B	FE	Perennial herb that occurs in valley and foothill grassland on rocky serpentine sites at elevations from 75-400 meters. Blooms: APR – JUN	Unlikely to occur; this species is a strict serpentine endemic (ICF 2012) and serpentinite is not present in the study area.
Pink creamsacs (*Castilleja rubicundula* ssp. *rubicundula*)	1B	None	Annual herb that occurs in moist serpentinite soil in chaparral openings, cismontane woodland, meadows and seeps, and valley and foothill grassland at elevations from 20-910 meters. Blooms: APR – JUN	Unlikely to occur; suitable habitat and serpentinite are not present in the study area.
Coyote ceanothus (*Ceanothus ferrisiae*)	1B	FE	Evergreen shrub that occurs in serpentinite soil in chaparral, coastal scrub, and valley and foothill grassland at elevations from 120-460 meters. Blooms: JAN – MAY	Unlikely to occur; suitable serpentinite habitat is not present in the study area.
Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*)	1B	None	Annual herb that occurs in alkaline and white clay soils in valley and foothill grassland habitats at elevations from 1-230 meters. Blooms: MAY – OCT	Unlikely to occur; suitable habitat is not present in the study area.
Monterey spineflower (*Chorizanthe pungens* var. *pungens*)	1B	FT	Annual herb that occurs in sandy chaparral (maritime), cismontane woodland, coastal dunes, coastal scrub, and valley and foothill grassland at elevations from 3-450 meters. Blooms: APR – JUL	Unlikely to occur; suitable habitat is not present in the study area.

Common Name *Scientific Name*	Status State	Status Federal	General Habitat Requirement and Blooming Period	Potential to Occur in the Study Area
Robust spineflower (*Chorizanthe robusta* var. *robusta*)	1B	FE	Annual herb that occurs in chaparral (maritime), cismontane woodland (openings), coastal dunes, and coastal scrub habitats with sandy or gravelly soil at elevations from 3-300 meters. Blooms: APR – SEP	Unlikely to occur; suitable habitat is not present in the study area.
Mt. Hamilton fountain thistle (*Cirsium fontinale* var. *campylon*)	1B	None	Perennial herb that occurs in serpentinite seeps and moist areas within chaparral, cismontane woodland, and valley and foothill grassland at elevations from 100-890 meters. Blooms: FEB – OCT	Unlikely to occur; suitable moist, serpentinite habitat is not present in the study area.
San Francisco collinsia (*Collinsia multicolor*)	1B	None	Annual herb that occurs in mudstone (decomposed shale) mixed with humus or serpentinite soils, closed-cone coniferous forests, and coastal scrub at elevations from 30-250 meters. Blooms: MAR – MAY	Unlikely to occur; suitable habitat is not present in the study area.
Hospital Canyon larkspur (*Delphinium californicum* ssp. *interius*)	1B	None	Perennial herb that occurs in wet, boggy meadows of cismontane woodlands and openings in chaparral and in canyons, at elevations from 230-1095 meters. Blooms: APR – JUN	Unlikely to occur; suitable habitat is not present in the study area.
Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*)	1B	FE	This perennial occurs in serpentinite and rocky soils and outcrops in cismontane woodland and valley and foothill grassland at elevations from 60-455 meters. No serpentine soils in the study area. Blooms: APR – OCT	Unlikely to occur; suitable serpentinite habitat is not present in the study area. Restricted to rocky, serpentine outcrops and is only found in Santa Clara County in the vicinity of Coyote Valley (ICF 2012).
Brandegee's eriastrum (*Eriastrum brandegeeae*)	1B	None	Annual herb that herb occurs in chaparral and cismontane woodlands on barren volcanic soils in open areas at elevations from 300-1030 meters.. Blooms: APR – AUG	Unlikely to occur; suitable habitat is not present in the study area.
Tracy's eriastrum (*Eriastrum tracyi*)	1B	None	Annual herb that plant occurs in clay and gravelly soils in chaparral habitats and cismontane woodlands (frequently in openings), at elevations from 315-1125 meters. Blooms: JUN – JUL	Unlikely to occur; closest CNDDB occurrence is >10 miles from the Tunnel Alternative Project Area.

Common Name *Scientific Name*	**Status** State	**Status** Federal	**General Habitat Requirement and Blooming Period**	**Potential to Occur in the Study Area**
Hoover's button-celery (*Eryngium aristulatum* var. *hooveri*)	1B	None	Occurs in vernal pools, alkaline depressions and roadside ditches at elevations from 3-45 meters. Blooms: JUL	Unlikely to occur; suitable habitat is not present in the study area.
Sand-loving wallflower (*Erysimum ammophilum*)	1B	None	Perennial herb that occurs in sandy soil and openings in chaparral (maritime), coastal dunes, and coastal scrub at elevations from 0-60 meters. Blooms: FEB – JUN	Unlikely to occur; suitable habitat is not present in the study area.
Fragrant fritillary (*Fritillaria liliacea*)	1B	None	This perennial usually occurs on serpentinite and sometimes in heavy clay soils in cismontane woodland, coastal prairie, coastal scrub, and valley and foothill grassland, at elevations from3-410 meters. Blooms: FEB – APR	Potential to occur in the study area in Grassland or woodland habitats; clay soils are present in the study area. Closest CNDDB occurrence is approximately 6.3 miles from the Tunnel Alternative Project Area.
Monterey gilia (*Gilia tenuiflora* ssp. *arenaria*)	CT, 1B	FE	Annual herb that occurs in sandy soil in openings in chaparral (maritime), cismontane woodland, coastal dunes, and coastal scrub at elevations from 0-45 meters. Blooms: APR – JUN	Unlikely to occur; suitable habitat is not present in the study area.
Loma Prieta hoita (*Hoita strobilina*)	1B	None	Perennial herb that usually occurs on serpentinite, mesic sites in chaparral, cismontane woodland, and riparian woodland at elevations from 30-860 meters.. No serpentine soils in the Project Area. Blooms: MAY – JUL	Potential to occur in the study area in or woodland habitats. Closest CNDDB occurrence is approximately 1.7 miles from the Tunnel Alternative Project Area.
Santa Cruz tarplant (*Holocarpha macradenia*)	SE, 1B	FT	Annual herb that occurs in coastal prairie and valley and foothill grasslands, in areas with light, sandy soil or sandy clay. Often occurs with non-natives, and is extant only in Monterey and Santa Cruz Counties and Wildcat Canyon. Found at elevations from 10-260 meters. Blooms: JUN – OCT	Unlikely to occur; suitable habitat is not present in the study area.

Common Name ***Scientific Name***	**Status** State	Federal	**General Habitat Requirement and Blooming Period**	**Potential to Occur in the Study Area**
Kellogg's horkelia (*Horkelia cuneata* ssp. *sericea*)	1B	None	Perennial herb that occurs in closed-cone coniferous forest, chaparral (maritime), coastal dunes and sandhills, and coastal scrub in openings with sandy or gravelly soils at elevations from10-200 meters. Blooms: APR – SEP	Unlikely to occur; suitable habitat is not present in the study area.
Contra Costa goldfields (*Lasthenia conjugens*)	1B	FE	Annual herb that occurs in cismontane woodland, alkaline playas, valley and foothill grassland, and vernal pools, often on mesic sites, at elevations from 0-470 meters. Blooms: MAR – JUN	Unlikely to occur; suitable habitat is not present in the study area.
Legenere (*Legenere limosa*)	1B	None	Annual herb that occurs in vernal pools at elevations from 1-880 meters. Blooms: APR – JUN	Unlikely to occur; suitable habitat is not present in the study area.
Mt. Hamilton coreopsis (*Leptosyne hamiltonii*)	1B	None	Annual herb that occurs in rocky talus soils in cismontane woodlands with open southwest exposure, ranging at elevations from 550-1300 meters. Blooms: MAR – MAY	Unlikely to occur; suitable habitat is not present in the study area.
Smooth lessingia (*Lessingia micradenia* var. *glabrata*)	1B	None	Annual herb that occurs in serpentinite soil, often along roadsides in chaparral and cismontane woodland at elevations from 120-420 meters. Blooms: JUL – NOV	Unlikely to occur; suitable moist, serpentinite habitat is not present in the study area.
Mt. Hamilton lomatium (*Lomatium observatorium*)	1B	None	Perennial herb that occurs in sedimentary and volcanic soils in cismontane woodlands (often associated with oaks and Coulter pines) at elevations from 1219-13030 meters. Blooms: MAR – MAY	Unlikely to occur; suitable habitat is not present in the study area.
Showy golden madia (*Madia radiata*)	1B	None	Annual herb that occurs on clay soils in cismontane woodland and valley and foothill grassland at elevations from 25-900 meters. Blooms: MAR – MAY	Unlikely to occur; closest CNDDB occurrence is >10 miles from the Tunnel Alternative Project Area.
Arcuate bush-mallow (*Malacothamnus arcuatus*)	1B	None	Evergreen shrub that occurs on gravelly soils and alluvium in chaparral and cismontane woodland at elevations from 15-355 meters. Blooms: APR – SEP	Potential to occur in the study area in woodland habitats. Closest CNDDB occurrence is approximately 2.0 miles from the Tunnel Alternative Project Area.

Common Name *Scientific Name*	Status State	Status Federal	General Habitat Requirement and Blooming Period	Potential to Occur in the Study Area
Hall's bush-mallow (*Malacothamnus hallii*)	1B	None	Evergreen shrub that occurs in chaparral and coastal scrub, sometimes on serpentinite soils, at elevations from 10-760 meters. Blooms: MAY – OCT	Unlikely to occur; suitable habitat is not present in the study area.
Oregon meconella (*Meconella oregana*)	1B	None	Annual herb that occurs in coastal prairie and scrub in open moist places at elevations from 250-620 meters. Blooms: MAR – APR	Unlikely to occur; suitable habitat is not present in the study area.
Woodland woolythreads (*Monolopia gracilens*)	1B	None	This fire adapted annual occurs in serpentine soils in broadleafed upland forest openings, chaparral openings, cismontane woodland, North Coast coniferous forest openings, and valley and foothill grassland at elevations from 100-1200 meters. Blooms: FEB – JUL	Unlikely to occur; suitable moist, serpentinite habitat is not present in the study area.
Dudley's lousewort (*Pedicularis dudleyi*)	Rare, 1B	None	Perennial herb that occurs in chaparral (maritime), cismontane woodland, North Coast coniferous forest (such as old growth redwoods), and valley and foothill grassland at elevations from 60-900 meters. Blooms: APR – JUN	Unlikely to occur; suitable habitat is not present in the study area.
Santa Cruz Mountains beardtongue (*Penstemon rattanii* var. *kleei*)	1B	None	Perennial herb that occurs on sandy slopes in chaparral, lower montane coniferous forest, North Coast coniferous forest (especially at forest/chaparral ecotones) at elevations from 400-1100 meters. Blooms: MAY – JUN	Unlikely to occur; suitable habitat is not present in the study area.
San Benito pentachaeta (*Pentachaeta exilis* ssp. *aeolica*)	1B	None	Annual herb that herb occurs on grassy areas in cismontane woodlands, and valley and foothill grassland habitats at elevations from 640-855 meters. Blooms: MAR – MAY	Unlikely to occur; closest CNDDB occurrence is >10 miles from the study area.
Mt. Diablo phacelia (*Phacelia phacelioides*)	1B	None	Annual herb that occurs in chaparral and cismontane woodlands on rock outcrop/talus slopes, sometimes serpentine soils, and edges of trails, between at elevations from 500-1370 meters. Blooms: APR – MAY	Unlikely to occur; suitable habitat is not present in the study area.

Common Name *Scientific Name*	Status State	Status Federal	General Habitat Requirement and Blooming Period	Potential to Occur in the Study Area
Monterey pine (*Pinus radiata*)	1B	None	Occurs in closed-cone coniferous forest and cismontane woodland habitats at elevations from 25-185 meters. Widely planted ornamental tree.	Unlikely to occur; suitable habitat for local native populations is not present in the study area.
Yadon's rein orchid (*Piperia yadonii*)	1B	FE	Perennial herb that occurs in sandy soil in coastal bluff scrub, closed-cone coniferous forest, and chaparral (maritime) habitats at elevations from 10-510 meters. Blooms: FEB – AUG	Unlikely to occur; suitable habitat is not present in the study area.
Choris' popcorn-flower (*Plagiobothrys chorisianus* var. *chorisianus*)	1B	None	Annual herb that occurs in mesic habitats, chaparral, coastal prairie, and coastal scrub at elevations from15-160 meters. Blooms: MAR – JUN	Unlikely to occur; suitable habitat is not present in the study area.
Hairless popcorn-flower (*Plagiobothrys glaber*)	1A	None	Annual herb that herb occurs in meadows, seeps, marshes, swamps, coastal salt marsh and alkaline meadows at elevations from 15-180 meters. Blooms: MAR – MAY	Unlikely to occur; suitable habitat is not present in the study area.
Hooked popcorn-flower (*Plagiobothrys uncinatus*)	1B	None	Annual herb that herb occurs in sandy soils, outcrops and canyon walls in chaparral, cismontane woodlands, and valley and foothill grassland habitats at elevations from 300-760 meters. Blooms: APR – MAY	Unlikely to occur; suitable habitat is not present in the study area.
Rock sanicle (*Sanicula saxatilis*)	Rare, 1B	None	Perennial herb that occurs in broadleafed upland forest, chaparral, and valley and foothill grassland habitats on bedrock outcrops and talus slopes at elevations from 615-1215 meters. Blooms: APR – MAY	Unlikely to occur; suitable habitat is not present in the study area.
Metcalf Canyon jewel-flower (*Streptanthus albidus* ssp. *albidus*)	1B	FE	Annual herb that occurs in serpentinite soil in valley and foothill grassland (open, dry, grassy areas) at elevations from 45-800 meters. Blooms: APR – JUL	Unlikely to occur; suitable serpentinite habitat is not present in the study area. This species is a serpentine endemic (ICF 2012).
Most beautiful jewel-flower (*Streptanthus albidus* ssp. *peramoenus*)	1B	None	Annual herb that occurs in chaparral, cismontane woodland, and valley and foothill grassland habitats, often on serpentine outcrops, ridges and slopes at elevations from120-730 meters Blooms: APR – SEP	Unlikely to occur; suitable serpentinite habitat is not present in the study area. This species is almost entirely restricted to serpentinite outcrops or serpentinite soils.

Common Name *Scientific Name*	Status State	Status Federal	General Habitat Requirement and Blooming Period	Potential to Occur in the Study Area
Mt. Hamilton jewel-flower (*Streptanthus callistus*)	1B	None	Annual herb that occurs in chaparral and cismontane woodland (often with grey pine or black oak) at elevations from 600-790 meters. Blooms: APR – MAY	Unlikely to occur; suitable habitat is not present in the study area.
Showy rancheria clover, two-forked clover (*Trifolium amoenum*)	1B	FE	Annual herb that occurs in valley and foothill grasslands, and coastal bluff scrub. It may occur on serpentine soils, open sunny sites, swales, and has recently been sighted along a roadside and eroding cliff face. Grows at elevations from 5-560 meters. Blooms: APR – JUN	Unlikely to occur; closest CNDDB occurrence is >10 miles from the Tunnel Alternative Project Area.
Santa Cruz clover (*Trifolium buckwestiorum*)	1B	None	Annual herb that occurs in gravelly soils on moist grassland on the margins of broadleafed upland forest, cismontane woodland, and coastal prairie at elevations from 105-610 meters. Blooms: APR – OCT	Unlikely to occur; suitable habitat is not present in the study area.
Saline clover (*Trifolium hydrophilum*)	1B	None	Annual herb that occurs in marshes and swamps, valley and foothill grassland (mesic, alkaline), and vernal pools at elevations from 0-300 meters. Blooms: APR – JUN	Unlikely to occur; suitable habitat is not present in the study area.

Status Code Definitions:

1A = Presumed extinct in California; California Rare Plant Rank (RPR)
1B = Rare or Endangered in California and elsewhere; California Rare Plant Rank (RPR)
CT = California Threatened under the CESA.
FE = Federally Endangered; listed by USFWS as in danger of extinction throughout all or a significant portion of its range.
FT = Federally Threatened; listed by USFWS as likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
Rare = State listed as Rare
SE = California Endangered Status under the CESA

Appendix H

CNDDB Occurrences in the Project Vicinity

US Army Corps of Engineers.

	Scientific Name/Comn1on Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
	Adela oplerella Opler's longhorn moth	IILEEOG040			G2G3	5253	
2	*Agelaius tricolor* tricolored blackbird	A8P8X80020			G2G3	52	5C
3	*Ambystoma californiense* California tiger salamander	AAAAA01180	Threatened	Threatened	G2G3	5253	5C
4	*Ambystoma macrodactylum croceum* Santa Cruz long-toed salamander	AAAAA01082	Endangered	Endangered	G5T1	51	
5	*Anniella pulchra nigra* black legless lizard	ARACC01011			G3G4T2T3 Q	52	5C
6	*Antrozous pallidus* pallid bat	AMACC10010			G5	53	5C
7	*Aquila chrysaetos* golden eagle	A8NKC22010			G5	53	
8	*Arctostaphylos andersonii* Anderson's manzanita	PDERI04030			G2	52?	18.2
9	*Arctostaphylos hookeri ssp. hookeri* Hooker's manzanita	PDERI040J1			G3T2?	52?	18.2
10	*Arctostaphylos pajaroensis* Pajaro manzanita	PDERI04100			G2	52.1	18.1
11	*Arctostaphylos regismontana* Kings Mountain manzanita	PDERI041CO			G2	52.2	18.2
12	*Ardea herodias* great blue heron	A8NGA04010			G5	54	
13	*Athene cunicularia* burrowing owl	A8N5810010			G4	52	5C
14	*Atriplexjoaquinana* San Joaquin spearscale	PDCHE041F3			G2	52	18.2
15	*Balsamorhiza macrolepis* big-scale balsamroot	PDA5T11061			G2	52	18.2
16	*Calyptridium parryi var. hesseae* Santa Cruz Mountains pussypaws	PDPOR09052			G3G4T2	52	18.1
17	*Campanula exigua* chaparral harebell	PDCAM020AO			G2	52.2	18.2
18	*Castilleja affinis ssp. neglecta* Tiburon paintbrush	PD5CROD013	Endangered	Threatened	G4G5T1	51	18.2
19	*Castilleja rubicundula ssp. rubicundula* pink creamsacs	PD5CROD482			G5T2	52	18.2
20	*Ceanothus ferrisiae* Coyote ceanothus	PDRHA041NO	Endangered		G2	52	18.1
21	*Central Dune Scrub*	CTT21320CA			G2	52.2	
22	*Centromadia parryi ssp. congdonii* Congdon's tarplant	PDA5T4ROP1			G4T2	52	18.2
23	*Charadrius alexandrinus nivosus* western snowy plover	A8NN803031	Threatened		G4T3	52	5C

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
24	***Chorizanthe pungens var. pungens*** **Monterey s·pineflower**	PDPGN040M2	**Threatened**		G2T2	52	18.2
25	***Chorizanthe robusta var. robusta*** **robust spineflower**	PDPGN040Q2	**Endangered**		G2T1	51	18.1
26	***Cirsium fontinale var. campy/on*** **Mt. Hamilton fountain thistle**	PDAST2E163			G2T2	52	18.2
27	***Clarkia concinna ssp. automixa*** **Santa Clara red ribbons**	PDONA050A1			G5?T3	53.3	4.3
28	***Coastal and Valley Freshwater Marsh***	CTT52410CA			G3	52.1	
29	***Collinsia multicolor*** **San Francisco collinsia**	PDSCROHOBO			G2	52.2	18.2
30	***Cypseloides niger*** **black swift**	ABNUA01010			G4	52	SC
31	***Danaus plexippus*** **monarch butterfly**	IILEPP2010			G5	53	
32	***Dipodomys venustus venustus*** **Santa Cruz kangaroo rat**	AMAFD03042			G4T1	51	
33	***Dud/eya abramsii ssp. setchellii*** Santa Clara Valley dudleya	PDCRA040ZO	**Endangered**		G3T2	52	1B.1
34	***Elanus leucurus*** **white-tailed kite**	ABNKC06010			G5	53	
35	***Emys marmorata*** **western pond turtle**	ARAAD02030			G3G4	53	SC
36	***Eryngium aristulatum var. hooveri*** **Hoover's button-celery**	PDAPIOZ043			G5T2	52.1	18.1
37	***Erysimum ammophilum*** **sand-loving wallflower**	PDBRA16010			G2	52.2	18.2
38	***Euphydryas editha bayensis*** Bay checkerspot bulterfly	IILEPK4055	**Threatened**		G5T1	51	
39	***Fritillaria liliacea*** **fragrant fritillary**	PMLILOVOCO			G2	52	18.2
40	***Gilia tenuiflora ssp. arenaria*** **sand gilia**	PDPLM041P2	**Endangered**	**Threatened**	G3G4T2	52	18.2
41	***Hoita strobilina*** **Lema Prieta hoita**	PDFAB5Z030			G2	52	18.1
42	***Holocarpha macradenia*** **Santa Cruz tarplant**	PDAST4X020	**Threatened**	**Endangered**	G1	51	18.1
43	***Horkelia cuneata var. sericea*** Kellogg's horkelia	PDROSOW043			G4T2	52?	18.1
44	***Lasiurus cinereus*** hoary bat	AMACC05030			G5	54?	
45	***Legenere limosa*** **legenere**	PDCAMOC010			G2	52.2	18.1
46	***Leptosyne hamiltonii*** **Mt. Hamilton coreopsis**	PDAST2LOCO			G2	52.2	18.2

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
47	*Lessingia micradenia var. glabrata* smooth lessingia	PDAST55062			G2T2	52	18.2
48	*Malacothamnus aboriginum* Indian Valley bush-mallow	PDMALOQ020			G2	52	18.2
49	*Malacothamnus arcuatus* arcuate bush-mallow	PDMALOQOEO			G2Q	52.2	18.2
50	*Malacothamnus hallii* Hall's bush-mallow	PDMALOQOFO			G2Q	52	18.2
51	*Microcina homi* Hom's micro-blind harvestman	ILARA47020			G1	51	
52	*Mono/opia gracilens* woodland woollythreads	PDA5T6G010			G2G3	5253	18.2
53	*Myotis yumanensis* Yuma myotis	AMACC01020			G5	54?	
54	*Navarretia prostrata* prostrate vernal pool navarretia	PDPLMOCOQO			G2	52	18.1
55	*Neotoma fuscipes annectens* San Francisco dusky-footed woodrat	AMAFF08082			G5T2T3	5253	5C
56	*Oncorhynchus mykiss irideus* steelhead -central California coast DPS	AFCHA0209G	Threatened		G5T2Q	52	
57	*Oncorhynchus mykiss irideus* steelhead -south/central California coast DPS	AFCHA0209H	Threatened		G5T2Q	52	5C
58	*Optioservus canus* Pinnacles optioservus riffle beetle	IICOL5E020			G1	51	
59	*Pedicularis dudleyi* Dudley's lousewort	PD5CR1KODO		Rare	G2	52.2	18.2
60	*Penstemon rattanii var. kleei* Santa Cruz Mountains beardtongue	PD5CR1L581			G4T2	52.2	18.2
61	*Phrynosoma blainvi/Iii* coast horned lizard	ARACF12100			G4G5	5354	5C
62	*P/agiobothrys chorisianus var. chorisianus* Choris' popcornflower	PD80ROV061			G3T2Q	52.2	18.2
63	*Plagiobothrys glaber* hairless popcornflower.	PD80ROV080			GH	5H	1A
64	*Rana boylii* foothill yellow-legged frog	AAA8H01050			G3	5253	5C
65	*Rana draytonii* California red-legged frog	AAA8H01022	Threatened		G4T2T3	5253	5C
66	*Riparia riparia* bank swallow	A8PAU08010		Threatened	G5	5253	
67	*Sanicu/a saxatilis* rock sanicle	PDAPI1ZOHO		Rare	G2	52	18.2
68	*Serpentine Bunchgrass*	CTT42130CA			G2	52.2	
69	*Streptanthus albidus ssp. albidus* Metcalf Canyon jewel-flower	PD8RA2G011	Endangered		G2T1	51	18.1

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	5Rank	CDFG or CNP5
70	*Streptanthus albidus ssp. peramoenus* most beautiful jewel-flower	PDBRA2G012			G2T2	52.2	1B.2
71	*Streptanthus callistus* Mt. Hamilton jewel-flower	PDBRA2GOAO			Gt	51	1B.3
72	Sycamore *Alluvial Woodland*	CTT62100CA			Gt	51.1	
73	*Taxidea taxus* American badger	AMAJF04010			GS	54	5C
74	*TrifOlium buckwestiorum* Santa Cruz clover	PDFAB402WO			Gt	51.1	1B.t
75	*Trifolium hydrophilum* saline clover	PDFAB400R5			G2	52	1B.2
76	*Vireo be/lii pusillus* least Bell's vireo	ABPBW01114	Endangered	Endangered	G5T2	52	
77	*Vulpes macrotis mutica* San Joaquin kit fox	AMAJA03041	Endangered	Threatened	G4T2T3	5253	

Appendix I

USFWS List of Species in the Project Vicinity

US Army Corps
of Engineers.

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 130128124310

Database Last Updated: September 18, 2011

Quad Lists

SAN FELIPE (385B)

Listed Species

Invertebrates

Euphydryas editha bayensis

bay checkerspot butterfly (T)

Fish

Oncorhynchus mykiss

South Central California steelhead (T) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Critical habitat, CA tiger salamander, central population (X)

Rana draytonii

California red-legged frog (T)

Critical habitat, California red-legged frog (X)

Birds

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Vireo bellii pusillus

Least Bell's vireo (E)

Mammals

Vulpes macrotis mutica

San Joaquin kit fox (E)

CHITTENDEN (386A)

Listed Species

Invertebrates

Euphydryas editha bayensis

bay checkerspot butterfly (T)

Fish

Oncorhynchus mykiss

South Central California steelhead (T) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Rana draytonii

California red-legged frog (T)

Birds

Brachyramphus marmoratus

marbled murrelet (T)

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Vireo bellii pusillus

Least Bell's vireo (E)

Mammals

Vulpes macrotis mutica

San Joaquin kit fox (E)

WATSONVILLE EAST (386B)

Listed Species

Invertebrates

Euphydryas editha bayensis

bay checkerspot butterfly (T)

Fish

Oncorhynchus mykiss

South Central California steelhead (T) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Rana draytonii

California red-legged frog (T)

Birds

Brachyramphus marmoratus

marbled murrelet (T)

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Vireo bellii pusillus

Least Bell's vireo (E)

Mammals

Vulpes macrotis mutica

San Joaquin kit fox (E)

Plants

Holocarpha macradenia

Critical habitat, Santa Cruz tarplant (X)

Santa Cruz tarplant (T)

MISSISSIPPI CREEK (405B)

Listed Species

Fish

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus mykiss
Central Valley steelhead (T) (NMFS)
South Central California steelhead (T) (NMFS)

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)

Rana draytonii
California red-legged frog (T)
Critical habitat, California red-legged frog (X)

Birds

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)

Mammals

Vulpes macrotis mutica
San Joaquin kit fox (E)

Plants

Dudleya setchellii
Santa Clara Valley dudleya (E)

GILROY HOT SPRINGS (405C)

Listed Species

Fish

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus mykiss
Central Valley steelhead (T) (NMFS)
South Central California steelhead (T) (NMFS)

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)
Critical habitat, CA tiger salamander, central population (X)

Rana draytonii
California red-legged frog (T)
Critical habitat, California red-legged frog (X)

Birds

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)

Vireo bellii pusillus
Least Bell's vireo (E)

Mammals

Vulpes macrotis mutica
San Joaquin kit fox (E)

Plants

Dudleya setchellii

Santa Clara Valley dudleya (E)

MT. SIZER (406A)

Listed Species

Invertebrates

Euphydryas editha bayensis

bay checkerspot butterfly (T)

Fish

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central California Coastal steelhead (T) (NMFS)

Central Valley steelhead (T) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Critical habitat, CA tiger salamander, central population (X)

Rana draytonii

California red-legged frog (T)

Critical habitat, California red-legged frog (X)

Birds

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Mammals

Vulpes macrotis mutica

San Joaquin kit fox (E)

Plants

Ceanothus ferrisae

Coyote ceanothus (E)

Dudleya setchellii

Santa Clara Valley dudleya (E)

Streptanthus albidus ssp. albidus

Metcalf Canyon jewelflower (E)

MORGAN HILL (406B)

Listed Species

Invertebrates

Euphydryas editha bayensis

bay checkerspot butterfly (T)

Critical habitat, bay checkerspot butterfly (X)

Fish

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central California Coastal steelhead (T) (NMFS)

Central Valley steelhead (T) (NMFS)

Critical habitat, Central California coastal steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Critical habitat, CA tiger salamander, central population (X)

Rana draytonii

California red-legged frog (T)

Critical habitat, California red-legged frog (X)

Birds

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Mammals

Vulpes macrotis mutica

San Joaquin kit fox (E)

Plants

Castilleja affinis ssp. neglecta

Tiburon paintbrush (E)

Ceanothus ferrisae

Coyote ceanothus (E)

Dudleya setchellii

Santa Clara Valley dudleya (E)

Streptanthus albidus ssp. albidus

Metcalf Canyon jewelflower (E)

MT. MADONNA (406C)

Listed Species

Invertebrates

Euphydryas editha bayensis

bay checkerspot butterfly (T)

Critical habitat, bay checkerspot butterfly (X)

Fish

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

South Central California steelhead (T) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS) winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)
Critical habitat, CA tiger salamander, central population (X)

Rana draytonii

California red-legged frog (T)

Birds

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Vireo bellii pusillus

Least Bell's vireo (E)

Mammals

Vulpes macrotis mutica

San Joaquin kit fox (E)

Plants

Dudleya setchellii

Santa Clara Valley dudleya (E)

Holocarpha macradenia

Critical habitat, Santa Cruz tarplant (X)
Santa Cruz tarplant (T)

GILROY (406D)

Listed Species

Invertebrates

Euphydryas editha bayensis

bay checkerspot butterfly (T)
Critical habitat, bay checkerspot butterfly (X)

Fish

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central Valley steelhead (T) (NMFS)
South Central California steelhead (T) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)
winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)
Critical habitat, CA tiger salamander, central population (X)

Rana draytonii

California red-legged frog (T)
Critical habitat, California red-legged frog (X)

Birds

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Vireo bellii pusillus

Least Bell's vireo (E)

Mammals

Vulpes macrotis mutica

San Joaquin kit fox (E)

Plants

Dudleya setchellii

Santa Clara Valley dudleya (E)

Streptanthus albidus ssp. albidus

Metcalf Canyon jewelflower (E)

SANTA TERESA HILLS (407A)

Listed Species

Invertebrates

Euphydryas editha bayensis

bay checkerspot butterfly (T)

Critical habitat, bay checkerspot butterfly (X)

Fish

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central California Coastal steelhead (T) (NMFS)

Central Valley steelhead (T) (NMFS)

Critical habitat, Central California coastal steelhead (X) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Critical habitat, CA tiger salamander, central population (X)

Rana draytonii

California red-legged frog (T)

Birds

Brachyramphus marmoratus

marbled murrelet (T)

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Mammals

Vulpes macrotis mutica

San Joaquin kit fox (E)

Plants

Dudleya setchellii

Santa Clara Valley dudleya (E)

Streptanthus albidus ssp. albidus

Metcalf Canyon jewelflower (E)

LOMA PRIETA (407D)
Listed Species

Invertebrates
Euphydryas editha bayensis
bay checkerspot butterfly (T)

Fish
Eucyclogobius newberryi
tidewater goby (E)

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus mykiss
Central Valley steelhead (T) (NMFS)
Critical habitat, Central California coastal steelhead (X) (NMFS)

Amphibians
Ambystoma californiense
California tiger salamander, central population (T)

Rana draytonii
California red-legged frog (T)

Birds
Brachyramphus marmoratus
marbled murrelet (T)

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)

Mammals
Vulpes macrotis mutica
San Joaquin kit fox (E)

Plants
Ceanothus ferrisae
Coyote ceanothus (E)

Holocarpha macradenia
Critical habitat, Santa Cruz tarplant (X)
Santa Cruz tarplant (T)

LICK OBSERVATORY (426C)
Listed Species

Invertebrates
Euphydryas editha bayensis
bay checkerspot butterfly (T)
Critical habitat, bay checkerspot butterfly (X)

Fish
Hypomesus transpacificus
delta smelt (T)

Oncorhynchus mykiss
Central California Coastal steelhead (T) (NMFS)
Central Valley steelhead (T) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Critical habitat, CA tiger salamander, central population (X)

Rana draytonii

California red-legged frog (T)

Critical habitat, California red-legged frog (X)

Birds

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Mammals

Vulpes macrotis mutica

San Joaquin kit fox (E)

Plants

Dudleya setchellii

Santa Clara Valley dudleya (E)

Streptanthus albidus ssp. albidus

Metcalf Canyon jewelflower (E)

ISABEL VALLEY (426D)

Listed Species

Invertebrates

Euphydryas editha bayensis

bay checkerspot butterfly (T)

Fish

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central California Coastal steelhead (T) (NMFS)

Central Valley steelhead (T) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Critical habitat, CA tiger salamander, central population (X)

Rana draytonii

California red-legged frog (T)

Critical habitat, California red-legged frog (X)

Birds

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Mammals

Vulpes macrotis mutica

San Joaquin kit fox (E)

Proposed Species

Amphibians

Rana draytonii

Critical habitat, California red-legged frog (PX)

SAN JOSE EAST (427D)

Listed Species

Invertebrates

Euphydryas editha bayensis

bay checkerspot butterfly (T)

Critical habitat, bay checkerspot butterfly (X)

Fish

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central California Coastal steelhead (T) (NMFS)

Central Valley steelhead (T) (NMFS)

Critical habitat, Central California coastal steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense

California tiger salamander, central population (T)

Rana draytonii

California red-legged frog (T)

Critical habitat, California red-legged frog (X)

Birds

Sternula antillarum (=Sterna, =albifrons) browni

California least tern (E)

Mammals

Vulpes macrotis mutica

San Joaquin kit fox (E)

Plants

Chorizanthe robusta var. robusta

robust spineflower (E)

Dudleya setchellii

Santa Clara Valley dudleya (E)

Lasthenia conjugens

Contra Costa goldfields (E)

Streptanthus albidus ssp. albidus

Metcalf Canyon jewelflower (E)

County Lists

Santa Clara County

Listed Species

Invertebrates

Branchinecta conservatio
- Conservancy fairy shrimp (E)

Branchinecta lynchi
- vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus
- valley elderberry longhorn beetle (T)

Euphydryas editha bayensis
- bay checkerspot butterfly (T)
- Critical habitat, bay checkerspot butterfly (X)

Lepidurus packardi
- Critical habitat, vernal pool tadpole shrimp (X)
- vernal pool tadpole shrimp (E)

Fish

Acipenser medirostris
- green sturgeon (T) (NMFS)

Eucyclogobius newberryi
- tidewater goby (E)

Hypomesus transpacificus
- delta smelt (T)

Oncorhynchus kisutch
- coho salmon - central CA coast (E) (NMFS)
- Critical habitat, coho salmon - central CA coast (X) (NMFS)

Oncorhynchus mykiss
- Central California Coastal steelhead (T) (NMFS)
- Central Valley steelhead (T) (NMFS)
- Critical habitat, Central California coastal steelhead (X) (NMFS)
- South Central California steelhead (T) (NMFS)

Oncorhynchus tshawytscha
- Central Valley spring-run chinook salmon (T) (NMFS)
- winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense
- California tiger salamander, central population (T)

Critical habitat, CA tiger salamander, central population (X)

Rana draytonii
California red-legged frog (T)
Critical habitat, California red-legged frog (X)

Reptiles

Gambelia (=Crotaphytus) sila
blunt-nosed leopard lizard (E)

Masticophis lateralis euryxanthus
Alameda whipsnake [=striped racer] (T)
Critical habitat, Alameda whipsnake (X)

Thamnophis gigas
giant garter snake (T)

Thamnophis sirtalis tetrataenia
San Francisco garter snake (E)

Birds

Brachyramphus marmoratus
Critical habitat, marbled murrelet (X)
marbled murrelet (T)

Charadrius alexandrinus nivosus
western snowy plover (T)

Pelecanus occidentalis californicus
California brown pelican (E)

Rallus longirostris obsoletus
California clapper rail (E)

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)

Vireo bellii pusillus
Least Bell's vireo (E)

Mammals

Reithrodontomys raviventris
salt marsh harvest mouse (E)

Vulpes macrotis mutica

San Joaquin kit fox (E)

Plants

Acanthomintha duttonii
San Mateo thornmint (E)

Castilleja affinis ssp. neglecta
Tiburon paintbrush (E)

Ceanothus ferrisae
Coyote ceanothus (E)

Chorizanthe robusta var. robusta
robust spineflower (E)

Cirsium fontinale var. fontinale
fountain thistle (E)

Dudleya setchellii
Santa Clara Valley dudleya (E)

Eriophyllum latilobum
San Mateo woolly sunflower (E)

Hesperolinon congestum
Marin dwarf-flax (=western flax) (T)

Holocarpha macradenia
Critical habitat, Santa Cruz tarplant (X)
Santa Cruz tarplant (T)

Lasthenia conjugens
Contra Costa goldfields (E)
Critical habitat, Contra Costa goldfields (X)

Streptanthus albidus ssp. albidus
Metcalf Canyon jewelflower (E)

Suaeda californica
California sea blite (E)

Trifolium amoenum
showy Indian clover (E)

Proposed Species

Amphibians

Rana draytonii

Critical habitat, California red-legged frog (PX)

Key:

(E) *Endangered* - Listed as being in danger of extinction.

(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.

(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.

(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.

Critical Habitat - Area essential to the conservation of a species.

(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.

(C) *Candidate* - Candidate to become a proposed species.

(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.

(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list. See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

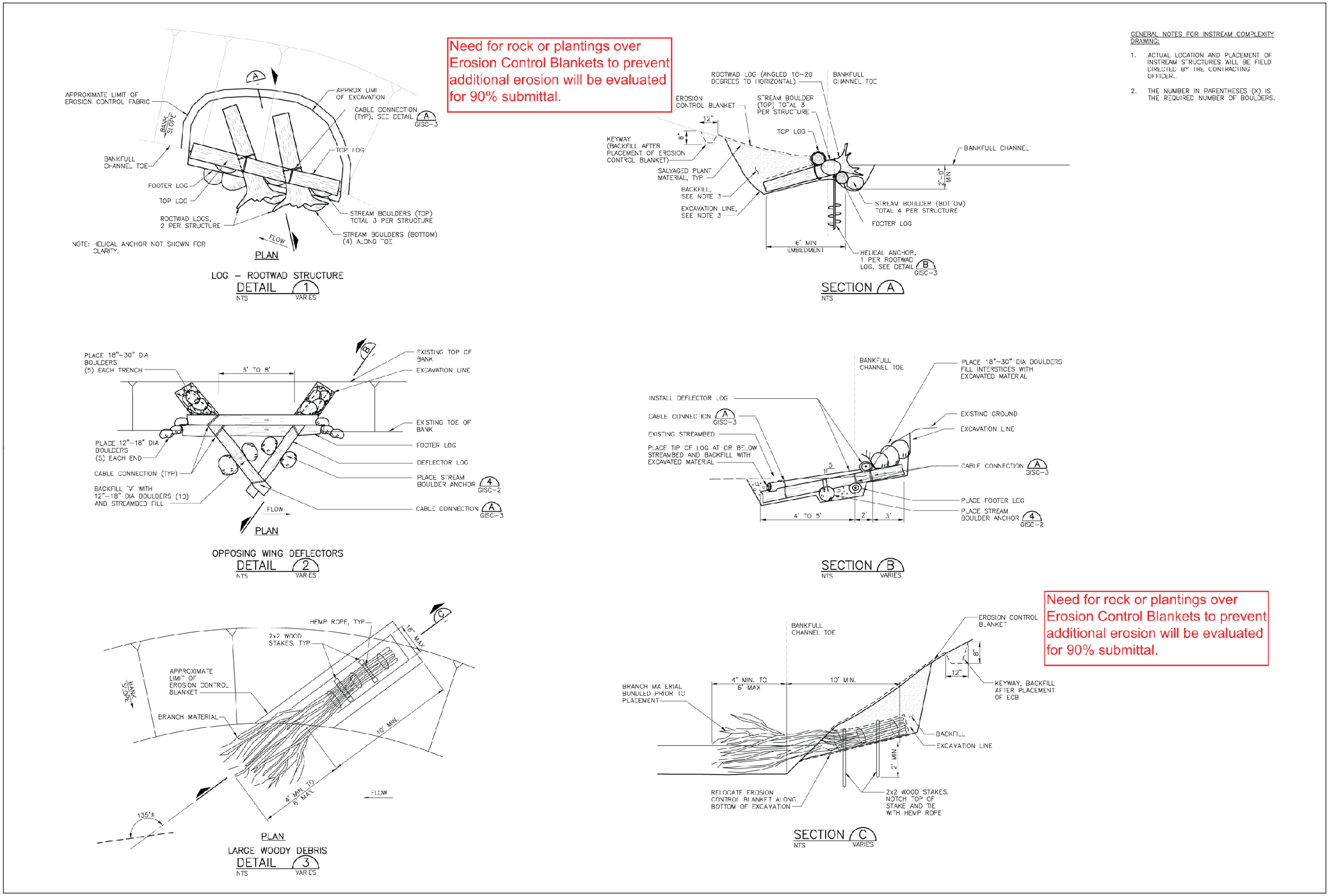
Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be April 28, 2013.

Appendix J

Instream Aquatic Habitat Features

US Army Corps
of Engineers



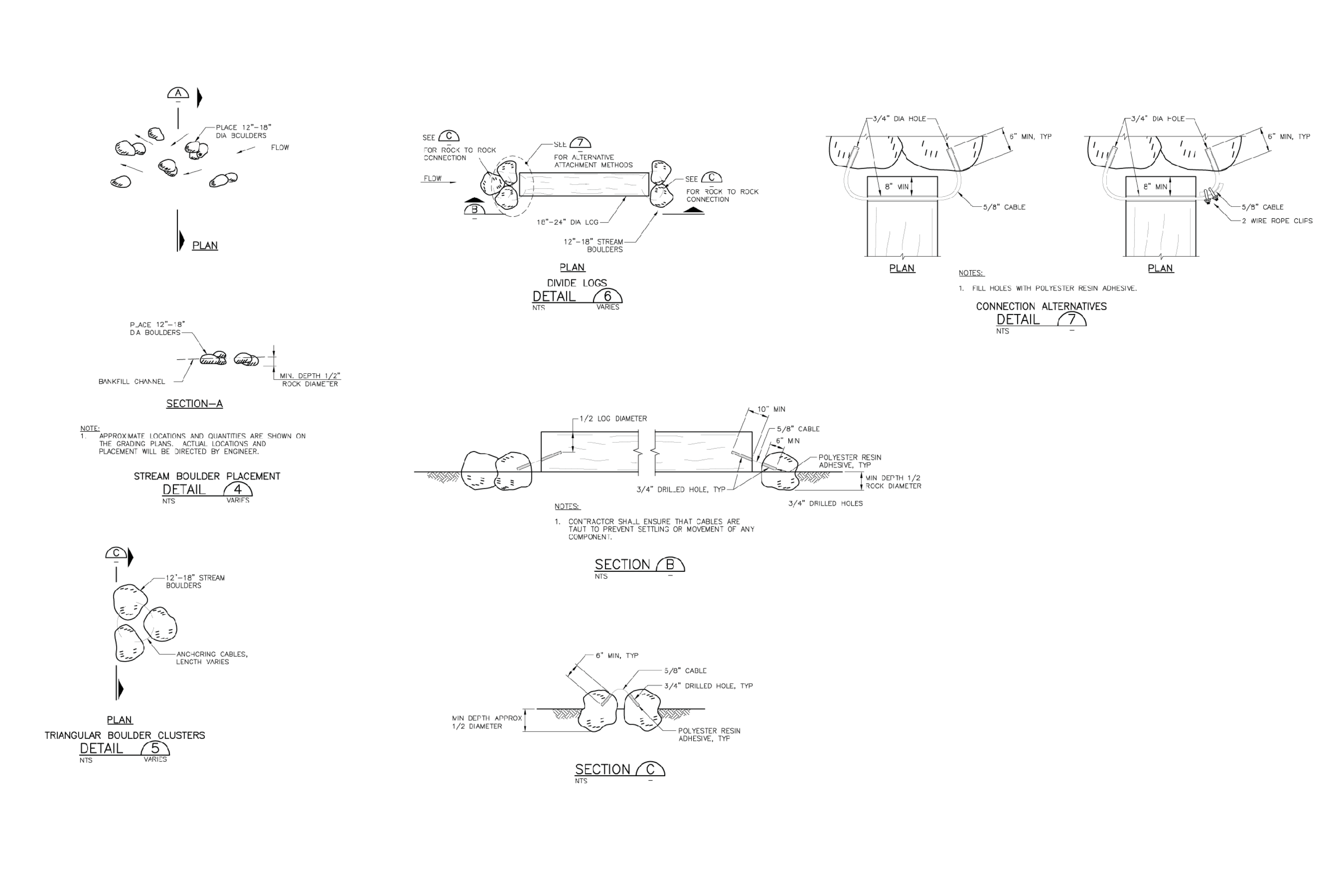
Source: Santa Clara Valley Water District, Feb 2013
Note: 65% Submittal Not for Construction

Cardno ENTRIX

Upper Llagas Creek Project

Appendix J | Figure 1 of 3

General Instream Complexities



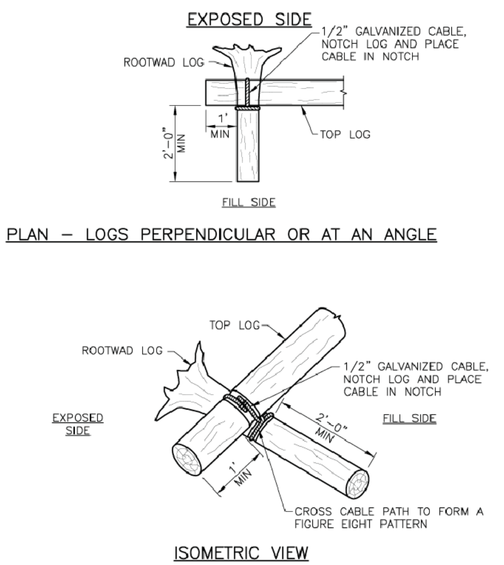
Source: Santa Clara Valley Water District, Feb 2013
Note: 65% Submittal Not for Construction

Cardno ENTRIX

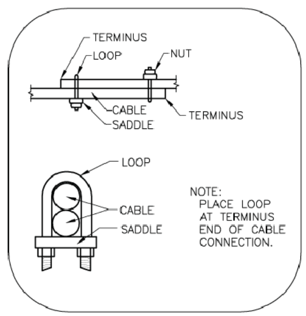
Upper Llagas Creek Project

Appendix J | Figure 2 of 3

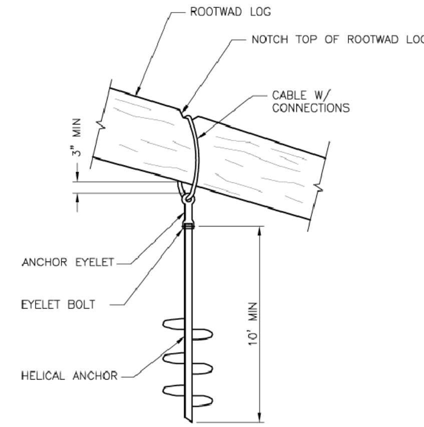
General Instream Complexities



CABLE CONNECTION
DETAIL A
NTS GISC–1



NOTE:
MAKE CABLE CONNECTIONS IN AREAS TO BE BACKFILLED AND MINIMIZE EXPOSED CABLE.



HELICAL ANCHOR
DETAIL B
NTS GISC–1

Source: Santa Clara Valley Water District, Feb 2013
Note: 65% Submittal Not for Construction

Upper Llagas Creek Project

Appendix J | Figure 3 of 3
General Instream Complexities

Appendix K

Air Quality Tables

US Army Corps
of Engineers

3.11-a Ambient Air Standards

Table 3.11-1 Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards		Federal Standards	
		ppmv	µg/m^3	ppmv	µg/m^3
Ozone (O_3) Nitrogen	1-hour	0.09	177	ʊ	ʊ
	8-hour	0.07	137	0.075	147
Dioxide (NO_2)	1-hour	0.18	338	0.100	188
	Annual	0.03	56	0.053	100
Sulfur Dioxide (SO_2)	1-hour	0.25	655	0.075	196
	3-hour Secondary	ʊ	ʊ	0.50	1,309
	24-hour	0.04	105	ʊ	ʊ
Carbon Monoxide (CO)	1-hour	20	22,898	35	40,071
	8-hour	9	10,304	9	10,304
	Lake Tahoe (8-hr)	6	6,869	ʊ	ʊ
Particulates (as PM_{10})	24-hour	ʊ	50	ʊ	150
	Annual	ʊ	20	ʊ	ʊ
Particulates (as $PM_{2.5}$)	24-hour	ʊ	ʊ	ʊ	35
	Annual Primary	ʊ	12	ʊ	12
	Annual Secondary	ʊ	ʊ	ʊ	15
Lead (Pb)	30-day	ʊ	1.5	ʊ	ʊ
	3-month (rolling)	ʊ	ʊ	ʊ	0.15
Sulfates (as SO_4)	24-hour	ʊ	25	ʊ	ʊ
Hydrogen Sulfide (H_2S)	1-hour	0.03	42	ʊ	ʊ
Vinyl Chloride (C_2H_3Cl)	24-hour	0.01	26	ʊ	ʊ
Visibility Reducing Particles	8-hour	Extinction coefficient of 0.23 per km; visibility of 10 miles or more (0.07 to 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70%.		ʊ	ʊ

Sources: CARB 2012a, USEPA 2011a

Notes:

ppmv = parts per million by volume

µg/m^3 = micrograms per cubic meter

The 1.5 µg/m^3 federal quarterly lead standard applied until 2008; 0.15 µg/m^3 rolling 3-month average thereafter

For gases, ug/m^3 calculated from ppmv based on molecular weight and standard conditions

Standard Temperature	25	deg C
Standard Molar Volume	24.465	liter/g-mole

3.11-b Attainment Status

Table 3.11-2 Attainment Status Summary - Bay Area Region

Criteria Pollutant	State Designation	Federal Designation
Ozone (O_3) (1-hour)	Nonattainment	ʊ
Ozone (O_3) (8-hour)	Nonattainment	Nonattainment(1)
Nitrogen Dioxide (NO_2) (1-hour)	Attainment	Unclassified(2)
Nitrogen Dioxide (NO_2) (annual)	Attainment	Attainment
Sulfur Dioxide (SO_2)	Attainment	Attainment
Carbon Monoxide (CO)	Attainment	Attainment
Respirable Particulates (as PM_{10}) (24-hour)	Nonattainment	Unclassified(2)
Respirable Particulates (as PM_{10}) (annual)	Nonattainment	ʊ
Fine Particulates (as $PM_{2.5}$) (24-hour)	ʊ	Nonattainment
Fine Particulates (as $PM_{2.5}$) (annual)	Nonattainment	Attainment
Lead (Pb)	Attainment	Attainment
Sulfates (as SO_4)	Attainment	ʊ
Hydrogen Sulfide (H_2S)	Unclassified(2)	ʊ
Vinyl Chloride (C_2H_3Cl)	n/d	ʊ
Visibility	Unclassified(2)	ʊ

Source: BAAQMD 2012a, CARB 2012b, USEPA 2012a

Notes:

(1) The 0.08 ppmv federal 8-hour ozone standard applied until 2008; 0.075 ppmv thereafter

(2) At the time of designation, if the available data does not support a designation of attainment or nonattainment, the area is designated as unclassified.

n/d - no data/information available

3.11-c Ambient AQ

Table 3.11-3 Ambient Air Quality in Project Vicinity - Santa Clara County

Criteria Pollutant	Year	San Jose		San Martin		Gilroy	
		monitored value	days over standard	monitored value	days over standard	monitored value	days over standard
Ozone (O_3) (1-hour max ppmv)	2011	0.098	1	0.091	0	0.081	0
	2010	0.126	5	0.109	2	0.094	0
	2009	0.088	0	0.107	4	0.098	1
Ozone (O_3) (8-hour max ppmv)	2011	0.067	0	0.072	2	0.073	1
	2010	0.086	3	0.087	8	0.081	7
	2009	0.068	0	0.081	6	0.078	4
Nitrogen Dioxide (NO_2) (1-hour max ppmv)	2011	0.061	0	ʊ	ʊ	ʊ	ʊ
	2010	0.064	0	ʊ	ʊ	ʊ	ʊ
	2009	0.069	0	ʊ	ʊ	ʊ	ʊ
Nitrogen Dioxide (NO_2) (annual average ppmv)	2011	0.015	0	ʊ	ʊ	ʊ	ʊ
	2010	0.014	0	ʊ	ʊ	ʊ	ʊ
	2009	0.015	0	ʊ	ʊ	ʊ	ʊ
Sulfur Dioxide (SO_2) (1-hour max ppmv)	2011	0.0072	0	ʊ	ʊ	ʊ	ʊ
	2010	0.0049	0	ʊ	ʊ	ʊ	ʊ
	2009	ʊ	0	ʊ	ʊ	ʊ	ʊ
Sulfur Dioxide (SO_2) (24-hour max ppmv)	2011	0.0024	0	ʊ	ʊ	ʊ	ʊ
	2010	0.0018	0	ʊ	ʊ	ʊ	ʊ
	2009	0.0010	0	ʊ	ʊ	ʊ	ʊ
Carbon Monoxide (CO) (1-hour max ppmv)	2011	2.5	0	ʊ	ʊ	ʊ	ʊ
	2010	2.8	0	ʊ	ʊ	ʊ	ʊ
	2009	3.4	0	ʊ	ʊ	ʊ	ʊ
Carbon Monoxide (CO) (8-hour max ppmv)	2011	2.3	0	ʊ	ʊ	ʊ	ʊ
	2010	2.2	0	ʊ	ʊ	ʊ	ʊ
	2009	2.5	0	ʊ	ʊ	ʊ	ʊ
Resp. Particulates (as PM_{10}) (24-hour max µg/m^3)	2011	44	0	ʊ	ʊ	ʊ	ʊ
	2010	47	0	ʊ	ʊ	ʊ	ʊ
	2009	43	0	ʊ	ʊ	ʊ	ʊ
Resp. Particulates (as PM_{10}) (annual avg µg/m^3)	2011	19.2	0	ʊ	ʊ	ʊ	ʊ
	2010	19.5	0	ʊ	ʊ	ʊ	ʊ
	2009	20.4	0	ʊ	ʊ	ʊ	ʊ
Fine Particulates (as $PM_{2.5}$) (24-hour max µg/m^3)	2011	50.5	3	ʊ	ʊ	35.5	1
	2010	41.5	3	ʊ	ʊ	29.9	0
	2009	35.0	0	ʊ	ʊ	36.6	1
Fine Particulates (as $PM_{2.5}$) (annual avg µg/m^3)	2011	9.9	0	ʊ	ʊ	8.1	0
	2010	8.8	0	ʊ	ʊ	8.2	0
	2009	10.1	0	ʊ	ʊ	8.9	0

Source: BAAQMD 2013

3.11-d Emissions Summaries

Table 3.11-10 CEQA Significance Thresholds - BAAQMD (1999)

Applicability	VOC	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$
Operation, tons/year	15	CAAQS	15	40(2)	15	10(2)
Operation, pounds/year	30,000	CAAQS	30,000	80,000	30,000	20,000
Operation, pounds/day	80	CAAQS	80	ʊ	80	ʊ
Construction, pounds/day	80	CAAQS	80	ʊ	80(3)	ʊ

Sources: BAAQMD 1999, 2012b (see note 4), 40 CFR 51.166

Notes:

(1) No violation of CAAQS for CO (9 ppmv for 1 hour, 20 ppmv for 8 hours)

(2) Prevention of Significant Deterioration (PSD), annual only

(3) For construction projects, applies to exhaust emissions only, not fugitive dusts

(4) On March 5, 2012 the Alameda County Superior Court issued a judgment finding that the District had failed to comply with CEQA when it adopted the thresholds of significance. The court did not determine whether the thresholds were valid on the merits, but found that the adoption of the thresholds was a project under CEQA. The court issued a writ of mandate ordering the District to set aside the 2010 thresholds and cease dissemination of them until the District had complied with CEQA. The District is no longer recommending that the 2010 thresholds be used as a generally applicable measure of a project's significance. Lead Agencies may continue to rely on the District's 1999 thresholds and may continue to make determinations regarding the significance of an individual project's air quality impacts based on the substantial evidence in the record for that project.

Table 3.11-11 Estimated Peak Daily Criteria Emissions for Project with Reach 8 NRCS or Culvert/Channel Alternatives

Project Phase	VOC lbs/day	CO lbs/day	NO_X lbs/day	SO_X lbs/day	C-PM_{10} lbs/day	C-$PM_{2.5}$ lbs/day	F-PM_{10} lbs/day	F-$PM_{2.5}$ lbs/day
Year 1	13	72	88	0.2	5	4	21	3
Year 2	38	210	260	0.5	14	12	62	8
Year 3	38	207	257	0.5	13	12	62	8
Year 4	19	104	128	0.3	7	6	31	4
Year 5	19	104	128	0.3	7	6	21	3
Year 6	7	36	44	0.1	2	2	10	1
Peak Day	**38**	**210**	**260**	**0.5**	**14**	**12**	**62**	**8**
Significance	**LTS**	**LTS**	**S**	**ʊ**	**LTS**	**ʊ**	**ʊ**	**ʊ**

Sources: SCAQMD 2008, USEPA 2011b

Notes:

Reach 8 Culvert/Channel Alternative same as NRCS Alternative (estimated emissions are the same)

"C" prefix denotes combustion byproduct particulate matter; "F" prefix denotes fugitive dust particulate matter

LTS = Less than significant; S = Significant; LTSM = Less than significant with mitigation

3.11-d Emissions Summaries

Table 3.11-12 Estimated Peak Daily Criteria Emissions for Project with Reach 8 Tunnel Alternative

Project Phase	VOC lbs/day	CO lbs/day	NO_X lbs/day	SO_X lbs/day	C-PM_{10} lbs/day	C-$PM_{2.5}$ lbs/day	F-PM_{10} lbs/day	F-$PM_{2.5}$ lbs/day
Year 1	13	72	88	0.2	5	4	21	3
Year 2	44	242	303	0.6	16	15	64	9
Year 3	44	240	300	0.6	16	14	64	9
Year 4	25	136	171	0.3	9	8	33	5
Year 5	25	136	171	0.3	9	8	23	3
Year 6	7	36	44	0.1	2	2	10	1
Peak Day	**44**	**242**	**303**	**0.6**	**16**	**15**	**64**	**9**
Significance	**LTS**	**LTS**	**S**	**ʊ**	**LTS**	**ʊ**	**ʊ**	**ʊ**

Sources: SCAQMD 2008, USEPA 2011b

Notes:

"C" prefix denotes combustion byproduct particulate matter; "F" prefix denotes fugitive dust particulate matter

LTS = Less than significant; S = Significant; LTSM = Less than significant with mitigation

Table 3.11-13 Estimated Peak Daily Criteria Emissions for Project with Reach 8 Tunnel and Reach 6 Bypass Alternatives

Project Phase	VOC lbs/day	CO lbs/day	NO_X lbs/day	SO_X lbs/day	C-PM_{10} lbs/day	C-$PM_{2.5}$ lbs/day	F-PM_{10} lbs/day	F-$PM_{2.5}$ lbs/day
Year 1	13	72	88	0.2	5	4	21	3
Year 2	40	221	277	0.5	15	13	55	8
Year 3	40	219	274	0.5	14	13	55	8
Year 4	21	115	145	0.3	8	7	24	4
Year 5	21	115	145	0.3	8	7	14	2
Year 6	7	36	44	0.1	2	2	10	1
Peak Day	**40**	**221**	**277**	**0.5**	**15**	**13**	**55**	**8**
Significance	**LTS**	**LTS**	**S**	**ʊ**	**LTS**	**ʊ**	**ʊ**	**ʊ**

Sources: SCAQMD 2008, USEPA 2011b

Notes:

"C" prefix denotes combustion byproduct particulate matter; "F" prefix denotes fugitive dust particulate matter

LTS = Less than significant; S = Significant; LTSM = Less than significant with mitigation

3.11-d Emissions Summaries

Table 3.11-14 Estimated Average Annual Criteria Emissions for Project with Reach 8 NRCS or Culvert/Channel Alternatives

Project Phase	VOC tons/yr	CO tons/yr	NO_X tons/yr	SO_X tons/yr	C-PM_{10} tons/yr	C-$PM_{2.5}$ tons/yr	F-PM_{10} tons/yr	F-$PM_{2.5}$ tons/yr
Year 1	1.0	5.6	6.8	0.01	0.4	0.3	1.4	0.2
Year 2	3.1	17.1	21.2	0.04	1.1	1.0	4.5	0.6
Year 3	3.2	17.2	21.4	0.04	1.1	1.0	4.6	0.6
Year 4	1.7	9.5	11.8	0.02	0.6	0.6	2.5	0.3
Year 5	1.7	9.5	11.8	0.02	0.6	0.6	1.8	0.2
Year 6	0.7	3.6	4.4	0.01	0.2	0.2	0.9	0.1
Highest Year	**3.2**	**17.2**	**21.4**	**0.04**	**1.1**	**1.0**	**4.6**	**0.6**

Sources: SCAQMD 2008, USEPA 2011b

Notes:

"C" prefix denotes combustion byproduct particulate matter; "F" prefix denotes fugitive dust particulate matter

Reach 8 Culvert/Channel Alternative same as NRCS Alternative (estimated emissions are the same)

Table 3.11-15 Estimated Average Annual Criteria Emissions for Project with Reach 8 Tunnel Alternative

Project Phase	VOC tons/yr	CO tons/yr	NO_X tons/yr	SO_X tons/yr	C-PM_{10} tons/yr	C-$PM_{2.5}$ tons/yr	F-PM_{10} tons/yr	F-$PM_{2.5}$ tons/yr
Year 1	1.0	5.6	6.8	0.01	0.4	0.3	1.4	0.2
Year 2	3.7	20.1	25.2	0.05	1.3	1.2	4.7	0.7
Year 3	3.7	20.3	25.3	0.05	1.3	1.2	4.7	0.7
Year 4	2.3	12.5	15.7	0.03	0.8	0.8	2.7	0.4
Year 5	2.3	12.5	15.7	0.03	0.8	0.8	1.9	0.3
Year 6	0.7	3.6	4.4	0.01	0.2	0.2	0.9	0.1
Highest Year	**3.7**	**20.3**	**25.3**	**0.05**	**1.3**	**1.2**	**4.7**	**0.7**

Sources: SCAQMD 2008, USEPA 2011b

Notes:

"C" prefix denotes combustion byproduct particulate matter; "F" prefix denotes fugitive dust particulate matter

3.11-d Emissions Summaries

Table 3.11-16 Estimated Average Annual Criteria Emissions for Project with Reach 8 Tunnel and Reach 6 Bypass Alternatives

Project Phase	VOC tons/yr	CO tons/yr	NO_X tons/yr	SO_X tons/yr	C-PM_{10} tons/yr	C-$PM_{2.5}$ tons/yr	F-PM_{10} tons/yr	F-$PM_{2.5}$ tons/yr
Year 1	1.0	5.6	6.8	0.01	0.4	0.3	1.4	0.2
Year 2	3.5	19.2	24.0	0.05	1.3	1.2	4.2	0.6
Year 3	3.5	19.3	24.1	0.05	1.3	1.2	4.3	0.6
Year 4	2.1	11.6	14.5	0.03	0.8	0.7	2.2	0.3
Year 5	2.1	11.6	14.5	0.03	0.8	0.7	1.5	0.2
Year 6	0.7	3.6	4.4	0.01	0.2	0.2	0.9	0.1
Highest Year	**3.5**	**19.3**	**24.1**	**0.05**	**1.3**	**1.2**	**4.3**	**0.6**

Sources: SCAQMD 2008, USEPA 2011b

Notes:

"C" prefix denotes combustion byproduct particulate matter; "F" prefix denotes fugitive dust particulate matter

Table 3.11-17 Estimated Total Criteria Emissions for All Project Alternatives

Project Options	VOC tons	CO tons	NO_X tons	SO_X tons	C-PM_{10} tons	C-$PM_{2.5}$ tons	F-PM_{10} tons	F-$PM_{2.5}$ tons
NRCS or Culvert/Channel	11.5	62.7	77.4	0.15	4.0	3.7	16.5	2.2
with Reach 8 Tunnel	13.7	74.7	93.2	0.18	4.9	4.5	17.2	2.4
with Tunnel and Bypass	12.9	71.3	88.9	0.17	4.7	4.3	15.5	2.2

Sources: SCAQMD 2008, USEPA 2011b

Notes:

"C" prefix denotes combustion byproduct particulate matter; "F" prefix denotes fugitive dust particulate matter

Reach 8 Culvert/Channel Alternative same as NRCS Alternative (estimated emissions are the same)

3.11-d Emissions Summaries

Table 3.11-18 Estimated GHG Emissions for NRCS or C/C Alternative

Project Phase	CO_2 MT/yr	CH_4 MT/yr	N_2O MT/yr	CO_2 e MT/yr
Year 1	1,084	0.1	0.0	1,097
Year 2	3,380	0.3	0.1	3,422
Year 3	3,406	0.3	0.1	3,449
Year 4	1,893	0.1	0.1	1,917
Year 5	1,893	0.1	0.1	1,917
Year 6	714	0.1	0.0	723
Highest Year	**3,406**	**0.3**	**0.1**	**3,449**

Sources: SCAQMD 2008, USEPA 2012b

Notes:

1 metric tonne (MT) = 1,000 kilograms or 2,204.6 pounds

Reach 8 Culvert/Channel Alternative same as NRCS Alternative (estimated emissions are the same)

Table 3.11-19 Estimated GHG Emissions for Reach 8 Tunnel Alternative

Project Phase	CO_2 MT/yr	CH_4 MT/yr	N_2O MT/yr	CO_2 e MT/yr
Year 1	1,084	0.1	0.0	1,097
Year 2	3,977	0.3	0.1	4,027
Year 3	4,003	0.3	0.1	4,054
Year 4	2,491	0.2	0.1	2,522
Year 5	2,491	0.2	0.1	2,522
Year 6	714	0.1	0.0	723
Highest Year	**4,003**	**0.3**	**0.1**	**4,054**

Sources: SCAQMD 2008, USEPA 2012b

Notes:

1 metric tonne (MT) = 1,000 kilograms or 2,204.6 pounds

3.11-d Emissions Summaries

Table 3.11-20 Estimated GHG Emissions for Tunnel and Bypass Alternatives

Project Phase	CO_2 MT/yr	CH_4 MT/yr	N_2O MT/yr	CO_2 e MT/yr
Year 1	1,084	0.1	0.0	1,097
Year 2	3,808	0.3	0.1	3,855
Year 3	3,834	0.3	0.1	3,882
Year 4	2,321	0.2	0.1	2,350
Year 5	2,321	0.2	0.1	2,350
Year 6	714	0.1	0.0	723
Highest Year	**3,834**	**0.3**	**0.1**	**3,882**

Sources: SCAQMD 2008, USEPA 2012b

Notes:

1 metric tonne (MT) = 1,000 kilograms or 2,204.6 pounds

Table 3.11-21 Estimated Total GHG Emissions for All Project Alternatives

Project Options	CO_2 MT	CH_4 MT	N_2O MT	CO_2 e MT
NRCS or Culvert/Channel	12,386	0.9	0.4	12,543
with Reach 8 Tunnel	14,777	1.1	0.5	14,962
with Tunnel and Bypass	14,179	1.0	0.5	14,354

Sources: SCAQMD 2008, USEPA 2012b

Notes:

1 metric tonne (MT) = 1,000 kilograms or 2,204.6 pounds

Reach 8 Culvert/Channel Alternative same as NRCS Alternative (estimated emissions are the same)

3.11-d Emissions Summaries

Table 3.11-22 Screening Health Risk Assessment for Excavation Activity

DPM Screen Parameter	Units	Reach 7a	Reach 7b	Reach 8
Onsite Emission Rate	lb/day	0.526	0.351	0.526
	g/sec	2.76E-03	1.84E-03	2.76E-03
Receptor Distance	meters	20	20	10
Modeled Hourly Concentration	$\mu g/m^3$	2.478	1.652	5.588
Corrected Annual Concentration	$\mu g/m^3$	0.248	0.165	0.559
Unit Risk Value (70-year MEI)	$(\mu g/m^3)^{-1}$	3.00E-04	3.00E-04	3.00E-04
Activity Duration	days	5	12	20
Annual MEI Correction	fraction	2.0E-04	4.7E-04	7.8E-04
Cancer Risk	probability	1.5E-08	2.3E-08	1.3E-07
	per million	0.01	0.02	0.13
CEQA Threshold	per million	10	10	10
	significance	**LTS**	**LTS**	**LTS**

Sources: NOAA 2008, USEPA 1992, USEPA 2011c, OEHHA 2009, WC 2013, BAAQMD 1999

Notes:

DPM = diesel particulate matter (PM_{10})

70-year Maximally Exposed Individual = 25,550 days = 613,200 hours

LTS = Less Than Significant; S = Significant

3.11-e Dry Air Composition

Table 3.11-4 Standard Composition of Dry Air

Principal Gas	Chemical Symbol	Gas MW g/mole	Concentration ppmv	Fraction percent	Fraction MW g/mole
Nitrogen	N_2	28.014	780,805.00	78.080500	21.873471
Oxygen	O_2	31.998	209,440.00	20.944000	6.701661
Argon	Ar	39.948	9,340.00	0.934000	0.373114
Carbon Dioxide	CO_2	44.009	387.69	0.038769	0.017062
Neon	Ne	20.183	18.21	0.001821	0.000368
Helium	He	4.003	5.24	0.000524	0.000021
Methane	CH_4	16.043	1.81	0.000181	0.000029
Krypton	Kr	83.800	1.14	0.000114	0.000096
Hydrogen	H_2	2.016	0.50	0.000050	0.000001
Nitrous Oxide	N_2O	44.013	0.32	0.000032	0.000014
Xenon	Xe	31.300	0.09	0.000009	0.000003
Totals			**1,000,000.00**	**100.000**	**28.966**

Sources: UIG 2008, USEPA 2012b, du Pont 1971, Jennings 1970

Notes:

MW = molecular weight, g/mole

ppmv = parts per million by volume (10^{-6})

3.11-f Fuels

Table 3.11-5 Typical GHG Contents of Common Fuels

Fuel	CO_2 kg/mmBTU	CH_4 kg/mmBTU	N_2O kg/mmBTU	CO_2 e lb/mmBTU	Energy BTU/gal	CO_2 e lb/gal
Diesel Fuel No. 2	73.96	0.0105	0.0006	163.97	138,300	22.68
Kerosene	73.19	0.0105	0.0006	162.27	138,700	22.51
Jet Fuel	72.23	0.0105	0.0006	160.17	135,000	21.62
Motor Gasoline	71.35	0.0105	0.0006	158.23	122,600	19.40
Aviation Gasoline	69.15	0.0105	0.0006	153.38	120,200	18.44
Propane	62.22	0.0053	0.0001	137.49	91,300	12.55
Pipeline Natural Gas	53.02	0.0053	0.0001	117.20	[illegible]	[illegible]

Sources: USEPA 2012b, USEPA 2011b

Notes:

kg/mmBTU - kilograms per million British Thermal Units

lb/mmBTU - pounds per million British Thermal Units

BTU - the amount of energy (heat) required to raise 1 pound of liquid water 1 degree Fahrenheit from 39 to 40 °F

3.11-g GHG Inventories

Table 3.11-6 Greenhouse Gas Emissions Inventories - Gross Basis

Summary Year	National MMT CO_2 e	California MMT CO_2 e	Bay Area MMT CO_2 e
2005	7,204	482.5	ʊ
2006	7,159	481.9	ʊ
2007	7,253	488.8	95.8
2008	7,048	484.7	ʊ
2009	6,608	456.8	ʊ
5-Year Average	**7,054**	**478.9**	ʊ
Average Annual Variation	**2.6%**	**1.8%**	ʊ

Sources: USEPA 2012b, CARB 2011b, BAAQMD 2010b

Notes:

MMT - million metric tonnes (annual)

1 metric tonne = 1,000 kilograms or 2,204.6 pounds

2009 is most recent CARB published data; Bay Area for 2007 only

Table 3.11-7 Bay Area GHG Emissions by Sector

End-Use Sector	District Emissions	
	Percent	MMT CO_2 e
Industrial / Commercial	36.4%	34.9
Residential Fuel Use	7.1%	6.8
Local Electric Power Generation	8.5%	8.1
Imported Electric Power Generation	7.4%	7.1
Offroad Equipment	3.0%	2.9
Transportation	36.4%	34.9
Agriculture / Farming	1.2%	1.1
Totals	**100.0%**	**95.8**

Source: BAAQMD 2010b

Notes:

MMT - million metric tonnes (annual)

1 metric tonne = 1,000 kilograms or 2,204.6 pounds

3.11-g GHG Inventories

Table 3.11-8 Bay Area GHG Emissions by County

County	District Emissions	
	Percent	MMT CO_2 e
Alameda	16.4%	15.7
Contra Costa	32.9%	31.5
Marin	2.8%	2.7
Napa	1.8%	1.7
San Francisco	7.4%	7.1
San Mateo	8.9%	8.5
Santa Clara	19.6%	18.8
Solano (within BAAQMD)	5.9%	5.7
Sonoma (within BAAQMD)	4.3%	4.1
Totals	**100.0%**	**95.8**

Source: BAAQMD 2010b

Notes:

MMT - million metric tonnes (annual)

1 metric tonne = 1,000 kilograms or 2,204.6 pounds

Table 3.11-9 Mobile Sectors GHG Emissions by County

County	Offroad MT CO_2 e	Transportation MT CO_2 e
Alameda	569,000	8,351,000
Contra Costa	406,000	4,998,000
Marin	99,000	1,286,000
Napa	50,000	917,000
San Francisco	415,000	2,673,000
San Mateo	270,000	4,850,000
Santa Clara	790,000	7,859,000
Solano (within BAAQMD)	147,000	1,834,000
Sonoma (within BAAQMD)	175,000	2,103,000
Totals	**2,921,000**	**34,871,000**

Source: BAAQMD 2010b

Notes:

MT - metric tonnes (annual)

1 metric tonne = 1,000 kilograms or 2,204.6 pounds

Values rounded to nearest 1,000 tonnes

"Offroad" is offroad equipment category

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles			Offroad	Planned Schedule				Duration	Offroad	Onroad	Daily Max		Project Total		Annual Averag		ROG	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	Category	Qty.	BHP	years	months	wks/mo	days/wk	days	hrs/day	mi/day	hours	VMT	hours	VMT	hours	VMT	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit
Reach 4																										
Hydraulic Excavator, Crawler (2 CY Bucket)	offroad	2	190	3	22.9	4.33	5	497	6		12		5964		1988		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Vibratory / Static Roller (Single Drum)	offroad	1	100	3	22.9	4.33	5	497	6		6		2982		994		0.07342	0.35631	0.40339	0.00059	0.03199	0.02943	49.56	0.00662	0.00294	50.61
Front End Loader (2.6 – 3.8 CY Bucket)	offroad	1	200	3	22.9	4.33	5	497	6		6		2982		994		0.09689	0.52527	0.70422	0.00136	0.03318	0.03052	120.54	0.00874	0.00389	121.92
Hydraulic Excavator (0.5 – 2 CY)	offroad	1	190	3	22.9	4.33	5	497	6		6		2982		994		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Tractor Crawler / Dozer	offroad	1	240	3	22.9	4.33	5	497	6		6		2982		994		0.14041	0.47127	1.11186	0.00180	0.04384	0.04033	160.14	0.01267	0.00563	162.15
Pavment Breaker	offroad	1	90	3	22.9	4.33	5	497	6		6		2982		994		0.05841	0.39630	0.38013	0.00070	0.02417	0.02224	58.20	0.00527	0.00234	59.04
Air Compressor	offroad	1	80	3	22.9	4.33	5	497	6		6		2982		994		0.05786	0.26003	0.26680	0.00040	0.02101	0.01933	32.85	0.00522	0.00232	33.68
Backhoe (0.8 CY)	offroad	1	120	3	22.9	4.33	5	497	6		6		2982		994		0.04771	0.34418	0.32159	0.00061	0.02166	0.01992	51.73	0.00430	0.00191	52.41
Grader	offroad	1	140	3	22.9	4.33	5	497	6		6		2982		994		0.10037	0.59422	0.64906	0.00107	0.04407	0.04055	92.77	0.00906	0.00403	94.21
Asphalt Compactor Roller (6 tons)	offroad	1	130	3	22.9	4.33	5	497	6		6		2982		994		0.07777	0.43431	0.52038	0.00079	0.03809	0.03504	67.93	0.00702	0.00312	69.04
Hydraulic Crane	offroad	1	270	3	22.9	4.33	5	497	6		6		2982		994		0.08646	0.27056	0.70619	0.00130	0.02441	0.02245	117.59	0.00780	0.00347	118.83
Hydroseeder (3,000 gal)	offroad	1	30	3	22.9	4.33	5	497	6		6		2982		994		0.02723	0.09811	0.13230	0.00021	0.00654	0.00601	16.63	0.00246	0.00109	17.02
Dump Trucks (12-20 CY)	onroad HD	2		3	22.9	4.33	5	497		20		40		19880		6627	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Water Tanker (5,000 gal)	onroad HD	1		3	22.9	4.33	5	497		20		20		9940		3313	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Flatbed Trucks	onroad MD	2		3	22.9	4.33	5	497		50		100		49700		16567	0.00150	0.00998	0.01070	0.00003	0.00043	0.00035	2.84	0.00007	0.00006	2.86
Pickup Trucks (worker transportation)	onroad LD	4		3	22.9	4.33	5	497		50		200		99400		33133	0.00060	0.00538	0.00051	0.00001	0.00009	0.00006	1.11	0.00005	0.00008	1.13
Reach 5																										
Hydraulic Excavator, Crawler (2 CY Bucket)	offroad	3	190	2	10.3	4.33	5	223	6		18		4014		2007		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Vibratory / Static Roller (Single Drum)	offroad	1	100	2	10.3	4.33	5	223	6		6		1338		669		0.07342	0.35631	0.40339	0.00059	0.03199	0.02943	49.56	0.00662	0.00294	50.61
Front End Loader (2.6 – 3.8 CY Bucket)	offroad	1	200	2	10.3	4.33	5	223	6		6		1338		669		0.09689	0.52527	0.70422	0.00136	0.03318	0.03052	120.54	0.00874	0.00389	121.92
Hydraulic Excavator (0.5 – 2 CY)	offroad	1	190	2	10.3	4.33	5	223	6		6		1338		669		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Tractor Crawler / Dozer	offroad	1	240	2	10.3	4.33	5	223	6		6		1338		669		0.14041	0.47127	1.11186	0.00180	0.04384	0.04033	160.14	0.01267	0.00563	162.15
Pavment Breaker	offroad		90	2	10.3	4.33	5	223									0.05841	0.39630	0.38013	0.00070	0.02417	0.02224	58.20	0.00527	0.00234	59.04
Air Compressor	offroad		80	2	10.3	4.33	5	223									0.05786	0.26003	0.26680	0.00040	0.02101	0.01933	32.85	0.00522	0.00232	33.68
Backhoe (0.8 CY)	offroad	1	120	2	10.3	4.33	5	223	6		6		1338		669		0.04771	0.34418	0.32159	0.00061	0.02166	0.01992	51.73	0.00430	0.00191	52.41
Grader	offroad	1	140	2	10.3	4.33	5	223	6		6		1338		669		0.10037	0.59422	0.64906	0.00107	0.04407	0.04055	92.77	0.00906	0.00403	94.21
Asphalt Compactor Roller (6 tons)	offroad	1	130	2	10.3	4.33	5	223	6		6		1338		669		0.07777	0.43431	0.52038	0.00079	0.03809	0.03504	67.93	0.00702	0.00312	69.04
Hydraulic Crane	offroad	1	270	2	10.3	4.33	5	223	6		6		1338		669		0.08646	0.27056	0.70619	0.00130	0.02441	0.02245	117.59	0.00780	0.00347	118.83
Hydroseeder (3,000 gal)	offroad	1	30	2	10.3	4.33	5	223	6		6		1338		669		0.02723	0.09811	0.13230	0.00021	0.00654	0.00601	16.63	0.00246	0.00109	17.02
Dump Trucks (12-20 CY)	onroad HD	2		2	10.3	4.33	5	223		20		40		8920		4460	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Water Tanker (5,000 gal)	onroad HD	1		2	10.3	4.33	5	223		20		20		4460		2230	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Flatbed Trucks	onroad MD	2		2	10.3	4.33	5	223		50		100		22300		11150	0.00150	0.00998	0.01070	0.00003	0.00043	0.00035	2.84	0.00007	0.00006	2.86
Pickup Trucks (worker transportation)	onroad LD	6		2	10.3	4.33	5	223		50		300		66900		33450	0.00060	0.00538	0.00051	0.00001	0.00009	0.00006	1.11	0.00005	0.00008	1.13
Reach 6																										
Hydraulic Excavator, Crawler (2 CY Bucket)	offroad	3	190	5	46.3	4.33	5	1003	6		18		18054		3611		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Vibratory / Static Roller (Single Drum)	offroad	1	100	5	46.3	4.33	5	1003	6		6		6018		1204		0.07342	0.35631	0.40339	0.00059	0.03199	0.02943	49.56	0.00662	0.00294	50.61
Front End Loader (2.6 – 3.8 CY Bucket)	offroad	1	200	5	46.3	4.33	5	1003	6		6		6018		1204		0.09689	0.52527	0.70422	0.00136	0.03318	0.03052	120.54	0.00874	0.00389	121.92
Hydraulic Excavator (0.5 – 2 CY)	offroad	1	190	5	46.3	4.33	5	1003	6		6		6018		1204		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Tractor Crawler / Dozer	offroad	1	240	5	46.3	4.33	5	1003	6		6		6018		1204		0.14041	0.47127	1.11186	0.00180	0.04384	0.04033	160.14	0.01267	0.00563	162.15
Pavment Breaker	offroad		90	5	46.3	4.33	5	1003									0.05841	0.39630	0.38013	0.00070	0.02417	0.02224	58.20	0.00527	0.00234	59.04
Air Compressor	offroad		80	5	46.3	4.33	5	1003									0.05786	0.26003	0.26680	0.00040	0.02101	0.01933	32.85	0.00522	0.00232	33.68
Backhoe (0.8 CY)	offroad	1	120	5	46.3	4.33	5	1003	6		6		6018		1204		0.04771	0.34418	0.32159	0.00061	0.02166	0.01992	51.73	0.00430	0.00191	52.41
Grader	offroad	1	140	5	46.3	4.33	5	1003	6		6		6018		1204		0.10037	0.59422	0.64906	0.00107	0.04407	0.04055	92.77	0.00906	0.00403	94.21
Asphalt Compactor Roller (6 tons)	offroad	1	130	5	46.3	4.33	5	1003	6		6		6018		1204		0.07777	0.43431	0.52038	0.00079	0.03809	0.03504	67.93	0.00702	0.00312	69.04
Hydraulic Crane	offroad	1	270	5	46.3	4.33	5	1003	6		6		6018		1204		0.08646	0.27056	0.70619	0.00130	0.02441	0.02245	117.59	0.00780	0.00347	118.83
Hydroseeder (3,000 gal)	offroad	1	30	5	46.3	4.33	5	1003	6		6		6018		1204		0.02723	0.09811	0.13230	0.00021	0.00654	0.00601	16.63	0.00246	0.00109	17.02
Dump Trucks (12-20 CY)	onroad HD	2		5	46.3	4.33	5	1003		20		40		40120		8024	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Water Tanker (5,000 gal)	onroad HD	1		5	46.3	4.33	5	1003		20		20		20060		4012	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Flatbed Trucks	onroad MD	2		5	46.3	4.33	5	1003		50		100		100300		20060	0.00150	0.00998	0.01070	0.00003	0.00043	0.00035	2.84	0.00007	0.00006	2.86
Pickup Trucks (worker transportation)	onroad LD	6		5	46.3	4.33	5	1003		50		300		300900		60180	0.00060	0.00538	0.00051	0.00001	0.00009	0.00006	1.11	0.00005	0.00008	1.13

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot
Reach 4																				
Hydraulic Excavator, Crawler (2 CY Bucket)	1.098	7.183	7.203	0.016	0.351	0.323	1458.2	0.099	0.044	1473.9	545.7	3570.0	3579.8	8.2	174.3	160.3	724708	49.2	21.9	732527
Vibratory / Static Roller (Single Drum)	0.440	2.138	2.420	0.004	0.192	0.177	297.4	0.040	0.018	303.7	218.9	1062.5	1202.9	1.8	95.4	87.8	147784	19.8	8.8	150920
Front End Loader (2.6 – 3.8 CY Bucket)	0.581	3.152	4.225	0.008	0.199	0.183	723.2	0.052	0.023	731.5	288.9	1566.4	2100.0	4.0	98.9	91.0	359437	26.1	11.6	363576
Hydraulic Excavator (0.5 – 2 CY)	0.549	3.592	3.601	0.008	0.175	0.161	729.1	0.050	0.022	736.9	272.9	1785.0	1789.9	4.1	87.1	80.2	362354	24.6	10.9	366263
Tractor Crawler / Dozer	0.842	2.828	6.671	0.011	0.263	0.242	960.8	0.076	0.034	972.9	418.7	1405.3	3315.6	5.4	130.7	120.3	477535	37.8	16.8	483533
Pavment Breaker	0.350	2.378	2.281	0.004	0.145	0.133	349.2	0.032	0.014	354.2	174.2	1181.8	1133.5	2.1	72.1	66.3	173554	15.7	7.0	176049
Air Compressor	0.347	1.560	1.601	0.002	0.126	0.116	197.1	0.031	0.014	202.1	172.5	775.4	795.6	1.2	62.6	57.6	97953	15.6	6.9	100424
Backhoe (0.8 CY)	0.286	2.065	1.930	0.004	0.130	0.120	310.4	0.026	0.011	314.5	142.3	1026.3	959.0	1.8	64.6	59.4	154253	12.8	5.7	156291
Grader	0.602	3.565	3.894	0.006	0.264	0.243	556.6	0.054	0.024	565.2	299.3	1772.0	1935.5	3.2	131.4	120.9	276632	27.0	12.0	280920
Asphalt Compactor Roller (6 tons)	0.467	2.606	3.122	0.005	0.229	0.210	407.6	0.042	0.019	414.2	231.9	1295.1	1551.8	2.3	113.6	104.5	202557	20.9	9.3	205879
Hydraulic Crane	0.519	1.623	4.237	0.008	0.146	0.135	705.6	0.047	0.021	713.0	257.8	806.8	2105.9	3.9	72.8	67.0	350666	23.3	10.3	354360
Hydroseeder (3,000 gal)	0.163	0.589	0.794	0.001	0.039	0.036	99.8	0.015	0.007	102.1	81.2	292.6	394.5	0.6	19.5	17.9	49585	7.3	3.3	50749
Dump Trucks (12-20 CY)	0.058	0.260	0.676	0.002	0.034	0.028	168.3	0.003	0.003	169.2	28.9	129.3	336.0	0.8	16.9	13.9	83659	1.3	1.3	84077
Water Tanker (5,000 gal)	0.029	0.130	0.338	0.001	0.017	0.014	84.2	0.001	0.001	84.6	14.4	64.7	168.0	0.4	8.4	6.9	41830	0.7	0.6	42039
Flatbed Trucks	0.150	0.998	1.070	0.003	0.043	0.035	284.0	0.007	0.006	286.1	74.7	496.1	531.8	1.4	21.4	17.2	141150	3.3	3.1	142186
Pickup Trucks (worker transportation)	0.120	1.076	0.103	0.002	0.019	0.012	221.3	0.011	0.016	226.6	59.7	534.7	51.0	1.1	9.4	6.2	109964	5.3	8.2	112615
Reach 5																				
Hydraulic Excavator, Crawler (2 CY Bucket)	1.647	10.775	10.804	0.025	0.526	0.484	2187.2	0.149	0.066	2210.8	367.3	2402.7	2409.3	5.5	117.3	107.9	487756	33.1	14.7	493019
Vibratory / Static Roller (Single Drum)	0.440	2.138	2.420	0.004	0.192	0.177	297.4	0.040	0.018	303.7	98.2	476.7	539.7	0.8	42.8	39.4	66309	8.9	3.9	67717
Front End Loader (2.6 – 3.8 CY Bucket)	0.581	3.152	4.225	0.008	0.199	0.183	723.2	0.052	0.023	731.5	129.6	702.8	942.2	1.8	44.4	40.8	161277	11.7	5.2	163134
Hydraulic Excavator (0.5 – 2 CY)	0.549	3.592	3.601	0.008	0.175	0.161	729.1	0.050	0.022	736.9	122.4	800.9	803.1	1.8	39.1	36.0	162585	11.0	4.9	164340
Tractor Crawler / Dozer	0.842	2.828	6.671	0.011	0.263	0.242	960.8	0.076	0.034	972.9	187.9	630.6	1487.7	2.4	58.7	54.0	214266	17.0	7.5	216957
Pavment Breaker																				
Air Compressor																				
Backhoe (0.8 CY)	0.286	2.065	1.930	0.004	0.130	0.120	310.4	0.026	0.011	314.5	63.8	460.5	430.3	0.8	29.0	26.7	69212	5.8	2.6	70127
Grader	0.602	3.565	3.894	0.006	0.264	0.243	556.6	0.054	0.024	565.2	134.3	795.1	868.4	1.4	59.0	54.3	124123	12.1	5.4	126047
Asphalt Compactor Roller (6 tons)	0.467	2.606	3.122	0.005	0.229	0.210	407.6	0.042	0.019	414.2	104.1	581.1	696.3	1.1	51.0	46.9	90886	9.4	4.2	92376
Hydraulic Crane	0.519	1.623	4.237	0.008	0.146	0.135	705.6	0.047	0.021	713.0	115.7	362.0	944.9	1.7	32.7	30.0	157341	10.4	4.6	158998
Hydroseeder (3,000 gal)	0.163	0.589	0.794	0.001	0.039	0.036	99.8	0.015	0.007	102.1	36.4	131.3	177.0	0.3	8.7	8.0	22249	3.3	1.5	22770
Dump Trucks (12-20 CY)	0.058	0.260	0.676	0.002	0.034	0.028	168.3	0.003	0.003	169.2	13.0	58.0	150.8	0.4	7.6	6.2	37537	0.6	0.6	37725
Water Tanker (5,000 gal)	0.029	0.130	0.338	0.001	0.017	0.014	84.2	0.001	0.001	84.6	6.5	29.0	75.4	0.2	3.8	3.1	18769	0.3	0.3	18862
Flatbed Trucks	0.150	0.998	1.070	0.003	0.043	0.035	284.0	0.007	0.006	286.1	33.5	222.6	238.6	0.6	9.6	7.7	63333	1.5	1.4	63798
Pickup Trucks (worker transportation)	0.180	1.614	0.154	0.003	0.028	0.019	331.9	0.016	0.025	339.9	40.2	359.8	34.3	0.7	6.3	4.1	74010	3.5	5.5	75794
Reach 6																				
Hydraulic Excavator, Crawler (2 CY Bucket)	1.647	10.775	10.804	0.025	0.526	0.484	2187.2	0.149	0.066	2210.8	1652.1	10806.9	10836.6	24.7	527.5	485.3	2193810	149.1	66.3	2217478
Vibratory / Static Roller (Single Drum)	0.440	2.138	2.420	0.004	0.192	0.177	297.4	0.040	0.018	303.7	441.8	2144.3	2427.6	3.6	192.5	177.1	298244	39.9	17.7	304573
Front End Loader (2.6 – 3.8 CY Bucket)	0.581	3.152	4.225	0.008	0.199	0.183	723.2	0.052	0.023	731.5	583.1	3161.1	4238.0	8.2	199.7	183.7	725384	52.6	23.4	733737
Hydraulic Excavator (0.5 – 2 CY)	0.549	3.592	3.601	0.008	0.175	0.161	729.1	0.050	0.022	736.9	550.7	3602.3	3612.2	8.2	175.8	161.8	731270	49.7	22.1	739159
Tractor Crawler / Dozer	0.842	2.828	6.671	0.011	0.263	0.242	960.8	0.076	0.034	972.9	845.0	2836.1	6691.2	10.8	263.8	242.7	963717	76.2	33.9	975822
Pavment Breaker																				
Air Compressor																				
Backhoe (0.8 CY)	0.286	2.065	1.930	0.004	0.130	0.120	310.4	0.026	0.011	314.5	287.1	2071.2	1935.3	3.7	130.3	119.9	311299	25.9	11.5	315413
Grader	0.602	3.565	3.894	0.006	0.264	0.243	556.6	0.054	0.024	565.2	604.0	3576.0	3906.1	6.4	265.2	244.0	558273	54.5	24.2	566927
Asphalt Compactor Roller (6 tons)	0.467	2.606	3.122	0.005	0.229	0.210	407.6	0.042	0.019	414.2	468.0	2613.7	3131.7	4.7	229.2	210.9	408781	42.2	18.8	415487
Hydraulic Crane	0.519	1.623	4.237	0.008	0.146	0.135	705.6	0.047	0.021	713.0	520.3	1628.2	4249.9	7.8	146.9	135.1	707682	46.9	20.9	715136
Hydroseeder (3,000 gal)	0.163	0.589	0.794	0.001	0.039	0.036	99.8	0.015	0.007	102.1	163.9	590.4	796.2	1.3	39.3	36.2	100069	14.8	6.6	102416
Dump Trucks (12-20 CY)	0.058	0.260	0.676	0.002	0.034	0.028	168.3	0.003	0.003	169.2	58.3	261.0	678.2	1.6	34.1	28.0	168833	2.7	2.5	169677
Water Tanker (5,000 gal)	0.029	0.130	0.338	0.001	0.017	0.014	84.2	0.001	0.001	84.6	29.1	130.5	339.1	0.8	17.0	14.0	84417	1.3	1.3	84838
Flatbed Trucks	0.150	0.998	1.070	0.003	0.043	0.035	284.0	0.007	0.006	286.1	150.7	1001.1	1073.2	2.7	43.3	34.7	284857	6.7	6.3	286947
Pickup Trucks (worker transportation)	0.180	1.614	0.154	0.003	0.028	0.019	331.9	0.016	0.025	339.9	180.9	1618.5	154.4	3.2	28.4	18.6	332878	15.9	24.8	340904

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
Reach 4										
Hydraulic Excavator, Crawler (2 CY Bucket)	181.9	1190.0	1193.3	2.7	58.1	53.4	241569	16.4	7.3	244176
Vibratory / Static Roller (Single Drum)	73.0	354.2	401.0	0.6	31.8	29.3	49261	6.6	2.9	50307
Front End Loader (2.6 – 3.8 CY Bucket)	96.3	522.1	700.0	1.3	33.0	30.3	119812	8.7	3.9	121192
Hydraulic Excavator (0.5 – 2 CY)	91.0	595.0	596.6	1.4	29.0	26.7	120785	8.2	3.6	122088
Tractor Crawler / Dozer	139.6	468.4	1105.2	1.8	43.6	40.1	159178	12.6	5.6	161178
Pavment Breaker	58.1	393.9	377.8	0.7	24.0	22.1	57851	5.2	2.3	58683
Air Compressor	57.5	258.5	265.2	0.4	20.9	19.2	32651	5.2	2.3	33475
Backhoe (0.8 CY)	47.4	342.1	319.7	0.6	21.5	19.8	51418	4.3	1.9	52097
Grader	99.8	590.7	645.2	1.1	43.8	40.3	92211	9.0	4.0	93640
Asphalt Compactor Roller (6 tons)	77.3	431.7	517.3	0.8	37.9	34.8	67519	7.0	3.1	68626
Hydraulic Crane	85.9	268.9	702.0	1.3	24.3	22.3	116889	7.8	3.4	118120
Hydroseeder (3,000 gal)	27.1	97.5	131.5	0.2	6.5	6.0	16528	2.4	1.1	16916
Dump Trucks (12-20 CY)	9.6	43.1	112.0	0.3	5.6	4.6	27886	0.4	0.4	28026
Water Tanker (5,000 gal)	4.8	21.6	56.0	0.1	2.8	2.3	13943	0.2	0.2	14013
Flatbed Trucks	24.9	165.4	177.3	0.5	7.1	5.7	47050	1.1	1.0	47395
Pickup Trucks (worker transportation)	19.9	178.2	17.0	0.4	3.1	2.1	36655	1.8	2.7	37538
Reach 5										
Hydraulic Excavator, Crawler (2 CY Bucket)	183.7	1201.4	1204.7	2.7	58.6	54.0	243878	16.6	7.4	246509
Vibratory / Static Roller (Single Drum)	49.1	238.4	269.9	0.4	21.4	19.7	33155	4.4	2.0	33858
Front End Loader (2.6 – 3.8 CY Bucket)	64.8	351.4	471.1	0.9	22.2	20.4	80638	5.8	2.6	81567
Hydraulic Excavator (0.5 – 2 CY)	61.2	400.5	401.6	0.9	19.5	18.0	81293	5.5	2.5	82170
Tractor Crawler / Dozer	93.9	315.3	743.8	1.2	29.3	27.0	107133	8.5	3.8	108479
Pavment Breaker										
Air Compressor										
Backhoe (0.8 CY)	31.9	230.3	215.1	0.4	14.5	13.3	34606	2.9	1.3	35063
Grader	67.1	397.5	434.2	0.7	29.5	27.1	62061	6.1	2.7	63023
Asphalt Compactor Roller (6 tons)	52.0	290.6	348.1	0.5	25.5	23.4	45443	4.7	2.1	46188
Hydraulic Crane	57.8	181.0	472.4	0.9	16.3	15.0	78671	5.2	2.3	79499
Hydroseeder (3,000 gal)	18.2	65.6	88.5	0.1	4.4	4.0	11124	1.6	0.7	11385
Dump Trucks (12-20 CY)	6.5	29.0	75.4	0.2	3.8	3.1	18769	0.3	0.3	18862
Water Tanker (5,000 gal)	3.2	14.5	37.7	0.1	1.9	1.6	9384	0.1	0.1	9431
Flatbed Trucks	16.8	111.3	119.3	0.3	4.8	3.9	31667	0.7	0.7	31899
Pickup Trucks (worker transportation)	20.1	179.9	17.2	0.4	3.2	2.1	37005	1.8	2.8	37897
Reach 6										
Hydraulic Excavator, Crawler (2 CY Bucket)	330.4	2161.4	2167.3	4.9	105.5	97.1	438762	29.8	13.3	443496
Vibratory / Static Roller (Single Drum)	88.4	428.9	485.5	0.7	38.5	35.4	59649	8.0	3.5	60915
Front End Loader (2.6 – 3.8 CY Bucket)	116.6	632.2	847.6	1.6	39.9	36.7	145077	10.5	4.7	146747
Hydraulic Excavator (0.5 – 2 CY)	110.1	720.5	722.4	1.6	35.2	32.4	146254	9.9	4.4	147832
Tractor Crawler / Dozer	169.0	567.2	1338.2	2.2	52.8	48.5	192743	15.2	6.8	195164
Pavment Breaker										
Air Compressor										
Backhoe (0.8 CY)	57.4	414.2	387.1	0.7	26.1	24.0	62260	5.2	2.3	63083
Grader	120.8	715.2	781.2	1.3	53.0	48.8	111655	10.9	4.8	113385
Asphalt Compactor Roller (6 tons)	93.6	522.7	626.3	0.9	45.8	42.2	81756	8.4	3.8	83097
Hydraulic Crane	104.1	325.6	850.0	1.6	29.4	27.0	141536	9.4	4.2	143027
Hydroseeder (3,000 gal)	32.8	118.1	159.2	0.3	7.9	7.2	20014	3.0	1.3	20483
Dump Trucks (12-20 CY)	11.7	52.2	135.6	0.3	6.8	5.6	33767	0.5	0.5	33935
Water Tanker (5,000 gal)	5.8	26.1	67.8	0.2	3.4	2.8	16883	0.3	0.3	16968
Flatbed Trucks	30.1	200.2	214.6	0.5	8.7	6.9	56971	1.3	1.3	57389
Pickup Trucks (worker transportation)	36.2	323.7	30.9	0.6	5.7	3.7	66576	3.2	5.0	68181

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles			Offroad	Planned Schedule				Duration	Offroad	Onroad	Daily Max		Project Total		Annual Averag		ROG	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	Category	Qty.	BHP	years	months	wks/mo	days/wk	days	hrs/day	mi/day	hours	VMT	hours	VMT	hours	VMT	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit
Reach 7a								290																		
Hydraulic Excavator, Crawler (2 CY Bucket)	offroad	3	190	2	13.4	4.33	5	290	6		18		5220		2610		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Vibratory / Static Roller (Single Drum)	offroad	1	100	2	13.4	4.33	5	290	6		6		1740		870		0.07342	0.35631	0.40339	0.00059	0.03199	0.02943	49.56	0.00662	0.00294	50.61
Front End Loader (2.6 – 3.8 CY Bucket)	offroad	1	200	2	13.4	4.33	5	290	6		6		1740		870		0.09689	0.52527	0.70422	0.00136	0.03318	0.03052	120.54	0.00874	0.00389	121.92
Hydraulic Excavator (0.5 – 2 CY)	offroad	1	190	2	13.4	4.33	5	290	6		6		1740		870		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Tractor Crawler / Dozer	offroad	1	240	2	13.4	4.33	5	290	6		6		1740		870		0.14041	0.47127	1.11186	0.00180	0.04384	0.04033	160.14	0.01267	0.00563	162.15
Pavment Breaker	offroad		90	2	13.4	4.33	5	290									0.05841	0.39630	0.38013	0.00070	0.02417	0.02224	58.20	0.00527	0.00234	59.04
Air Compressor	offroad		80	2	13.4	4.33	5	290									0.05786	0.26003	0.26680	0.00040	0.02101	0.01933	32.85	0.00522	0.00232	33.68
Backhoe (0.8 CY)	offroad	1	120	2	13.4	4.33	5	290	6		6		1740		870		0.04771	0.34418	0.32159	0.00061	0.02166	0.01992	51.73	0.00430	0.00191	52.41
Grader	offroad	1	140	2	13.4	4.33	5	290	6		6		1740		870		0.10037	0.59422	0.64906	0.00107	0.04407	0.04055	92.77	0.00906	0.00403	94.21
Asphalt Compactor Roller (6 tons)	offroad	1	130	2	13.4	4.33	5	290	6		6		1740		870		0.07777	0.43431	0.52038	0.00079	0.03809	0.03504	67.93	0.00702	0.00312	69.04
Hydraulic Crane	offroad	1	270	2	13.4	4.33	5	290	6		6		1740		870		0.08646	0.27056	0.70619	0.00130	0.02441	0.02245	117.59	0.00780	0.00347	118.83
Hydroseeder (3,000 gal)	offroad	1	30	2	13.4	4.33	5	290	6		6		1740		870		0.02723	0.09811	0.13230	0.00021	0.00654	0.00601	16.63	0.00246	0.00109	17.02
Dump Trucks (12-20 CY)	onroad HD	2		2	13.4	4.33	5	290		20		40		11600		5800	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Water Tanker (5,000 gal)	onroad HD	1		2	13.4	4.33	5	290		20		20		5800		2900	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Flatbed Trucks	onroad MD	2		2	13.4	4.33	5	290		50		100		29000		14500	0.00150	0.00998	0.01070	0.00003	0.00043	0.00035	2.84	0.00007	0.00006	2.86
Pickup Trucks (worker transportation)	onroad LD	6		2	13.4	4.33	5	290		50		300		87000		43500	0.00060	0.00538	0.00051	0.00001	0.00009	0.00006	1.11	0.00005	0.00008	1.13
Reach 7b								496																		
Hydraulic Excavator, Crawler (2 CY Bucket)	offroad	2	190	3	22.9	4.33	5	496	6		12		5952		1984		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Vibratory / Static Roller (Single Drum)	offroad	1	100	3	22.9	4.33	5	496	6		6		2976		992		0.07342	0.35631	0.40339	0.00059	0.03199	0.02943	49.56	0.00662	0.00294	50.61
Front End Loader (2.6 – 3.8 CY Bucket)	offroad	1	200	3	22.9	4.33	5	496	6		6		2976		992		0.09689	0.52527	0.70422	0.00136	0.03318	0.03052	120.54	0.00874	0.00389	121.92
Hydraulic Excavator (0.5 – 2 CY)	offroad	1	190	3	22.9	4.33	5	496	6		6		2976		992		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Tractor Crawler / Dozer	offroad	1	240	3	22.9	4.33	5	496	6		6		2976		992		0.14041	0.47127	1.11186	0.00180	0.04384	0.04033	160.14	0.01267	0.00563	162.15
Pavment Breaker	offroad		90	3	22.9	4.33	5	496									0.05841	0.39630	0.38013	0.00070	0.02417	0.02224	58.20	0.00527	0.00234	59.04
Air Compressor	offroad		80	3	22.9	4.33	5	496									0.05786	0.26003	0.26680	0.00040	0.02101	0.01933	32.85	0.00522	0.00232	33.68
Backhoe (0.8 CY)	offroad	1	120	3	22.9	4.33	5	496	6		6		2976		992		0.04771	0.34418	0.32159	0.00061	0.02166	0.01992	51.73	0.00430	0.00191	52.41
Grader	offroad	1	140	3	22.9	4.33	5	496	6		6		2976		992		0.10037	0.59422	0.64906	0.00107	0.04407	0.04055	92.77	0.00906	0.00403	94.21
Asphalt Compactor Roller (6 tons)	offroad	1	130	3	22.9	4.33	5	496	6		6		2976		992		0.07777	0.43431	0.52038	0.00079	0.03809	0.03504	67.93	0.00702	0.00312	69.04
Hydraulic Crane	offroad	1	270	3	22.9	4.33	5	496	6		6		2976		992		0.08646	0.27056	0.70619	0.00130	0.02441	0.02245	117.59	0.00780	0.00347	118.83
Hydroseeder (3,000 gal)	offroad	1	30	3	22.9	4.33	5	496	6		6		2976		992		0.02723	0.09811	0.13230	0.00021	0.00654	0.00601	16.63	0.00246	0.00109	17.02
Dump Trucks (12-20 CY)	onroad HD	2		3	22.9	4.33	5	496		20		40		19840		6613	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Water Tanker (5,000 gal)	onroad HD	1		3	22.9	4.33	5	496		20		20		9920		3307	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Flatbed Trucks	onroad MD	2		3	22.9	4.33	5	496		50		100		49600		16533	0.00150	0.00998	0.01070	0.00003	0.00043	0.00035	2.84	0.00007	0.00006	2.86
Pickup Trucks (worker transportation)	onroad LD	4		3	22.9	4.33	5	496		50		200		99200		33067	0.00060	0.00538	0.00051	0.00001	0.00009	0.00006	1.11	0.00005	0.00008	1.13
Reach 8 - NRCS Alternative								735																		
Hydraulic Excavator, Crawler (2 CY Bucket)	offroad	3	190	4	33.9	4.33	5	735	6		18		13230		3308		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Vibratory / Static Roller (Single Drum)	offroad	1	100	4	33.9	4.33	5	735	6		6		4410		1103		0.07342	0.35631	0.40339	0.00059	0.03199	0.02943	49.56	0.00662	0.00294	50.61
Front End Loader (2.6 – 3.8 CY Bucket)	offroad	1	200	4	33.9	4.33	5	735	6		6		4410		1103		0.09689	0.52527	0.70422	0.00136	0.03318	0.03052	120.54	0.00874	0.00389	121.92
Hydraulic Excavator (0.5 – 2 CY)	offroad	1	190	4	33.9	4.33	5	735	6		6		4410		1103		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Tractor Crawler / Dozer	offroad	1	240	4	33.9	4.33	5	735	6		6		4410		1103		0.14041	0.47127	1.11186	0.00180	0.04384	0.04033	160.14	0.01267	0.00563	162.15
Pavment Breaker	offroad		90	4	33.9	4.33	5	735									0.05841	0.39630	0.38013	0.00070	0.02417	0.02224	58.20	0.00527	0.00234	59.04
Air Compressor	offroad		80	4	33.9	4.33	5	735									0.05786	0.26003	0.26680	0.00040	0.02101	0.01933	32.85	0.00522	0.00232	33.68
Backhoe (0.8 CY)	offroad	1	120	4	33.9	4.33	5	735	6		6		4410		1103		0.04771	0.34418	0.32159	0.00061	0.02166	0.01992	51.73	0.00430	0.00191	52.41
Grader	offroad	1	140	4	33.9	4.33	5	735	6		6		4410		1103		0.10037	0.59422	0.64906	0.00107	0.04407	0.04055	92.77	0.00906	0.00403	94.21
Asphalt Compactor Roller (6 tons)	offroad	1	130	4	33.9	4.33	5	735	6		6		4410		1103		0.07777	0.43431	0.52038	0.00079	0.03809	0.03504	67.93	0.00702	0.00312	69.04
Hydraulic Crane	offroad	1	270	4	33.9	4.33	5	735	6		6		4410		1103		0.08646	0.27056	0.70619	0.00130	0.02441	0.02245	117.59	0.00780	0.00347	118.83
Hydroseeder (3,000 gal)	offroad	1	30	4	33.9	4.33	5	735	6		6		4410		1103		0.02723	0.09811	0.13230	0.00021	0.00654	0.00601	16.63	0.00246	0.00109	17.02
Dump Trucks (12-20 CY)	onroad HD	2		4	33.9	4.33	5	735		20		40		29400		7350	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Water Tanker (5,000 gal)	onroad HD	1		4	33.9	4.33	5	735		20		20		14700		3675	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Flatbed Trucks	onroad MD	2		4	33.9	4.33	5	735		50		100		73500		18375	0.00150	0.00998	0.01070	0.00003	0.00043	0.00035	2.84	0.00007	0.00006	2.86
Pickup Trucks (worker transportation)	onroad LD	6		4	33.9	4.33	5	735		50		300		220500		55125	0.00060	0.00538	0.00051	0.00001	0.00009	0.00006	1.11	0.00005	0.00008	1.13

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot
Reach 7a					0.526	as DPM														
Hydraulic Excavator, Crawler (2 CY Bucket)	1.647	10.775	10.804	0.025	0.526	0.484	2187.2	0.149	0.066	2210.8	477.7	3124.6	3133.2	7.1	152.5	140.3	634302	43.1	19.2	641145
Vibratory / Static Roller (Single Drum)	0.440	2.138	2.420	0.004	0.192	0.177	297.4	0.040	0.018	303.7	127.7	620.0	701.9	1.0	55.7	51.2	86232	11.5	5.1	88062
Front End Loader (2.6 – 3.8 CY Bucket)	0.581	3.152	4.225	0.008	0.199	0.183	723.2	0.052	0.023	731.5	168.6	914.0	1225.3	2.4	57.7	53.1	209732	15.2	6.8	212147
Hydraulic Excavator (0.5 – 2 CY)	0.549	3.592	3.601	0.008	0.175	0.161	729.1	0.050	0.022	736.9	159.2	1041.5	1044.4	2.4	50.8	46.8	211434	14.4	6.4	213715
Tractor Crawler / Dozer	0.842	2.828	6.671	0.011	0.263	0.242	960.8	0.076	0.034	972.9	244.3	820.0	1934.6	3.1	76.3	70.2	278642	22.0	9.8	282142
Pavment Breaker																				
Air Compressor																				
Backhoe (0.8 CY)	0.286	2.065	1.930	0.004	0.130	0.120	310.4	0.026	0.011	314.5	83.0	598.9	559.6	1.1	37.7	34.7	90007	7.5	3.3	91196
Grader	0.602	3.565	3.894	0.006	0.264	0.243	556.6	0.054	0.024	565.2	174.6	1034.0	1129.4	1.9	76.7	70.6	161415	15.8	7.0	163917
Asphalt Compactor Roller (6 tons)	0.467	2.606	3.122	0.005	0.229	0.210	407.6	0.042	0.019	414.2	135.3	755.7	905.5	1.4	66.3	61.0	118192	12.2	5.4	120131
Hydraulic Crane	0.519	1.623	4.237	0.008	0.146	0.135	705.6	0.047	0.021	713.0	150.4	470.8	1228.8	2.3	42.5	39.1	204614	13.6	6.0	206769
Hydroseeder (3,000 gal)	0.163	0.589	0.794	0.001	0.039	0.036	99.8	0.015	0.007	102.1	47.4	170.7	230.2	0.4	11.4	10.5	28933	4.3	1.9	29612
Dump Trucks (12-20 CY)	0.058	0.260	0.676	0.002	0.034	0.028	168.3	0.003	0.003	169.2	16.8	75.5	196.1	0.5	9.8	8.1	48815	0.8	0.7	49059
Water Tanker (5,000 gal)	0.029	0.130	0.338	0.001	0.017	0.014	84.2	0.001	0.001	84.6	8.4	37.7	98.0	0.2	4.9	4.0	24408	0.4	0.4	24530
Flatbed Trucks	0.150	0.998	1.070	0.003	0.043	0.035	284.0	0.007	0.006	286.1	43.6	289.4	310.3	0.8	12.5	10.0	82361	1.9	1.8	82966
Pickup Trucks (worker transportation)	0.180	1.614	0.154	0.003	0.028	0.019	331.9	0.016	0.025	339.9	52.3	468.0	44.6	0.9	8.2	5.4	96246	4.6	7.2	98566
Reach 7b					0.351	as DPM														
Hydraulic Excavator, Crawler (2 CY Bucket)	1.098	7.183	7.203	0.016	0.351	0.323	1458.2	0.099	0.044	1473.9	544.7	3562.8	3572.6	8.1	173.9	160.0	723250	49.1	21.8	731053
Vibratory / Static Roller (Single Drum)	0.440	2.138	2.420	0.004	0.192	0.177	297.4	0.040	0.018	303.7	218.5	1060.4	1200.5	1.8	95.2	87.6	147486	19.7	8.8	150616
Front End Loader (2.6 – 3.8 CY Bucket)	0.581	3.152	4.225	0.008	0.199	0.183	723.2	0.052	0.023	731.5	288.3	1563.2	2095.8	4.0	98.7	90.8	358714	26.0	11.6	362845
Hydraulic Excavator (0.5 – 2 CY)	0.549	3.592	3.601	0.008	0.175	0.161	729.1	0.050	0.022	736.9	272.3	1781.4	1786.3	4.1	87.0	80.0	361625	24.6	10.9	365527
Tractor Crawler / Dozer	0.842	2.828	6.671	0.011	0.263	0.242	960.8	0.076	0.034	972.9	417.9	1402.5	3308.9	5.4	130.5	120.0	476574	37.7	16.8	482560
Pavment Breaker																				
Air Compressor																				
Backhoe (0.8 CY)	0.286	2.065	1.930	0.004	0.130	0.120	310.4	0.026	0.011	314.5	142.0	1024.3	957.1	1.8	64.5	59.3	153943	12.8	5.7	155977
Grader	0.602	3.565	3.894	0.006	0.264	0.243	556.6	0.054	0.024	565.2	298.7	1768.4	1931.6	3.2	131.2	120.7	276075	27.0	12.0	280355
Asphalt Compactor Roller (6 tons)	0.467	2.606	3.122	0.005	0.229	0.210	407.6	0.042	0.019	414.2	231.5	1292.5	1548.7	2.3	113.3	104.3	202149	20.9	9.3	205465
Hydraulic Crane	0.519	1.623	4.237	0.008	0.146	0.135	705.6	0.047	0.021	713.0	257.3	805.2	2101.6	3.9	72.6	66.8	349961	23.2	10.3	353647
Hydroseeder (3,000 gal)	0.163	0.589	0.794	0.001	0.039	0.036	99.8	0.015	0.007	102.1	81.0	292.0	393.7	0.6	19.5	17.9	49486	7.3	3.2	50646
Dump Trucks (12-20 CY)	0.058	0.260	0.676	0.002	0.034	0.028	168.3	0.003	0.003	169.2	28.8	129.1	335.4	0.8	16.8	13.8	83491	1.3	1.3	83908
Water Tanker (5,000 gal)	0.029	0.130	0.338	0.001	0.017	0.014	84.2	0.001	0.001	84.6	14.4	64.5	167.7	0.4	8.4	6.9	41745	0.7	0.6	41954
Flatbed Trucks	0.150	0.998	1.070	0.003	0.043	0.035	284.0	0.007	0.006	286.1	74.5	495.1	530.7	1.4	21.4	17.2	140866	3.3	3.1	141900
Pickup Trucks (worker transportation)	0.120	1.076	0.103	0.002	0.019	0.012	221.3	0.011	0.016	226.6	59.6	533.6	50.9	1.1	9.4	6.1	109742	5.3	8.2	112388
Reach 8 - NRCS Alternative					0.526	as DPM														
Hydraulic Excavator, Crawler (2 CY Bucket)	1.647	10.775	10.804	0.025	0.526	0.484	2187.2	0.149	0.066	2210.8	1210.6	7919.3	7941.1	18.1	386.6	355.7	1607628	109.2	48.5	1624972
Vibratory / Static Roller (Single Drum)	0.440	2.138	2.420	0.004	0.192	0.177	297.4	0.040	0.018	303.7	323.8	1571.3	1778.9	2.6	141.1	129.8	218553	29.2	13.0	223192
Front End Loader (2.6 – 3.8 CY Bucket)	0.581	3.152	4.225	0.008	0.199	0.183	723.2	0.052	0.023	731.5	427.3	2316.5	3105.6	6.0	146.3	134.6	531562	38.6	17.1	537683
Hydraulic Excavator (0.5 – 2 CY)	0.549	3.592	3.601	0.008	0.175	0.161	729.1	0.050	0.022	736.9	403.5	2639.8	2647.0	6.0	128.9	118.6	535876	36.4	16.2	541657
Tractor Crawler / Dozer	0.842	2.828	6.671	0.011	0.263	0.242	960.8	0.076	0.034	972.9	619.2	2078.3	4903.3	7.9	193.3	177.9	706213	55.9	24.8	715084
Pavment Breaker																				
Air Compressor																				
Backhoe (0.8 CY)	0.286	2.065	1.930	0.004	0.130	0.120	310.4	0.026	0.011	314.5	210.4	1517.8	1418.2	2.7	95.5	87.9	228121	19.0	8.4	231135
Grader	0.602	3.565	3.894	0.006	0.264	0.243	556.6	0.054	0.024	565.2	442.6	2620.5	2862.4	4.7	194.4	178.8	409104	39.9	17.8	415445
Asphalt Compactor Roller (6 tons)	0.467	2.606	3.122	0.005	0.229	0.210	407.6	0.042	0.019	414.2	343.0	1915.3	2294.9	3.5	168.0	154.5	299556	30.9	13.8	304469
Hydraulic Crane	0.519	1.623	4.237	0.008	0.146	0.135	705.6	0.047	0.021	713.0	381.3	1193.2	3114.3	5.7	107.6	99.0	518591	34.4	15.3	524053
Hydroseeder (3,000 gal)	0.163	0.589	0.794	0.001	0.039	0.036	99.8	0.015	0.007	102.1	120.1	432.7	583.4	0.9	28.8	26.5	73330	10.8	4.8	75051
Dump Trucks (12-20 CY)	0.058	0.260	0.676	0.002	0.034	0.028	168.3	0.003	0.003	169.2	42.7	191.3	497.0	1.2	25.0	20.5	123721	2.0	1.9	124339
Water Tanker (5,000 gal)	0.029	0.130	0.338	0.001	0.017	0.014	84.2	0.001	0.001	84.6	21.3	95.6	248.5	0.6	12.5	10.2	61861	1.0	0.9	62170
Flatbed Trucks	0.150	0.998	1.070	0.003	0.043	0.035	284.0	0.007	0.006	286.1	110.4	733.6	786.5	2.0	31.7	25.4	208744	4.9	4.6	210275
Pickup Trucks (worker transportation)	0.180	1.614	0.154	0.003	0.028	0.019	331.9	0.016	0.025	339.9	132.5	1186.1	113.1	2.4	20.8	13.7	243934	11.7	18.2	249815

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
Reach 7a										
Hydraulic Excavator, Crawler (2 CY Bucket)	238.8	1562.3	1566.6	3.6	76.3	70.2	317151	21.5	9.6	320573
Vibratory / Static Roller (Single Drum)	63.9	310.0	350.9	0.5	27.8	25.6	43116	5.8	2.6	44031
Front End Loader (2.6 – 3.8 CY Bucket)	84.3	457.0	612.7	1.2	28.9	26.6	104866	7.6	3.4	106074
Hydraulic Excavator (0.5 – 2 CY)	79.6	520.8	522.2	1.2	25.4	23.4	105717	7.2	3.2	106858
Tractor Crawler / Dozer	122.2	410.0	967.3	1.6	38.1	35.1	139321	11.0	4.9	141071
Pavment Breaker										
Air Compressor										
Backhoe (0.8 CY)	41.5	299.4	279.8	0.5	18.8	17.3	45003	3.7	1.7	45598
Grader	87.3	517.0	564.7	0.9	38.3	35.3	80708	7.9	3.5	81959
Asphalt Compactor Roller (6 tons)	67.7	377.9	452.7	0.7	33.1	30.5	59096	6.1	2.7	60065
Hydraulic Crane	75.2	235.4	614.4	1.1	21.2	19.5	102307	6.8	3.0	103385
Hydroseeder (3,000 gal)	23.7	85.4	115.1	0.2	5.7	5.2	14467	2.1	0.9	14806
Dump Trucks (12-20 CY)	8.4	37.7	98.0	0.2	4.9	4.0	24408	0.4	0.4	24530
Water Tanker (5,000 gal)	4.2	18.9	49.0	0.1	2.5	2.0	12204	0.2	0.2	12265
Flatbed Trucks	21.8	144.7	155.2	0.4	6.3	5.0	41181	1.0	0.9	41483
Pickup Trucks (worker transportation)	26.1	234.0	22.3	0.5	4.1	2.7	48123	2.3	3.6	49283
Reach 7b										
Hydraulic Excavator, Crawler (2 CY Bucket)	181.6	1187.6	1190.9	2.7	58.0	53.3	241083	16.4	7.3	243684
Vibratory / Static Roller (Single Drum)	72.8	353.5	400.2	0.6	31.7	29.2	49162	6.6	2.9	50205
Front End Loader (2.6 – 3.8 CY Bucket)	96.1	521.1	698.6	1.3	32.9	30.3	119571	8.7	3.9	120948
Hydraulic Excavator (0.5 – 2 CY)	90.8	593.8	595.4	1.4	29.0	26.7	120542	8.2	3.6	121842
Tractor Crawler / Dozer	139.3	467.5	1103.0	1.8	43.5	40.0	158858	12.6	5.6	160853
Pavment Breaker										
Air Compressor										
Backhoe (0.8 CY)	47.3	341.4	319.0	0.6	21.5	19.8	51314	4.3	1.9	51992
Grader	99.6	589.5	643.9	1.1	43.7	40.2	92025	9.0	4.0	93452
Asphalt Compactor Roller (6 tons)	77.2	430.8	516.2	0.8	37.8	34.8	67383	7.0	3.1	68488
Hydraulic Crane	85.8	268.4	700.5	1.3	24.2	22.3	116654	7.7	3.4	117882
Hydroseeder (3,000 gal)	27.0	97.3	131.2	0.2	6.5	6.0	16495	2.4	1.1	16882
Dump Trucks (12-20 CY)	9.6	43.0	111.8	0.3	5.6	4.6	27830	0.4	0.4	27969
Water Tanker (5,000 gal)	4.8	21.5	55.9	0.1	2.8	2.3	13915	0.2	0.2	13985
Flatbed Trucks	24.8	165.0	176.9	0.5	7.1	5.7	46955	1.1	1.0	47300
Pickup Trucks (worker transportation)	19.9	177.9	17.0	0.4	3.1	2.0	36581	1.8	2.7	37463
Reach 8 - NRCS Alternative										
Hydraulic Excavator, Crawler (2 CY Bucket)	302.7	1979.8	1985.3	4.5	96.6	88.9	401907	27.3	12.1	406243
Vibratory / Static Roller (Single Drum)	80.9	392.8	444.7	0.7	35.3	32.4	54638	7.3	3.2	55798
Front End Loader (2.6 – 3.8 CY Bucket)	106.8	579.1	776.4	1.5	36.6	33.7	132891	9.6	4.3	134421
Hydraulic Excavator (0.5 – 2 CY)	100.9	659.9	661.8	1.5	32.2	29.6	133969	9.1	4.0	135414
Tractor Crawler / Dozer	154.8	519.6	1225.8	2.0	48.3	44.5	176553	14.0	6.2	178771
Pavment Breaker										
Air Compressor										
Backhoe (0.8 CY)	52.6	379.5	354.6	0.7	23.9	22.0	57030	4.7	2.1	57784
Grader	110.7	655.1	715.6	1.2	48.6	44.7	102276	10.0	4.4	103861
Asphalt Compactor Roller (6 tons)	85.7	478.8	573.7	0.9	42.0	38.6	74889	7.7	3.4	76117
Hydraulic Crane	95.3	298.3	778.6	1.4	26.9	24.8	129648	8.6	3.8	131013
Hydroseeder (3,000 gal)	30.0	108.2	145.9	0.2	7.2	6.6	18333	2.7	1.2	18763
Dump Trucks (12-20 CY)	10.7	47.8	124.2	0.3	6.2	5.1	30930	0.5	0.5	31085
Water Tanker (5,000 gal)	5.3	23.9	62.1	0.1	3.1	2.6	15465	0.2	0.2	15542
Flatbed Trucks	27.6	183.4	196.6	0.5	7.9	6.4	52186	1.2	1.2	52569
Pickup Trucks (worker transportation)	33.1	296.5	28.3	0.6	5.2	3.4	60983	2.9	4.5	62454

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles			Offroad	Planned Schedule				Duration	Offroad	Onroad	Daily Max		Project Total		Annual Averag		ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	Category	Qty.	BHP	years	months	wks/mo	days/wk	days	hrs/day	mi/day	hours	VMT	hours	VMT	hours	VMT	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit
Reach 8 - Culvert/Channel Alternative																										
Hydraulic Excavator, Crawler (2 CY Bucket)	offroad	3	190	4	33.9	4.33	5	735	6		18		13230		3308		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Vibratory / Static Roller (Single Drum)	offroad	1	100	4	33.9	4.33	5	735	6		6		4410		1103		0.07342	0.35631	0.40339	0.00059	0.03199	0.02943	49.56	0.00662	0.00294	50.61
Front End Loader (2.6 – 3.8 CY Bucket)	offroad	1	200	4	33.9	4.33	5	735	6		6		4410		1103		0.09689	0.52527	0.70422	0.00136	0.03318	0.03052	120.54	0.00874	0.00389	121.92
Hydraulic Excavator (0.5 – 2 CY)	offroad	1	190	4	33.9	4.33	5	735	6		6		4410		1103		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Tractor Crawler / Dozer	offroad	1	240	4	33.9	4.33	5	735	6		6		4410		1103		0.14041	0.47127	1.11186	0.00180	0.04384	0.04033	160.14	0.01267	0.00563	162.15
Pavment Breaker	offroad		90	4	33.9	4.33	5	735									0.05841	0.39630	0.38013	0.00070	0.02417	0.02224	58.20	0.00527	0.00234	59.04
Air Compressor	offroad		80	4	33.9	4.33	5	735									0.05786	0.26003	0.26680	0.00040	0.02101	0.01933	32.85	0.00522	0.00232	33.68
Backhoe (0.8 CY)	offroad	1	120	4	33.9	4.33	5	735	6		6		4410		1103		0.04771	0.34418	0.32159	0.00061	0.02166	0.01992	51.73	0.00430	0.00191	52.41
Grader	offroad	1	140	4	33.9	4.33	5	735	6		6		4410		1103		0.10037	0.59422	0.64906	0.00107	0.04407	0.04055	92.77	0.00906	0.00403	94.21
Asphalt Compactor Roller (6 tons)	offroad	1	130	4	33.9	4.33	5	735	6		6		4410		1103		0.07777	0.43431	0.52038	0.00079	0.03809	0.03504	67.93	0.00702	0.00312	69.04
Hydraulic Crane	offroad	1	270	4	33.9	4.33	5	735	6		6		4410		1103		0.08646	0.27056	0.70619	0.00130	0.02441	0.02245	117.59	0.00780	0.00347	118.83
Hydroseeder (3,000 gal)	offroad	1	30	4	33.9	4.33	5	735	6		6		4410		1103		0.02723	0.09811	0.13230	0.00021	0.00654	0.00601	16.63	0.00246	0.00109	17.02
Dump Trucks (12-20 CY)	onroad HD	2		4	33.9	4.33	5	735		20		40		29400		7350	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Water Tanker (5,000 gal)	onroad HD	1		4	33.9	4.33	5	735		20		20		14700		3675	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Flatbed Trucks	onroad MD	2		4	33.9	4.33	5	735		50		100		73500		18375	0.00150	0.00998	0.01070	0.00003	0.00043	0.00035	2.84	0.00007	0.00006	2.86
Pickup Trucks (worker transportation)	onroad LD	6		4	33.9	4.33	5	735		50		300		220500		55125	0.00060	0.00538	0.00051	0.00001	0.00009	0.00006	1.11	0.00005	0.00008	1.13
Reach 8 - Tunnel Alternative																										
Hydraulic Excavator, Crawler (2 CY Bucket)	offroad	2	190	4	33.9	4.33	5	735	6		12		8820		2205		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Vibratory / Static Roller (Single Drum)	offroad	1	100	4	33.9	4.33	5	735	6		6		4410		1103		0.07342	0.35631	0.40339	0.00059	0.03199	0.02943	49.56	0.00662	0.00294	50.61
Front End Loader (2.6 – 3.8 CY Bucket)	offroad	1	200	4	33.9	4.33	5	735	6		6		4410		1103		0.09689	0.52527	0.70422	0.00136	0.03318	0.03052	120.54	0.00874	0.00389	121.92
Hydraulic Excavator (0.5 – 2 CY)	offroad	1	190	4	33.9	4.33	5	735	6		6		4410		1103		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Tractor Crawler / Dozer	offroad	1	240	4	33.9	4.33	5	735	6		6		4410		1103		0.14041	0.47127	1.11186	0.00180	0.04384	0.04033	160.14	0.01267	0.00563	162.15
Pavment Breaker	offroad		90	4	33.9	4.33	5	735									0.05841	0.39630	0.38013	0.00070	0.02417	0.02224	58.20	0.00527	0.00234	59.04
Air Compressor	offroad	1	80	4	33.9	4.33	5	735	8		8		5880		1470		0.05786	0.26003	0.26680	0.00040	0.02101	0.01933	32.85	0.00522	0.00232	33.68
Backhoe (0.8 CY)	offroad	1	120	4	33.9	4.33	5	735	6		6		4410		1103		0.04771	0.34418	0.32159	0.00061	0.02166	0.01992	51.73	0.00430	0.00191	52.41
Grader	offroad	1	140	4	33.9	4.33	5	735	6		6		4410		1103		0.10037	0.59422	0.64906	0.00107	0.04407	0.04055	92.77	0.00906	0.00403	94.21
Asphalt Compactor Roller (6 tons)	offroad	1	130	4	33.9	4.33	5	735	6		6		4410		1103		0.07777	0.43431	0.52038	0.00079	0.03809	0.03504	67.93	0.00702	0.00312	69.04
Hydraulic Crane	offroad	1	270	4	33.9	4.33	5	735	6		6		4410		1103		0.08646	0.27056	0.70619	0.00130	0.02441	0.02245	117.59	0.00780	0.00347	118.83
Hydroseeder (3,000 gal)	offroad	1	30	4	33.9	4.33	5	735	6		6		4410		1103		0.02723	0.09811	0.13230	0.00021	0.00654	0.00601	16.63	0.00246	0.00109	17.02
Dump Trucks (12-20 CY)	onroad HD	2		4	33.9	4.33	5	735		20		40		29400		7350	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Water Tanker (5,000 gal)	onroad HD	1		4	33.9	4.33	5	735		20		20		14700		3675	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Flatbed Trucks	onroad MD	2		4	33.9	4.33	5	735		50		100		73500		18375	0.00150	0.00998	0.01070	0.00003	0.00043	0.00035	2.84	0.00007	0.00006	2.86
Pickup Trucks (worker transportation)	onroad LD	8		4	33.9	4.33	5	735		50		400		294000		73500	0.00060	0.00538	0.00051	0.00001	0.00009	0.00006	1.11	0.00005	0.00008	1.13
Vibratory / Sheet Pile Driver	offroad	1	280	4	33.9	4.33	5	735	6		6		4410		1103		0.08318	0.55163	0.64262	0.00162	0.02713	0.02496	154.24	0.00751	0.00334	155.43
Impact Pile Driver	offroad	1	280	4	33.9	4.33	5	735	6		6		4410		1103		0.08318	0.55163	0.64262	0.00162	0.02713	0.02496	154.24	0.00751	0.00334	155.43
Drilling Jumbo	offroad	1	60	4	33.9	4.33	5	735	8		8		5880		1470		0.02266	0.25656	0.21306	0.00047	0.00514	0.00473	37.62	0.00204	0.00091	37.95
Roadheader	offroad	1	100	4	33.9	4.33	5	735	8		8		5880		1470		0.07565	0.37558	0.40931	0.00060	0.03318	0.03053	50.52	0.00683	0.00303	51.61
Load/Haul/Dump (Mucking) Unit	offroad	1	120	4	33.9	4.33	5	735	8		8		5880		1470		0.07141	0.40381	0.44595	0.00069	0.03456	0.03180	58.91	0.00644	0.00286	59.94
Wheeled Loader (4.88 CY)	offroad	1	350	4	33.9	4.33	5	735	8		8		5880		1470		0.12053	0.41386	0.93056	0.00194	0.03248	0.02989	184.19	0.01088	0.00483	185.92
Spader	offroad	1	180	4	33.9	4.33	5	735	8		8		5880		1470		0.16097	0.83015	1.22145	0.00168	0.06517	0.05996	149.16	0.01452	0.00646	151.47
Pump (dewatering)	offroad	1	80	4	33.9	4.33	5	735	8		8		5880		1470		0.07143	0.36260	0.40337	0.00065	0.02768	0.02547	53.03	0.00644	0.00286	54.05
Shotcrete Pump	offroad	1	160	4	33.9	4.33	5	735	8		8		5880		1470		0.08910	0.66491	0.77125	0.00140	0.03983	0.03664	123.17	0.00804	0.00357	124.44
Shotcrete / Concrete Trucks	onroad HD	2		4	33.9	4.33	5	735		50		100		73500		18375	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot
Reach 8 - Culvert/Channel Alternative																				
Hydraulic Excavator, Crawler (2 CY Bucket)	1.647	10.775	10.804	0.025	0.526	0.484	2187.2	0.149	0.066	2210.8	1210.6	7919.3	7941.1	18.1	386.6	355.7	1607628	109.2	48.5	1624972
Vibratory / Static Roller (Single Drum)	0.440	2.138	2.420	0.004	0.192	0.177	297.4	0.040	0.018	303.7	323.8	1571.3	1778.9	2.6	141.1	129.8	218553	29.2	13.0	223192
Front End Loader (2.6 – 3.8 CY Bucket)	0.581	3.152	4.225	0.008	0.199	0.183	723.2	0.052	0.023	731.5	427.3	2316.5	3105.6	6.0	146.3	134.6	531562	38.6	17.1	537683
Hydraulic Excavator (0.5 – 2 CY)	0.549	3.592	3.601	0.008	0.175	0.161	729.1	0.050	0.022	736.9	403.5	2639.8	2647.0	6.0	128.9	118.6	535876	36.4	16.2	541657
Tractor Crawler / Dozer	0.842	2.828	6.671	0.011	0.263	0.242	960.8	0.076	0.034	972.9	619.2	2078.3	4903.3	7.9	193.3	177.9	706213	55.9	24.8	715084
Pavment Breaker																				
Air Compressor																				
Backhoe (0.8 CY)	0.286	2.065	1.930	0.004	0.130	0.120	310.4	0.026	0.011	314.5	210.4	1517.8	1418.2	2.7	95.5	87.9	228121	19.0	8.4	231135
Grader	0.602	3.565	3.894	0.006	0.264	0.243	556.6	0.054	0.024	565.2	442.6	2620.5	2862.4	4.7	194.4	178.8	409104	39.9	17.8	415445
Asphalt Compactor Roller (6 tons)	0.467	2.606	3.122	0.005	0.229	0.210	407.6	0.042	0.019	414.2	343.0	1915.3	2294.9	3.5	168.0	154.5	299556	30.9	13.8	304469
Hydraulic Crane	0.519	1.623	4.237	0.008	0.146	0.135	705.6	0.047	0.021	713.0	381.3	1193.2	3114.3	5.7	107.6	99.0	518591	34.4	15.3	524053
Hydroseeder (3,000 gal)	0.163	0.589	0.794	0.001	0.039	0.036	99.8	0.015	0.007	102.1	120.1	432.7	583.4	0.9	28.8	26.5	73330	10.8	4.8	75051
Dump Trucks (12-20 CY)	0.058	0.260	0.676	0.002	0.034	0.028	168.3	0.003	0.003	169.2	42.7	191.3	497.0	1.2	25.0	20.5	123721	2.0	1.9	124339
Water Tanker (5,000 gal)	0.029	0.130	0.338	0.001	0.017	0.014	84.2	0.001	0.001	84.6	21.3	95.6	248.5	0.6	12.5	10.2	61861	1.0	0.9	62170
Flatbed Trucks	0.150	0.998	1.070	0.003	0.043	0.035	284.0	0.007	0.006	286.1	110.4	733.6	786.5	2.0	31.7	25.4	208744	4.9	4.6	210275
Pickup Trucks (worker transportation)	0.180	1.614	0.154	0.003	0.028	0.019	331.9	0.016	0.025	339.9	132.5	1186.1	113.1	2.4	20.8	13.7	243934	11.7	18.2	249815
Reach 8 - Tunnel Alternative																				
Hydraulic Excavator, Crawler (2 CY Bucket)	1.098	7.183	7.203	0.016	0.351	0.323	1458.2	0.099	0.044	1473.9	807.1	5279.5	5294.0	12.1	257.7	237.1	1071752	72.8	32.4	1083314
Vibratory / Static Roller (Single Drum)	0.440	2.138	2.420	0.004	0.192	0.177	297.4	0.040	0.018	303.7	323.8	1571.3	1778.9	2.6	141.1	129.8	218553	29.2	13.0	223192
Front End Loader (2.6 – 3.8 CY Bucket)	0.581	3.152	4.225	0.008	0.199	0.183	723.2	0.052	0.023	731.5	427.3	2316.5	3105.6	6.0	146.3	134.6	531562	38.6	17.1	537683
Hydraulic Excavator (0.5 – 2 CY)	0.549	3.592	3.601	0.008	0.175	0.161	729.1	0.050	0.022	736.9	403.5	2639.8	2647.0	6.0	128.9	118.6	535876	36.4	16.2	541657
Tractor Crawler / Dozer	0.842	2.828	6.671	0.011	0.263	0.242	960.8	0.076	0.034	972.9	619.2	2078.3	4903.3	7.9	193.3	177.9	706213	55.9	24.8	715084
Pavment Breaker																				
Air Compressor	0.463	2.080	2.134	0.003	0.168	0.155	262.8	0.042	0.019	269.4	340.2	1529.0	1568.8	2.4	123.5	113.6	193146	30.7	13.6	198020
Backhoe (0.8 CY)	0.286	2.065	1.930	0.004	0.130	0.120	310.4	0.026	0.011	314.5	210.4	1517.8	1418.2	2.7	95.5	87.9	228121	19.0	8.4	231135
Grader	0.602	3.565	3.894	0.006	0.264	0.243	556.6	0.054	0.024	565.2	442.6	2620.5	2862.4	4.7	194.4	178.8	409104	39.9	17.8	415445
Asphalt Compactor Roller (6 tons)	0.467	2.606	3.122	0.005	0.229	0.210	407.6	0.042	0.019	414.2	343.0	1915.3	2294.9	3.5	168.0	154.5	299556	30.9	13.8	304469
Hydraulic Crane	0.519	1.623	4.237	0.008	0.146	0.135	705.6	0.047	0.021	713.0	381.3	1193.2	3114.3	5.7	107.6	99.0	518591	34.4	15.3	524053
Hydroseeder (3,000 gal)	0.163	0.589	0.794	0.001	0.039	0.036	99.8	0.015	0.007	102.1	120.1	432.7	583.4	0.9	28.8	26.5	73330	10.8	4.8	75051
Dump Trucks (12-20 CY)	0.058	0.260	0.676	0.002	0.034	0.028	168.3	0.003	0.003	169.2	42.7	191.3	497.0	1.2	25.0	20.5	123721	2.0	1.9	124339
Water Tanker (5,000 gal)	0.029	0.130	0.338	0.001	0.017	0.014	84.2	0.001	0.001	84.6	21.3	95.6	248.5	0.6	12.5	10.2	61861	1.0	0.9	62170
Flatbed Trucks	0.150	0.998	1.070	0.003	0.043	0.035	284.0	0.007	0.006	286.1	110.4	733.6	786.5	2.0	31.7	25.4	208744	4.9	4.6	210275
Pickup Trucks (worker transportation)	0.240	2.152	0.205	0.004	0.038	0.025	442.5	0.021	0.033	453.2	176.7	1581.4	150.8	3.2	27.8	18.2	325245	15.6	24.2	333087
Vibratory / Sheet Pile Driver	0.499	3.310	3.856	0.010	0.163	0.150	925.4	0.045	0.020	932.6	366.8	2432.7	2834.0	7.1	119.6	110.1	680205	33.1	14.7	685460
Impact Pile Driver	0.499	3.310	3.856	0.010	0.163	0.150	925.4	0.045	0.020	932.6	366.8	2432.7	2834.0	7.1	119.6	110.1	680205	33.1	14.7	685460
Drilling Jumbo	0.181	2.052	1.704	0.004	0.041	0.038	301.0	0.016	0.007	303.6	133.3	1508.6	1252.8	2.8	30.3	27.8	221208	12.0	5.3	223117
Roadheader	0.605	3.005	3.274	0.005	0.265	0.244	404.2	0.055	0.024	412.9	444.8	2208.4	2406.7	3.5	195.1	179.5	297082	40.1	17.8	303455
Load/Haul/Dump (Mucking) Unit	0.571	3.230	3.568	0.006	0.276	0.254	471.3	0.052	0.023	479.5	419.9	2374.4	2622.2	4.1	203.2	187.0	346411	37.9	16.8	352427
Wheeled Loader (4.88 CY)	0.964	3.311	7.444	0.015	0.260	0.239	1473.5	0.087	0.039	1487.3	708.7	2433.5	5471.7	11.4	191.0	175.7	1083033	63.9	28.4	1093187
Spader	1.288	6.641	9.772	0.013	0.521	0.480	1193.3	0.116	0.052	1211.8	946.5	4881.3	7182.1	9.9	383.2	352.6	877089	85.4	38.0	890649
Pump (dewatering)	0.571	2.901	3.227	0.005	0.221	0.204	424.2	0.052	0.023	432.4	420.0	2132.1	2371.8	3.8	162.8	149.8	311798	37.9	16.8	317815
Shotcrete Pump	0.713	5.319	6.170	0.011	0.319	0.293	985.3	0.064	0.029	995.5	523.9	3909.7	4534.9	8.2	234.2	215.4	724221	47.3	21.0	731727
Shotcrete / Concrete Trucks	0.145	0.651	1.690	0.004	0.085	0.070	420.8	0.007	0.006	422.9	106.7	478.1	1242.4	3.0	62.4	51.2	309303	4.9	4.7	310848

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
Reach 8 - Culvert/Channel Alternative										
Hydraulic Excavator, Crawler (2 CY Bucket)	302.7	1979.8	1985.3	4.5	96.6	88.9	401907	27.3	12.1	406243
Vibratory / Static Roller (Single Drum)	80.9	392.8	444.7	0.7	35.3	32.4	54638	7.3	3.2	55798
Front End Loader (2.6 – 3.8 CY Bucket)	106.8	579.1	776.4	1.5	36.6	33.7	132891	9.6	4.3	134421
Hydraulic Excavator (0.5 – 2 CY)	100.9	659.9	661.8	1.5	32.2	29.6	133969	9.1	4.0	135414
Tractor Crawler / Dozer	154.8	519.6	1225.8	2.0	48.3	44.5	176553	14.0	6.2	178771
Pavment Breaker										
Air Compressor										
Backhoe (0.8 CY)	52.6	379.5	354.6	0.7	23.9	22.0	57030	4.7	2.1	57784
Grader	110.7	655.1	715.6	1.2	48.6	44.7	102276	10.0	4.4	103861
Asphalt Compactor Roller (6 tons)	85.7	478.8	573.7	0.9	42.0	38.6	74889	7.7	3.4	76117
Hydraulic Crane	95.3	298.3	778.6	1.4	26.9	24.8	129648	8.6	3.8	131013
Hydroseeder (3,000 gal)	30.0	108.2	145.9	0.2	7.2	6.6	18333	2.7	1.2	18763
Dump Trucks (12-20 CY)	10.7	47.8	124.2	0.3	6.2	5.1	30930	0.5	0.5	31085
Water Tanker (5,000 gal)	5.3	23.9	62.1	0.1	3.1	2.6	15465	0.2	0.2	15542
Flatbed Trucks	27.6	183.4	196.6	0.5	7.9	6.4	52186	1.2	1.2	52569
Pickup Trucks (worker transportation)	33.1	296.5	28.3	0.6	5.2	3.4	60983	2.9	4.5	62454
Reach 8 - Tunnel Alternative										
Hydraulic Excavator, Crawler (2 CY Bucket)	201.8	1319.9	1323.5	3.0	64.4	59.3	267938	18.2	8.1	270829
Vibratory / Static Roller (Single Drum)	80.9	392.8	444.7	0.7	35.3	32.4	54638	7.3	3.2	55798
Front End Loader (2.6 – 3.8 CY Bucket)	106.8	579.1	776.4	1.5	36.6	33.7	132891	9.6	4.3	134421
Hydraulic Excavator (0.5 – 2 CY)	100.9	659.9	661.8	1.5	32.2	29.6	133969	9.1	4.0	135414
Tractor Crawler / Dozer	154.8	519.6	1225.8	2.0	48.3	44.5	176553	14.0	6.2	178771
Pavment Breaker										
Air Compressor	85.0	382.2	392.2	0.6	30.9	28.4	48287	7.7	3.4	49505
Backhoe (0.8 CY)	52.6	379.5	354.6	0.7	23.9	22.0	57030	4.7	2.1	57784
Grader	110.7	655.1	715.6	1.2	48.6	44.7	102276	10.0	4.4	103861
Asphalt Compactor Roller (6 tons)	85.7	478.8	573.7	0.9	42.0	38.6	74889	7.7	3.4	76117
Hydraulic Crane	95.3	298.3	778.6	1.4	26.9	24.8	129648	8.6	3.8	131013
Hydroseeder (3,000 gal)	30.0	108.2	145.9	0.2	7.2	6.6	18333	2.7	1.2	18763
Dump Trucks (12-20 CY)	10.7	47.8	124.2	0.3	6.2	5.1	30930	0.5	0.5	31085
Water Tanker (5,000 gal)	5.3	23.9	62.1	0.1	3.1	2.6	15465	0.2	0.2	15542
Flatbed Trucks	27.6	183.4	196.6	0.5	7.9	6.4	52186	1.2	1.2	52569
Pickup Trucks (worker transportation)	44.2	395.4	37.7	0.8	6.9	4.6	81311	3.9	6.1	83272
Vibratory / Sheet Pile Driver	91.7	608.2	708.5	1.8	29.9	27.5	170051	8.3	3.7	171365
Impact Pile Driver	91.7	608.2	708.5	1.8	29.9	27.5	170051	8.3	3.7	171365
Drilling Jumbo	33.3	377.1	313.2	0.7	7.6	7.0	55302	3.0	1.3	55779
Roadheader	111.2	552.1	601.7	0.9	48.8	44.9	74271	10.0	4.5	75864
Load/Haul/Dump (Mucking) Unit	105.0	593.6	655.5	1.0	50.8	46.7	86603	9.5	4.2	88107
Wheeled Loader (4.88 CY)	177.2	608.4	1367.9	2.8	47.8	43.9	270758	16.0	7.1	273297
Spader	236.6	1220.3	1795.5	2.5	95.8	88.1	219272	21.4	9.5	222662
Pump (dewatering)	105.0	533.0	593.0	0.9	40.7	37.4	77949	9.5	4.2	79454
Shotcrete Pump	131.0	977.4	1133.7	2.1	58.5	53.9	181055	11.8	5.3	182932
Shotcrete / Concrete Trucks	26.7	119.5	310.6	0.7	15.6	12.8	77326	1.2	1.2	77712

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles			Offroad	Planned Schedule				Duration	Offroad	Onroad	Daily Max		Project Total		Annual Averag		ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	Category	Qty.	BHP	years	months	wks/mo	days/wk	days	hrs/day	mi/day	hours	VMT	hours	VMT	hours	VMT	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit
Reach 14																										
Hydraulic Excavator, Crawler (2 CY Bucket)	offroad	2	190	2	15.9	4.33	5	345	6		12		4140		2070		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Vibratory / Static Roller (Single Drum)	offroad	1	100	2	15.9	4.33	5	345	6		6		2070		1035		0.07342	0.35631	0.40339	0.00059	0.03199	0.02943	49.56	0.00662	0.00294	50.61
Front End Loader (2.6 – 3.8 CY Bucket)	offroad	1	200	2	15.9	4.33	5	345	6		6		2070		1035		0.09689	0.52527	0.70422	0.00136	0.03318	0.03052	120.54	0.00874	0.00389	121.92
Hydraulic Excavator (0.5 – 2 CY)	offroad	1	190	2	15.9	4.33	5	345	6		6		2070		1035		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Tractor Crawler / Dozer	offroad	1	240	2	15.9	4.33	5	345	6		6		2070		1035		0.14041	0.47127	1.11186	0.00180	0.04384	0.04033	160.14	0.01267	0.00563	162.15
Pavment Breaker	offroad		90	2	15.9	4.33	5	345									0.05841	0.39630	0.38013	0.00070	0.02417	0.02224	58.20	0.00527	0.00234	59.04
Air Compressor	offroad		80	2	15.9	4.33	5	345									0.05786	0.26003	0.26680	0.00040	0.02101	0.01933	32.85	0.00522	0.00232	33.68
Backhoe (0.8 CY)	offroad	1	120	2	15.9	4.33	5	345	6		6		2070		1035		0.04771	0.34418	0.32159	0.00061	0.02166	0.01992	51.73	0.00430	0.00191	52.41
Grader	offroad	1	140	2	15.9	4.33	5	345	6		6		2070		1035		0.10037	0.59422	0.64906	0.00107	0.04407	0.04055	92.77	0.00906	0.00403	94.21
Asphalt Compactor Roller (6 tons)	offroad	1	130	2	15.9	4.33	5	345	6		6		2070		1035		0.07777	0.43431	0.52038	0.00079	0.03809	0.03504	67.93	0.00702	0.00312	69.04
Hydraulic Crane	offroad	1	270	2	15.9	4.33	5	345	6		6		2070		1035		0.08646	0.27056	0.70619	0.00130	0.02441	0.02245	117.59	0.00780	0.00347	118.83
Hydroseeder (3,000 gal)	offroad	1	30	2	15.9	4.33	5	345	6		6		2070		1035		0.02723	0.09811	0.13230	0.00021	0.00654	0.00601	16.63	0.00246	0.00109	17.02
Dump Trucks (12-20 CY)	onroad HD	2		2	15.9	4.33	5	345		20		40		13800		6900	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Water Tanker (5,000 gal)	onroad HD	1		2	15.9	4.33	5	345		20		20		6900		3450	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Flatbed Trucks	onroad MD	2		2	15.9	4.33	5	345		50		100		34500		17250	0.00150	0.00998	0.01070	0.00003	0.00043	0.00035	2.84	0.00007	0.00006	2.86
Pickup Trucks (worker transportation)	onroad LD	4		2	15.9	4.33	5	345		50		200		69000		34500	0.00060	0.00538	0.00051	0.00001	0.00009	0.00006	1.11	0.00005	0.00008	1.13
Reach 6 - Bypass Alternative																										
Hydraulic Excavator, Crawler (2 CY Bucket)	offroad	3	190	4	33.7	4.33	5	730	6		18		13140		3285		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Vibratory / Static Roller (Single Drum)	offroad	1	100	4	33.7	4.33	5	730	6		6		4380		1095		0.07342	0.35631	0.40339	0.00059	0.03199	0.02943	49.56	0.00662	0.00294	50.61
Front End Loader (2.6 – 3.8 CY Bucket)	offroad	1	200	4	33.7	4.33	5	730	6		6		4380		1095		0.09689	0.52527	0.70422	0.00136	0.03318	0.03052	120.54	0.00874	0.00389	121.92
Hydraulic Excavator (0.5 – 2 CY)	offroad	1	190	4	33.7	4.33	5	730	6		6		4380		1095		0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.51	0.00826	0.00367	122.82
Tractor Crawler / Dozer	offroad	1	240	4	33.7	4.33	5	730	6		6		4380		1095		0.14041	0.47127	1.11186	0.00180	0.04384	0.04033	160.14	0.01267	0.00563	162.15
Pavment Breaker	offroad		90	4	33.7	4.33	5	730									0.05841	0.39630	0.38013	0.00070	0.02417	0.02224	58.20	0.00527	0.00234	59.04
Air Compressor	offroad	1	80	4	33.7	4.33	5	730	6		6		4380		1095		0.05786	0.26003	0.26680	0.00040	0.02101	0.01933	32.85	0.00522	0.00232	33.68
Backhoe (0.8 CY)	offroad	1	120	4	33.7	4.33	5	730	6		6		4380		1095		0.04771	0.34418	0.32159	0.00061	0.02166	0.01992	51.73	0.00430	0.00191	52.41
Grader	offroad	1	140	4	33.7	4.33	5	730	6		6		4380		1095		0.10037	0.59422	0.64906	0.00107	0.04407	0.04055	92.77	0.00906	0.00403	94.21
Asphalt Compactor Roller (6 tons)	offroad	1	130	4	33.7	4.33	5	730	6		6		4380		1095		0.07777	0.43431	0.52038	0.00079	0.03809	0.03504	67.93	0.00702	0.00312	69.04
Hydraulic Crane	offroad	1	270	4	33.7	4.33	5	730	6		6		4380		1095		0.08646	0.27056	0.70619	0.00130	0.02441	0.02245	117.59	0.00780	0.00347	118.83
Hydroseeder (3,000 gal)	offroad	1	30	4	33.7	4.33	5	730	6		6		4380		1095		0.02723	0.09811	0.13230	0.00021	0.00654	0.00601	16.63	0.00246	0.00109	17.02
Dump Trucks (12-20 CY)	onroad HD	2		4	33.7	4.33	5	730		20		40		29200		7300	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Water Tanker (5,000 gal)	onroad HD	1		4	33.7	4.33	5	730		20		20		14600		3650	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23
Flatbed Trucks	onroad MD	2		4	33.7	4.33	5	730		50		100		73000		18250	0.00150	0.00998	0.01070	0.00003	0.00043	0.00035	2.84	0.00007	0.00006	2.86
Pickup Trucks (worker transportation)	onroad LD	6		4	33.7	4.33	5	730		50		300		219000		54750	0.00060	0.00538	0.00051	0.00001	0.00009	0.00006	1.11	0.00005	0.00008	1.13
Vibratory / Sheet Pile Driver	offroad	1	280	4	33.7	4.33	5	730	6		6		4380		1095		0.08318	0.55163	0.64262	0.00162	0.02713	0.02496	154.24	0.00751	0.00334	155.43
Impact Pile Driver	offroad	1	280	4	33.7	4.33	5	730	6		6		4380		1095		0.08318	0.55163	0.64262	0.00162	0.02713	0.02496	154.24	0.00751	0.00334	155.43
Drilling Jumbo	offroad		60	4	33.7	4.33	5	730									0.02266	0.25656	0.21306	0.00047	0.00514	0.00473	37.62	0.00204	0.00091	37.95
Roadheader	offroad		100	4	33.7	4.33	5	730									0.07565	0.37558	0.40931	0.00060	0.03318	0.03053	50.52	0.00683	0.00303	51.61
Load/Haul/Dump (Mucking) Unit	offroad		120	4	33.7	4.33	5	730									0.07141	0.40381	0.44595	0.00069	0.03456	0.03180	58.91	0.00644	0.00286	59.94
Wheeled Loader (4.88 CY)	offroad		350	4	33.7	4.33	5	730									0.12053	0.41386	0.93056	0.00194	0.03248	0.02989	184.19	0.01088	0.00483	185.92
Spader	offroad		180	4	33.7	4.33	5	730									0.16097	0.83015	1.22145	0.00168	0.06517	0.05996	149.16	0.01452	0.00646	151.47
Pump (dewatering)	offroad	1	80	4	33.7	4.33	5	730	6		6		4380		1095		0.07143	0.36260	0.40337	0.00065	0.02768	0.02547	53.03	0.00644	0.00286	54.05
Shotcrete Pump	offroad	1	160	4	33.7	4.33	5	730	6		6		4380		1095		0.08910	0.66491	0.77125	0.00140	0.03983	0.03664	123.17	0.00804	0.00357	124.44
Shotcrete / Concrete Trucks	onroad HD	2		4	33.7	4.33	5	730		50		100		73000		18250	0.00145	0.00651	0.01690	0.00004	0.00085	0.00070	4.21	0.00007	0.00006	4.23

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot
Reach 14																				
Hydraulic Excavator, Crawler (2 CY Bucket)	1.098	7.183	7.203	0.016	0.351	0.323	1458.2	0.099	0.044	1473.9	378.8	2478.2	2485.0	5.7	121.0	111.3	503067	34.2	15.2	508495
Vibratory / Static Roller (Single Drum)	0.440	2.138	2.420	0.004	0.192	0.177	297.4	0.040	0.018	303.7	152.0	737.6	835.0	1.2	66.2	60.9	102586	13.7	6.1	104763
Front End Loader (2.6 – 3.8 CY Bucket)	0.581	3.152	4.225	0.008	0.199	0.183	723.2	0.052	0.023	731.5	200.6	1087.3	1457.7	2.8	68.7	63.2	249509	18.1	8.0	252382
Hydraulic Excavator (0.5 – 2 CY)	0.549	3.592	3.601	0.008	0.175	0.161	729.1	0.050	0.022	736.9	189.4	1239.1	1242.5	2.8	60.5	55.6	251534	17.1	7.6	254247
Tractor Crawler / Dozer	0.842	2.828	6.671	0.011	0.263	0.242	960.8	0.076	0.034	972.9	290.6	975.5	2301.5	3.7	90.7	83.5	331488	26.2	11.7	335652
Pavment Breaker																				
Air Compressor																				
Backhoe (0.8 CY)	0.286	2.065	1.930	0.004	0.130	0.120	310.4	0.026	0.011	314.5	98.8	712.4	665.7	1.3	44.8	41.2	107077	8.9	4.0	108492
Grader	0.602	3.565	3.894	0.006	0.264	0.243	556.6	0.054	0.024	565.2	207.8	1230.0	1343.6	2.2	91.2	83.9	192028	18.7	8.3	195005
Asphalt Compactor Roller (6 tons)	0.467	2.606	3.122	0.005	0.229	0.210	407.6	0.042	0.019	414.2	161.0	899.0	1077.2	1.6	78.8	72.5	140608	14.5	6.5	142914
Hydraulic Crane	0.519	1.623	4.237	0.008	0.146	0.135	705.6	0.047	0.021	713.0	179.0	560.1	1461.8	2.7	50.5	46.5	243420	16.1	7.2	245984
Hydroseeder (3,000 gal)	0.163	0.589	0.794	0.001	0.039	0.036	99.8	0.015	0.007	102.1	56.4	203.1	273.9	0.4	13.5	12.4	34420	5.1	2.3	35228
Dump Trucks (12-20 CY)	0.058	0.260	0.676	0.002	0.034	0.028	168.3	0.003	0.003	169.2	20.0	89.8	233.3	0.6	11.7	9.6	58073	0.9	0.9	58363
Water Tanker (5,000 gal)	0.029	0.130	0.338	0.001	0.017	0.014	84.2	0.001	0.001	84.6	10.0	44.9	116.6	0.3	5.9	4.8	29037	0.5	0.4	29182
Flatbed Trucks	0.150	0.998	1.070	0.003	0.043	0.035	284.0	0.007	0.006	286.1	51.8	344.3	369.2	0.9	14.9	11.9	97982	2.3	2.2	98701
Pickup Trucks (worker transportation)	0.120	1.076	0.103	0.002	0.019	0.012	221.3	0.011	0.016	226.6	41.5	371.1	35.4	0.7	6.5	4.3	76333	3.7	5.7	78173
Reach 6 - Bypass Alternative																				
Hydraulic Excavator, Crawler (2 CY Bucket)	1.647	10.775	10.804	0.025	0.526	0.484	2187.2	0.149	0.066	2210.8	1202.4	7865.4	7887.0	18.0	383.9	353.2	1596691	108.5	48.2	1613917
Vibratory / Static Roller (Single Drum)	0.440	2.138	2.420	0.004	0.192	0.177	297.4	0.040	0.018	303.7	321.6	1560.6	1766.8	2.6	140.1	128.9	217067	29.0	12.9	221673
Front End Loader (2.6 – 3.8 CY Bucket)	0.581	3.152	4.225	0.008	0.199	0.183	723.2	0.052	0.023	731.5	424.4	2300.7	3084.5	5.9	145.3	133.7	527946	38.3	17.0	534026
Hydraulic Excavator (0.5 – 2 CY)	0.549	3.592	3.601	0.008	0.175	0.161	729.1	0.050	0.022	736.9	400.8	2621.8	2629.0	6.0	128.0	117.7	532230	36.2	16.1	537972
Tractor Crawler / Dozer	0.842	2.828	6.671	0.011	0.263	0.242	960.8	0.076	0.034	972.9	615.0	2064.2	4869.9	7.9	192.0	176.7	701409	55.5	24.7	710219
Pavment Breaker																				
Air Compressor	0.347	1.560	1.601	0.002	0.126	0.116	197.1	0.031	0.014	202.1	253.4	1138.9	1168.6	1.8	92.0	84.7	143874	22.9	10.2	147505
Backhoe (0.8 CY)	0.286	2.065	1.930	0.004	0.130	0.120	310.4	0.026	0.011	314.5	209.0	1507.5	1408.6	2.7	94.9	87.3	226569	18.9	8.4	229563
Grader	0.602	3.565	3.894	0.006	0.264	0.243	556.6	0.054	0.024	565.2	439.6	2602.7	2842.9	4.7	193.0	177.6	406321	39.7	17.6	412619
Asphalt Compactor Roller (6 tons)	0.467	2.606	3.122	0.005	0.229	0.210	407.6	0.042	0.019	414.2	340.6	1902.3	2279.3	3.4	166.8	153.5	297518	30.7	13.7	302398
Hydraulic Crane	0.519	1.623	4.237	0.008	0.146	0.135	705.6	0.047	0.021	713.0	378.7	1185.1	3093.1	5.7	106.9	98.3	515063	34.2	15.2	520488
Hydroseeder (3,000 gal)	0.163	0.589	0.794	0.001	0.039	0.036	99.8	0.015	0.007	102.1	119.3	429.7	579.5	0.9	28.6	26.3	72832	10.8	4.8	74540
Dump Trucks (12-20 CY)	0.058	0.260	0.676	0.002	0.034	0.028	168.3	0.003	0.003	169.2	42.4	190.0	493.6	1.2	24.8	20.4	122879	2.0	1.8	123493
Water Tanker (5,000 gal)	0.029	0.130	0.338	0.001	0.017	0.014	84.2	0.001	0.001	84.6	21.2	95.0	246.8	0.6	12.4	10.2	61440	1.0	0.9	61747
Flatbed Trucks	0.150	0.998	1.070	0.003	0.043	0.035	284.0	0.007	0.006	286.1	109.7	728.6	781.1	2.0	31.5	25.3	207324	4.9	4.6	208845
Pickup Trucks (worker transportation)	0.180	1.614	0.154	0.003	0.028	0.019	331.9	0.016	0.025	339.9	131.6	1178.0	112.3	2.4	20.7	13.6	242274	11.6	18.1	248116
Vibratory / Sheet Pile Driver	0.499	3.310	3.856	0.010	0.163	0.150	925.4	0.045	0.020	932.6	364.3	2416.1	2814.7	7.1	118.8	109.3	675578	32.9	14.6	680797
Impact Pile Driver	0.499	3.310	3.856	0.010	0.163	0.150	925.4	0.045	0.020	932.6	364.3	2416.1	2814.7	7.1	118.8	109.3	675578	32.9	14.6	680797
Drilling Jumbo																				
Roadheader																				
Load/Haul/Dump (Mucking) Unit																				
Wheeled Loader (4.88 CY)																				
Spader																				
Pump (dewatering)	0.429	2.176	2.420	0.004	0.166	0.153	318.2	0.039	0.017	324.3	312.8	1588.2	1766.8	2.8	121.3	111.6	232257	28.2	12.5	236739
Shotcrete Pump	0.535	3.989	4.627	0.008	0.239	0.220	739.0	0.048	0.021	746.7	390.3	2912.3	3378.1	6.1	174.4	160.5	539471	35.2	15.6	545062
Shotcrete / Concrete Trucks	0.145	0.651	1.690	0.004	0.085	0.070	420.8	0.007	0.006	422.9	106.0	474.9	1234.0	2.9	62.0	50.9	307199	4.9	4.6	308734

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
Reach 14										
Hydraulic Excavator, Crawler (2 CY Bucket)	189.4	1239.1	1242.5	2.8	60.5	55.6	251534	17.1	7.6	254247
Vibratory / Static Roller (Single Drum)	76.0	368.8	417.5	0.6	33.1	30.5	51293	6.9	3.0	52382
Front End Loader (2.6 – 3.8 CY Bucket)	100.3	543.7	728.9	1.4	34.3	31.6	124754	9.0	4.0	126191
Hydraulic Excavator (0.5 – 2 CY)	94.7	619.5	621.2	1.4	30.2	27.8	125767	8.5	3.8	127124
Tractor Crawler / Dozer	145.3	487.8	1150.8	1.9	45.4	41.7	165744	13.1	5.8	167826
Pavment Breaker										
Air Compressor										
Backhoe (0.8 CY)	49.4	356.2	332.8	0.6	22.4	20.6	53538	4.5	2.0	54246
Grader	103.9	615.0	671.8	1.1	45.6	42.0	96014	9.4	4.2	97502
Asphalt Compactor Roller (6 tons)	80.5	449.5	538.6	0.8	39.4	36.3	70304	7.3	3.2	71457
Hydraulic Crane	89.5	280.0	730.9	1.3	25.3	23.2	121710	8.1	3.6	122992
Hydroseeder (3,000 gal)	28.2	101.5	136.9	0.2	6.8	6.2	17210	2.5	1.1	17614
Dump Trucks (12-20 CY)	10.0	44.9	116.6	0.3	5.9	4.8	29037	0.5	0.4	29182
Water Tanker (5,000 gal)	5.0	22.4	58.3	0.1	2.9	2.4	14518	0.2	0.2	14591
Flatbed Trucks	25.9	172.2	184.6	0.5	7.4	6.0	48991	1.1	1.1	49350
Pickup Trucks (worker transportation)	20.7	185.6	17.7	0.4	3.3	2.1	38166	1.8	2.8	39087
Reach 6 - Bypass Alternative										
Hydraulic Excavator, Crawler (2 CY Bucket)	300.6	1966.4	1971.8	4.5	96.0	88.3	399173	27.1	12.1	403479
Vibratory / Static Roller (Single Drum)	80.4	390.2	441.7	0.6	35.0	32.2	54267	7.3	3.2	55418
Front End Loader (2.6 – 3.8 CY Bucket)	106.1	575.2	771.1	1.5	36.3	33.4	131987	9.6	4.3	133506
Hydraulic Excavator (0.5 – 2 CY)	100.2	655.5	657.3	1.5	32.0	29.4	133058	9.0	4.0	134493
Tractor Crawler / Dozer	153.7	516.0	1217.5	2.0	48.0	44.2	175352	13.9	6.2	177555
Pavment Breaker										
Air Compressor	63.4	284.7	292.2	0.4	23.0	21.2	35969	5.7	2.5	36876
Backhoe (0.8 CY)	52.2	376.9	352.1	0.7	23.7	21.8	56642	4.7	2.1	57391
Grader	109.9	650.7	710.7	1.2	48.3	44.4	101580	9.9	4.4	103155
Asphalt Compactor Roller (6 tons)	85.2	475.6	569.8	0.9	41.7	38.4	74379	7.7	3.4	75600
Hydraulic Crane	94.7	296.3	773.3	1.4	26.7	24.6	128766	8.5	3.8	130122
Hydroseeder (3,000 gal)	29.8	107.4	144.9	0.2	7.2	6.6	18208	2.7	1.2	18635
Dump Trucks (12-20 CY)	10.6	47.5	123.4	0.3	6.2	5.1	30720	0.5	0.5	30873
Water Tanker (5,000 gal)	5.3	23.7	61.7	0.1	3.1	2.5	15360	0.2	0.2	15437
Flatbed Trucks	27.4	182.2	195.3	0.5	7.9	6.3	51831	1.2	1.1	52211
Pickup Trucks (worker transportation)	32.9	294.5	28.1	0.6	5.2	3.4	60569	2.9	4.5	62029
Vibratory / Sheet Pile Driver	91.1	604.0	703.7	1.8	29.7	27.3	168895	8.2	3.7	170199
Impact Pile Driver	91.1	604.0	703.7	1.8	29.7	27.3	168895	8.2	3.7	170199
Drilling Jumbo										
Roadheader										
Load/Haul/Dump (Mucking) Unit										
Wheeled Loader (4.88 CY)										
Spader										
Pump (dewatering)	78.2	397.1	441.7	0.7	30.3	27.9	58064	7.1	3.1	59185
Shotcrete Pump	97.6	728.1	844.5	1.5	43.6	40.1	134868	8.8	3.9	136265
Shotcrete / Concrete Trucks	26.5	118.7	308.5	0.7	15.5	12.7	76800	1.2	1.2	77183

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles			Offroad	Planned Schedule				Duration	Offroad	Onroad	Daily Max		Project Total		Annual Averag		ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	Category	Qty.	BHP	years	months	wks/mo	days/wk	days	hrs/day	mi/day	hours	VMT	hours	VMT	hours	VMT	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit
Reach 4																										
Bulldozer (tracked)											6		2982													
Bulldozer (wheeled)																										
Scraper (dumper)																										
Dump Truck/ADT																										
Clamshell Derrick																										
Dragline (small)																										
Motor Grader											6		2982													
Tractor/Offroad Forklift																										
Compactor/Roller											6		2982													
Crane (tracked)																										
Backhoe/Skip Loader											6		2982													
Bobcat/Skid Steer Loader																										
Drill Auger/Borer																										
Hydraulic Excavator											18		8946													
Front End Loader											6		2982													
Concrete Grinder											6		2982													
Screener (coarse)																										
Reach 5																										
Bulldozer (tracked)											6		1338													
Bulldozer (wheeled)																										
Scraper (dumper)																										
Dump Truck/ADT																										
Clamshell Derrick																										
Dragline (small)																										
Motor Grader											6		1338													
Tractor/Offroad Forklift																										
Compactor/Roller											6		1338													
Crane (tracked)																										
Backhoe/Skip Loader											6		1338													
Bobcat/Skid Steer Loader																										
Drill Auger/Borer																										
Hydraulic Excavator											24		5352													
Front End Loader											6		1338													
Concrete Grinder																										
Screener (coarse)																										
Reach 6																										
Bulldozer (tracked)											6		6018													
Bulldozer (wheeled)																										
Scraper (dumper)																										
Dump Truck/ADT																										
Clamshell Derrick																										
Dragline (small)																										
Motor Grader											6		6018													
Tractor/Offroad Forklift																										
Compactor/Roller											6		6018													
Crane (tracked)																										
Backhoe/Skip Loader											6		6018													
Bobcat/Skid Steer Loader																										
Drill Auger/Borer																										
Hydraulic Excavator											24		24072													
Front End Loader											6		6018													
Concrete Grinder																										
Screener (coarse)																										

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot

Reach 4
Bulldozer (tracked)
Bulldozer (wheeled)
Scraper (dumper)
Dump Truck/ADT
Clamshell Derrick
Dragline (small)
Motor Grader
Tractor/Offroad Forklift
Compactor/Roller
Crane (tracked)
Backhoe/Skip Loader
Bobcat/Skid Steer Loader
Drill Auger/Borer
Hydraulic Excavator
Front End Loader
Concrete Grinder
Screener (coarse)
Reach 5
Bulldozer (tracked)
Bulldozer (wheeled)
Scraper (dumper)
Dump Truck/ADT
Clamshell Derrick
Dragline (small)
Motor Grader
Tractor/Offroad Forklift
Compactor/Roller
Crane (tracked)
Backhoe/Skip Loader
Bobcat/Skid Steer Loader
Drill Auger/Borer
Hydraulic Excavator
Front End Loader
Concrete Grinder
Screener (coarse)
Reach 6
Bulldozer (tracked)
Bulldozer (wheeled)
Scraper (dumper)
Dump Truck/ADT
Clamshell Derrick
Dragline (small)
Motor Grader
Tractor/Offroad Forklift
Compactor/Roller
Crane (tracked)
Backhoe/Skip Loader
Bobcat/Skid Steer Loader
Drill Auger/Borer
Hydraulic Excavator
Front End Loader
Concrete Grinder
Screener (coarse)

TOTALS	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons
basic	11.5	62.7	77.4	0.2	4.0	3.7	13654	1.0	0.5	13826
tunnel	13.7	74.7	93.2	0.2	4.9	4.5	16288	1.2	0.6	16493
bypass	10.7	59.3	73.1	0.1	3.8	3.5	12995	0.9	0.5	13156
tun + by	12.9	71.3	88.9	0.2	4.7	4.3	15629	1.1	0.5	15823

For basic project (no options)

Maxima	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day
Year 1	13.1	71.7	88.1	0.2	4.7	4.3	15399	1.2	0.6	15595
Year 2	38.4	209.7	260.0	0.5	13.6	12.4	45611	3.4	1.6	46184
Year 3	38.0	207.2	256.5	0.5	13.4	12.3	45103	3.4	1.6	45674
Year 4	18.9	103.7	128.2	0.3	6.7	6.1	22698	1.7	0.8	22984
Year 5	18.9	103.7	128.2	0.3	6.7	6.1	22698	1.7	0.8	22984
Year 6	6.5	35.9	43.9	0.1	2.3	2.1	7846	0.6	0.3	7945
PEAK	**38.4**	**209.7**	**260.0**	**0.5**	**13.6**	**12.4**	**45611**	**3.4**	**1.6**	**46184**

For tunnel option project

Maxima	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day
Year 1	13.1	71.7	88.1	0.2	4.7	4.3	15399	1.2	0.6	15595
Year 2	44.4	242.4	303.2	0.6	15.9	14.5	52780	3.9	1.9	53441
Year 3	44.0	239.9	299.7	0.6	15.8	14.4	52272	3.9	1.9	52930
Year 4	24.9	136.4	171.3	0.3	9.0	8.2	29867	2.2	1.1	30241
Year 5	24.9	136.4	171.3	0.3	9.0	8.2	29867	2.2	1.1	30241
Year 6	6.5	35.9	43.9	0.1	2.3	2.1	7846	0.6	0.3	7945
PEAK	**44.4**	**242.4**	**303.2**	**0.6**	**15.9**	**14.5**	**52780**	**3.9**	**1.9**	**53441**

For bypass option project

Maxima	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day
Year 1	13.1	71.7	88.1	0.2	4.7	4.3	15399	1.2	0.6	15595
Year 2	34.3	188.7	234.2	0.5	12.2	11.2	41291	3.0	1.4	41800
Year 3	33.9	186.2	230.7	0.5	12.1	11.0	40783	3.0	1.4	41290
Year 4	14.9	82.7	102.3	0.2	5.3	4.9	18378	1.3	0.6	18600
Year 5	14.9	82.7	102.3	0.2	5.3	4.9	18378	1.3	0.6	18600
Year 6	6.5	35.9	43.9	0.1	2.3	2.1	7846	0.6	0.3	7945
PEAK	**34.3**	**188.7**	**234.2**	**0.5**	**12.2**	**11.2**	**41291**	**3.0**	**1.4**	**41800**

For tunnel + bypass option project

Maxima	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day
Year 1	13.1	71.7	88.1	0.2	4.7	4.3	15399	1.2	0.6	15595
Year 2	40.3	221.5	277.3	0.5	14.6	13.3	48460	3.6	1.7	49057
Year 3	39.9	219.0	273.8	0.5	14.4	13.2	47952	3.5	1.7	48547
Year 4	20.9	115.5	145.4	0.3	7.6	7.0	25547	1.8	0.9	25857
Year 5	20.9	115.5	145.4	0.3	7.6	7.0	25547	1.8	0.9	25857
Year 6	6.5	35.9	43.9	0.1	2.3	2.1	7846	0.6	0.3	7945
PEAK	**40.3**	**221.5**	**277.3**	**0.5**	**14.6**	**13.3**	**48460**	**3.6**	**1.7**	**49057**

Option	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day
5	6.5	35.9	43.9	0.1	2.3	2.1	7846	0.6	0.3	7945
6	6.5	35.9	43.9	0.1	2.3	2.1	7846	0.6	0.3	7945
6 bypass	9.0	50.9	62.0	0.1	3.2	2.9	11372	0.8	0.4	11506
delta 6	-4.1	-20.9	-25.9	0.0	-1.3	-1.2	-4320	-0.4	-0.2	-4384
8 NRCS	6.5	35.9	43.9	0.1	2.3	2.1	7846	0.6	0.3	7945
8 culvert	6.5	35.9	43.9	0.1	2.3	2.1	7846	0.6	0.3	7945
8 tunnel	12.5	68.7	87.1	0.2	4.6	4.2	15015	1.1	0.5	15202
delta 8	6.0	32.8	43.1	0.1	2.3	2.1	7169	0.5	0.2	7257

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
Reach 4										
Bulldozer (tracked)										
Bulldozer (wheeled)										
Scraper (dumper)										
Dump Truck/ADT										
Clamshell Derrick										
Dragline (small)										
Motor Grader										
Tractor/Offroad Forklift										
Compactor/Roller										
Crane (tracked)										
Backhoe/Skip Loader										
Bobcat/Skid Steer Loader										
Drill Auger/Borer										
Hydraulic Excavator										
Front End Loader										
Concrete Grinder										
Screener (coarse)										
Reach 5										
Bulldozer (tracked)										
Bulldozer (wheeled)										
Scraper (dumper)										
Dump Truck/ADT										
Clamshell Derrick										
Dragline (small)										
Motor Grader										
Tractor/Offroad Forklift										
Compactor/Roller										
Crane (tracked)										
Backhoe/Skip Loader										
Bobcat/Skid Steer Loader										
Drill Auger/Borer										
Hydraulic Excavator										
Front End Loader										
Concrete Grinder										
Screener (coarse)										
Reach 6										
Bulldozer (tracked)										
Bulldozer (wheeled)										
Scraper (dumper)										
Dump Truck/ADT										
Clamshell Derrick										
Dragline (small)										
Motor Grader										
Tractor/Offroad Forklift										
Compactor/Roller										
Crane (tracked)										
Backhoe/Skip Loader										
Bobcat/Skid Steer Loader										
Drill Auger/Borer										
Hydraulic Excavator										
Front End Loader										
Concrete Grinder										
Screener (coarse)										

For basic project (no options)

Averages	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
Year 1	1.0	5.6	6.8	0.0	0.4	0.3	1194	0.1	0.0	1210
Year 2	3.1	17.1	21.2	0.0	1.1	1.0	3725	0.3	0.1	3772
Year 3	3.2	17.2	21.4	0.0	1.1	1.0	3754	0.3	0.1	3802
Year 4	1.7	9.5	11.8	0.0	0.6	0.6	2087	0.2	0.1	2113
Year 5	1.7	9.5	11.8	0.0	0.6	0.6	2087	0.2	0.1	2113
Year 6	0.7	3.6	4.4	0.0	0.2	0.2	787	0.1	0.0	797
HIGH	**3.2**	**17.2**	**21.4**	**0.0**	**1.1**	**1.0**	**3754**	**0.3**	**0.1**	**3802**

For tunnel option project

Averages	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
Year 1	1.0	5.6	6.8	0.0	0.4	0.3	1194	0.1	0.0	1210
Year 2	3.7	20.1	25.2	0.0	1.3	1.2	4384	0.3	0.2	4439
Year 3	3.7	20.3	25.3	0.0	1.3	1.2	4413	0.3	0.2	4469
Year 4	2.3	12.5	15.7	0.0	0.8	0.8	2746	0.2	0.1	2780
Year 5	2.3	12.5	15.7	0.0	0.8	0.8	2746	0.2	0.1	2780
Year 6	0.7	3.6	4.4	0.0	0.2	0.2	787	0.1	0.0	797
HIGH	**3.7**	**20.3**	**25.3**	**0.0**	**1.3**	**1.2**	**4413**	**0.3**	**0.2**	**4469**

For bypass option project

Averages	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
Year 1	1.0	5.6	6.8	0.0	0.4	0.3	1194	0.1	0.0	1210
Year 2	2.9	16.2	20.0	0.0	1.0	1.0	3539	0.3	0.1	3582
Year 3	3.0	16.3	20.2	0.0	1.1	1.0	3568	0.3	0.1	3612
Year 4	1.5	8.6	10.6	0.0	0.6	0.5	1900	0.1	0.1	1923
Year 5	1.5	8.6	10.6	0.0	0.6	0.5	1900	0.1	0.1	1923
Year 6	0.7	3.6	4.4	0.0	0.2	0.2	787	0.1	0.0	797
HIGH	**3.0**	**16.3**	**20.2**	**0.0**	**1.1**	**1.0**	**3568**	**0.3**	**0.1**	**3612**

For tunnel + bypass option project

Averages	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
Year 1	1.0	5.6	6.8	0.0	0.4	0.3	1194	0.1	0.0	1210
Year 2	3.5	19.2	24.0	0.0	1.3	1.2	4197	0.3	0.1	4249
Year 3	3.5	19.3	24.1	0.0	1.3	1.2	4226	0.3	0.1	4279
Year 4	2.1	11.6	14.5	0.0	0.8	0.7	2559	0.2	0.1	2590
Year 5	2.1	11.6	14.5	0.0	0.8	0.7	2559	0.2	0.1	2590
Year 6	0.7	3.6	4.4	0.0	0.2	0.2	787	0.1	0.0	797
HIGH	**3.5**	**19.3**	**24.1**	**0.0**	**1.3**	**1.2**	**4226**	**0.3**	**0.1**	**4279**

Option	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
5	0.36	2.00	2.45	0.00	0.13	0.12	437	0.03	0.02	443
6	0.65	3.60	4.41	0.01	0.23	0.21	787	0.06	0.03	797
6 bypass	0.82	4.65	5.66	0.01	0.29	0.27	1038	0.07	0.03	1050
delta 6	-0.20	-0.96	-1.20	0.00	-0.06	-0.06	-187	-0.02	-0.01	-190
8 NRCS	0.60	3.30	4.04	0.01	0.21	0.19	721	0.05	0.03	730
8 culvert	0.60	3.30	4.04	0.01	0.21	0.19	721	0.05	0.03	730
8 tunnel	1.15	6.31	8.00	0.02	0.42	0.39	1379	0.10	0.05	1397
delta 8	0.55	3.01	3.96	0.01	0.21	0.19	659	0.05	0.02	667

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles			Offroad	Planned Schedule				Duration	Offroad	Onroad	Daily Max		Project Total		Annual Averag		ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	Category	Qty.	BHP	years	months	wks/mo	days/wk	days	hrs/day	mi/day	hours	VMT	hours	VMT	hours	VMT	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit
Reach 7a																										
Bulldozer (tracked)											6		1740													
Bulldozer (wheeled)																										
Scraper (dumper)																										
Dump Truck/ADT																										
Clamshell Derrick																										
Dragline (small)																										
Motor Grader											6		1740													
Tractor/Offroad Forklift																										
Compactor/Roller											6		1740													
Crane (tracked)																										
Backhoe/Skip Loader											6		1740													
Bobcat/Skid Steer Loader																										
Drill Auger/Borer																										
Hydraulic Excavator											24		6960													
Front End Loader											6		1740													
Concrete Grinder																										
Screener (coarse)																										
Reach 7b																										
Bulldozer (tracked)											6		2976													
Bulldozer (wheeled)																										
Scraper (dumper)																										
Dump Truck/ADT																										
Clamshell Derrick																										
Dragline (small)																										
Motor Grader											6		2976													
Tractor/Offroad Forklift																										
Compactor/Roller											6		2976													
Crane (tracked)																										
Backhoe/Skip Loader											6		2976													
Bobcat/Skid Steer Loader																										
Drill Auger/Borer																										
Hydraulic Excavator											18		8928													
Front End Loader											6		2976													
Concrete Grinder																										
Screener (coarse)																										
Reach 8 - NRCS Alternative																										
Bulldozer (tracked)											6		4410													
Bulldozer (wheeled)																										
Scraper (dumper)																										
Dump Truck/ADT																										
Clamshell Derrick																										
Dragline (small)																										
Motor Grader											6		4410													
Tractor/Offroad Forklift																										
Compactor/Roller											6		4410													
Crane (tracked)																										
Backhoe/Skip Loader											6		4410													
Bobcat/Skid Steer Loader																										
Drill Auger/Borer																										
Hydraulic Excavator											24		17640													
Front End Loader											6		4410													
Concrete Grinder																										
Screener (coarse)																										

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot
Reach 7a																				
Bulldozer (tracked)																				
Bulldozer (wheeled)																				
Scraper (dumper)																				
Dump Truck/ADT																				
Clamshell Derrick																				
Dragline (small)																				
Motor Grader																				
Tractor/Offroad Forklift																				
Compactor/Roller																				
Crane (tracked)																				
Backhoe/Skip Loader																				
Bobcat/Skid Steer Loader																				
Drill Auger/Borer																				
Hydraulic Excavator																				
Front End Loader																				
Concrete Grinder																				
Screener (coarse)																				
Reach 7b																				
Bulldozer (tracked)																				
Bulldozer (wheeled)																				
Scraper (dumper)																				
Dump Truck/ADT																				
Clamshell Derrick																				
Dragline (small)																				
Motor Grader																				
Tractor/Offroad Forklift																				
Compactor/Roller																				
Crane (tracked)																				
Backhoe/Skip Loader																				
Bobcat/Skid Steer Loader																				
Drill Auger/Borer																				
Hydraulic Excavator																				
Front End Loader																				
Concrete Grinder																				
Screener (coarse)																				
Reach 8 - NRCS Alternative																				
Bulldozer (tracked)																				
Bulldozer (wheeled)																				
Scraper (dumper)																				
Dump Truck/ADT																				
Clamshell Derrick																				
Dragline (small)																				
Motor Grader																				
Tractor/Offroad Forklift																				
Compactor/Roller																				
Crane (tracked)																				
Backhoe/Skip Loader																				
Bobcat/Skid Steer Loader																				
Drill Auger/Borer																				
Hydraulic Excavator																				
Front End Loader																				
Concrete Grinder																				
Screener (coarse)																				

Reach	Project Year					
	1	2	3	4	5	6
4	X	X	X			
5		X	X			
6		X	X	X	X	X
7a	X	X				
7b			X	X	X	
8 NRCS		X	X	X	X	
8 culvert		X	X	X	X	
8 tunnel		X	X	X	X	
14		X	X			
6 bypass		X	X	X	X	

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
Reach 7a										
Bulldozer (tracked)										
Bulldozer (wheeled)										
Scraper (dumper)										
Dump Truck/ADT										
Clamshell Derrick										
Dragline (small)										
Motor Grader										
Tractor/Offroad Forklift										
Compactor/Roller										
Crane (tracked)										
Backhoe/Skip Loader										
Bobcat/Skid Steer Loader										
Drill Auger/Borer										
Hydraulic Excavator										
Front End Loader										
Concrete Grinder										
Screener (coarse)										
Reach 7b										
Bulldozer (tracked)										
Bulldozer (wheeled)										
Scraper (dumper)										
Dump Truck/ADT										
Clamshell Derrick										
Dragline (small)										
Motor Grader										
Tractor/Offroad Forklift										
Compactor/Roller										
Crane (tracked)										
Backhoe/Skip Loader										
Bobcat/Skid Steer Loader										
Drill Auger/Borer										
Hydraulic Excavator										
Front End Loader										
Concrete Grinder										
Screener (coarse)										
Reach 8 - NRCS Alternative										
Bulldozer (tracked)										
Bulldozer (wheeled)										
Scraper (dumper)										
Dump Truck/ADT										
Clamshell Derrick										
Dragline (small)										
Motor Grader										
Tractor/Offroad Forklift										
Compactor/Roller										
Crane (tracked)										
Backhoe/Skip Loader										
Bobcat/Skid Steer Loader										
Drill Auger/Borer										
Hydraulic Excavator										
Front End Loader										
Concrete Grinder										
Screener (coarse)										

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles			Offroad	Planned Schedule				Duration	Offroad	Onroad	Daily Max		Project Total		Annual Averag		ROG	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	Category	Qty.	BHP	years	months	wks/mo	days/wk	days	hrs/day	mi/day	hours	VMT	hours	VMT	hours	VMT	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit
Reach 8 - Culvert/Channel Alternative																										
Bulldozer (tracked)											6		4410													
Bulldozer (wheeled)																										
Scraper (dumper)																										
Dump Truck/ADT																										
Clamshell Derrick																										
Dragline (small)																										
Motor Grader											6		4410													
Tractor/Offroad Forklift																										
Compactor/Roller											6		4410													
Crane (tracked)																										
Backhoe/Skip Loader											6		4410													
Bobcat/Skid Steer Loader																										
Drill Auger/Borer																										
Hydraulic Excavator											24		17640													
Front End Loader											6		4410													
Concrete Grinder																										
Screener (coarse)																										
Reach 8 - Tunnel																										
Bulldozer (tracked)											6		4410													
Bulldozer (wheeled)																										
Scraper (dumper)																										
Dump Truck/ADT																										
Clamshell Derrick																										
Dragline (small)																										
Motor Grader											6		4410													
Tractor/Offroad Forklift																										
Compactor/Roller											6		4410													
Crane (tracked)																										
Backhoe/Skip Loader											6		4410													
Bobcat/Skid Steer Loader																										
Drill Auger/Borer																										
Hydraulic Excavator											18		13230													
Front End Loader											6		4410													
Concrete Grinder																										
Screener (coarse)																										
Reach 14																										
Bulldozer (tracked)											6		2070													
Bulldozer (wheeled)																										
Scraper (dumper)																										
Dump Truck/ADT																										
Clamshell Derrick																										
Dragline (small)																										
Motor Grader											6		2070													
Tractor/Offroad Forklift																										
Compactor/Roller											6		2070													
Crane (tracked)																										
Backhoe/Skip Loader											6		2070													
Bobcat/Skid Steer Loader																										
Drill Auger/Borer																										
Hydraulic Excavator											18		6210													
Front End Loader											6		2070													
Concrete Grinder																										
Screener (coarse)																										

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot
Reach 8 - Culvert/Channel Alternative																				
Bulldozer (tracked)																				
Bulldozer (wheeled)																				
Scraper (dumper)																				
Dump Truck/ADT																				
Clamshell Derrick																				
Dragline (small)																				
Motor Grader																				
Tractor/Offroad Forklift																				
Compactor/Roller																				
Crane (tracked)																				
Backhoe/Skip Loader																				
Bobcat/Skid Steer Loader																				
Drill Auger/Borer																				
Hydraulic Excavator																				
Front End Loader																				
Concrete Grinder																				
Screener (coarse)																				
Reach 8 - Tunnel																				
Bulldozer (tracked)																				
Bulldozer (wheeled)																				
Scraper (dumper)																				
Dump Truck/ADT																				
Clamshell Derrick																				
Dragline (small)																				
Motor Grader																				
Tractor/Offroad Forklift																				
Compactor/Roller																				
Crane (tracked)																				
Backhoe/Skip Loader																				
Bobcat/Skid Steer Loader																				
Drill Auger/Borer																				
Hydraulic Excavator																				
Front End Loader																				
Concrete Grinder																				
Screener (coarse)																				
Reach 14																				
Bulldozer (tracked)																				
Bulldozer (wheeled)																				
Scraper (dumper)																				
Dump Truck/ADT																				
Clamshell Derrick																				
Dragline (small)																				
Motor Grader																				
Tractor/Offroad Forklift																				
Compactor/Roller																				
Crane (tracked)																				
Backhoe/Skip Loader																				
Bobcat/Skid Steer Loader																				
Drill Auger/Borer																				
Hydraulic Excavator																				
Front End Loader																				
Concrete Grinder																				
Screener (coarse)																				

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
Reach 8 - Culvert/Channel Alternative										
Bulldozer (tracked)										
Bulldozer (wheeled)										
Scraper (dumper)										
Dump Truck/ADT										
Clamshell Derrick										
Dragline (small)										
Motor Grader										
Tractor/Offroad Forklift										
Compactor/Roller										
Crane (tracked)										
Backhoe/Skip Loader										
Bobcat/Skid Steer Loader										
Drill Auger/Borer										
Hydraulic Excavator										
Front End Loader										
Concrete Grinder										
Screener (coarse)										
Reach 8 - Tunnel										
Bulldozer (tracked)										
Bulldozer (wheeled)										
Scraper (dumper)										
Dump Truck/ADT										
Clamshell Derrick										
Dragline (small)										
Motor Grader										
Tractor/Offroad Forklift										
Compactor/Roller										
Crane (tracked)										
Backhoe/Skip Loader										
Bobcat/Skid Steer Loader										
Drill Auger/Borer										
Hydraulic Excavator										
Front End Loader										
Concrete Grinder										
Screener (coarse)										
Reach 14										
Bulldozer (tracked)										
Bulldozer (wheeled)										
Scraper (dumper)										
Dump Truck/ADT										
Clamshell Derrick										
Dragline (small)										
Motor Grader										
Tractor/Offroad Forklift										
Compactor/Roller										
Crane (tracked)										
Backhoe/Skip Loader										
Bobcat/Skid Steer Loader										
Drill Auger/Borer										
Hydraulic Excavator										
Front End Loader										
Concrete Grinder										
Screener (coarse)										

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles			Offroad	Planned Schedule				Duration	Offroad	Onroad	Daily Max		Project Total		Annual Averag		ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	Category	Qty.	BHP	years	months	wks/mo	days/wk	days	hrs/day	mi/day	hours	VMT	hours	VMT	hours	VMT	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit
Reach 6 - Bypass Alternative																										
Bulldozer (tracked)											6		4380													
Bulldozer (wheeled)																										
Scraper (dumper)																										
Dump Truck/ADT																										
Clamshell Derrick																										
Dragline (small)																										
Motor Grader											6		4380													
Tractor/Offroad Forklift																										
Compactor/Roller											6		4380													
Crane (tracked)																										
Backhoe/Skip Loader											6		4380													
Bobcat/Skid Steer Loader																										
Drill Auger/Borer																										
Hydraulic Excavator											24		17520													
Front End Loader											6		4380													
Concrete Grinder																										
Screener (coarse)																										
Reach 4											522		303150													
Tractor Trailer (materials/hauling)																										
Tractor Trailer (equipment/supplies)																										
Cement Truck (concrete/pumping)																										
Dump Truck (soil/sand/gravel transport)												40		19880												
Water Truck (dust control)												20		9940												
Work Truck (all trades)												100		49700												
Pickup/SUV (managers/engineers)												200		99400												
Pickup/SUV (supervisors/foremen)																										
Pickup/SUV (operators/drivers)																										
Pickup/SUV (tradesmen/laborers)																										
Reach 5																										
Tractor Trailer (materials/hauling)																										
Tractor Trailer (equipment/supplies)																										
Cement Truck (concrete/pumping)																										
Dump Truck (soil/sand/gravel transport)												40		8920												
Water Truck (dust control)												20		4460												
Work Truck (all trades)												100		22300												
Pickup/SUV (managers/engineers)												300		66900												
Pickup/SUV (supervisors/foremen)																										
Pickup/SUV (operators/drivers)																										
Pickup/SUV (tradesmen/laborers)																										
Reach 6																										
Tractor Trailer (materials/hauling)																										
Tractor Trailer (equipment/supplies)																										
Cement Truck (concrete/pumping)																										
Dump Truck (soil/sand/gravel transport)												40		40120												
Water Truck (dust control)												20		20060												
Work Truck (all trades)												100		100300												
Pickup/SUV (managers/engineers)												300		300900												
Pickup/SUV (supervisors/foremen)																										
Pickup/SUV (operators/drivers)																										
Pickup/SUV (tradesmen/laborers)																										

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot
Reach 6 - Bypass Alternative																				
Bulldozer (tracked)																				
Bulldozer (wheeled)																				
Scraper (dumper)																				
Dump Truck/ADT																				
Clamshell Derrick																				
Dragline (small)																				
Motor Grader																				
Tractor/Offroad Forklift																				
Compactor/Roller																				
Crane (tracked)																				
Backhoe/Skip Loader																				
Bobcat/Skid Steer Loader																				
Drill Auger/Borer																				
Hydraulic Excavator																				
Front End Loader																				
Concrete Grinder																				
Screener (coarse)																				
Reach 4																				
Tractor Trailer (materials/hauling)																				
Tractor Trailer (equipment/supplies)																				
Cement Truck (concrete/pumping)																				
Dump Truck (soil/sand/gravel transport)																				
Water Truck (dust control)																				
Work Truck (all trades)																				
Pickup/SUV (managers/engineers)																				
Pickup/SUV (supervisors/foremen)																				
Pickup/SUV (operators/drivers)																				
Pickup/SUV (tradesmen/laborers)																				
Reach 5																				
Tractor Trailer (materials/hauling)																				
Tractor Trailer (equipment/supplies)																				
Cement Truck (concrete/pumping)																				
Dump Truck (soil/sand/gravel transport)																				
Water Truck (dust control)																				
Work Truck (all trades)																				
Pickup/SUV (managers/engineers)																				
Pickup/SUV (supervisors/foremen)																				
Pickup/SUV (operators/drivers)																				
Pickup/SUV (tradesmen/laborers)																				
Reach 6																				
Tractor Trailer (materials/hauling)																				
Tractor Trailer (equipment/supplies)																				
Cement Truck (concrete/pumping)																				
Dump Truck (soil/sand/gravel transport)																				
Water Truck (dust control)																				
Work Truck (all trades)																				
Pickup/SUV (managers/engineers)																				
Pickup/SUV (supervisors/foremen)																				
Pickup/SUV (operators/drivers)																				
Pickup/SUV (tradesmen/laborers)																				

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
Reach 6 - Bypass Alternative										
Bulldozer (tracked)										
Bulldozer (wheeled)										
Scraper (dumper)										
Dump Truck/ADT										
Clamshell Derrick										
Dragline (small)										
Motor Grader										
Tractor/Offroad Forklift										
Compactor/Roller										
Crane (tracked)										
Backhoe/Skip Loader										
Bobcat/Skid Steer Loader										
Drill Auger/Borer										
Hydraulic Excavator										
Front End Loader										
Concrete Grinder										
Screener (coarse)										
Reach 4										
Tractor Trailer (materials/hauling)										
Tractor Trailer (equipment/supplies)										
Cement Truck (concrete/pumping)										
Dump Truck (soil/sand/gravel transport)										
Water Truck (dust control)										
Work Truck (all trades)										
Pickup/SUV (managers/engineers)										
Pickup/SUV (supervisors/foremen)										
Pickup/SUV (operators/drivers)										
Pickup/SUV (tradesmen/laborers)										
Reach 5										
Tractor Trailer (materials/hauling)										
Tractor Trailer (equipment/supplies)										
Cement Truck (concrete/pumping)										
Dump Truck (soil/sand/gravel transport)										
Water Truck (dust control)										
Work Truck (all trades)										
Pickup/SUV (managers/engineers)										
Pickup/SUV (supervisors/foremen)										
Pickup/SUV (operators/drivers)										
Pickup/SUV (tradesmen/laborers)										
Reach 6										
Tractor Trailer (materials/hauling)										
Tractor Trailer (equipment/supplies)										
Cement Truck (concrete/pumping)										
Dump Truck (soil/sand/gravel transport)										
Water Truck (dust control)										
Work Truck (all trades)										
Pickup/SUV (managers/engineers)										
Pickup/SUV (supervisors/foremen)										
Pickup/SUV (operators/drivers)										
Pickup/SUV (tradesmen/laborers)										

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles			Offroad	Planned Schedule				Duration	Offroad	Onroad	Daily Max		Project Total		Annual Averag		ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	Category	Qty.	BHP	years	months	wks/mo	days/wk	days	hrs/day	mi/day	hours	VMT	hours	VMT	hours	VMT	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit
Reach 7a																										
Tractor Trailer (materials/hauling)																										
Tractor Trailer (equipment/supplies)																										
Cement Truck (concrete/pumping)																										
Dump Truck (soil/sand/gravel transport)												40		11600												
Water Truck (dust control)												20		5800												
Work Truck (all trades)												100		29000												
Pickup/SUV (managers/engineers)												300		87000												
Pickup/SUV (supervisors/foremen)																										
Pickup/SUV (operators/drivers)																										
Pickup/SUV (tradesmen/laborers)																										
Reach 7b																										
Tractor Trailer (materials/hauling)																										
Tractor Trailer (equipment/supplies)																										
Cement Truck (concrete/pumping)																										
Dump Truck (soil/sand/gravel transport)												40		19840												
Water Truck (dust control)												20		9920												
Work Truck (all trades)												100		49600												
Pickup/SUV (managers/engineers)												200		99200												
Pickup/SUV (supervisors/foremen)																										
Pickup/SUV (operators/drivers)																										
Pickup/SUV (tradesmen/laborers)																										
Reach 8 - NRCS																										
Tractor Trailer (materials/hauling)																										
Tractor Trailer (equipment/supplies)																										
Cement Truck (concrete/pumping)																										
Dump Truck (soil/sand/gravel transport)												40		29400												
Water Truck (dust control)												20		14700												
Work Truck (all trades)												100		73500												
Pickup/SUV (managers/engineers)												300		220500												
Pickup/SUV (supervisors/foremen)																										
Pickup/SUV (operators/drivers)																										
Pickup/SUV (tradesmen/laborers)																										
Reach 8 - Culvert/Channel																										
Tractor Trailer (materials/hauling)																										
Tractor Trailer (equipment/supplies)																										
Cement Truck (concrete/pumping)																										
Dump Truck (soil/sand/gravel transport)												40		29400												
Water Truck (dust control)												20		14700												
Work Truck (all trades)												100		73500												
Pickup/SUV (managers/engineers)												300		220500												
Pickup/SUV (supervisors/foremen)																										
Pickup/SUV (operators/drivers)																										
Pickup/SUV (tradesmen/laborers)																										
Reach 8 - Tunnel																										
Tractor Trailer (materials/hauling)																										
Tractor Trailer (equipment/supplies)																										
Cement Truck (concrete/pumping)												100		73500												
Dump Truck (soil/sand/gravel transport)												40		29400												
Water Truck (dust control)												20		14700												
Work Truck (all trades)												100		73500												
Pickup/SUV (managers/engineers)												400		294000												
Pickup/SUV (supervisors/foremen)																										
Pickup/SUV (operators/drivers)																										
Pickup/SUV (tradesmen/laborers)																										

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot
Reach 7a																				
Tractor Trailer (materials/hauling)																				
Tractor Trailer (equipment/supplies)																				
Cement Truck (concrete/pumping)																				
Dump Truck (soil/sand/gravel transport)																				
Water Truck (dust control)																				
Work Truck (all trades)																				
Pickup/SUV (managers/engineers)																				
Pickup/SUV (supervisors/foremen)																				
Pickup/SUV (operators/drivers)																				
Pickup/SUV (tradesmen/laborers)																				
Reach 7b																				
Tractor Trailer (materials/hauling)																				
Tractor Trailer (equipment/supplies)																				
Cement Truck (concrete/pumping)																				
Dump Truck (soil/sand/gravel transport)																				
Water Truck (dust control)																				
Work Truck (all trades)																				
Pickup/SUV (managers/engineers)																				
Pickup/SUV (supervisors/foremen)																				
Pickup/SUV (operators/drivers)																				
Pickup/SUV (tradesmen/laborers)																				
Reach 8 - NRCS																				
Tractor Trailer (materials/hauling)																				
Tractor Trailer (equipment/supplies)																				
Cement Truck (concrete/pumping)																				
Dump Truck (soil/sand/gravel transport)																				
Water Truck (dust control)																				
Work Truck (all trades)																				
Pickup/SUV (managers/engineers)																				
Pickup/SUV (supervisors/foremen)																				
Pickup/SUV (operators/drivers)																				
Pickup/SUV (tradesmen/laborers)																				
Reach 8 - Culvert/Channel																				
Tractor Trailer (materials/hauling)																				
Tractor Trailer (equipment/supplies)																				
Cement Truck (concrete/pumping)																				
Dump Truck (soil/sand/gravel transport)																				
Water Truck (dust control)																				
Work Truck (all trades)																				
Pickup/SUV (managers/engineers)																				
Pickup/SUV (supervisors/foremen)																				
Pickup/SUV (operators/drivers)																				
Pickup/SUV (tradesmen/laborers)																				
Reach 8 - Tunnel																				
Tractor Trailer (materials/hauling)																				
Tractor Trailer (equipment/supplies)																				
Cement Truck (concrete/pumping)																				
Dump Truck (soil/sand/gravel transport)																				
Water Truck (dust control)																				
Work Truck (all trades)																				
Pickup/SUV (managers/engineers)																				
Pickup/SUV (supervisors/foremen)																				
Pickup/SUV (operators/drivers)																				
Pickup/SUV (tradesmen/laborers)																				

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
Reach 7a										
Tractor Trailer (materials/hauling)										
Tractor Trailer (equipment/supplies)										
Cement Truck (concrete/pumping)										
Dump Truck (soil/sand/gravel transport)										
Water Truck (dust control)										
Work Truck (all trades)										
Pickup/SUV (managers/engineers)										
Pickup/SUV (supervisors/foremen)										
Pickup/SUV (operators/drivers)										
Pickup/SUV (tradesmen/laborers)										
Reach 7b										
Tractor Trailer (materials/hauling)										
Tractor Trailer (equipment/supplies)										
Cement Truck (concrete/pumping)										
Dump Truck (soil/sand/gravel transport)										
Water Truck (dust control)										
Work Truck (all trades)										
Pickup/SUV (managers/engineers)										
Pickup/SUV (supervisors/foremen)										
Pickup/SUV (operators/drivers)										
Pickup/SUV (tradesmen/laborers)										
Reach 8 - NRCS										
Tractor Trailer (materials/hauling)										
Tractor Trailer (equipment/supplies)										
Cement Truck (concrete/pumping)										
Dump Truck (soil/sand/gravel transport)										
Water Truck (dust control)										
Work Truck (all trades)										
Pickup/SUV (managers/engineers)										
Pickup/SUV (supervisors/foremen)										
Pickup/SUV (operators/drivers)										
Pickup/SUV (tradesmen/laborers)										
Reach 8 - Culvert/Channel										
Tractor Trailer (materials/hauling)										
Tractor Trailer (equipment/supplies)										
Cement Truck (concrete/pumping)										
Dump Truck (soil/sand/gravel transport)										
Water Truck (dust control)										
Work Truck (all trades)										
Pickup/SUV (managers/engineers)										
Pickup/SUV (supervisors/foremen)										
Pickup/SUV (operators/drivers)										
Pickup/SUV (tradesmen/laborers)										
Reach 8 - Tunnel										
Tractor Trailer (materials/hauling)										
Tractor Trailer (equipment/supplies)										
Cement Truck (concrete/pumping)										
Dump Truck (soil/sand/gravel transport)										
Water Truck (dust control)										
Work Truck (all trades)										
Pickup/SUV (managers/engineers)										
Pickup/SUV (supervisors/foremen)										
Pickup/SUV (operators/drivers)										
Pickup/SUV (tradesmen/laborers)										

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles			Offroad	Planned Schedule				Duration	Offroad	Onroad	Daily Max		Project Total		Annual Averag		ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	Category	Qty.	BHP	years	months	wks/mo	days/wk	days	hrs/day	mi/day	hours	VMT	hours	VMT	hours	VMT	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit	lb/unit
Reach 14																										
Tractor Trailer (materials/hauling)																										
Tractor Trailer (equipment/supplies)																										
Cement Truck (concrete/pumping)																										
Dump Truck (soil/sand/gravel transport)												40		13800												
Water Truck (dust control)												20		6900												
Work Truck (all trades)												100		34500												
Pickup/SUV (managers/engineers)												200		69000												
Pickup/SUV (supervisors/foremen)																										
Pickup/SUV (operators/drivers)																										
Pickup/SUV (tradesmen/laborers)																										
Reach 6 - Bypass																										
Tractor Trailer (materials/hauling)																										
Tractor Trailer (equipment/supplies)																										
Cement Truck (concrete/pumping)												100		73000												
Dump Truck (soil/sand/gravel transport)												40		29200												
Water Truck (dust control)												20		14600												
Work Truck (all trades)												100		73000												
Pickup/SUV (managers/engineers)												300		219000												
Pickup/SUV (supervisors/foremen)												4600		3E+06												
Pickup/SUV (operators/drivers)																										
Pickup/SUV (tradesmen/laborers)																										

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot	lbs tot
Reach 14																				
Tractor Trailer (materials/hauling)																				
Tractor Trailer (equipment/supplies)																				
Cement Truck (concrete/pumping)																				
Dump Truck (soil/sand/gravel transport)																				
Water Truck (dust control)																				
Work Truck (all trades)																				
Pickup/SUV (managers/engineers)																				
Pickup/SUV (supervisors/foremen)																				
Pickup/SUV (operators/drivers)																				
Pickup/SUV (tradesmen/laborers)																				
Reach 6 - Bypass																				
Tractor Trailer (materials/hauling)																				
Tractor Trailer (equipment/supplies)																				
Cement Truck (concrete/pumping)																				
Dump Truck (soil/sand/gravel transport)																				
Water Truck (dust control)																				
Work Truck (all trades)																				
Pickup/SUV (managers/engineers)																				
Pickup/SUV (supervisors/foremen)																				
Pickup/SUV (operators/drivers)																				
Pickup/SUV (tradesmen/laborers)																				

Llagas Creek Equipment and Vehicle Schedule for Proposed Project (from PD Tables 2.5-3 2.5-5)

Offroad Equipments and Onroad Vehicles	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2 e
Name or Type	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
Reach 14										
Tractor Trailer (materials/hauling)										
Tractor Trailer (equipment/supplies)										
Cement Truck (concrete/pumping)										
Dump Truck (soil/sand/gravel transport)										
Water Truck (dust control)										
Work Truck (all trades)										
Pickup/SUV (managers/engineers)										
Pickup/SUV (supervisors/foremen)										
Pickup/SUV (operators/drivers)										
Pickup/SUV (tradesmen/laborers)										
Reach 6 - Bypass										
Tractor Trailer (materials/hauling)										
Tractor Trailer (equipment/supplies)										
Cement Truck (concrete/pumping)										
Dump Truck (soil/sand/gravel transport)										
Water Truck (dust control)										
Work Truck (all trades)										
Pickup/SUV (managers/engineers)										
Pickup/SUV (supervisors/foremen)										
Pickup/SUV (operators/drivers)										
Pickup/SUV (tradesmen/laborers)										

3.11-i Offroad Dust

Estimated Offroad Fugitive Dust Emissions

Earthmoving	Activity		Required Variables							Uncontrolled		Controlled Emissions				
	Pk. Daily	Project	EET	Moist (M)	Silt (s)	Drop (d)	Speed (S)	Wind (U)	Den (D)	Rate (V)	PM_{10}	$PM_{2.5}$	Control	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
	hours	hours	code	percent	percent	feet	mph	mph	ton/cy	cy/hr	lb/hr	lb/hr	%	lb/day	lb/day	lbs	lbs
Reach 4																	
Bulldozer (tracked)	6	2,982	A	14	9						0.50332	0.27119	85%	0.5	0.2	225.1	121.3
Bulldozer (wheeled)	-	-	A	14	9						0.37749	0.20339	85%	-	-	-	-
Scraper (dumper)	-	-	B+C	14		3	5			30	3.92192	0.33705	85%	-	-	-	-
Dump Truck/ADT	-	-	B	14		6				30	0.07623	0.00351	85%	-	-	-	-
Clamshell Derrick	-	-	B	14		9				30	0.10124	0.00549	85%	-	-	-	-
Dragline (small)	-	-	B	14		12				60	0.24766	0.01506	85%	-	-	-	-
Motor Grader	6	2,982	C	14			4				1.98400	0.15360	85%	1.8	0.1	887.4	68.7
Tractor/Offroad Forklift	-	-	C	14			3				0.83700	0.05612	85%	-	-	-	-
Compactor/Roller	6	2,982	C	14			2				0.24800	0.01358	85%	0.2	0.0	110.9	6.1
Crane (tracked)	-	-	C	14			1				0.03100	0.00120	85%	-	-	-	-
Backhoe/Skip Loader	6	2,982	D	14				6.7	1.5	20	0.00317	0.00049	85%	0.0	0.0	1.4	0.2
Bobcat/Skid Steer Loader	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Drill Auger/Borer	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Hydraulic Excavator	18	8,946	D	14				6.7	1.5	60	0.00950	0.00147	85%	0.0	0.0	12.7	2.0
Front End Loader	6	2,982	D	14				6.7	1.5	30	0.00475	0.00073	85%	0.0	0.0	2.1	0.3
Concrete Grinder	6	2,982	E	10					1.9	40	0.18240	0.03040	78%	0.2	0.0	117.9	19.6
Screener (coarse)			F	18					1.9	40	0.66120	0.04560	92%	-	-	-	-
Reach 5																	
Bulldozer (tracked)	6	1,338	A	14	9						0.50332	0.27119	85%	0.5	0.2	101.0	54.4
Bulldozer (wheeled)	-	-	A	14	9						0.37749	0.20339	85%	-	-	-	-
Scraper (dumper)	-	-	B+C	14		3	5			30	3.92192	0.33705	85%	-	-	-	-
Dump Truck/ADT	-	-	B	14		6				30	0.07623	0.00351	85%	-	-	-	-
Clamshell Derrick	-	-	B	14		9				30	0.10124	0.00549	85%	-	-	-	-
Dragline (small)	-	-	B	14		12				60	0.24766	0.01506	85%	-	-	-	-
Motor Grader	6	1,338	C	14			4				1.98400	0.15360	85%	1.8	0.1	398.2	30.8
Tractor/Offroad Forklift	-	-	C	14			3				0.83700	0.05612	85%	-	-	-	-
Compactor/Roller	6	1,338	C	14			2				0.24800	0.01358	85%	0.2	0.0	49.8	2.7
Crane (tracked)	-	-	C	14			1				0.03100	0.00120	85%	-	-	-	-
Backhoe/Skip Loader	6	1,338	D	14				6.7	1.5	20	0.00317	0.00049	85%	0.0	0.0	0.6	0.1
Bobcat/Skid Steer Loader	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Drill Auger/Borer	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Hydraulic Excavator	24	5,352	D	14				6.7	1.5	60	0.00950	0.00147	85%	0.0	0.0	7.6	1.2
Front End Loader	6	1,338	D	14				6.7	1.5	30	0.00475	0.00073	85%	0.0	0.0	1.0	0.1
Concrete Grinder			E	10					1.9	40	0.18240	0.03040	78%	-	-	-	-
Screener (coarse)			F	18					1.9	40	0.66120	0.04560	92%	-	-	-	-

3.11-i Offroad Dust

Estimated Offroad Fugitive Dust Emissions

Reach 6																	
Bulldozer (tracked)	6	6,018	A	14	9						0.50332	0.27119	85%	0.5	0.2	454.3	244.8
Bulldozer (wheeled)	-	-	A	14	9						0.37749	0.20339	85%	-	-	-	-
Scraper (dumper)	-	-	B+C	14		3	5			30	3.92192	0.33705	85%	-	-	-	-
Dump Truck/ADT	-	-	B	14		6				30	0.07623	0.00351	85%	-	-	-	-
Clamshell Derrick	-	-	B	14		9				30	0.10124	0.00549	85%	-	-	-	-
Dragline (small)	-	-	B	14		12				60	0.24766	0.01506	85%	-	-	-	-
Motor Grader	6	6,018	C	14			4				1.98400	0.15360	85%	1.8	0.1	1,791.0	138.7
Tractor/Offroad Forklift	-	-	C	14			3				0.83700	0.05612	85%	-	-	-	-
Compactor/Roller	6	6,018	C	14			2				0.24800	0.01358	85%	0.2	0.0	223.9	12.3
Crane (tracked)	-	-	C	14			1				0.03100	0.00120	85%	-	-	-	-
Backhoe/Skip Loader	6	6,018	D	14				6.7	1.5	20	0.00317	0.00049	85%	0.0	0.0	2.9	0.4
Bobcat/Skid Steer Loader	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Drill Auger/Borer	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Hydraulic Excavator	24	24,072	D	14				6.7	1.5	10	0.00158	0.00024	85%	0.0	0.0	5.7	0.9
Front End Loader	6	6,018	D	14				6.7	1.5	30	0.00475	0.00073	85%	0.0	0.0	4.3	0.7
Concrete Grinder			E	10					1.9	40	0.18240	0.03040	78%	-	-	-	-
Screener (coarse)			F	18					1.9	40	0.66120	0.04560	92%	-	-	-	-
Reach 7a																	
Bulldozer (tracked)	6	1,740	A	14	9						0.50332	0.27119	85%	0.5	0.2	131.4	70.8
Bulldozer (wheeled)	-	-	A	14	9						0.37749	0.20339	85%	-	-	-	-
Scraper (dumper)	-	-	B+C	14		3	5			30	3.92192	0.33705	85%	-	-	-	-
Dump Truck/ADT	-	-	B	14		6				30	0.07623	0.00351	85%	-	-	-	-
Clamshell Derrick	-	-	B	14		9				30	0.10124	0.00549	85%	-	-	-	-
Dragline (small)	-	-	B	14		12				60	0.24766	0.01506	85%	-	-	-	-
Motor Grader	6	1,740	C	14			4				1.98400	0.15360	85%	1.8	0.1	517.8	40.1
Tractor/Offroad Forklift	-	-	C	14			3				0.83700	0.05612	85%	-	-	-	-
Compactor/Roller	6	1,740	C	14			2				0.24800	0.01358	85%	0.2	0.0	64.7	3.5
Crane (tracked)	-	-	C	14			1				0.03100	0.00120	85%	-	-	-	-
Backhoe/Skip Loader	6	1,740	D	14				6.7	1.5	20	0.00317	0.00049	85%	0.0	0.0	0.8	0.1
Bobcat/Skid Steer Loader	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Drill Auger/Borer	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Hydraulic Excavator	24	6,960	D	14				6.7	1.5	60	0.00950	0.00147	85%	0.0	0.0	9.9	1.5
Front End Loader	6	1,740	D	14				6.7	1.5	30	0.00475	0.00073	85%	0.0	0.0	1.2	0.2
Concrete Grinder			E	10					1.9	40	0.18240	0.03040	78%	-	-	-	-
Screener (coarse)			F	18					1.9	40	0.66120	0.04560	92%	-	-	-	-

3.11-i Offroad Dust

Estimated Offroad Fugitive Dust Emissions

Reach 7b																	
Bulldozer (tracked)	6	2,976	A	14	9						0.50332	0.27119	85%	0.5	0.2	224.7	121.1
Bulldozer (wheeled)	-	-	A	14	9						0.37749	0.20339	85%	-	-	-	-
Scraper (dumper)	-	-	B+C	14		3	5			30	3.92192	0.33705	85%	-	-	-	-
Dump Truck/ADT	-	-	B	14		6				30	0.07623	0.00351	85%	-	-	-	-
Clamshell Derrick	-	-	B	14		9				30	0.10124	0.00549	85%	-	-	-	-
Dragline (small)	-	-	B	14		12				60	0.24766	0.01506	85%	-	-	-	-
Motor Grader	6	2,976	C	14			4				1.98400	0.15360	85%	1.8	0.1	885.7	68.6
Tractor/Offroad Forklift	-	-	C	14			3				0.83700	0.05612	85%	-	-	-	-
Compactor/Roller	6	2,976	C	14			2				0.24800	0.01358	85%	0.2	0.0	110.7	6.1
Crane (tracked)	-	-	C	14			1				0.03100	0.00120	85%	-	-	-	-
Backhoe/Skip Loader	6	2,976	D	14				6.7	1.5	20	0.00317	0.00049	85%	0.0	0.0	1.4	0.2
Bobcat/Skid Steer Loader	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Drill Auger/Borer	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Hydraulic Excavator	18	8,928	D	14				6.7	1.5	60	0.00950	0.00147	85%	0.0	0.0	12.7	2.0
Front End Loader	6	2,976	D	14				6.7	1.5	30	0.00475	0.00073	85%	0.0	0.0	2.1	0.3
Concrete Grinder			E	10					1.9	40	0.18240	0.03040	78%	-	-	-	-
Screener (coarse)			F	18					1.9	40	0.66120	0.04560	92%	-	-	-	-
Reach 8 - NRCS																	
Bulldozer (tracked)	6	4,410	A	14	9						0.50332	0.27119	85%	0.5	0.2	332.9	179.4
Bulldozer (wheeled)	-	-	A	14	9						0.37749	0.20339	85%	-	-	-	-
Scraper (dumper)	-	-	B+C	14		3	5			30	3.92192	0.33705	85%	-	-	-	-
Dump Truck/ADT	-	-	B	14		6				30	0.07623	0.00351	85%	-	-	-	-
Clamshell Derrick	-	-	B	14		9				30	0.10124	0.00549	85%	-	-	-	-
Dragline (small)	-	-	B	14		12				60	0.24766	0.01506	85%	-	-	-	-
Motor Grader	6	4,410	C	14			4				1.98400	0.15360	85%	1.8	0.1	1,312.4	101.6
Tractor/Offroad Forklift	-	-	C	14			3				0.83700	0.05612	85%	-	-	-	-
Compactor/Roller	6	4,410	C	14			2				0.24800	0.01358	85%	0.2	0.0	164.1	9.0
Crane (tracked)	-	-	C	14			1				0.03100	0.00120	85%	-	-	-	-
Backhoe/Skip Loader	6	4,410	D	14				6.7	1.5	20	0.00317	0.00049	85%	0.0	0.0	2.1	0.3
Bobcat/Skid Steer Loader	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Drill Auger/Borer	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Hydraulic Excavator	24	17,640	D	14				6.7	1.5	60	0.00950	0.00147	85%	0.0	0.0	25.1	3.9
Front End Loader	6	4,410	D	14				6.7	1.5	30	0.00475	0.00073	85%	0.0	0.0	3.1	0.5
Concrete Grinder			E	10					1.9	40	0.18240	0.03040	78%	-	-	-	-
Screener (coarse)			F	18					1.9	40	0.66120	0.04560	92%	-	-	-	-

3.11-i Offroad Dust

Estimated Offroad Fugitive Dust Emissions

Reach 8 - Culvert/Channel																	
Bulldozer (tracked)	6	4,410	A	14	9						0.50332	0.27119	85%	0.5	0.2	332.9	179.4
Bulldozer (wheeled)	-	-	A	14	9						0.37749	0.20339	85%	-	-	-	-
Scraper (dumper)	-	-	B+C	14		3	5			30	3.92192	0.33705	85%	-	-	-	-
Dump Truck/ADT	-	-	B	14		6				30	0.07623	0.00351	85%	-	-	-	-
Clamshell Derrick	-	-	B	14		9				30	0.10124	0.00549	85%	-	-	-	-
Dragline (small)	-	-	B	14		12				60	0.24766	0.01506	85%	-	-	-	-
Motor Grader	6	4,410	C	14			4				1.98400	0.15360	85%	1.8	0.1	1,312.4	101.6
Tractor/Offroad Forklift	-	-	C	14			3				0.83700	0.05612	85%	-	-	-	-
Compactor/Roller	6	4,410	C	14			2				0.24800	0.01358	85%	0.2	0.0	164.1	9.0
Crane (tracked)	-	-	C	14			1				0.03100	0.00120	85%	-	-	-	-
Backhoe/Skip Loader	6	4,410	D	14				6.7	1.5	20	0.00317	0.00049	85%	0.0	0.0	2.1	0.3
Bobcat/Skid Steer Loader	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Drill Auger/Borer	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Hydraulic Excavator	24	17,640	D	14				6.7	1.5	60	0.00950	0.00147	85%	0.0	0.0	25.1	3.9
Front End Loader	6	4,410	D	14				6.7	1.5	30	0.00475	0.00073	85%	0.0	0.0	3.1	0.5
Concrete Grinder			E	10					1.9	40	0.18240	0.03040	78%	-	-	-	-
Screener (coarse)			F	18					1.9	40	0.66120	0.04560	92%	-	-	-	-
Reach 8 - Tunnel																	
Bulldozer (tracked)	6	4,410	A	14	9						0.50332	0.27119	85%	0.5	0.2	332.9	179.4
Bulldozer (wheeled)	-	-	A	14	9						0.37749	0.20339	85%	-	-	-	-
Scraper (dumper)	-	-	B+C	14		3	5			30	3.92192	0.33705	85%	-	-	-	-
Dump Truck/ADT	-	-	B	14		6				30	0.07623	0.00351	85%	-	-	-	-
Clamshell Derrick	-	-	B	14		9				30	0.10124	0.00549	85%	-	-	-	-
Dragline (small)	-	-	B	14		12				60	0.24766	0.01506	85%	-	-	-	-
Motor Grader	6	4,410	C	14			4				1.98400	0.15360	85%	1.8	0.1	1,312.4	101.6
Tractor/Offroad Forklift	-	-	C	14			3				0.83700	0.05612	85%	-	-	-	-
Compactor/Roller	6	4,410	C	14			2				0.24800	0.01358	85%	0.2	0.0	164.1	9.0
Crane (tracked)	-	-	C	14			1				0.03100	0.00120	85%	-	-	-	-
Backhoe/Skip Loader	6	4,410	D	14				6.7	1.5	20	0.00317	0.00049	85%	0.0	0.0	2.1	0.3
Bobcat/Skid Steer Loader	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Drill Auger/Borer	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Hydraulic Excavator	18	13,230	D	14				6.7	1.5	60	0.00950	0.00147	85%	0.0	0.0	18.9	2.9
Front End Loader	6	4,410	D	14				6.7	1.5	30	0.00475	0.00073	85%	0.0	0.0	3.1	0.5
Concrete Grinder			E	10					1.9	40	0.18240	0.03040	78%	-	-	-	-
Screener (coarse)			F	18					1.9	40	0.66120	0.04560	92%	-	-	-	-

3.11-i Offroad Dust

Estimated Offroad Fugitive Dust Emissions

Reach 14																	
Bulldozer (tracked)	6	2,070	A	14	9						0.50332	0.27119	85%	0.5	0.2	156.3	84.2
Bulldozer (wheeled)	-	-	A	14	9						0.37749	0.20339	85%	-	-	-	-
Scraper (dumper)	-	-	B+C	14		3	5			30	3.92192	0.33705	85%	-	-	-	-
Dump Truck/ADT	-	-	B	14		6				30	0.07623	0.00351	85%	-	-	-	-
Clamshell Derrick	-	-	B	14		9				30	0.10124	0.00549	85%	-	-	-	-
Dragline (small)	-	-	B	14		12				60	0.24766	0.01506	85%	-	-	-	-
Motor Grader	6	2,070	C	14			4				1.98400	0.15360	85%	1.8	0.1	616.0	47.7
Tractor/Offroad Forklift	-	-	C	14			3				0.83700	0.05612	85%	-	-	-	-
Compactor/Roller	6	2,070	C	14			2				0.24800	0.01358	85%	0.2	0.0	77.0	4.2
Crane (tracked)	-	-	C	14			1				0.03100	0.00120	85%	-	-	-	-
Backhoe/Skip Loader	6	2,070	D	14				6.7	1.5	20	0.00317	0.00049	85%	0.0	0.0	1.0	0.2
Bobcat/Skid Steer Loader	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Drill Auger/Borer	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Hydraulic Excavator	18	6,210	D	14				6.7	1.5	60	0.00950	0.00147	85%	0.0	0.0	8.8	1.4
Front End Loader	6	2,070	D	14				6.7	1.5	30	0.00475	0.00073	85%	0.0	0.0	1.5	0.2
Concrete Grinder			E	10					1.9	40	0.18240	0.03040	78%	-	-	-	-
Screener (coarse)			F	18					1.9	40	0.66120	0.04560	92%	-	-	-	-
Reach 6 - Bypass																	
Bulldozer (tracked)	6	4,380	A	14	9						0.50332	0.27119	85%	0.5	0.2	330.7	178.2
Bulldozer (wheeled)	-	-	A	14	9						0.37749	0.20339	85%	-	-	-	-
Scraper (dumper)	-	-	B+C	14		3	5			30	3.92192	0.33705	85%	-	-	-	-
Dump Truck/ADT	-	-	B	14		6				30	0.07623	0.00351	85%	-	-	-	-
Clamshell Derrick	-	-	B	14		9				30	0.10124	0.00549	85%	-	-	-	-
Dragline (small)	-	-	B	14		12				60	0.24766	0.01506	85%	-	-	-	-
Motor Grader	6	4,380	C	14			4				1.98400	0.15360	85%	1.8	0.1	1,303.5	100.9
Tractor/Offroad Forklift	-	-	C	14			3				0.83700	0.05612	85%	-	-	-	-
Compactor/Roller	6	4,380	C	14			2				0.24800	0.01358	85%	0.2	0.0	162.9	8.9
Crane (tracked)	-	-	C	14			1				0.03100	0.00120	85%	-	-	-	-
Backhoe/Skip Loader	6	4,380	D	14				6.7	1.5	20	0.00317	0.00049	85%	0.0	0.0	2.1	0.3
Bobcat/Skid Steer Loader	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Drill Auger/Borer	-	-	D	14				6.7	1.5	10	0.00158	0.00024	85%	-	-	-	-
Hydraulic Excavator	24	17,520	D	14				6.7	1.5	60	0.00950	0.00147	85%	0.0	0.0	25.0	3.9
Front End Loader	6	4,380	D	14				6.7	1.5	30	0.00475	0.00073	85%	0.0	0.0	3.1	0.5
Concrete Grinder			E	10					1.9	40	0.18240	0.03040	78%	-	-	-	-
Screener (coarse)			F	18					1.9	40	0.66120	0.04560	92%	-	-	-	-
CHECKSUMS	522	303150	303672														

Onsite Equipment	lbs/day	lbs/day	tons	tons
Reach 4	2.7	0.4	0.68	0.11
Reach 5	2.5	0.4	0.28	0.04
Reach 6	2.5	0.4	1.24	0.20
Reach 7a	2.5	0.4	0.36	0.06
Reach 7b	2.5	0.4	0.62	0.10
Reach 8 - NRCS	2.5	0.4	0.92	0.15
Reach 8 - Culvert/Channel	2.5	0.4	0.92	0.15
Reach 8 - Tunnel	2.5	0.4	0.92	0.15
Reach 14	2.5	0.4	0.43	0.07
Reach 6 - Bypass	2.5	0.4	0.91	0.15

3.11-i Offroad Dust

Estimated Offroad Fugitive Dust Emissions

Construction Earthmoving	Activity		Required Variables								Uncontrolled		Controlled Emissions				
	Pk. Daily	Project	EET	Moist (M)	Silt (s)	Drop (d)	Speed (S)	Wind (U)	Den (D)	Rate (V)	PM_{10}	$PM_{2.5}$	Control	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
	hours	hours	code	percent	percent	feet	mph	mph	ton/cy	cy/hr	lb/hr	lb/hr	%	lb/day	lb/day	lbs	lbs
Bulldozer (tracked)			A	7	9						1.32827	0.66775	56%	-	-	-	-
Bulldozer (wheeled)			A	7	9						0.99621	0.50081	56%	-	-	-	-
Scraper (dumper)			B+C	7		3	5			30	3.93277	0.33743	56%	-	-	-	-
Dump Truck/ADT			B	7		6				30	0.09385	0.00432	56%	-	-	-	-
Clamshell Derrick			B	7		9				30	0.12465	0.00675	56%	-	-	-	-
Dragline (small)			B	7		12				60	0.30491	0.01854	56%	-	-	-	-
Motor Grader			C	7			4				1.98400	0.15360	56%	-	-	-	-
Tractor/Offroad Forklift			C	7			3				0.83700	0.05612	56%	-	-	-	-
Compactor/Roller			C	7			2				0.24800	0.01358	56%	-	-	-	-
Crane (tracked)			C	7			1				0.03100	0.00120	56%	-	-	-	-
Backhoe/Skip Loader			D	7				6.7	1.5	20	0.00836	0.00129	56%	-	-	-	-
Bobcat/Skid Steer Loader			D	7				6.7	1.5	10	0.00418	0.00065	56%	-	-	-	-
Drill Auger/Borer			D	7				6.7	1.5	10	0.00418	0.00065	56%	-	-	-	-
Hydraulic Excavator			D	7				6.7	1.5	60	0.02507	0.00387	56%	-	-	-	-
Front End Loader			D	7				6.7	1.5	30	0.01254	0.00194	56%	-	-	-	-
Concrete Grinder			E	10					1.9	40	0.18240	0.03040	78%	-	-	-	-
Screener (coarse)			F	18					1.9	40	0.66120	0.04560	92%	-	-	-	-

EET Code A

AP-42 Chapter 11.9 for bulldozer, tractor dozer (Tables 11.9-1):

$E = 0.75 * 1.0 * (s)^{1.5} / (M)^{1.4}$ for PM_{10}

$E = 0.105 * 5.7 * (s)^{1.2} / (M)^{1.3}$ for $PM_{2.5}$

Simplifies to $E = 0.75 * (s)^{1.5} / (M)^{1.4}$ for PM_{10}

Simplifies to $E = 0.60 * (s)^{1.2} / (M)^{1.3}$ for $PM_{2.5}$

E = lb/hr fugitive

s = silt content, percent

M = moisture content, percent

EET Code B

AP-42 Chapter 11.9 for small dragline, clamshell, dumping, scraper (Table 11.9-1):

$E = 0.75 * 0.0021 * (d)^{0.7} / (M)^{0.3}$ for PM_{10}

$E = 0.017 * 0.0021 * (d)^{1.1} / (M)^{0.3}$ for $PM_{2.5}$

Simplifies to $E = 1.6e\text{-}3 * (d)^{0.7} / (M)^{0.3}$ for PM_{10}

Simplifies to $E = 3.6e\text{-}5 * (d)^{1.1} / (M)^{0.3}$ for $PM_{2.5}$

E = lb/cy * cy/hr = lb/hr fugitive

M = moisture content, percent

d = drop distance = 12 feet (small dragline)

d = drop distance = 9 feet (clamshell)

d = drop distance = 6 feet (dump truck/ADT)

d = drop distance = 3 feet (scraper)

3.11-i Offroad Dust

Estimated Offroad Fugitive Dust Emissions

EET Code C

AP-42 Chapter 11.9 for scraper, grader, tractor, compactor, crane (Table 11.9-1) :

E = S * 0.60 * 0.051 x $(S)^{2.0}$ for PM_{10}

E = S * 0.031 * 0.040 x $(S)^{2.5}$ for $PM_{2.5}$

Simplifies to E = 0.031 x $(S)^{3.0}$ for PM_{10}

Simplifies to E = 0.0012 x $(S)^{3.5}$ for $PM_{2.5}$

E = lb/VMT * VMT/hr = lb/hr fugitive

S = Mean Vehicle Speed = 5 mph (scrapers)

S = Mean Vehicle Speed = 4 mph (graders)

S = Mean Vehicle Speed = 3 mph (tractors)

S = Mean Vehicle Speed = 2 mph (compactors)

S = Mean Vehicle Speed = 1 mph (cranes)

EET Code D

AP-42 Chapter 13.2.4 Loading/Handling (backhoe, Bobcat, drill auger, excavator, backhoe, front end loader):

E = V * D * 0.35 * 0.0032 * $(U/5)^{1.3}$/ $(M/2)^{1.4}$ for PM_{10}

E = V * D * 0.053 * 0.0032 * $(U/5)^{1.3}$/ $(M/2)^{1.4}$ for $PM_{2.5}$

Simplifies to E = V * D * 1.1e-3 * $(U/5)^{1.3}$/ $(M/2)^{1.4}$ for PM_{10}

Simplifies to E = V * D * 1.7e-4 * $(U/5)^{1.3}$/ $(M/2)^{1.4}$ for $PM_{2.5}$

V = cy/hr

M = moisture content, percent

E = lb/ton * tons/cy * cy/hr = lb/hr fugitive

D = 1.3 tons/cy for sand or cinder concrete

D = 1.5 tons/cy for soil (typical)

D = 1.9 tons/cy for sandstone or stone concrete

D = 2.1 tons/cy for granite rock

U = wind speed = 1 m/s or 2.2 mi/hr (light air)

U = wind speed = 2 m/s or 4.5 mi/hr (light breeze)

U = wind speed = 3 m/s or 6.7 mi/hr (light breeze)

U = wind speed = 4 m/s or 8.9 mi/hr (gentle breeze)

U = wind speed = 5 m/s or 11.2 mi/hr (gentle breeze)

U = wind speed = 6 m/s or 13.4 mi/hr (moderate breeze)

U = wind speed = 7 m/s or 15.7 mi/hr (moderate breeze)

EET Code E

AP-42 Chapter 11.19.2 Coarse Tertiary Crushing

E = 0.0024 lb/ton uncontrolled PM_{10}

E = 0.0004 lb/ton uncontrolled $PM_{2.5}$

E = D * V * 0.0024 lb/hr uncontrolled PM10

E = D * V* 0.0004 lb/hr uncontrolled PM2.5

V = cy/hr

E = lb/ton * tons/cy * cy/hr = lb/hr fugitive

D = 1.3 tons/cy for sand or cinder concrete

D = 1.5 tons/cy for soil (typical)

D = 1.9 tons/cy for sandstone or stone concrete

D = 2.1 tons/cy for granite rock

Control efficiency = 78% where applicable (water spray)

3.11-i Offroad Dust

Estimated Offroad Fugitive Dust Emissions

EET Code F

AP-42 Chapter 11.19.2 Coarse Screening

E = 0.0087 lb/ton uncontrolled PM_{10}

E = 0.0006 lb/ton uncontrolled $PM_{2.5}$

E = D * V * 0.0087 lb/hr uncontrolled PM10

E = D * V * 0.0006 lb/hr uncontrolled PM2.5

V = cy/hr

E = lb/ton * tons/cy * cy/hr = lb/hr fugitive

D = 1.3 tons/cy for sand or cinder concrete

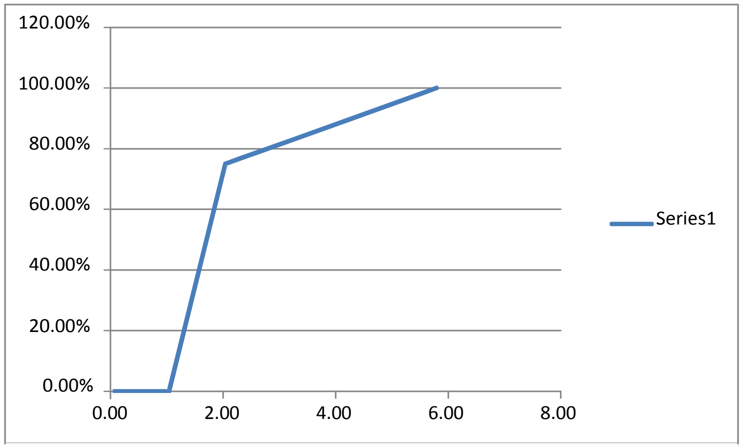
D = 1.5 tons/cy for soil (typical)

D = 1.9 tons/cy for sandstone or stone concrete

D = 2.1 tons/cy for granite rock

Control efficiency = 92% where applicable (water spray)

AP-42	Silt Content, percent			Moisture Content, percent		
Table	lower	upper	g-mean	lower	upper	g-mean
11.9-3	3.8	15.1	6.9	2.2	16.8	7.9
11.9-3	7.2	25.2	16.4	0.2	16.3	3.2
11.9-3	1.2	19.2	4.3	0.3	20.1	2.4
13.2.2-1	2.4	16.0	10.0			
13.2.2-1	5.0	15.0	8.3			
13.2.2-1	2.8	18.0	8.4			
13.2.2-1	0.6	23.0	8.5			
13.2.2-1	2.2	21.0	6.4			
13.2.4-1	3.8	15.0	7.5	2.8	20.0	6.9
13.2.4-1	5.1	21.0	15.0	0.8	6.4	3.4
13.2.4-1	5.0	16.0	9.0	8.9	16.0	12.0
13.2.4-1	4.5	7.4	6.0	8.9	11.0	10.0
Averages (rounded)	**4**	**18**	**9**	**3**	**15**	**7**
EET application as:	**coarse**	**fine**	**typical**	**dry**	**moist**	**typical**



AP-42 Figure 13.2.2-2		
Moisture (M)		Control
percent	ratio	%
0	0.00	0.00%
1	0.25	0.00%
2	0.50	0.00%
3	0.75	0.00%
4	1.00	0.00%
5	1.25	18.75%
6	1.50	37.50%
7	1.75	56.25%
8	2.00	75.00%
9	2.25	76.67%
10	2.50	78.33%
11	2.75	80.00%
12	3.00	81.67%
13	3.25	83.33%
14	3.50	85.00%
15	3.75	86.67%
16	4.00	88.34%
17	4.25	90.00%
18	4.50	91.67%
19	4.75	93.34%
20	5.00	95.00%
21	5.25	96.67%
22	5.50	98.34%
23	5.75	100.00%

Estimated Onroad Fugitive Dust Emissions

All Roads Travelled	Vehicle Category	Activity		Usage	
		Pk. Daily VMT	Project VMT	Unpaved %	Paved %
Reach 4					
Tractor Trailer (materials/hauling)	onroad HHD			1%	99%
Tractor Trailer (equipment/supplies)	onroad HHD			1%	99%
Cement Truck (concrete/pumping)	onroad HHD			1%	99%
Dump Truck (soil/sand/gravel transport)	onroad HHD	40	19880	10%	90%
Water Truck (dust control)	onroad HHD	20	9940	90%	10%
Work Truck (all trades)	onroad MD	100	49700	1%	99%
Pickup/SUV (managers/engineers)	onroad LD	200	99400	1%	99%
Pickup/SUV (supervisors/foremen)	onroad LD			1%	99%
Pickup/SUV (operators/drivers)	onroad LD			1%	99%
Pickup/SUV (tradesmen/laborers)	onroad LD			1%	99%
Reach 5					
Tractor Trailer (materials/hauling)	onroad HHD			1%	99%
Tractor Trailer (equipment/supplies)	onroad HHD			1%	99%
Cement Truck (concrete/pumping)	onroad HHD			1%	99%
Dump Truck (soil/sand/gravel transport)	onroad HHD	40	8920	10%	90%
Water Truck (dust control)	onroad HHD	20	4460	90%	10%
Work Truck (all trades)	onroad MD	100	22300	1%	99%
Pickup/SUV (managers/engineers)	onroad LD	300	66900	1%	99%
Pickup/SUV (supervisors/foremen)	onroad LD			1%	99%
Pickup/SUV (operators/drivers)	onroad LD			1%	99%
Pickup/SUV (tradesmen/laborers)	onroad LD			1%	99%
Reach 6					
Tractor Trailer (materials/hauling)	onroad HHD			1%	99%
Tractor Trailer (equipment/supplies)	onroad HHD			1%	99%
Cement Truck (concrete/pumping)	onroad HHD			1%	99%
Dump Truck (soil/sand/gravel transport)	onroad HHD	40	40120	10%	90%
Water Truck (dust control)	onroad HHD	20	20060	90%	10%
Work Truck (all trades)	onroad MD	100	100300	1%	99%
Pickup/SUV (managers/engineers)	onroad LD	300	300900	1%	99%
Pickup/SUV (supervisors/foremen)	onroad LD			1%	99%
Pickup/SUV (operators/drivers)	onroad LD			1%	99%
Pickup/SUV (tradesmen/laborers)	onroad LD			1%	99%
Reach 7a					
Tractor Trailer (materials/hauling)	onroad HHD			1%	99%
Tractor Trailer (equipment/supplies)	onroad HHD			1%	99%
Cement Truck (concrete/pumping)	onroad HHD			1%	99%
Dump Truck (soil/sand/gravel transport)	onroad HHD	40	11600	10%	90%
Water Truck (dust control)	onroad HHD	20	5800	90%	10%
Work Truck (all trades)	onroad MD	100	29000	1%	99%
Pickup/SUV (managers/engineers)	onroad LD	300	87000	1%	99%
Pickup/SUV (supervisors/foremen)	onroad LD			1%	99%
Pickup/SUV (operators/drivers)	onroad LD			1%	99%
Pickup/SUV (tradesmen/laborers)	onroad LD			1%	99%
Reach 7b					
Tractor Trailer (materials/hauling)	onroad HHD			1%	99%
Tractor Trailer (equipment/supplies)	onroad HHD			1%	99%
Cement Truck (concrete/pumping)	onroad HHD			1%	99%
Dump Truck (soil/sand/gravel transport)	onroad HHD	40	19840	10%	90%
Water Truck (dust control)	onroad HHD	20	9920	90%	10%

Estimated Onroad Fugitive Dust Emissions

Work Truck (all trades)	onroad MD	100	49600	1%	99%
Pickup/SUV (managers/engineers)	onroad LD	200	99200	1%	99%
Pickup/SUV (supervisors/foremen)	onroad LD			1%	99%
Pickup/SUV (operators/drivers)	onroad LD			1%	99%
Pickup/SUV (tradesmen/laborers)	onroad LD			1%	99%
Reach 8 - NRCS					
Tractor Trailer (materials/hauling)	onroad HHD			1%	99%
Tractor Trailer (equipment/supplies)	onroad HHD			1%	99%
Cement Truck (concrete/pumping)	onroad HHD			1%	99%
Dump Truck (soil/sand/gravel transport)	onroad HHD	40	29400	10%	90%
Water Truck (dust control)	onroad HHD	20	14700	90%	10%
Work Truck (all trades)	onroad MD	100	73500	1%	99%
Pickup/SUV (managers/engineers)	onroad LD	300	220500	1%	99%
Pickup/SUV (supervisors/foremen)	onroad LD			1%	99%
Pickup/SUV (operators/drivers)	onroad LD			1%	99%
Pickup/SUV (tradesmen/laborers)	onroad LD			1%	99%
Reach 8 - Culvert/Channel					
Tractor Trailer (materials/hauling)	onroad HHD			1%	99%
Tractor Trailer (equipment/supplies)	onroad HHD			1%	99%
Cement Truck (concrete/pumping)	onroad HHD			1%	99%
Dump Truck (soil/sand/gravel transport)	onroad HHD	40	29400	10%	90%
Water Truck (dust control)	onroad HHD	20	14700	90%	10%
Work Truck (all trades)	onroad MD	100	73500	1%	99%
Pickup/SUV (managers/engineers)	onroad LD	300	220500	1%	99%
Pickup/SUV (supervisors/foremen)	onroad LD			1%	99%
Pickup/SUV (operators/drivers)	onroad LD			1%	99%
Pickup/SUV (tradesmen/laborers)	onroad LD			1%	99%
Reach 8 - Tunnel					
Tractor Trailer (materials/hauling)	onroad HHD			1%	99%
Tractor Trailer (equipment/supplies)	onroad HHD			1%	99%
Cement Truck (concrete/pumping)	onroad HHD	100	73500	1%	99%
Dump Truck (soil/sand/gravel transport)	onroad HHD	40	29400	10%	90%
Water Truck (dust control)	onroad HHD	20	14700	90%	10%
Work Truck (all trades)	onroad MD	100	73500	1%	99%
Pickup/SUV (managers/engineers)	onroad LD	400	294000	1%	99%
Pickup/SUV (supervisors/foremen)	onroad LD			1%	99%
Pickup/SUV (operators/drivers)	onroad LD			1%	99%
Pickup/SUV (tradesmen/laborers)	onroad LD			1%	99%
Reach 14					
Tractor Trailer (materials/hauling)	onroad HHD			1%	99%
Tractor Trailer (equipment/supplies)	onroad HHD			1%	99%
Cement Truck (concrete/pumping)	onroad HHD			1%	99%
Dump Truck (soil/sand/gravel transport)	onroad HHD	40	13800	10%	90%
Water Truck (dust control)	onroad HHD	20	6900	90%	10%
Work Truck (all trades)	onroad MD	100	34500	1%	99%
Pickup/SUV (managers/engineers)	onroad LD	200	69000	1%	99%
Pickup/SUV (supervisors/foremen)	onroad LD			1%	99%
Pickup/SUV (operators/drivers)	onroad LD			1%	99%
Pickup/SUV (tradesmen/laborers)	onroad LD			1%	99%

Estimated Onroad Fugitive Dust Emissions

Reach 6 - Bypass					
Tractor Trailer (materials/hauling)	onroad HHD			1%	99%
Tractor Trailer (equipment/supplies)	onroad HHD			1%	99%
Cement Truck (concrete/pumping)	onroad HHD	100	73000	1%	99%
Dump Truck (soil/sand/gravel transport)	onroad HHD	40	29200	10%	90%
Water Truck (dust control)	onroad HHD	20	14600	90%	10%
Work Truck (all trades)	onroad MD	100	73000	1%	99%
Pickup/SUV (managers/engineers)	onroad LD	300	219000	1%	99%
Pickup/SUV (supervisors/foremen)	onroad LD			1%	99%
Pickup/SUV (operators/drivers)	onroad LD			1%	99%
Pickup/SUV (tradesmen/laborers)	onroad LD			1%	99%
		4600	2749140		

Unpaved Road Dust	Vehicle Category	Activity		Required Variables						Uncontrolled		Controlled Emissions				
		Pk. Daily	Project	EET	Moist (M)	Silt (s)	Weight (W)	Speed (S)	Precip (P)	PM_{10}	$PM_{2.5}$	Control	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
		VMT	VMT	code	percent	percent	tons	mph	days/yr	lb/VMT	lb/VMT	%	lb/day	lb/day	lbs	lbs
Reach 4																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	G	14	9	30	50	60	2.07888	0.20773	85%	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	4	1,988	G	14	9	30	20	60	1.91440	0.19128	85%	1.1	0.1	477.0	47.7
Water Truck (dust control)	onroad HHD	18	8,946	G	14	9	30	5	60	1.77289	0.17713	85%	4.8	0.5	1,988.0	198.6
Work Truck (all trades)	onroad MD	1	497	G	14	9	8	20	60	1.18292	0.11814	85%	0.2	0.0	73.7	7.4
Pickup/SUV (managers/engineers)	onroad LD	2	994	G	14	9	3	20	60	0.86171	0.08601	85%	0.3	0.0	107.4	10.7
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Reach 5																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	4	892	G	14	9	30	20	60	1.91440	0.19128	85%	1.1	0.1	214.0	21.4
Water Truck (dust control)	onroad HHD	18	4,014	G	14	9	30	5	60	1.77289	0.17713	85%	4.8	0.5	892.0	89.1
Work Truck (all trades)	onroad MD	1	223	G	14	9	8	20	60	1.18292	0.11814	85%	0.2	0.0	33.1	3.3
Pickup/SUV (managers/engineers)	onroad LD	3	669	G	14	9	3	20	60	0.86171	0.08601	85%	0.4	0.0	72.3	7.2
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Reach 6																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	4	4,012	G	14	9	30	20	60	1.91440	0.19128	85%	1.1	0.1	962.7	96.2
Water Truck (dust control)	onroad HHD	18	18,054	G	14	9	30	5	60	1.77289	0.17713	85%	4.8	0.5	4,011.9	400.8
Work Truck (all trades)	onroad MD	1	1,003	G	14	9	8	20	60	1.18292	0.11814	85%	0.2	0.0	148.7	14.9
Pickup/SUV (managers/engineers)	onroad LD	3	3,009	G	14	9	3	20	60	0.86171	0.08601	85%	0.4	0.0	325.0	32.4
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-

Estimated Onroad Fugitive Dust Emissions

Reach 7a																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	4	1,160	G	14	9	30	20	60	1.91440	0.19128	85%	1.1	0.1	278.3	27.8
Water Truck (dust control)	onroad HHD	18	5,220	G	14	9	30	5	60	1.77289	0.17713	85%	4.8	0.5	1,160.0	115.9
Work Truck (all trades)	onroad MD	1	290	G	14	9	8	20	60	1.18292	0.11814	85%	0.2	0.0	43.0	4.3
Pickup/SUV (managers/engineers)	onroad LD	3	870	G	14	9	3	20	60	0.86171	0.08601	85%	0.4	0.0	94.0	9.4
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Reach 7b																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	4	1,984	G	14	9	30	20	60	1.91440	0.19128	85%	1.1	0.1	476.1	47.6
Water Truck (dust control)	onroad HHD	18	8,928	G	14	9	30	5	60	1.77289	0.17713	85%	4.8	0.5	1,984.0	198.2
Work Truck (all trades)	onroad MD	1	496	G	14	9	8	20	60	1.18292	0.11814	85%	0.2	0.0	73.5	7.3
Pickup/SUV (managers/engineers)	onroad LD	2	992	G	14	9	3	20	60	0.86171	0.08601	85%	0.3	0.0	107.1	10.7
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Reach 8 - NRCS																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	4	2,940	G	14	9	30	20	60	1.91440	0.19128	85%	1.1	0.1	705.5	70.5
Water Truck (dust control)	onroad HHD	18	13,230	G	14	9	30	5	60	1.77289	0.17713	85%	4.8	0.5	2,939.9	293.7
Work Truck (all trades)	onroad MD	1	735	G	14	9	8	20	60	1.18292	0.11814	85%	0.2	0.0	109.0	10.9
Pickup/SUV (managers/engineers)	onroad LD	3	2,205	G	14	9	3	20	60	0.86171	0.08601	85%	0.4	0.0	238.2	23.8
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Reach 8 - Culvert/Channel																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	4	2,940	G	14	9	30	20	60	1.91440	0.19128	85%	1.1	0.1	705.5	70.5
Water Truck (dust control)	onroad HHD	18	13,230	G	14	9	30	5	60	1.77289	0.17713	85%	4.8	0.5	2,939.9	293.7
Work Truck (all trades)	onroad MD	1	735	G	14	9	8	20	60	1.18292	0.11814	85%	0.2	0.0	109.0	10.9
Pickup/SUV (managers/engineers)	onroad LD	3	2,205	G	14	9	3	20	60	0.86171	0.08601	85%	0.4	0.0	238.2	23.8
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Reach 8 - Tunnel																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	1	735	G	14	9	30	20	60	1.91440	0.19128	85%	0.3	0.0	176.4	17.6
Dump Truck (soil/sand/gravel transport)	onroad HHD	4	2,940	G	14	9	30	20	60	1.91440	0.19128	85%	1.1	0.1	705.5	70.5
Water Truck (dust control)	onroad HHD	18	13,230	G	14	9	30	5	60	1.77289	0.17713	85%	4.8	0.5	2,939.9	293.7
Work Truck (all trades)	onroad MD	1	735	G	14	9	8	20	60	1.18292	0.11814	85%	0.2	0.0	109.0	10.9
Pickup/SUV (managers/engineers)	onroad LD	4	2,940	G	14	9	3	20	60	0.86171	0.08601	85%	0.5	0.1	317.5	31.7
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-

Estimated Onroad Fugitive Dust Emissions

Pickup/SUV (operators/drivers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Reach 14 - Tunnel																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	4	1,380	G	14	9	30	20	60	1.91440	0.19128	85%	1.1	0.1	331.1	33.1
Water Truck (dust control)	onroad HHD	18	6,210	G	14	9	30	5	60	1.77289	0.17713	85%	4.8	0.5	1,380.0	137.9
Work Truck (all trades)	onroad MD	1	345	G	14	9	8	20	60	1.18292	0.11814	85%	0.2	0.0	51.2	5.1
Pickup/SUV (managers/engineers)	onroad LD	2	690	G	14	9	3	20	60	0.86171	0.08601	85%	0.3	0.0	74.5	7.4
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Reach 6 - Bypass																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	G	14	9	30	20	60	1.91440	0.19128	85%	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	1	730	G	14	9	30	20	60	1.91440	0.19128	85%	0.3	0.0	175.2	17.5
Dump Truck (soil/sand/gravel transport)	onroad HHD	4	2,920	G	14	9	30	20	60	1.91440	0.19128	85%	1.1	0.1	700.7	70.0
Water Truck (dust control)	onroad HHD	18	13,140	G	14	9	30	5	60	1.77289	0.17713	85%	4.8	0.5	2,919.9	291.7
Work Truck (all trades)	onroad MD	1	730	G	14	9	8	20	60	1.18292	0.11814	85%	0.2	0.0	108.2	10.8
Pickup/SUV (managers/engineers)	onroad LD	3	2,190	G	14	9	3	20	60	0.86171	0.08601	85%	0.4	0.0	236.5	23.6
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	G	14	9	3	20	60	0.86171	0.08601	85%	-	-	-	-

Special Note: Daily maximums do not include importing equipment from other areas in state (local emissions only)

Unpaved Roads	lbs/day	lbs/day	tons	tons
Reach 4	**6.4**	**0.6**	**1.3**	**0.1**
Reach 5	**6.5**	**0.6**	**0.6**	**0.1**
Reach 6	**6.5**	**0.6**	**2.7**	**0.3**
Reach 7a	**6.5**	**0.6**	**0.8**	**0.1**
Reach 7b	**6.4**	**0.6**	**1.3**	**0.1**
Reach 8 - NRCS	**6.5**	**0.6**	**2.0**	**0.2**
Reach 8 - Culvert/Channel	**6.5**	**0.6**	**2.0**	**0.2**
Reach 8 - Tunnel	**6.9**	**0.7**	**2.1**	**0.2**
Reach 14	**6.4**	**0.6**	**0.9**	**0.1**
Reach 6 - Bypass	**6.8**	**0.7**	**2.1**	**0.2**

Estimated Onroad Fugitive Dust Emissions

Paved Road Dust	Vehicle Category	Activity		Required Variables						Uncontrolled		Controlled Emissions				
		Pk. Daily	Project	EET	Moist (M)	Silt (sL)	Weight (W)	Speed (S)	Precip (P)	PM_{10}	$PM_{2.5}$	Control	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
		VMT	VMT	code	percent	g/m^2	tons	mph	days/yr	lb/VMT	lb/VMT	%	lb/day	lb/day	lbs	lbs
Reach 4																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	H	--	0.015	30	--	60	0.00155	0.00038	--	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	36	17,892	H	--	0.18	30	--	60	0.01484	0.00364	--	0.5	0.1	254.6	62.5
Water Truck (dust control)	onroad HHD	2	994	H	--	0.18	30	--	60	0.01484	0.00364	--	0.0	0.0	14.1	3.5
Work Truck (all trades)	onroad MD	99	49,203	H	--	0.18	8	--	60	0.00385	0.00095	--	0.4	0.1	181.8	44.6
Pickup/SUV (managers/engineers)	onroad LD	198	98,406	H	--	0.18	3	--	60	0.00142	0.00035	--	0.3	0.1	133.7	32.8
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Reach 5																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	H	--	0.015	30	--	60	0.00155	0.00038	--	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	36	8,028	H	--	0.18	30	--	60	0.01484	0.00364	--	0.5	0.1	114.2	28.0
Water Truck (dust control)	onroad HHD	2	446	H	--	0.18	30	--	60	0.01484	0.00364	--	0.0	0.0	6.3	1.6
Work Truck (all trades)	onroad MD	99	22,077	H	--	0.18	8	--	60	0.00385	0.00095	--	0.4	0.1	81.6	20.0
Pickup/SUV (managers/engineers)	onroad LD	297	66,231	H	--	0.18	3	--	60	0.00142	0.00035	--	0.4	0.1	90.0	22.1
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Reach 6																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	H	--	0.015	30	--	60	0.00155	0.00038	--	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	36	36,108	H	--	0.18	30	--	60	0.01484	0.00364	--	0.5	0.1	513.8	126.1
Water Truck (dust control)	onroad HHD	2	2,006	H	--	0.18	30	--	60	0.01484	0.00364	--	0.0	0.0	28.5	7.0
Work Truck (all trades)	onroad MD	99	99,297	H	--	0.18	8	--	60	0.00385	0.00095	--	0.4	0.1	366.9	90.1
Pickup/SUV (managers/engineers)	onroad LD	297	297,891	H	--	0.18	3	--	60	0.00142	0.00035	--	0.4	0.1	404.8	99.4
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Reach 7a																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	H	--	0.015	30	--	60	0.00155	0.00038	--	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	36	10,440	H	--	0.18	30	--	60	0.01484	0.00364	--	0.5	0.1	148.5	36.5
Water Truck (dust control)	onroad HHD	2	580	H	--	0.18	30	--	60	0.01484	0.00364	--	0.0	0.0	8.3	2.0
Work Truck (all trades)	onroad MD	99	28,710	H	--	0.18	8	--	60	0.00385	0.00095	--	0.4	0.1	106.1	26.0
Pickup/SUV (managers/engineers)	onroad LD	297	86,130	H	--	0.18	3	--	60	0.00142	0.00035	--	0.4	0.1	117.0	28.7
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Reach 7b																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	H	--	0.015	30	--	60	0.00155	0.00038	--	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	36	17,856	H	--	0.18	30	--	60	0.01484	0.00364	--	0.5	0.1	254.1	62.4
Water Truck (dust control)	onroad HHD	2	992	H	--	0.18	30	--	60	0.01484	0.00364	--	0.0	0.0	14.1	3.5

Estimated Onroad Fugitive Dust Emissions

Work Truck (all trades)	onroad MD	99	49,104	H	--	0.18	8	--	60	0.00385	0.00095	--	0.4	0.1	181.5	44.5
Pickup/SUV (managers/engineers)	onroad LD	198	98,208	H	--	0.18	3	--	60	0.00142	0.00035	--	0.3	0.1	133.4	32.8
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Reach 8 - NRCS																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	H	--	0.015	30	--	60	0.00155	0.00038	--	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	36	26,460	H	--	0.18	30	--	60	0.01484	0.00364	--	0.5	0.1	376.5	92.4
Water Truck (dust control)	onroad HHD	2	1,470	H	--	0.18	30	--	60	0.01484	0.00364	--	0.0	0.0	20.9	5.1
Work Truck (all trades)	onroad MD	99	72,765	H	--	0.18	8	--	60	0.00385	0.00095	--	0.4	0.1	268.9	66.0
Pickup/SUV (managers/engineers)	onroad LD	297	218,295	H	--	0.18	3	--	60	0.00142	0.00035	--	0.4	0.1	296.6	72.8
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Reach 8 - Culvert/Channel																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	H	--	0.015	30	--	60	0.00155	0.00038	--	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	36	26,460	H	--	0.18	30	--	60	0.01484	0.00364	--	0.5	0.1	376.5	92.4
Water Truck (dust control)	onroad HHD	2	1,470	H	--	0.18	30	--	60	0.01484	0.00364	--	0.0	0.0	20.9	5.1
Work Truck (all trades)	onroad MD	99	72,765	H	--	0.18	8	--	60	0.00385	0.00095	--	0.4	0.1	268.9	66.0
Pickup/SUV (managers/engineers)	onroad LD	297	218,295	H	--	0.18	3	--	60	0.00142	0.00035	--	0.4	0.1	296.6	72.8
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Reach 8 - Tunnel																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	H	--	0.015	30	--	60	0.00155	0.00038	--	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	99	72,765	H	--	0.18	30	--	60	0.01484	0.00364	--	1.5	0.4	1,035.3	254.1
Dump Truck (soil/sand/gravel transport)	onroad HHD	36	26,460	H	--	0.18	30	--	60	0.01484	0.00364	--	0.5	0.1	376.5	92.4
Water Truck (dust control)	onroad HHD	2	1,470	H	--	0.18	30	--	60	0.01484	0.00364	--	0.0	0.0	20.9	5.1
Work Truck (all trades)	onroad MD	99	72,765	H	--	0.18	8	--	60	0.00385	0.00095	--	0.4	0.1	268.9	66.0
Pickup/SUV (managers/engineers)	onroad LD	396	291,060	H	--	0.18	3	--	60	0.00142	0.00035	--	0.6	0.1	395.5	97.1
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Reach 14																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	H	--	0.015	30	--	60	0.00155	0.00038	--	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Dump Truck (soil/sand/gravel transport)	onroad HHD	36	12,420	H	--	0.18	30	--	60	0.01484	0.00364	--	0.5	0.1	176.7	43.4
Water Truck (dust control)	onroad HHD	2	690	H	--	0.18	30	--	60	0.01484	0.00364	--	0.0	0.0	9.8	2.4
Work Truck (all trades)	onroad MD	99	34,155	H	--	0.18	8	--	60	0.00385	0.00095	--	0.4	0.1	126.2	31.0
Pickup/SUV (managers/engineers)	onroad LD	198	68,310	H	--	0.18	3	--	60	0.00142	0.00035	--	0.3	0.1	92.8	22.8
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Reach 6 - Bypass																
Tractor Trailer (materials/hauling)	onroad HHD	-	-	H	--	0.18	30	--	60	0.01484	0.00364	--	-	-	-	-
Tractor Trailer (equipment/supplies)	onroad HHD	-	-	H	--	0.015	30	--	60	0.00155	0.00038	--	-	-	-	-
Cement Truck (concrete/pumping)	onroad HHD	99	72,270	H	--	0.18	30	--	60	0.01484	0.00364	--	1.5	0.4	1,028.3	252.4

Estimated Onroad Fugitive Dust Emissions

Dump Truck (soil/sand/gravel transport)	onroad HHD	36	26,280	H	--	0.18	30	--	60	0.01484	0.00364	--	0.5	0.1	373.9	91.8
Water Truck (dust control)	onroad HHD	2	1,460	H	--	0.18	30	--	60	0.01484	0.00364	--	0.0	0.0	20.8	5.1
Work Truck (all trades)	onroad MD	99	72,270	H	--	0.18	8	--	60	0.00385	0.00095	--	0.4	0.1	267.1	65.6
Pickup/SUV (managers/engineers)	onroad LD	297	216,810	H	--	0.18	3	--	60	0.00142	0.00035	--	0.4	0.1	294.6	72.3
Pickup/SUV (supervisors/foremen)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (operators/drivers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-
Pickup/SUV (tradesmen/laborers)	onroad LD	-	-	H	--	0.18	3	--	60	0.00142	0.00035	--	-	-	-	-

Special Note: Daily maximums do not include importing equipment from other areas in state (local emissions only)

Paved Roads	lbs/day	lbs/day	tons	tons
Reach 4	**1.2**	**0.3**	**0.3**	**0.1**
Reach 5	**1.4**	**0.3**	**0.1**	**0.0**
Reach 6	**1.4**	**0.3**	**0.7**	**0.2**
Reach 7a	**1.4**	**0.3**	**0.2**	**0.0**
Reach 7b	**1.2**	**0.3**	**0.3**	**0.1**
Reach 8 - NRCS	**1.4**	**0.3**	**0.5**	**0.1**
Reach 8 - Culvert/Channel	**1.4**	**0.3**	**0.5**	**0.1**
Reach 8 - Tunnel	**3.0**	**0.7**	**1.0**	**0.3**
Reach 14	**1.2**	**0.3**	**0.2**	**0.0**
Reach 6 - Bypass	**2.8**	**0.7**	**1.0**	**0.2**

Years	tons/yr	tons/yr	Offroad + Unpaved + Paved	lbs/day	lbs/day	tons	tons
3	**0.8**	**0.1**	**Reach 4**	**10.3**	**1.4**	**2.3**	**0.3**
2	**0.5**	**0.1**	**Reach 5**	**10.4**	**1.4**	**1.0**	**0.1**
5	**0.9**	**0.1**	**Reach 6**	**10.3**	**1.4**	**4.6**	**0.6**
2	**0.7**	**0.1**	**Reach 7a**	**10.4**	**1.4**	**1.3**	**0.2**
3	**0.7**	**0.1**	**Reach 7b**	**10.1**	**1.3**	**2.2**	**0.3**
4	**0.8**	**0.1**	**Reach 8 - NRCS**	**10.4**	**1.4**	**3.4**	**0.5**
4	**0.8**	**0.1**	**Reach 8 - Culvert/Channel**	**10.4**	**1.4**	**3.4**	**0.5**
4	**1.0**	**0.2**	**Reach 8 - Tunnel**	**12.4**	**1.8**	**4.1**	**0.6**
2	**0.8**	**0.1**	**Reach 14**	**10.1**	**1.3**	**1.6**	**0.2**
4	**1.0**	**0.1**	**Reach 6 - Bypass**	**12.1**	**1.8**	**4.0**	**0.6**

TOTALS			tons	tons
basic			16.5	2.2
tunnel			17.2	2.4
bypass			14.8	2.1
tun + by			15.5	2.2

EET Code G

Unpaved Road Dust (AP-42 Section 13.2.2):

E = $[1.5 \cdot (s/12)^{0.9} \cdot (W/3)^{0.45}] \cdot P_C \cdot (1\text{-}CE)$ for PM_{10}

E = $[1.8 \cdot (s/12)^{1.0} \cdot (S/30)^{0.5} / (M/0.5)^{0.2} - 0.00047] \cdot P_C \cdot (1\text{-}CE)$ for PM_{10}

E = $[0.15 \cdot (s/12)^{0.9} \cdot (W/3)^{0.45}] \cdot P_C \cdot (1\text{-}CE)$ for $PM_{2.5}$

E = $[0.18 \cdot (s/12)^{1.0} \cdot (S/30)^{0.5} / (M/0.5)^{0.2} - 0.00036] \cdot P_C \cdot (1\text{-}CE)$ for $PM_{2.5}$

Equation pairs calculated for average factoring of both vehicle weight and speed

s = silt content, percent

W = average vehicle weight (see below)

M = moisture content, percent

S = mean vehicle speed = 5-10 mph for watering trucks

S = mean vehicle speed = 15 mph for haul roads (general mitigation measure)

S = mean vehicle speed = 20 mph for graded dirt/gravel roads

E = lb/VMT fugitive

P_C = (365-P)/365

P = Number of wet days over 0.01 in precipitation for averaging period (from AP-42 Figure 13.2.1-2)

Note: precipitation correction not used (P_C = 1) for worst case day calculations

CE = control efficiency for watering (moisture content)

Light Duty = 3 tons average (loaded)

Medium Duty = 8 tons average (loaded)

Heavy Heavy Duty = 30 tons average (loaded 40 tons, unloaded 20 tons)

EET Code H

Paved Road Dust (New AP-42 Section 13.2.1):

E = $0.0022 \cdot (sL)^{0.91} \cdot (W)^{1.02} \cdot P_C$ for PM_{10}

E = $0.00054 \cdot (sL)^{0.91} \cdot (W)^{1.02} \cdot P_C$ for $PM_{2.5}$

E = lb/VMT fugitive

sL = Silt Loading from Table 13.2.1-2

W = Average weight of vehicles in tons (below)

P_C = (1-P/4N)

P = Number of wet days over 0.01 in precipitation for averaging period (from AP-42 Figure 13.2.1-2)

Reach	Project Year					
	1	2	3	4	5	6
4	X	X	X			
5		X	X			
6		X	X	X	X	X
7a	X	X				
7b			X	X	X	
8 NRCS		X	X	X	X	
8 culvert		X	X	X	X	
8 tunnel		X	X	X	X	
14		X	X			
6 bypass		X	X	X	X	

Estimated Onroad Fugitive Dust Emissions

N = days of period = 365 days (4N = 1460)

Note: precipitation correction not used (P_C = 1) for worst case day calculations

Light Duty = 3 tons average (loaded)

Medium Duty = 8 tons average (loaded)

Heavy Heavy Duty = 30 tons average (loaded 40 tons, unloaded 20 tons)

For basic project (no options)

	lbs/day	lbs/day	tons/yr	tons/yr
Year 1	20.7	2.8	1.4	0.2
Year 2	61.9	8.3	4.5	0.6
Year 3	61.6	8.2	4.6	0.6
Year 4	30.8	4.1	2.5	0.3
Year 5	20.7	2.8	1.8	0.2
Year 6	10.3	1.4	0.9	0.1
MAX	**61.9**	**8.3**	**4.6**	**0.6**

For tunnel option project

	lbs/day	lbs/day	tons/yr	tons/yr
Year 1	20.7	2.8	1.4	0.2
Year 2	63.9	8.7	4.7	0.7
Year 3	63.6	8.6	4.7	0.7
Year 4	32.8	4.5	2.7	0.4
Year 5	22.7	3.2	1.9	0.3
Year 6	10.3	1.4	0.9	0.1
MAX	**63.9**	**8.7**	**4.7**	**0.7**

For bypass option project

	lbs/day	lbs/day	tons/yr	tons/yr
Year 1	20.7	2.8	1.4	0.2
Year 2	53.3	7.3	4.1	0.6
Year 3	53.0	7.2	4.1	0.6
Year 4	22.2	3.1	2.1	0.3
Year 5	12.1	1.8	1.3	0.2
Year 6	10.3	1.4	0.9	0.1
MAX	**53.3**	**7.3**	**4.1**	**0.6**

For tunnel + bypass option project

	lbs/day	lbs/day	tons/yr	tons/yr
Year 1	20.7	2.8	1.4	0.2
Year 2	55.3	7.7	4.2	0.6
Year 3	55.0	7.6	4.3	0.6
Year 4	24.2	3.5	2.2	0.3
Year 5	14.1	2.2	1.5	0.2
Year 6	10.3	1.4	0.9	0.1
MAX	**55.3**	**7.7**	**4.3**	**0.6**

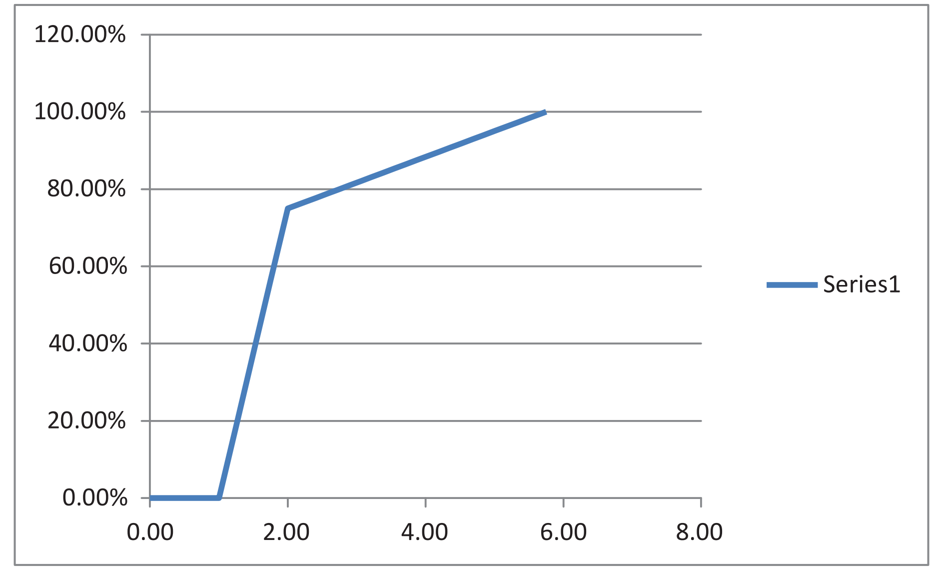
Option	lbs/day	lbs/day	tons/yr	tons/yr
5	10.4	1.4	0.5	0.1
6	10.3	1.4	0.9	0.1
6 bypass	12.1	1.8	1.0	0.1
delta 6	-8.6	-1.0	-0.4	0.0
8 NRCS	10.4	1.4	0.8	0.1
8 culvert	10.4	1.4	0.8	0.1
8 tunnel	12.4	1.8	1.0	0.2
delta 8	2.0	0.4	0.2	0.0

Estimated Onroad Fugitive Dust Emissions

AP-42 Figure 13.2.1-2 (California)	
Values for Precipitation (P)	**days/yr**
Low Deserts	20
High Deserts & Inland SoCal	30
South/Central Coast/Valley & Mountains	40
Mid/Northern Central Valley	50
Bay & Delta Areas	60
Wine Country & Sierras	90
North Coast	120

AP-42 Table 13.2.1-2 (US)	
Values for Silt Loading (sL)	**g/m^3**
< 500 average daily traffic (ADT) count	0.6
500 - 5,000 ADT	0.2
5,000 - 10,000 ADT	0.06
> 10,000 ADT (surface streets)	0.03
> 10,000 ADT (limited access)	0.015
Average Rural	0.4
Average Mid-Range	0.13
Average Urban	0.023
Average for All Roads	0.18

AP-42 Figure 13.2.2-2		
Moisture (M)		**Control**
percent	**ratio**	**%**
0	0.00	0.00%
1	0.25	0.00%
2	0.50	0.00%
3	0.75	0.00%
4	1.00	0.00%
5	1.25	18.75%
6	1.50	37.50%
7	1.75	56.25%
8	2.00	75.00%
9	2.25	76.67%
10	2.50	78.33%
11	2.75	80.00%
12	3.00	81.67%
13	3.25	83.33%
14	3.50	85.00%
15	3.75	86.67%
16	4.00	88.34%
17	4.25	90.00%
18	4.50	91.67%
19	4.75	93.34%
20	5.00	95.00%
21	5.25	96.67%
22	5.50	98.34%
23	5.75	100.00%



AERSCREEN INPUT DATA	UNITS	VALUES	VALUES	VALUES
Initial Information				
Title of modeling run	alpha	Reach_7a	Reach_7b	Reach_8
Input units, English or metric (E/M)	alpha	M	M	M
Source type (Point, Volume, Area, Circle, Flare, Shielded, Horizontal)	alpha	P	P	P
Source Information				
Emission rate	grams/sec	2.76E-03	1.84E-03	2.76E-03
Stack height	meters	1.5	1.5	1.5
Stack diameter	meters	0.15	0.15	0.15
Stack exit temperature	°K	700	700	700
Stack exit velocity (option 1, m/s)	meters/sec	38	38	38
Rural/Urban (R/U)	alpha	U	U	U
Population of urban area	integer	38000	38000	38000
Minimum distance to ambient air	meters	default	default	default
Option for modeling NO_2 chemistry (1, 2, 3)	option #	1	1	1
1) No chemistry or pollutant is not NO_2 (worst case unitary)				
2) Use ozone limiting method				
3) Use plume volume molar ratio method				
In-stack NO_2 to NO_X ratio for options 2 or 3	ratio	0.1	0.1	0.1
Ozone concentration (ambient) for options 2 or 3	ppmv			
Building Downwash Information				
Include building downwash (Y/N)	alpha	N	N	N
Use existing BPIPPRM input file (Y/N)	alpha	N	N	N
Building height	meters			
Maximum horizontal dimension	meters			
Minimum horizontal dimension	meters			
Orientation of maximum building dimension to true North (0-179)	degrees			
Direction of stack from true North axis (0-359)	degrees			
Distance from stack to building center axis	meters			
Terrain Height Information				
Include terrain heights (Y/N)	alpha	N	N	N
Maximum distance to probe (2 km radius of vicinity)	meters	500	500	500
Include up to 10 discrete receptors (Y/N)	alpha	Y	Y	Y
Filename of discrete receptors (*.txt)	.txt	receptorA.txt	receptorA.txt	receptorA.txt
Use flagpole receptors (Y/N)	alpha	Y	Y	Y
Flagpole receptor height	meters	1.5	1.5	1.5
Source base elevation above mean sea level (land parcel)	meters	100	100	100
Meteorology Information for MAKEMET				
Minimum temperature (35 °F)	°K	275	275	275
Maximum temperature (107 °F)	°K	305	305	305
Minimum wind speed (2.2 mph)	meters/sec	1	1	1
Anemometer height	meters	10	10	10
Source of surface characteristics (1-user spec, 2-AERMET, 3-ext file)	option #	2	2	2
Dominant surface profile (land use: 1, 2, 3, 4, 5, 6, 7, 8)	option #	7	7	7
Dominant climate profile (1-average, 2-wet, 3-dry)	option #	3	3	3
Output File				
Use non-default name (*.out)	.out	Reach_7a	Reach_7b	Reach_8

Reach	**7a**	**7b**	**8**
miles	1.74	1.31	1.13
meters	2800	2108	1819
days	290	496	735
m/day	9.7	4.3	2.5
m	50	50	50
days	**5**	**12**	**20**

3.11-I Offroad 2017

SCAB Fleet Average Emission Factors (Diesel)

3.11-I Offroad 2017

Air Basin	**SC**

Extrapolation (down)
Interpolation
Extrapolation (up)

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2 e**
	10	0.00671	0.03522	0.04205	0.00009	0.00165	0.00152	5.8	0.00061	0.00027	5.86
Aerial Lifts	15	0.01007	0.05283	0.06308	0.00013	0.00247	0.00228	8.7	0.00091	0.00040	8.80
	25	0.01463	0.04734	0.08734	0.00014	0.00409	0.00377	11.0	0.00132	0.00059	11.17
	50	0.03817	0.15475	0.15797	0.00025	0.01042	0.00958	19.6	0.00344	0.00153	20.16
	80	0.03759	0.18855	0.20971	0.00034	0.01425	0.01311	27.5	0.00339	0.00151	28.06
	120	0.03682	0.23362	0.27870	0.00045	0.01937	0.01782	38.1	0.00332	0.00148	38.60
	500	0.08905	0.39831	0.98906	0.00209	0.02986	0.02747	212.9	0.00803	0.00357	214.13
	750	0.16472	0.71998	1.84446	0.00387	0.05489	0.05050	384.8	0.01486	0.00661	387.12
	800	0.17570	0.76798	1.96742	0.00413	0.05855	0.05386	410.4	0.01585	0.00705	412.92
Aerial Lifts Composite		0.03580	0.17681	0.23101	0.00040	0.01340	0.01233	34.7	0.00323	0.00144	35.23
Air Compressors	15	0.01005	0.04581	0.06239	0.00011	0.00350	0.00322	7.2	0.00091	0.00040	7.37
	25	0.02124	0.06543	0.12049	0.00018	0.00624	0.00574	14.4	0.00192	0.00085	14.75
	50	0.05907	0.22091	0.19135	0.00029	0.01475	0.01357	22.3	0.00533	0.00237	23.12
	80	0.05786	0.26003	0.26680	0.00040	0.02101	0.01933	32.8	0.00522	0.00232	33.68
	120	0.05624	0.31220	0.36741	0.00055	0.02935	0.02700	47.0	0.00507	0.00226	47.76
	175	0.07516	0.49984	0.57004	0.00100	0.03059	0.02814	88.5	0.00678	0.00301	89.56
	250	0.07911	0.26918	0.73883	0.00148	0.02302	0.02118	131.2	0.00714	0.00317	132.35
	500	0.13214	0.45980	1.13631	0.00227	0.03815	0.03510	231.7	0.01192	0.00530	233.63
	750	0.20568	0.71061	1.81415	0.00360	0.06003	0.05523	358.1	0.01856	0.00825	361.09
	1000	0.31274	1.07393	3.95056	0.00489	0.10481	0.09642	486.4	0.02822	0.01254	490.84
Air Compressors Composite		0.06411	0.31653	0.43179	0.00071	0.02816	0.02591	63.6	0.00578	0.00257	64.53
Bore/Drill Rigs	15	0.01204	0.06317	0.07542	0.00016	0.00295	0.00271	10.3	0.00109	0.00048	10.52
	25	0.01929	0.06583	0.12189	0.00020	0.00457	0.00421	16.0	0.00174	0.00077	16.26
	50	0.02100	0.22153	0.19920	0.00040	0.00441	0.00406	31.0	0.00189	0.00084	31.34
	60	0.02266	0.25656	0.21306	0.00047	0.00514	0.00473	37.6	0.00204	0.00091	37.95
	120	0.03264	0.46671	0.29622	0.00090	0.00954	0.00878	77.1	0.00295	0.00131	77.59
	175	0.05189	0.75410	0.35886	0.00159	0.01211	0.01114	141.1	0.00468	0.00208	141.82
	250	0.05798	0.34256	0.31238	0.00212	0.00882	0.00812	188.1	0.00523	0.00233	188.93
	500	0.09552	0.55113	0.50351	0.00306	0.01447	0.01331	311.3	0.00862	0.00383	312.68
	750	0.18908	1.08901	1.00179	0.00618	0.02866	0.02637	615.1	0.01706	0.00758	617.80
	1000	0.30161	1.64571	4.39725	0.00933	0.08548	0.07864	928.3	0.02721	0.01209	932.60
Bore/Drill Rigs Composite		0.05776	0.50129	0.46916	0.00175	0.01259	0.01158	164.9	0.00521	0.00232	165.72
Cement and Mortar Mixers	15	0.00736	0.03859	0.04610	0.00010	0.00184	0.00169	6.3	0.00066	0.00030	6.43
	25	0.02372	0.07620	0.14109	0.00022	0.00669	0.00615	17.6	0.00214	0.00095	17.90
Cement and Mortar Mixers Composite		0.00871	0.04170	0.05394	0.00011	0.00224	0.00206	7.2	0.00079	0.00035	7.37

3.11-I Offroad 2017

SCAB Fleet Average Emission Factors (Diesel)

3.11-I Offroad 2017	
Air Basin	SC

Legend
Extrapolation (down)
Interpolation
Extrapolation (up)

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2 e**
Concrete/Industrial Saws	25	0.01988	0.06785	0.12562	0.00021	0.00468	0.00431	16.5	0.00179	0.00080	16.76
	50	0.06246	0.26019	0.24733	0.00039	0.01666	0.01533	30.2	0.00564	0.00250	31.10
	120	0.07276	0.46911	0.53312	0.00087	0.03847	0.03539	74.1	0.00657	0.00292	75.19
	175	0.11156	0.86631	0.93487	0.00180	0.04665	0.04292	160.2	0.01007	0.00447	161.80
Concrete/Industrial Saws Composite		0.06787	0.38921	0.42671	0.00070	0.02980	0.02742	58.5	0.00612	0.00272	59.44
Cranes	50	0.07095	0.25878	0.20872	0.00030	0.01676	0.01542	23.2	0.00640	0.00285	24.20
	120	0.06901	0.35088	0.41553	0.00059	0.03414	0.03141	50.1	0.00623	0.00277	51.14
	175	0.08067	0.47739	0.55495	0.00090	0.03140	0.02889	80.3	0.00728	0.00324	81.50
	250	0.08300	0.25720	0.68322	0.00126	0.02348	0.02160	112.2	0.00749	0.00333	113.35
	270	0.08646	0.27056	0.70619	0.00130	0.02441	0.02245	117.6	0.00780	0.00347	118.83
	500	0.12620	0.42426	0.97036	0.00177	0.03510	0.03229	180.1	0.01139	0.00506	181.91
	750	0.21372	0.71321	1.68905	0.00305	0.06017	0.05536	303.0	0.01928	0.00857	306.11
	1000	0.78229	2.53432	8.28271	0.00976	0.23442	0.21567	970.6	0.07058	0.03137	981.81
Cranes Composite		0.10733	0.41525	0.86248	0.00138	0.03522	0.03240	128.6	0.00968	0.00430	130.17
Crawler Tractors	50	0.08762	0.29471	0.23119	0.00032	0.01973	0.01815	24.9	0.00791	0.00351	26.13
	120	0.10076	0.47074	0.59715	0.00077	0.04893	0.04501	65.8	0.00909	0.00404	67.25
	175	0.13472	0.73425	0.92929	0.00136	0.05222	0.04804	121.2	0.01216	0.00540	123.12
	240	0.14041	0.47127	1.11186	0.00180	0.04384	0.04033	160.1	0.01267	0.00563	162.15
	250	0.14128	0.43081	1.13995	0.00187	0.04255	0.03915	166.1	0.01275	0.00567	168.16
	500	0.20692	0.75307	1.59874	0.00254	0.06094	0.05607	259.2	0.01867	0.00830	262.19
	750	0.37261	1.34748	2.94021	0.00467	0.11065	0.10180	464.7	0.03362	0.01494	470.02
	1000	0.56717	2.11858	6.02449	0.00662	0.17934	0.16499	658.1	0.05117	0.02274	666.23
Crawler Tractors Composite		0.12580	0.54636	0.86167	0.00126	0.05002	0.04602	114.0	0.01135	0.00504	115.82
Crushing/Proc. Equipment	50	0.10858	0.43554	0.37389	0.00057	0.02745	0.02525	44.0	0.00980	0.00435	45.57
	120	0.09478	0.55470	0.62098	0.00098	0.04837	0.04450	83.1	0.00855	0.00380	84.50
	175	0.13798	0.95267	1.01554	0.00188	0.05451	0.05015	167.3	0.01245	0.00553	169.24
	250	0.14663	0.49934	1.28541	0.00275	0.04045	0.03722	244.5	0.01323	0.00588	246.63
	500	0.21347	0.73571	1.71086	0.00367	0.05823	0.05357	373.6	0.01926	0.00856	376.70
	750	0.33474	1.15489	2.76412	0.00592	0.09202	0.08465	588.8	0.03020	0.01342	593.63
	1000	0.87024	2.83102	10.17982	0.01315	0.26928	0.24774	1307.8	0.07852	0.03490	1320.23
Crushing/Proc. Equipment Composite		0.12186	0.63879	0.81135	0.00146	0.04729	0.04351	132.3	0.01100	0.00489	134.05
Dumpers/Tenders	25	0.00923	0.03139	0.05852	0.00010	0.00231	0.00212	7.6	0.00083	0.00037	7.76
Dumpers/Tenders Composite		0.00923	0.03139	0.05852	0.00010	0.00231	0.00212	7.6	0.00083	0.00037	7.76
Excavators	25	0.01983	0.06769	0.12533	0.00021	0.00468	0.00431	16.4	0.00179	0.00080	16.72
	50	0.05213	0.25680	0.20816	0.00032	0.01281	0.01179	25.0	0.00470	0.00209	25.76
	120	0.07598	0.50422	0.48400	0.00086	0.03399	0.03127	73.6	0.00686	0.00305	74.71

3.11-l Offroad 2017

SCAB Fleet Average Emission Factors (Diesel)

3.11-l Offroad 2017

Air Basin	**SC**

Legend
Extrapolation (down)
Interpolation
Extrapolation (up)

Equipment	MaxHP	ROG (lb/hr)	CO (lb/hr)	NOX (lb/hr)	SOX (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)	CO2 (lb/hr)	CH4 (lb/hr)	N2O (lb/hr)	CO2 e (lb/hr)
	175	0.08958	0.66439	0.57833	0.00126	0.03075	0.02829	112.2	0.00808	0.00359	113.50
	190	0.09151	0.59859	0.60023	0.00137	0.02922	0.02688	121.5	0.00826	0.00367	122.82
	250	0.09922	0.33538	0.68783	0.00179	0.02308	0.02123	158.7	0.00895	0.00398	160.10
	500	0.14153	0.47617	0.89880	0.00229	0.03228	0.02970	233.7	0.01277	0.00568	235.76
	750	0.23559	0.78899	1.53590	0.00390	0.05437	0.05002	387.4	0.02126	0.00945	390.79
Excavators Composite		0.09157	0.51840	0.58578	0.00132	0.02888	0.02657	119.6	0.00826	0.00367	120.89
Forklifts	50	0.02537	0.14629	0.12284	0.00019	0.00685	0.00630	14.7	0.00229	0.00102	15.04
	120	0.02874	0.21254	0.19258	0.00037	0.01277	0.01175	31.2	0.00259	0.00115	31.64
	175	0.04245	0.33221	0.26851	0.00063	0.01457	0.01341	56.1	0.00383	0.00170	56.66
	250	0.04670	0.15643	0.30568	0.00087	0.01032	0.00949	77.1	0.00421	0.00187	77.79
	500	0.06591	0.21389	0.39374	0.00109	0.01447	0.01331	111.0	0.00595	0.00264	111.92
Forklifts Composite		0.03991	0.21811	0.24927	0.00060	0.01186	0.01091	54.4	0.00360	0.00160	54.97
Generator Sets	15	0.01262	0.06474	0.08743	0.00016	0.00453	0.00417	10.2	0.00114	0.00051	10.39
	25	0.02359	0.07985	0.14706	0.00022	0.00730	0.00672	17.6	0.00213	0.00095	17.97
	50	0.05588	0.23263	0.24426	0.00040	0.01559	0.01435	30.6	0.00504	0.00224	31.42
	120	0.07248	0.47284	0.56285	0.00091	0.03810	0.03505	77.9	0.00654	0.00291	78.99
	175	0.09023	0.73279	0.84395	0.00160	0.03832	0.03526	142.0	0.00814	0.00362	143.27
	250	0.09263	0.39885	1.10034	0.00239	0.03070	0.02824	212.5	0.00836	0.00371	213.83
	500	0.13426	0.62365	1.54642	0.00331	0.04594	0.04226	336.9	0.01211	0.00538	338.78
	750	0.22238	1.00678	2.57457	0.00547	0.07540	0.06936	543.8	0.02007	0.00892	546.98
	1000	0.56218	2.15700	7.97781	0.01054	0.19394	0.17843	1048.6	0.05072	0.02254	1056.66
Generator Sets Composite		0.05269	0.28209	0.40525	0.00070	0.02155	0.01983	61.0	0.00475	0.00211	61.75
Graders	50	0.07430	0.29319	0.23875	0.00036	0.01760	0.01619	27.5	0.00670	0.00298	28.60
	120	0.09285	0.51656	0.57530	0.00088	0.04472	0.04114	75.0	0.00838	0.00372	76.30
	140	0.10037	0.59422	0.64906	0.00107	0.04407	0.04055	92.8	0.00906	0.00403	94.21
	175	0.11354	0.73014	0.77814	0.00139	0.04294	0.03950	123.9	0.01024	0.00455	125.55
	250	0.11799	0.38476	0.93829	0.00194	0.03211	0.02954	172.1	0.01065	0.00473	173.80
	500	0.14967	0.53441	1.11386	0.00225	0.04005	0.03685	229.5	0.01350	0.00600	231.63
	750	0.31871	1.13030	2.43229	0.00488	0.08624	0.07934	485.7	0.02876	0.01278	490.31
Graders Composite		0.11210	0.58438	0.80079	0.00150	0.03966	0.03648	132.7	0.01011	0.00450	134.35
Off-Highway Tractors	120	0.17119	0.69313	0.99729	0.00110	0.08345	0.07677	93.7	0.01545	0.00687	96.19
	175	0.16968	0.81222	1.19874	0.00147	0.06768	0.06227	130.4	0.01531	0.00680	132.85
	250	0.13443	0.40015	1.10033	0.00147	0.04458	0.04101	130.4	0.01213	0.00539	132.34
	750	0.54339	2.21702	4.43095	0.00571	0.17651	0.16239	568.1	0.04903	0.02179	575.92
	1000	0.82195	3.47382	8.43785	0.00819	0.26961	0.24804	814.3	0.07416	0.03296	826.07
Off-Highway Tractors Composite		0.17158	0.69061	1.31772	0.00167	0.06234	0.05735	151.4	0.01548	0.00688	153.87

3.11-l Offroad 2017

SCAB Fleet Average Emission Factors (Diesel)

3.11-l Offroad 2017	
Air Basin	SC

Legend
Extrapolation (down)
Interpolation
Extrapolation (up)

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2 e**
Off-Highway Trucks	175	0.10715	0.75465	0.67644	0.00141	0.03631	0.03341	125.1	0.00967	0.00430	126.62
	250	0.11088	0.36084	0.76252	0.00187	0.02564	0.02359	166.5	0.01000	0.00445	168.13
	500	0.17532	0.56763	1.10340	0.00267	0.03970	0.03652	272.3	0.01582	0.00703	274.85
	750	0.28563	0.92035	1.84756	0.00444	0.06548	0.06024	441.7	0.02577	0.01145	445.83
	1000	0.43079	1.36598	4.60135	0.00628	0.12293	0.11310	624.7	0.03887	0.01728	630.90
Off-Highway Trucks Composite		0.17123	0.57217	1.18513	0.00266	0.04067	0.03742	260.1	0.01545	0.00687	262.51
Other Construction Equipment	15	0.01177	0.06171	0.07368	0.00016	0.00288	0.00265	10.1	0.00106	0.00047	10.28
	25	0.01595	0.05442	0.10076	0.00017	0.00378	0.00348	13.2	0.00144	0.00064	13.45
	50	0.04678	0.23917	0.21851	0.00036	0.01248	0.01148	28.0	0.00422	0.00188	28.66
	90	0.05841	0.39630	0.38013	0.00070	0.02417	0.02224	58.2	0.00527	0.00234	59.04
	120	0.06714	0.51415	0.50134	0.00095	0.03294	0.03030	80.9	0.00606	0.00269	81.82
	175	0.06652	0.58598	0.51327	0.00120	0.02524	0.02322	106.5	0.00600	0.00267	107.47
	280	0.08318	0.55163	0.64262	0.00162	0.02713	0.02496	154.2	0.00751	0.00334	155.43
	500	0.11808	0.47964	0.91364	0.00250	0.03108	0.02860	254.2	0.01065	0.00474	255.93
Other Construction Equipment Composite		0.06746	0.35683	0.50445	0.00127	0.02062	0.01897	122.5	0.00609	0.00271	123.51
Other General Industrial Equipmen	15	0.00663	0.03905	0.04662	0.00010	0.00182	0.00168	6.4	0.00060	0.00027	6.49
	25	0.01852	0.06320	0.11701	0.00019	0.00437	0.00402	15.3	0.00167	0.00074	15.61
	30	0.02723	0.09811	0.13230	0.00021	0.00654	0.00601	16.6	0.00246	0.00109	17.02
	50	0.06208	0.23774	0.19346	0.00028	0.01520	0.01399	21.7	0.00560	0.00249	22.63
	100	0.07565	0.37558	0.40931	0.00060	0.03318	0.03053	50.5	0.00683	0.00303	51.61
	120	0.08108	0.43072	0.49564	0.00073	0.04037	0.03714	62.0	0.00732	0.00325	63.20
	175	0.09108	0.56646	0.63069	0.00108	0.03507	0.03227	95.9	0.00822	0.00365	97.24
	250	0.09356	0.29002	0.77777	0.00153	0.02494	0.02295	135.6	0.00844	0.00375	136.92
	500	0.17453	0.54426	1.32575	0.00261	0.04590	0.04223	265.4	0.01575	0.00700	267.91
	750	0.28937	0.89705	2.25697	0.00440	0.07699	0.07083	437.4	0.02611	0.01160	441.60
	1000	0.40682	1.27392	4.64029	0.00563	0.12742	0.11722	559.6	0.03671	0.01631	565.43
Other General Industrial Equipmen Composite		0.11872	0.46495	0.91382	0.00160	0.03792	0.03488	152.2	0.01071	0.00476	153.94
Other Material Handling Equipment	50	0.08600	0.32822	0.26891	0.00039	0.02113	0.01944	30.3	0.00776	0.00345	31.57
	120	0.07860	0.41920	0.48395	0.00071	0.03939	0.03624	60.7	0.00709	0.00315	61.80
	175	0.11462	0.71726	0.80136	0.00137	0.04445	0.04090	122.1	0.01034	0.00460	123.72
	250	0.09880	0.30875	0.83094	0.00163	0.02661	0.02448	145.0	0.00891	0.00396	146.43
	500	0.12432	0.39152	0.95596	0.00188	0.03305	0.03040	191.6	0.01122	0.00499	193.41
	1000	0.56209	1.68211	6.13721	0.00728	0.16807	0.15462	741.3	0.05072	0.02254	749.40
Other Material Handling Equipment Composite		0.11230	0.45436	0.89481	0.00154	0.03665	0.03372	141.2	0.01013	0.00450	142.80

3.11-I Offroad 2017

SCAB Fleet Average Emission Factors (Diesel)

3.11-I Offroad 2017	
Air Basin	SC

Extrapolation (down)
Interpolation
Extrapolation (up)

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2 e**
Pavers	25	0.02277	0.07710	0.14399	0.00024	0.00580	0.00533	18.7	0.00205	0.00091	18.99
	50	0.10404	0.32616	0.26149	0.00036	0.02342	0.02155	28.0	0.00939	0.00417	29.48
	120	0.10951	0.48945	0.66060	0.00081	0.05480	0.05042	69.2	0.00988	0.00439	70.77
	175	0.14432	0.76533	1.04374	0.00144	0.05822	0.05356	128.3	0.01302	0.00579	130.35
	250	0.16637	0.51743	1.42903	0.00219	0.05370	0.04941	194.4	0.01501	0.00667	196.76
	500	0.18582	0.72392	1.54153	0.00229	0.05881	0.05410	233.2	0.01677	0.00745	235.91
Pavers Composite		0.11932	0.50734	0.66721	0.00089	0.04533	0.04170	77.9	0.01077	0.00479	79.64
Paving Equipment	25	0.01523	0.05200	0.09627	0.00016	0.00361	0.00332	12.6	0.00137	0.00061	12.85
	50	0.08853	0.27605	0.22296	0.00031	0.02003	0.01843	23.9	0.00799	0.00355	25.19
	120	0.08576	0.38343	0.51875	0.00064	0.04334	0.03988	54.5	0.00774	0.00344	55.73
	175	0.11244	0.59869	0.81962	0.00114	0.04576	0.04210	101.0	0.01015	0.00451	102.63
	250	0.10176	0.31777	0.89494	0.00138	0.03290	0.03026	122.3	0.00918	0.00408	123.75
Paving Equipment Composite		0.09096	0.41654	0.59652	0.00079	0.04044	0.03720	68.9	0.00821	0.00365	70.24
Plate Compactors	15	0.00502	0.02634	0.03145	0.00007	0.00123	0.00113	4.3	0.00045	0.00020	4.39
Plate Compactors Composite		0.00502	0.02634	0.03145	0.00007	0.00123	0.00113	4.3	0.00045	0.00020	4.39
Pressure Washers	15	0.00605	0.03102	0.04189	0.00008	0.00217	0.00200	4.9	0.00055	0.00024	4.98
	25	0.00956	0.03237	0.05962	0.00009	0.00296	0.00272	7.1	0.00086	0.00038	7.28
	50	0.01949	0.09179	0.10979	0.00018	0.00611	0.00562	14.3	0.00176	0.00078	14.57
	120	0.01912	0.13927	0.16591	0.00028	0.00999	0.00919	24.1	0.00173	0.00077	24.35
Pressure Washers Composite		0.01110	0.05702	0.07325	0.00013	0.00402	0.00370	9.4	0.00100	0.00044	9.57
Pumps	15	0.01033	0.04709	0.06412	0.00012	0.00360	0.00331	7.4	0.00093	0.00041	7.57
	25	0.02865	0.08826	0.16254	0.00025	0.00842	0.00774	19.5	0.00258	0.00115	19.90
	50	0.06797	0.27439	0.27729	0.00044	0.01843	0.01695	34.3	0.00613	0.00273	35.31
	80	0.07143	0.36260	0.40337	0.00065	0.02768	0.02547	53.0	0.00644	0.00286	54.05
	120	0.07603	0.48021	0.57149	0.00091	0.04003	0.03683	77.9	0.00686	0.00305	79.04
	160	0.08910	0.66491	0.77125	0.00140	0.03983	0.03664	123.2	0.00804	0.00357	124.44
	175	0.09400	0.73417	0.84616	0.00158	0.03975	0.03657	140.1	0.00848	0.00377	141.47
	250	0.09320	0.38414	1.06009	0.00227	0.03032	0.02790	201.4	0.00841	0.00374	202.70
	500	0.14684	0.64778	1.60535	0.00339	0.04893	0.04502	345.2	0.01325	0.00589	347.31
	750	0.24812	1.07092	2.73769	0.00574	0.08226	0.07568	570.7	0.02239	0.00995	574.26
	1000	0.75480	2.82734	10.42951	0.01362	0.25686	0.23631	1354.8	0.06810	0.03027	1365.65
Pumps Composite		0.05081	0.27513	0.35605	0.00059	0.02138	0.01967	49.6	0.00458	0.00204	50.33
Rollers	15	0.00736	0.03859	0.04607	0.00010	0.00180	0.00166	6.3	0.00066	0.00030	6.43
	25	0.01610	0.05494	0.10172	0.00017	0.00381	0.00351	13.3	0.00145	0.00065	13.57
	50	0.07285	0.26114	0.22449	0.00034	0.01745	0.01605	26.0	0.00657	0.00292	27.03
	100	0.07342	0.35631	0.40339	0.00059	0.03199	0.02943	49.6	0.00662	0.00294	50.61

3.11-l Offroad 2017

SCAB Fleet Average Emission Factors (Diesel)

3.11-l Offroad 2017	
Air Basin	SC

Extrapolation (down)
Interpolation
Extrapolation (up)

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2 e**
	120	0.07364	0.39438	0.47495	0.00069	0.03781	0.03478	59.0	0.00664	0.00295	60.04
	130	0.07777	0.43431	0.52038	0.00079	0.03809	0.03504	67.9	0.00702	0.00312	69.04
	175	0.09637	0.61403	0.72484	0.00122	0.03933	0.03618	108.1	0.00870	0.00386	109.53
	250	0.09850	0.33755	0.90348	0.00172	0.03020	0.02778	153.1	0.00889	0.00395	154.50
	500	0.13233	0.50913	1.14635	0.00215	0.04015	0.03694	219.1	0.01194	0.00531	221.00
Rollers Composite		0.07360	0.39130	0.48665	0.00077	0.03216	0.02959	67.0	0.00664	0.00295	68.10
Rough Terrain Forklifts	50	0.07431	0.33727	0.28464	0.00044	0.01902	0.01750	33.9	0.00671	0.00298	34.92
	120	0.06598	0.42034	0.43409	0.00073	0.03195	0.02939	62.4	0.00595	0.00265	63.40
	175	0.09929	0.72327	0.68993	0.00141	0.03706	0.03409	124.9	0.00896	0.00398	126.32
	250	0.10467	0.35439	0.80975	0.00192	0.02687	0.02472	170.8	0.00944	0.00420	172.30
	500	0.15143	0.51043	1.07071	0.00252	0.03827	0.03521	256.6	0.01366	0.00607	258.74
Rough Terrain Forklifts Composite		0.07039	0.45224	0.46452	0.00082	0.03227	0.02969	70.3	0.00635	0.00282	71.29
Rubber Tired Dozers	175	0.17629	0.82324	1.22394	0.00146	0.06918	0.06365	129.5	0.01591	0.00707	132.00
	250	0.19924	0.58446	1.59537	0.00206	0.06545	0.06021	183.5	0.01798	0.00799	186.34
	500	0.26601	1.09723	2.08932	0.00260	0.08491	0.07812	264.9	0.02400	0.01067	268.68
	750	0.40155	1.64685	3.20706	0.00401	0.12889	0.11858	398.8	0.03623	0.01610	404.54
	1000	0.62758	2.66064	6.26645	0.00595	0.20338	0.18711	591.9	0.05663	0.02517	600.88
Rubber Tired Dozers Composite		0.24650	0.93004	1.95084	0.00245	0.07960	0.07323	239.1	0.02224	0.00988	242.62
Rubber Tired Loaders	25	0.02042	0.06971	0.12906	0.00021	0.00481	0.00443	16.9	0.00184	0.00082	17.22
	50	0.08179	0.32695	0.26839	0.00040	0.01955	0.01798	31.1	0.00738	0.00328	32.32
	120	0.07141	0.40381	0.44595	0.00069	0.03456	0.03180	58.9	0.00644	0.00286	59.94
	175	0.09535	0.62338	0.65712	0.00120	0.03618	0.03329	106.3	0.00860	0.00382	107.68
	200	0.09689	0.52527	0.70422	0.00136	0.03318	0.03052	120.5	0.00874	0.00389	121.92
	250	0.09995	0.32905	0.79842	0.00168	0.02717	0.02499	149.0	0.00902	0.00401	150.41
	350	0.12053	0.41386	0.93056	0.00194	0.03248	0.02989	184.2	0.01088	0.00483	185.92
	500	0.15140	0.54108	1.12876	0.00233	0.04046	0.03722	237.0	0.01366	0.00607	239.18
	750	0.31207	1.10767	2.38764	0.00488	0.08437	0.07762	485.5	0.02816	0.01251	490.00
	1000	0.41489	1.48219	4.71455	0.00597	0.13025	0.11983	593.9	0.03744	0.01664	599.82
Rubber Tired Loaders Composite		0.09198	0.45097	0.64463	0.00120	0.03362	0.03093	108.6	0.00830	0.00369	109.93
Scrapers	120	0.14714	0.67285	0.87122	0.00110	0.07195	0.06619	93.9	0.01328	0.00590	96.01
	175	0.16733	0.89748	1.16378	0.00167	0.06551	0.06027	148.1	0.01510	0.00671	150.47
	250	0.18054	0.54954	1.47826	0.00236	0.05523	0.05081	209.5	0.01629	0.00724	212.06
	500	0.25944	0.96023	2.03752	0.00315	0.07767	0.07146	321.4	0.02341	0.01040	325.15
	750	0.45024	1.65573	3.61013	0.00558	0.13588	0.12501	555.3	0.04062	0.01806	561.73
Scrapers Composite		0.22565	0.87132	1.74832	0.00269	0.07162	0.06589	262.5	0.02036	0.00905	265.72

3.11-I Offroad 2017

SCAB Fleet Average Emission Factors (Diesel)

3.11-I Offroad 2017	
Air Basin	SC

Extrapolation (down)
Interpolation
Extrapolation (up)

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2 e**
Signal Boards	15	0.00718	0.03767	0.04498	0.00010	0.00176	0.00162	6.2	0.00065	0.00029	6.27
	50	0.07379	0.30474	0.29231	0.00047	0.01952	0.01796	36.2	0.00666	0.00296	37.25
	120	0.07810	0.50332	0.57287	0.00094	0.04102	0.03774	80.2	0.00705	0.00313	81.33
	175	0.10572	0.82797	0.89883	0.00174	0.04398	0.04046	154.5	0.00954	0.00424	156.06
	250	0.12302	0.49193	1.28336	0.00287	0.03788	0.03485	255.3	0.01110	0.00493	257.05
Signal Boards Composite		0.01512	0.09184	0.10981	0.00021	0.00550	0.00506	16.7	0.00136	0.00061	16.91
Skid Steer Loaders	25	0.01794	0.05877	0.10904	0.00018	0.00504	0.00464	13.8	0.00162	0.00072	14.05
	50	0.02876	0.20566	0.18651	0.00033	0.00786	0.00723	25.5	0.00259	0.00115	25.93
	120	0.02680	0.26860	0.21722	0.00050	0.01143	0.01052	42.8	0.00242	0.00107	43.15
Skid Steer Loaders Composite		0.02741	0.21613	0.19123	0.00037	0.00882	0.00811	30.3	0.00247	0.00110	30.67
Surfacing Equipment	50	0.03456	0.12700	0.11780	0.00018	0.00849	0.00781	14.1	0.00312	0.00139	14.60
	120	0.07221	0.40962	0.49952	0.00075	0.03679	0.03385	63.8	0.00652	0.00290	64.80
	175	0.06846	0.46854	0.55888	0.00097	0.02818	0.02593	85.8	0.00618	0.00275	86.76
	250	0.07799	0.29267	0.77323	0.00152	0.02533	0.02331	134.9	0.00704	0.00313	135.99
	500	0.11860	0.52479	1.13920	0.00217	0.03854	0.03546	221.2	0.01070	0.00476	222.91
	750	0.18875	0.82239	1.84082	0.00349	0.06143	0.05652	347.0	0.01703	0.00757	349.75
Surfacing Equipment Composite		0.09807	0.43334	0.88546	0.00167	0.03206	0.02949	166.0	0.00885	0.00393	167.37
Sweepers/Scrubbers	15	0.01238	0.07289	0.08703	0.00019	0.00340	0.00313	11.9	0.00112	0.00050	12.12
	25	0.02366	0.08076	0.14952	0.00025	0.00557	0.00513	19.6	0.00213	0.00095	19.95
	50	0.05812	0.30191	0.26267	0.00041	0.01582	0.01455	31.6	0.00524	0.00233	32.38
	120	0.07012	0.49958	0.48550	0.00088	0.03362	0.03093	75.0	0.00633	0.00281	76.04
	175	0.10286	0.80175	0.70990	0.00156	0.03812	0.03507	139.0	0.00928	0.00412	140.47
	250	0.09356	0.32324	0.69698	0.00182	0.02297	0.02114	162.0	0.00844	0.00375	163.36
Sweepers/Scrubbers Composite		0.07372	0.49620	0.47264	0.00092	0.02881	0.02651	78.5	0.00665	0.00296	79.60
Tractors/Loaders/Backhoes	25	0.01916	0.06532	0.12131	0.00020	0.00471	0.00433	15.9	0.00173	0.00077	16.14
	50	0.05552	0.28893	0.24354	0.00039	0.01405	0.01293	30.3	0.00501	0.00223	31.14
	120	0.04771	0.34418	0.32159	0.00061	0.02166	0.01992	51.7	0.00430	0.00191	52.41
	175	0.07261	0.58469	0.48856	0.00114	0.02539	0.02336	101.4	0.00655	0.00291	102.43
	250	0.09684	0.35064	0.68873	0.00193	0.02291	0.02108	171.7	0.00874	0.00388	173.12
	500	0.18857	0.68588	1.23147	0.00388	0.04383	0.04033	344.9	0.01701	0.00756	347.55
	750	0.28422	1.02862	1.90401	0.00582	0.06683	0.06148	517.3	0.02564	0.01140	521.35
Tractors/Loaders/Backhoes Composite		0.05589	0.36663	0.36806	0.00078	0.02218	0.02041	66.8	0.00504	0.00224	67.60
Trenchers	15	0.00985	0.05168	0.06170	0.00013	0.00241	0.00222	8.5	0.00089	0.00040	8.61
	25	0.03971	0.13554	0.25094	0.00042	0.00936	0.00861	32.9	0.00358	0.00159	33.49
	50	0.12220	0.37283	0.30514	0.00043	0.02737	0.02518	32.9	0.01103	0.00490	34.67
	120	0.10178	0.45292	0.62661	0.00076	0.05138	0.04727	64.9	0.00918	0.00408	66.35

3.11-I Offroad 2017

SCAB Fleet Average Emission Factors (Diesel)

3.11-I Offroad 2017	
Air Basin	**SC**

Extrapolation (down)
Interpolation
Extrapolation (up)

Equipment	**MaxHP**	**ROG** (lb/hr)	**CO** (lb/hr)	**NOX** (lb/hr)	**SOX** (lb/hr)	**PM10** (lb/hr)	**PM2.5** (lb/hr)	**CO2** (lb/hr)	**CH4** (lb/hr)	**N2O** (lb/hr)	**CO2 e** (lb/hr)
	175	0.15902	0.84637	1.18930	0.00162	0.06529	0.06007	143.9	0.01435	0.00638	146.18
	180	0.16097	0.83015	1.22145	0.00168	0.06517	0.05996	149.2	0.01452	0.00646	151.47
	250	0.18835	0.60308	1.67150	0.00251	0.06348	0.05841	222.9	0.01699	0.00755	225.60
	500	0.24330	1.00858	2.10484	0.00306	0.08052	0.07408	311.3	0.02195	0.00976	314.79
	750	0.46103	1.89711	4.06161	0.00590	0.15352	0.14124	586.9	0.04160	0.01849	593.48
Trenchers Composite		0.11291	0.44218	0.54103	0.00070	0.04227	0.03889	58.7	0.01019	0.00453	60.33
Welders	15	0.00864	0.03937	0.05362	0.00010	0.00301	0.00277	6.2	0.00078	0.00035	6.33
	25	0.01659	0.05111	0.09413	0.00014	0.00487	0.00448	11.3	0.00150	0.00067	11.52
	50	0.06383	0.24084	0.21834	0.00034	0.01620	0.01490	26.0	0.00576	0.00256	26.87
	120	0.04443	0.25591	0.30326	0.00046	0.02341	0.02153	39.5	0.00401	0.00178	40.14
	175	0.07741	0.54039	0.62144	0.00110	0.03215	0.02958	98.2	0.00698	0.00310	99.30
	250	0.06568	0.23836	0.65818	0.00134	0.01999	0.01839	119.1	0.00593	0.00263	120.01
	500	0.08655	0.32632	0.80959	0.00165	0.02640	0.02429	167.6	0.00781	0.00347	168.84
Welders Composite		0.04337	0.19120	0.20541	0.00032	0.01504	0.01384	25.6	0.00391	0.00174	26.22

Notes:
SCAQMD emission factors for 2017 (SCAQMD 2008)
Offroad diesel exhaust $PM_{2.5}$ = 92% of PM_{10} per EMFAC 2007 version 2.3 (SCAQMD 2008)
N2O & CO2 eqv per Inventory of U.S. GHG Emissions & Sinks - Annex 3 (USEPA 2012)
Non-matching application-specific values interpolated or extrapolated for improved accuracy
USEPA GWPs for CO2 eqv (1, 21, 310)

3.11-m Onroad 2017

SCAB Fleet Average Emission Factors

3.11-m Onroad 2017

Air Basin		SC

		(lb/mi)	(lb/mi)	(lb/mi)	(lb/mi)	(lb/mi)	(lb/mi)	(lb/mi)	(lb/mi)	(lb/mi)	(lb/mi)
Vehicle Type	**Category**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2 e**
Light Duty (pickups/SUVs)	Onroad LD	0.000601	0.005379	0.000513	0.000011	0.000094	0.000062	1.106275	0.000053	0.000082	1.132948
Medium Duty (work trucks)	Onroad MD	0.001502	0.009981	0.010700	0.000027	0.000431	0.000346	2.840050	0.000067	0.000063	2.860890
Heavy Heavy Duty (tractor/trailers)	Onroad HHD	0.001452	0.006505	0.016904	0.000040	0.000849	0.000697	4.208201	0.000067	0.000063	4.229226

Notes:
SCAQMD 2008
HHD includes tire & brake wear
N2O & CO2 eqv per Inventory of U.S. GHG Emissions & Sinks - Annex 3 (USEPA 2012)

3.11-n Onroad LD MD 2011-2026

Highest (Most Conservative) EMFAC2007 (version 2.3) Emission Factors for On-Road Passenger Vehicles & Delivery Trucks Projects in the SCAQMD (Scenario Years 2011 - 2026)
Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class: Passenger Vehicles (<8500 pounds) & Delivery Trucks (>8500 pounds)

The following emission factors were compiled by running the California Air Resources Board's EMFAC2007 (version 2.3) Burden Model, taking the weighted average of vehicle types and simplifying into two categories:
Passenger Vehicles & Delivery Trucks.

These emission factors can be used to calculate on-road mobile source emissions for the vehicle categories listed in the tables below, by use of the following equation:
Emissions (pounds per day) = N x TL x EF
where N = number of trips, TL = trip length (miles/day), and EF = emission factor (pounds per mile)

This methodology replaces the old EMFAC emission factors in Tables A-9-5-J-1 through A-9-5-L in Appendix A9 of the current SCAQMD CEQA Handbook. All the emission factors account for the emissions from start, running and idling exhaust. In addition, the ROG emission factors include diurnal, hot soak, running and resting emissions, and the PM10 & PM2.5 emission factors include tire and brake wear.

3.11-n Onroad LD MD 2011-2026

Scenario Year: **2011**
All model years in the range 1967 to 2011

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00826276	CO	0.01693242
NOx	0.00084460	NOx	0.01893366
ROG	0.00085233	ROG	0.00241868
SOx	0.00001077	SOx	0.00002728
PM10	0.00008879	PM10	0.00070097
PM2.5	0.00005653	PM2.5	0.00059682
CO2	1.10235154	CO2	2.75180822
CH4	0.00007678	CH4	0.00011655
N2O	0.00011943	N2O	0.00010970
CO2 eqv	1.14098746	CO2 eqv	2.78826189

Scenario Year: **2012**
All model years in the range 1968 to 2012

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00765475	CO	0.01545741
NOx	0.00077583	NOx	0.01732423
ROG	0.00079628	ROG	0.00223776
SOx	0.00001073	SOx	0.00002667
PM10	0.00008979	PM10	0.00064975
PM2.5	0.00005750	PM2.5	0.00054954
CO2	1.10152540	CO2	2.76628414
CH4	0.00007169	CH4	0.00010668
N2O	0.00011151	N2O	0.00010040
CO2 eqv	1.13760039	CO2 eqv	2.79964841

Scenario Year: **2013**
All model years in the range 1969 to 2013

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00709228	CO	0.01407778
NOx	0.00071158	NOx	0.01577311
ROG	0.00074567	ROG	0.00206295
SOx	0.00001072	SOx	0.00002682
PM10	0.00009067	PM10	0.00059956
PM2.5	0.00005834	PM2.5	0.00050174
CO2	1.10087435	CO2	2.78163459
CH4	0.00006707	CH4	0.00009703
N2O	0.00010434	N2O	0.00009133
CO2 eqv	1.13462778	CO2 eqv	2.81198332

Scenario Year: **2014**
All model years in the range 1970 to 2014

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00660353	CO	0.01284321
NOx	0.00065484	NOx	0.01425162
ROG	0.00070227	ROG	0.00189649
SOx	0.00001069	SOx	0.00002754
PM10	0.00009185	PM10	0.00054929
PM2.5	0.00005939	PM2.5	0.00045519
CO2	1.10257205	CO2	2.79845465
CH4	0.00006312	CH4	0.00008798
N2O	0.00009818	N2O	0.00008280
CO2 eqv	1.13433310	CO2 eqv	2.82597096

Scenario Year: **2015**
All model years in the range 1971 to 2015

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00614108	CO	0.01169445
NOx	0.00060188	NOx	0.01285026
ROG	0.00066355	ROG	0.00173890
SOx	0.00001070	SOx	0.00002741
PM10	0.00009259	PM10	0.00050307
PM2.5	0.00006015	PM2.5	0.00041268
CO2	1.10192837	CO2	2.81247685
CH4	0.00005923	CH4	0.00008076
N2O	0.00009213	N2O	0.00007601
CO2 eqv	1.13173218	CO2 eqv	2.83773531

Scenario Year: **2016**
All model years in the range 1972 to 2016

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00575800	CO	0.01080542
NOx	0.00055658	NOx	0.01172881
ROG	0.00063254	ROG	0.00161521
SOx	0.00001071	SOx	0.00002767
PM10	0.00009392	PM10	0.00046606
PM2.5	0.00006131	PM2.5	0.00037868
CO2	1.10677664	CO2	2.83134285
CH4	0.00005623	CH4	0.00007355
N2O	0.00008747	N2O	0.00006922
CO2 eqv	1.13507331	CO2 eqv	2.85434695

3.11-n Onroad LD MD 2011-2026

Scenario Year: **2017**
All model years in the range 1973 to 2017

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00537891	CO	0.00998101
NOx	0.00051297	NOx	0.01070034
ROG	0.00060109	ROG	0.00150242
SOx	0.00001079	SOx	0.00002723
PM10	0.00009446	PM10	0.00043131
PM2.5	0.00006192	PM2.5	0.00034605
CO2	1.10627489	CO2	2.84005015
CH4	0.00005300	CH4	0.00006663
N2O	0.00008245	N2O	0.00006271
CO2 eqv	1.13294795	CO2 eqv	2.86088993

Scenario Year: **2018**
All model years in the range 1974 to 2018

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00502881	CO	0.00923234
NOx	0.00047300	NOx	0.00979416
ROG	0.00057178	ROG	0.00139856
SOx	0.00001071	SOx	0.00002749
PM10	0.00009494	PM10	0.00040110
PM2.5	0.00006234	PM2.5	0.00031792
CO2	1.10562643	CO2	2.84646835
CH4	0.00005003	CH4	0.00006203
N2O	0.00007782	N2O	0.00005838
CO2 eqv	1.13080168	CO2 eqv	2.86587008

Scenario Year: **2019**
All model years in the range 1975 to 2019

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00471820	CO	0.00857192
NOx	0.00043716	NOx	0.00900205
ROG	0.00054654	ROG	0.00130563
SOx	0.00001072	SOx	0.00002706
PM10	0.00009523	PM10	0.00037393
PM2.5	0.00006259	PM2.5	0.00029276
CO2	1.10496100	CO2	2.85060182
CH4	0.00004743	CH4	0.00005619
N2O	0.00007378	N2O	0.00005289
CO2 eqv	1.12882815	CO2 eqv	2.86817714

Scenario Year: **2020**
All model years in the range 1976 to 2020

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00444247	CO	0.00799617
NOx	0.00040506	NOx	0.00831802
ROG	0.00052463	ROG	0.00122382
SOx	0.00001073	SOx	0.00002733
PM10	0.00009550	PM10	0.00035054
PM2.5	0.00006279	PM2.5	0.00027128
CO2	1.10456157	CO2	2.85148109
CH4	0.00004495	CH4	0.00005330
N2O	0.00006992	N2O	0.00005016
CO2 eqv	1.12718066	CO2 eqv	2.86815105

Scenario Year: **2021**
All model years in the range 1977 to 2021

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00421218	CO	0.00748303
NOx	0.00037757	NOx	0.00773500
ROG	0.00050573	ROG	0.00115568
SOx	0.00001073	SOx	0.00002755
PM10	0.00009640	PM10	0.00033125
PM2.5	0.00006364	PM2.5	0.00025331
CO2	1.11009559	CO2	2.86434187
CH4	0.00004322	CH4	0.00004905
N2O	0.00006724	N2O	0.00004616
CO2 eqv	1.13184726	CO2 eqv	2.87968274

Scenario Year: **2022**
All model years in the range 1978 to 2022

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00397866	CO	0.00699290
NOx	0.00035150	NOx	0.00722470
ROG	0.00048658	ROG	0.00108569
SOx	0.00001072	SOx	0.00002774
PM10	0.00009661	PM10	0.00031501
PM2.5	0.00006389	PM2.5	0.00023906
CO2	1.11019931	CO2	2.87006769
CH4	0.00004121	CH4	0.00004557
N2O	0.00006411	N2O	0.00004289
CO2 eqv	1.13093833	CO2 eqv	2.88431947

3.11-n Onroad LD MD 2011-2026

Scenario Year: **2023**
All model years in the range 1979 to 2023

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00377527	CO	0.00658123
NOx	0.00032851	NOx	0.00679147
ROG	0.00046900	ROG	0.00102852
SOx	0.00001070	SOx	0.00002790
PM10	0.00009676	PM10	0.00030109
PM2.5	0.00006405	PM2.5	0.00022582
CO2	1.11023373	CO2	2.87466338
CH4	0.00003951	CH4	0.00004218
N2O	0.00006146	N2O	0.00003970
CO2 eqv	1.13011498	CO2 eqv	2.88785549

Scenario Year: **2024**
All model years in the range 1980 to 2024

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00358611	CO	0.00625076
NOx	0.00030721	NOx	0.00647083
ROG	0.00045136	ROG	0.00096578
SOx	0.00001080	SOx	0.00002807
PM10	0.00009676	PM10	0.00029407
PM2.5	0.00006410	PM2.5	0.00021880
CO2	1.11061572	CO2	2.88010717
CH4	0.00003781	CH4	0.00004019
N2O	0.00005881	N2O	0.00003782
CO2 eqv	1.12964186	CO2 eqv	2.89267641

Scenario Year: **2025**
All model years in the range 1981 to 2025

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00342738	CO	0.00595363
NOx	0.00028846	NOx	0.00615945
ROG	0.00043545	ROG	0.00092178
SOx	0.00001070	SOx	0.00002761
PM10	0.00009679	PM10	0.00028425
PM2.5	0.00006418	PM2.5	0.00020958
CO2	1.11078571	CO2	2.88143570
CH4	0.00003641	CH4	0.00003765
N2O	0.00005663	N2O	0.00003543
CO2 eqv	1.12910559	CO2 eqv	2.89321111

Scenario Year: **2026**
All model years in the range 1982 to 2026

Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)	
CO	0.00328779	CO	0.00569435
NOx	0.00027141	NOx	0.00589869
ROG	0.00042052	ROG	0.00088403
SOx	0.00001076	SOx	0.00002716
PM10	0.00009687	PM10	0.00027657
PM2.5	0.00006415	PM2.5	0.00020187
CO2	1.11105829	CO2	2.88298299
CH4	0.00003518	CH4	0.00003581
N2O	0.00005472	N2O	0.00003370
CO2 eqv	1.12876023	CO2 eqv	2.89418178

Notes:
SCAQMD 2008
HHD-DSL composite includes tire & brake wear
N2O & CO2 eqv per Inventory of U.S. GHG Emissions & Sinks - Annex 3 (USEPA 2012)

3.11-o Onroad HHD 2011-2026

Highest (Most Conservative) EMFAC2007 (version 2.3) Emission Factors for On-Road Heavy-Heavy-Duty Diesel Trucks Projects in the SCAQMD (Scenario Years 2011 - 2026)
Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class: Heavy-Heavy-Duty Diesel Trucks (33,001 to 60,000 pounds)

The following emission factors were compiled by running the California Air Resources Board's EMFAC2007 (version 2.3) Burden Model and extracting the **Heavy-Heavy-Duty Diesel Truck (HHDT)** Emission Factors.

These emission factors can be used to calculate on-road mobile source emissions for the vehicle/emission categories listed in the tables below, by use of the following equation:

Emissions (pounds per day) = N x TL x EF

where N = number of trips, TL = trip length (miles/day), and EF = emission factor (pounds per mile)

The **HHDT-DSL** vehicle/emission category accounts for all emissions from heavy-heavy-duty diesel trucks, including start, running and idling exhaust. In addition, ROG emission factors account for diurnal, hot soak, running and resting emissions, and the PM10 & PM2.5 emission factors account for tire and brake wear.

The **HHDT-DSL, Exh** vehicle/emission category includes only the exhaust portion of PM10 & PM2.5 emissions from heavy-heavy-duty diesel trucks.

3.11-o Onroad HHD 2011-2026

Scenario Year: **2011**
All model years in the range 1967 to 2011

HHDT-DSL (pounds/mile)	
CO	0.01112463
NOx	0.03455809
ROG	0.00279543
SOx	0.00003972
PM10	0.00166087
PM2.5	0.00144489
CO2	4.22045680
CH4	0.00012910
N2O	0.00012150
CO2 eqv	4.26083358

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00151936
PM2.5	0.00139772

Scenario Year: **2012**
All model years in the range 1968 to 2012

HHDT-DSL (pounds/mile)	
CO	0.01021519
NOx	0.03092379
ROG	0.00252764
SOx	0.00004042
PM10	0.00149566
PM2.5	0.00129354
CO2	4.21590774
CH4	0.00011651
N2O	0.00010966
CO2 eqv	4.25234923

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00135537
PM2.5	0.00124837

Scenario Year: **2013**
All model years in the range 1969 to 2013

HHDT-DSL (pounds/mile)	
CO	0.00931790
NOx	0.02742935
ROG	0.00226308
SOx	0.00004086
PM10	0.00133697
PM2.5	0.00114629
CO2	4.21518556
CH4	0.00010441
N2O	0.00009827
CO2 eqv	4.24784287

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00119623
PM2.5	0.00109863

Scenario Year: **2014**
All model years in the range 1970 to 2014

HHDT-DSL (pounds/mile)	
CO	0.00846435
NOx	0.02418049
ROG	0.00201594
SOx	0.00004092
PM10	0.00118458
PM2.5	0.00100582
CO2	4.21279345
CH4	0.00009261
N2O	0.00008716
CO2 eqv	4.24175938

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00104243
PM2.5	0.00096059

Scenario Year: **2015**
All model years in the range 1971 to 2015

HHDT-DSL (pounds/mile)	
CO	0.00766891
NOx	0.02122678
ROG	0.00178608
SOx	0.00004082
PM10	0.00104715
PM2.5	0.00087977
CO2	4.20902225
CH4	0.00008369
N2O	0.00007877
CO2 eqv	4.23519770

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00090631
PM2.5	0.00083282

Scenario Year: **2016**
All model years in the range 1972 to 2016

HHDT-DSL (pounds/mile)	
CO	0.00704604
NOx	0.01887374
ROG	0.00161035
SOx	0.00003952
PM10	0.00094448
PM2.5	0.00078443
CO2	4.21063031
CH4	0.00007508
N2O	0.00007067
CO2 eqv	4.23411393

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00080419
PM2.5	0.00073898

3.11-o Onroad HHD 2011-2026

Scenario Year: **2017**
All model years in the range 1973 to 2017

HHDT-DSL (pounds/mile)	
CO	0.00650533
NOx	0.01690387
ROG	0.00145203
SOx	0.00004033
PM10	0.00084894
PM2.5	0.00069721
CO2	4.20820129
CH4	0.00006722
N2O	0.00006327
CO2 eqv	4.22922648

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00070873
PM2.5	0.00065111

Scenario Year: **2018**
All model years in the range 1974 to 2018

HHDT-DSL (pounds/mile)	
CO	0.00604721
NOx	0.01526414
ROG	0.00131697
SOx	0.00003934
PM10	0.00076808
PM2.5	0.00062383
CO2	4.20756838
CH4	0.00006182
N2O	0.00005818
CO2 eqv	4.22690378

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00062758
PM2.5	0.00057700

Scenario Year: **2019**
All model years in the range 1975 to 2019

HHDT-DSL (pounds/mile)	
CO	0.00565433
NOx	0.01389113
ROG	0.00120235
SOx	0.00004032
PM10	0.00070198
PM2.5	0.00056085
CO2	4.20637830
CH4	0.00005499
N2O	0.00005175
CO2 eqv	4.22357577

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00056085
PM2.5	0.00051320

Scenario Year: **2020**
All model years in the range 1976 to 2020

HHDT-DSL (pounds/mile)	
CO	0.00532242
NOx	0.01274755
ROG	0.00110621
SOx	0.00003957
PM10	0.00064574
PM2.5	0.00050904
CO2	4.20541416
CH4	0.00005216
N2O	0.00004909
CO2 eqv	4.22172889

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00050364
PM2.5	0.00046227

Scenario Year: **2021**
All model years in the range 1977 to 2021

HHDT-DSL (pounds/mile)	
CO	0.00503726
NOx	0.01179977
ROG	0.00103095
SOx	0.00004033
PM10	0.00059437
PM2.5	0.00046287
CO2	4.21495573
CH4	0.00004734
N2O	0.00004455
CO2 eqv	4.22976181

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00045411
PM2.5	0.00041729

Scenario Year: **2022**
All model years in the range 1978 to 2022

HHDT-DSL (pounds/mile)	
CO	0.00478830
NOx	0.01098794
ROG	0.00096142
SOx	0.00004106
PM10	0.00055427
PM2.5	0.00042597
CO2	4.21520828
CH4	0.00004448
N2O	0.00004186
CO2 eqv	4.22911963

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00041399
PM2.5	0.00037807

3.11-o Onroad HHD 2011-2026

Scenario Year: **2023**

All model years in the range 1979 to 2023

HHDT-DSL (pounds/mile)	
CO	0.00457902
NOx	0.01031407
ROG	0.00090210
SOx	0.00004009
PM10	0.00052122
PM2.5	0.00039592
CO2	4.21483461
CH4	0.00004176
N2O	0.00003931
CO2 eqv	4.22789696

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00037922
PM2.5	0.00034915

Scenario Year: **2024**

All model years in the range 1980 to 2024

HHDT-DSL (pounds/mile)	
CO	0.00444444
NOx	0.00974372
ROG	0.00084009
SOx	0.00003930
PM10	0.00050766
PM2.5	0.00038320
CO2	4.19552935
CH4	0.00003930
N2O	0.00003699
CO2 eqv	4.20782175

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00036682
PM2.5	0.00033735

Scenario Year: **2025**

All model years in the range 1981 to 2025

HHDT-DSL (pounds/mile)	
CO	0.00431086
NOx	0.00932573
ROG	0.00080206
SOx	0.00004018
PM10	0.00048541
PM2.5	0.00036326
CO2	4.19512979
CH4	0.00003697
N2O	0.00003479
CO2 eqv	4.20669226

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00034397
PM2.5	0.00031664

Scenario Year: **2026**

All model years in the range 1982 to 2026

HHDT-DSL (pounds/mile)	
CO	0.00420297
NOx	0.00898990
ROG	0.00077178
SOx	0.00003946
PM10	0.00046717
PM2.5	0.00034564
CO2	4.19349747
CH4	0.00003630
N2O	0.00003417
CO2 eqv	4.20485099

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00032670
PM2.5	0.00029830

Notes:

SCAQMD 2008

HHD-DSL composite includes tire & brake wear

N2O & CO2 eqv per Inventory of U.S. GHG Emissions & Sinks - Annex 3 (USEPA 2012)

Appendix L

Upper Llagas Creek Baseline Noise Measurements

US Army Corps
of Engineers

Cardno ENTRIX
Shaping the Future

Cardno ENTRIX

2300 Clayton Road
Suite 200
Concord, CA 94520
USA

Phone 925 935 9920
Toll-free 800 368 7511
Fax 925 935 5368
www.cardno.com

www.cardnoentrix.com

Technical Memorandum

Date February 20, 2012

To: Chelsea Ayala, Senior Project Scientist
Cardno ENTRIX

cc: Christie Robinson, Senior Consultant

From: Adam O'Connor, Senior Staff Scientist

RE: **Llagas Creek Noise Measurements**

1.0 Introduction

This report summarizes background noise measurements recorded from November 15 to December 22, 2011 for the Upper Llagas Creek Project (Figure 1). The purpose of the baseline noise measurements is to identify the baseline noise levels which will be used to prepare a Noise Control Plan which will identify, control and mitigate short-term noise impacts during construction along the path of the creek. Baseline noise measurements will also be used to determine impacts from construction and operation of the project.

2.0 Methods

A total of seven baseline noise measurements were recorded at locations along Upper Llagas Creek in San Martin and Morgan Hill, California from November 15 to December 22, 2011. Five long-term measurements (24 hours) and two-short term measurements (1 hour) were made over the course of this study. Figures 2 through 7 depict the measurement locations. The following is a summary of the study locations:

1. 24-hour measurement near intersection of Amistad Lane and Church Avenue, San Martin, Reach 14, semi-rural residential area some distance from industry and airport.
2. 24 hour measurement near intersection of Spring Street and Llagas Avenue, San Martin, Reach 6b, densest semi-rural residential area in San Martin but still some distance from airport. Takeoffs and landings were recorded intermittently throughout noise measurement duration.
3. 24 hour measurement along Watsonville Road near La Jolla Drive, Morgan Hill, Reach 7a.

4. 24 hour measurement near intersection of Warren Avenue and Hale Avenue for baseline noise at North Tunnel Portal location.
5. 24 hour measurement along Del Monte Avenue between Dunne Avenue and 5th Street for baseline noise at South Tunnel Portal location.
6. 1-hour measurement near Rucker Avenue and Borges Court for Reach 4 near south end of project and outside San Martin.
7. 1-hour measurement near Monterey Road and Spring Avenue for residential development in Morgan Hill, Reach 7b.

Noise levels were gathered using a Quest Technologies Sound Pro SE/DL Sound Level Meter and analyzed using QuestSuite Professional II software. The Sound Level Meters were calibrated before and after each event, with no change in levels noted. The microphones were placed approximately 2 meters from the ground surface and at least 1 meter from any surface that may reflect sound. The monitoring equipment was set to record the following measurements over 5 second intervals for the duration of each study:

Parameter	**Description**
L_{eq}	True equivalent sound level measured over the run time. Functionally the same as the average.
L_{min}	Minimum (lowest) sound pressure level (SPL) recorded over the run time.
L_{max}	Maximum (highest) sound pressure level SPL recorded over the run time.
L_{pk}	Peak SPL (highest) instantaneous sound level detected by the microphone during a study. L_{pk} is affected by frequency response settings but not the time response.
TWA	Time weighted average. The constant SPL over and 8-hour interval that would produce the same exposure to sound as an exposure measured over a run time sampling interval.

All measurements were taken over typical weekday periods on a Tuesday, Wednesday or Thursday. Full descriptions of the equipment setup and weather conditions can be found in Appendix A (Field Notes).

General weather conditions such as wind, air temperature and humidity were recorded using a Kestrel 3000 Pocket Weather Meter during equipment setup and removal. Weather at the sites was generally sunny and clear. All measurements were made during periods when no rain or fog was present to interfere with measurements. On a few occasions intermittent winds were gusting throughout the monitoring period.

3.0 Results and Discussion

The results of the Baseline Noise Study are summarized in Table 1. All the recorded data and field notes are provided in Appendix A. The 24-hour long term measurements show a diurnal pattern in the noise levels, with lowest decibel levels late in the evening between approximately 10pm and 2am. Automobile traffic was the dominant noise source observed at all locations. Other sources of detectable noises included: landscaping (lawn mowers, hedge trimmers and leaf cutters), pedestrian traffic and vegetation blowing during gusts of wind.

The L_{min} values were similar at all seven study locations with a minimum of 31.8 decibels (dB) and a max of 47.2 dB. The two highest minimum noise levels were recorded during the 1-hour studies at Sites 6 and 7. The L_{min} values recorded at Sites 1 through 5 ranged from 31.8 dB to 40.8 dB.

Measurements collected at Sites 1, 2 and 3 had the highest $L_{max,}$ L_{pk} and time weighted average (TWA) values measured during this study. These values correspond to high volumes of observed automobile traffic along Church Avenue at Site 1, Llagas Avenue at Site 2 and Watsonville Road at Site 3. Measurements at Site 2 had the additional observed noise source associated with the airport, located approximately 0.25 miles to the east, and the 101 freeway, located approximately 0.5 miles to the east.

This Page Intentionally Left Blank

Tables

Table 1
Summary of Baseline Noise Sudy
Upper Llagas Creek
Morgan Hill and San Martin, California

Station ID	Duration of Study	Start of Study	Leq	Lmin	Lmax	Lpk	TWA
Site 1	24-hours	11/22/2011 11:30	63.6	40.8	98.3	112.8	68.4
Site 2	24-hours	11/30/2011 10:52	55.4	33.5	95.3	104.8	60.1
Site 3	24-hours	12/21/2011 11:47	63.3	31.8	94.3	107.1	68.1
Site 4	24-hours	11/15/2011 11:28	49.5	35.2	82.3	96.3	54.3
Site 5	24-hours	12/20/2011 11:16	53.5	35.3	84.8	96	58.3
Site 6	1-hour	11/17/2011 10:43	60.1	42.9	80.1	99.5	51
Site 7	1-hour	11/15/2011 12:30	62.1	47.2	85.7	100.9	53.1

Notes:
All measurments in decibels (dB)

Figures

Cardno ENTRIX

REGIONAL LOCATION MAP

UPPER LLAGAS CREEK BASELINE NOISE STUDY

MORGAN HILL, CALIFORNIA

Drawn By: APOC	PROJECT No. 30523020	FIGURE. No. 1	DATE 1/12

LEGEND

● Noise Monitoring Location

Cardno ENTRIX	**UPPER LLAGAS CREEK** **BASELINE NOISE STUDY** **MORGAN HILL and SAN MARTIN, CALIFORNIA**	**FIGURE 2** STUDY LOCATION 1 UPPER LLAGAS CREEK SAN MARTIN, CA

LEGEND

● Noise Monitoring Location

Cardno ENTRIX

UPPER LLAGAS CREEK
BASELINE NOISE STUDY
MORGAN HILL and SAN MARTIN, CALIFORNIA

FIGURE 3
STUDY LOCATION 2
UPPER LLAGAS CREEK
SAN MARTIN, CA

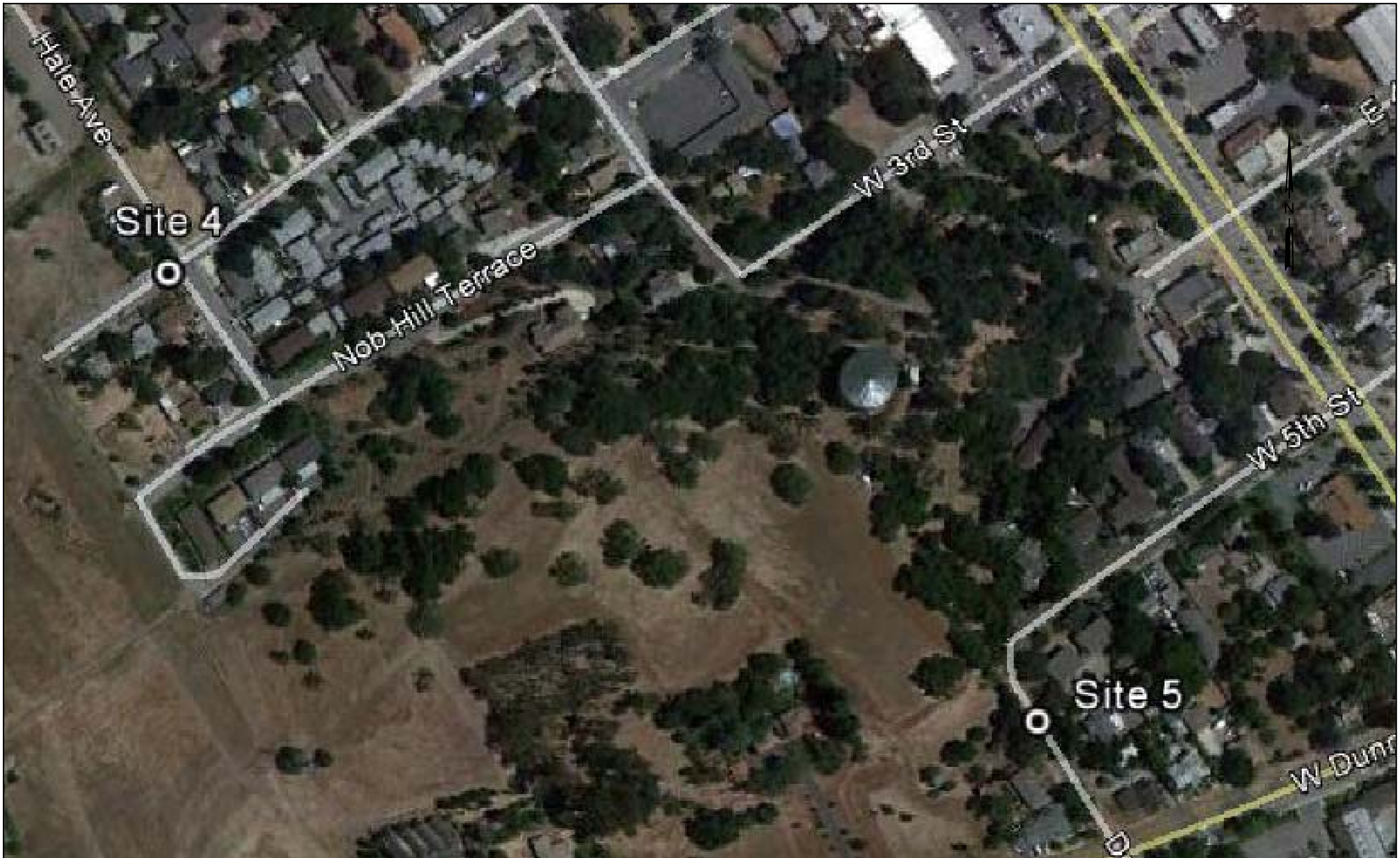
LEGEND

● Noise Monitoring Location

Cardno ENTRIX

UPPER LLAGAS CREEK
BASELINE NOISE STUDY
MORGAN HILL and SAN MARTIN, CALIFORNIA

FIGURE 4
STUDY LOCATION 3
UPPER LLAGAS CREEK
MORGAN HILL, CA



LEGEND

● Noise Monitoring Location

Cardno ENTRIX	**UPPER LLAGAS CREEK** **BASELINE NOISE STUDY** **MORGAN HILL and SAN MARTIN, CALIFORNIA**	**FIGURE 5** STUDY LOCATIONS 4 and 5 UPPER LLAGAS CREEK MORGAN HILL, CA

LEGEND

● Noise Monitoring Location

Cardno ENTRIX	**UPPER LLAGAS CREEK** **BASELINE NOISE STUDY** **MORGAN HILL and SAN MARTIN,** **CALIFORNIA**	**FIGURE 6** STUDY LOCATION 6 UPPER LLAGAS CREEK SAN MARTIN, CA

LEGEND

● Noise Monitoring Location

Cardno ENTRIX	**UPPER LLAGAS CREEK** **BASELINE NOISE STUDY** **MORGAN HILL and SAN MARTIN, CALIFORNIA**	**FIGURE 7** STUDY LOCATION 7 UPPER LLAGAS CREEK SAN MARTIN, CA

Appendix M

Special-status Wildlife Species Potentially Occurring in the Project Vicinity

US Army Corps of Engineers.

M.1 Special-status Wildlife potentially Occurring Near Llagas Creek

Name	Status**		General Habitat Description	Species Occurs in USGS Quad*	Project Area Habitat Suitability	Potential for Occurrence
	State	Federal				
Mammals						
Hoary bat (*Lasiurus cinereus*)	None	None	Prefers open habitats or habitat mosaics, with access to trees for cover and open areas or habitat edges for feeding. Roosts in dense foliage of medium to large trees. Feeds primarily on moths and requires water.	GI	Habitat within the Project area provides low suitability for reproduction, cover, and foraging for this species. Higher foraging suitability near perennial water.	Moderate
Pallid bat (*Antrozous pallidus*)	CSC	None	Deserts, grasslands, scrublands, woodlands and open forests. Most common in open, dry habitats with rocky areas for roosting.	GI, MH	May roost in hollow trees, buildings, under bridges, and in tunnels. Suitable foraging habitat present. 2 CNDDB occurrences within 10 miles of Project area.	Moderate
Yuma myotis (*Myotis yumanensis*)	None	None	Optimal habitats are open forests and woodlands with sources of water over which to feed. Distribution is closely tied to bodies of water. Maternity colonies in caves, mines, buildings, or crevices.	ST	May roost under bridges and in tunnels. Suitable foraging habitat present. 1 CNDDB occurrence within 10 miles of Project area.	Moderate
San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*)	CSC	None	Found among oak/bay woodland and riparian areas around the San Francisco Bay Area. May also be found in rock outcrops and chaparral habitat types.	MH	May nest in areas with high density of woody vegetation. Sensitive to disturbance. Dens have been observed near the intersection of Monterey Road and Watsonville Road.	Moderate
San Joaquin kit fox (*Vulpes macrotis mutica*)	CT	FE	Open, level, sandy ground preferred. Often associated with annual grasslands and small mammal burrow complexes.	CH, GH, PP, WW	Occasionally occurs in agricultural areas. Dominate Project area has low to no suitability, except as a potential migratory corridor.	Low
American badger (*Taxidea taxus*)	CSC	None	Herbaceous, shrub, and open stages of most habitats with dry, friable soils.	CH, GI, MH	Prefers open grasslands with ground squirrels. Dominate Project area has low to no suitability, except as a potential migratory corridor.	Low

Name	Status**		General Habitat Description	Species Occurs in USGS Quad*	Project Area Habitat Suitability	Potential for Occurrence
	State	Federal				
Salt marsh harvest mouse (*Reithrodontomys raviventris*)	CE	FE	Restricted to salk and brackish marsh. Critically dependent upon dense cover and preferred habitat is pickleweed (*Salicornia virginica*). Occurs in the upper zone of marshes with salt-tolerant plants. May move in to grasslands during highest winter tides.	SCC	No suitable nesting or foraging habitat within the Project area and large distance from nearest known occurrence.	None
Birds						
Western burrowing owl (*Athene cunicularia hypugaea*)	CSC	None	Ground dweller of open country, golf courses, airports, etc. Often associated with California ground squirrel burrow complexes.	CH, LO, MH, MM, SF	Prefers open areas with ground squirrels burrows. Will use man-made structures. Multiple CNDDB occurrences within Project area. Suitable burrowing and foraging habitat in adjacent agricultural fields.	Low-Moderate
Least Bell's vireo (*Vireo bellii pusillus*)	CE	FE	Natural early successional riparian and cottonwood-willow riparian areas, young forests and woodlands, coastal chaparral, and scrub oak ecosystems.	CH, SF, WE	Limited potential riparian nesting habitat, but too narrow and no historical or recent breeding records within 2.5 miles of the Project area.	Low-None
Black swift (*Cypseloides niger*)	CSC	None	Steep cliffs ledges and shallow caves behind or near waterfalls. Forages in forests and open montane habitat.	ST	No suitable nesting or foraging habitat. 1 CNDDB occurrence within 10 miles of Project Area.	None
Yellow warbler (*Dendroica petechial*)	CSC	None	(Nesting) Occurs widely in migration and a summer resident from late March early Oct. Breeding numbers greatly declined in lowland areas west of Cascade-Sierra Nevada and Central Valley. Breeds locally in Santa Clara County., San Mateo, Santa Cruz, Monterey, and San Luis Obispo County. Occupies riparian vegetation in close proximity to water, along streams and wet meadows. Found in willow and cottonwood.	--	Limited riparian nesting habitat, but too narrow and no historical or recent breeding records. No known occurrences within 10 miles of Project area.	Low-None

Name	Status**		General Habitat Description	Species Occurs in USGS Quad*	Project Area Habitat Suitability	Potential for Occurrence
	State	Federal				
Bank swallow (*Riparia riparia*)	CT	None	Lowland vertical or near vertical banks with erodible soil near coasts, rivers, streams, lakes, reservoirs, and wetlands. Feeding sites are near wetlands, open water, grasslands, riparian woodlands, agricultural areas, shrublands, and, occasionally, upland woodlands.	CH	No suitable nesting habitat. Potential feeding habitats (grassland and agricultural areas) adjacent to Project area.	Low
Tricolored blackbird (*Agelaius tricolor*)	CSC	None	Open grasslands and pasturelands associated with nesting cover (e.g., blackberry shrubs, wetland emergent vegetation, etc.).	CH, ST	Potential feeding and nesting habitat present in reaches with perennial water. 2 CNDDB occurrences within 10 miles of Project area.	Low
White-tailed kite (*Elanus leucurus*)	FP	None	Rolling foothills and valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodland. Forages in open grasslands, meadows, or marshes, close to isolated, dense-topped trees for nesting and perching.	GI	Low habitat suitability for foraging and nesting within the Project area, however suitable foraging habitat is present in adjacent agricultural fields. 1 CNDDB occurrence within 10 miles of Project area.	Low
Golden eagle (*Aquila chrysaetos*)	FP	None	(Nesting & wintering) Rolling foothills, mountain areas, sage-juniper flats and desert. Cliff-walled canyons provide nesting habitat in most parts of range; also large trees in open areas.	ST	No suitable feeding or nesting habitat. 1 CNDDB occurrence within 10 miles of Project area.	None
Great blue heron (*Ardea herodias*)	None	None	(Nesting) Colonial nester in tall trees, cliffsides, and sequestered spots on marshes. Rookery sites in close proximity to foraging areas–marshes, lake margins, tide-flats, rivers and streams, and wet meadows.	MH	Suitable feeding (fresh and saline wetlands) habitat at perennial reaches within Project area. Riparian trees adjacent to creek provide suitable nesting habitat.	Moderate
Marbled murrelet (*Brachyramphus marmoratus*)	CT	FT	(Nesting) Uses old-growth forest, characterized by large trees, multiple canopy layers and high canopy closure. Prefers nesting along coastal and in near-shore marine waters as far south as northern Monterey Bay.	CH, WE, WW	No suitable nesting or foraging habitat and large distance from nearest known occurrence.	None

Name	Status**		General Habitat Description	Species Occurs in USGS Quad*	Project Area Habitat Suitability	Potential for Occurrence
	State	Federal				
California least tern (*Sternula antillarum (=Sterna, =albifrons) browni*	FP	FE	Occurs from Pacific coast from San Francisco to Baja, Califronia. Breeding colonies are located along marine and estuarine shores, abandoned salt ponds along estuarine shores. Feeds in shallow, estuarine waters.	SF, CH, PP, WE, WW	No suitable nesting or foraging habitat and large distance from nearest known occurrence.	None
Western snowy plover (*Charadrius alexandrines nivosus*)	CSC	FT	(Nesting) Breeds primarily on coastal beaches from southern Washington to southern Baja, California. Breeds above high tide line on coastal beaches, sand spits, dune-backed beaches, sparsely-vegetated dunes, beaches at creek and river mouths, and salt pans. Less common nesting habitat include river bars, dry salt pond, salt pond levees.	SCC, WW[1]	No suitable nesting or foraging habitat and large distance from nearest known occurrence.	None
Western brown pelican (*Pelecanus occidentails californicus*)	DE	FE	Range from Gulf of California to southern British Columbia. Nests on islands and rarely seen inland or far out at sea.	SCC	No suitable nesting or foraging habitat and large distance from nearest known occurrence.	None
California clapper rail (*Rallus longirostris obsoletus*)	CE	FE	Restricted almost entirely to marshes of San Francisco estuary, where only known breeding population occurs. Distribution is patchy and discontinuous.	SCC	No suitable nesting or foraging habitat and large distance from nearest known occurrence.	None
Reptiles						
Western pond turtle (*Actinemys marmorata,* formerly *Clemmys or Emmys marmorata*)	CSC	None	Aquatic turtle of ponds, lakes, marshes, rivers, streams, and irrigation ditches that typically have rocky or muddy bottom, with aquatic vegetation. Nests in uplands associated with wetland habitat.	CH, GH, GI, LO, LP, MC, MH, MM, MS, PP, SE, ST, WE	Dominate habitat within Project area, especially areas with perennial waters. Females move overland to find suitable egg laying sites.	Moderate-High
Black legless lizard (*Anniella pulchra nigra*)	CSC	None	Loose soil and leaf litter within coastal scrub types, coastal dunes, valley foothills, and chaparral. Isolated population within the desert in Riverside County.	WW	No suitable habitat and large distance from nearest known habitat. Nearest CNDDB occurrence is 9.5 miles.	None

Name	Status**		General Habitat Description	Species Occurs in USGS Quad*	Project Area Habitat Suitability	Potential for Occurrence
	State	Federal				
Coast horned lizard (*Phrynosoma blainvillii,* formerly *P. coronatum frontale*)	CSC	None	Open country, especially sandy areas, washes, flood plains and wind-blown deposits in a wide variety of habitats. Common in lowlands along sandy washes where scattered low shrubs provide cover. Requires friable soils.	GH, ST	Possible in sandier portions of reaches. Nearest CDDB occurrence is 7.3 miles from Project area.	Low-None
Blunt-nosed leopard lizard (*Gambelia (=Crotaphytus) sila*)	CE	FE	Found only in the San Joaquin Valley and adjacent foothills, Carrizo Plain and Cuyama Valley. Inhabits open, sparely vegetated low relief areas on the valley floor and surrounding foothill. Also inhabits alkali playa and valley saltbrush scrub. Generally absent from dense vegetation or areas subject to seasonal flooding.	SCC	No suitable habitat within Project area and large distance from nearest known occurrence.	None
Alameda whipsnake (*Masticophis lateralis euryxanthus*)	CT	FT	Inhabits inner coast range in Contra Costa., Alameda, San Joaquin, and Santa Clara counties. Found in chaparral-northern coastal sage scrub and coastal sage. Will occur up to 500 feet into adjacent habitats, including grassland, oak savanna, and occasionally oak-bay woodland. Lays eggs in grassland communities adjacent to chaparral community.	SCC	No suitable habitat within Project area and large distance from nearest known occurrence.	None
Amphibians						
California tiger salamander (*Ambystoma californiense*)	CT, CSC	FT	Quiet water of ponds, reservoirs, lakes, vernal pools, streams, and stock ponds within annual grasslands, oak savannah, oak woodland and open chaparral.	CH, GH, GI, IV, LO, MH, MM, MS, PP, SF, ST, WW	Suitable habitat exists but fragmented by development. The Project area is within a region where the CTS has been presumed to be extinct, but portions of the Project area are within the migration range of potential breeding habitat, including designated critical habitat. Multiple CNDDB occurrences within 10 miles of Project area.	Low

Name	Status**		General Habitat Description	Species Occurs in USGS Quad*	Project Area Habitat Suitability	Potential for Occurrence
	State	Federal				
California red-legged frog (*Rana draytonii*)	CSC	FT	Chiefly lakes, ponds, and streams in coastal forest, inland woodlands, and valley grasslands where cattails, bulrush, or other plants provide dense cover. Aquatic sites need not be permanent.	CH, GH, GI, LO, LP, MC, MH, MM, MS, PP, SF, ST, WE, WW	Pooled waters in some reaches, but surveys in the Project area and vicinity indicate that CRLF no longer occurs in the lowlands of the valley. The Project area is within a region in which the CRLF is presumed to be extinct. However, multiple CNDDB occurrences are within 10mi of Project area.	Low-None
Foothill yellow-legged frog (*Rana boylii*)	CSC	None	Closely associated with permanent water courses including streams or rivers in woodland, chaparral, and forest. Often found in riffles with rocks and sunny banks.	GH, MC, MH, MS, ST	In areas with perennial waters.	Low-None
Invertebrates						
Conservancy fairy shrimp (*Branchinecta conservation*)	None	FE	Inhabits large, cool-water vernal pools with moderately turbid water. Pools generally last until June. Eight recorded populations, none of which are in Santa Clara County.	SCC	No vernal pools within Project area.	None
Vernal pool fairy shrimp (*Branchinecta lynchi*)	None	FT	Aquatic species that inhabits a variety of different vernal pools habitats, from small, clear sandstone rock pools to large, turbid, alkaline valley floor pools. Tends to occur in smaller pools. Occurs in a wide range of vernal pools in southern and Central Valley, California.	SCC	No vernal pools within Project area.	None
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	None	FT	Found on or close to its host plant, elderberry (*Sambucus* spp.). Shrubs must have steams 1" or greater in diameter at ground level. Occurs from southern Shasta County to Fresno County.	SCC	The Project area is not within VELB habitat range.	None

Name	Status** State	Status** Federal	General Habitat Description	Species Occurs in USGS Quad*	Project Area Habitat Suitability	Potential for Occurrence
Opler's longhorn moth (*Adela oplerella*)	None	FC	Almost completely restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay where its host plant, *Platystemon californicus*, is known to occur.	MH, MM, ST	Multiple CNDDB occurrences with closest occurrence at 0.7 mile from Project area. Potentially suitable habitat present if the host plant is present within the Project area. Botanical survey of annual native plant food should be conducted.	Low- None
Monarch butterfly (*Danaus plexippus*)	None	None	Can be found in a wide range of habitats, such as fields, meadows, prairie remnants, urban and suburban parks, gardens, trees, and roadsides. It overwinters in cypress groves, but will also use Eucalyptus.	WW	Roosting groves are not present within the Project area. May migrate through the Project area to more suitable areas. 1 CNDDB occurrence within 10 miles of Project area.	Low
Jung's micro-blind harvestman (*Microcina jungi*)	None	None	Known only to occur beneath serpentine rocks in grasslands habitats in the San Francisco Bay region.	LO	1 CNDDB occurrence within 10 miles of Project area.	None
Bay checkerspot butterfly (*Euphydryas editha bayensis*)	None	FT	Inhabits grasslands and open woodlands, especially on serpentine, near growths of its primary larval food plant, native plantain (*Plantago erecta*) an annual herb, or one of two species of their secondary larval food plant, owl's clover (*Castilleja densiflorus* and *C. exerta*). *Plantago erecta* occurs at 0 to 2,500 feet elevation.	GI, LO, MH, MM, ST, WE	Potentially suitable habitat present if the host plant is present within the Project area. Spring botanical survey of annual native food plants should be conducted. CNDDB occurrences within 2.5 miles of Project area. May migrate through the Project area to more suitable areas; critical habitat for the species is within 2.5 miles and is located north, west, and east of the Project area.	Moderate

Name	Status**		General Habitat Description	Species Occurs in USGS Quad*	Project Area Habitat Suitability	Potential for Occurrence
	State	Federal				

Legend:

* Location Codes: CH – Chittenden, GH – Gilroy Hot Springs, GI – Gilroy, IV – Isabel Valley, LO – Lick Observatory, LP – Loma Prieta, MC – Mississippi Creek, MH – Morgan Hill, MM – Mt. Madonna, MS – Mt. Sizer, PP – Pacheco Peak, SF – San Felipe, ST – Santa Teresa Hills, WE – Watsonville East, WW – Watsonville West

SCC – Santa Clara County

-- Species is show up on quad or county list but is included at the request of CDFW Scoping Comments Nov. 9, 2012.

** Special status codes

None = no special status granted or recognized by named party

FC = Federal Candidate; USFWS has enough information on biological vulnerability and threats to support a proposal to list as endangered or threatened.

FE = Federally Endangered; listed by USFWS as in danger of extinction throughout all or a significant portion of its range.

FT = Federally Threatened; listed by USFWS as likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

CCE = California Candidate for Endangered Status under the CESA.

CCT = California Candidate for Threatened Status under the CESA.

CSC = California Species of Special Concern.

CE = California Endangered under the CESA.

CT = California Threatened under the CESA.

FP = Fully Protected under California Fish and Game Code (Sections 3511, 4700, 5050, and 5515)

DE = Delisted/Recovered

a = Based on 7.5-minute USGS quad lists from query of California Natural Diversity Database (CNDDB) search, accessed December 2012.

1= Critical habitat in WW, but no species occurrences.

Sources: CNDDB 2013, USFWS, Santa Clara County List