Appendix A: Biological Resources Data

CALIFORNIA DEPARTMENT OF FISH and WILDLIFE **RareFind**

Query Summary:
Quad IS (Sacramento West (3812155))

Print Close

CNDDB Element Query Results

Scientific Name	Common Name	Taxonomic Group	Element Code	Total Occs	Returned Occs	Federal Status	State Status	Global Rank	State Rank	CA Rare Plant Rank	Other Status	Habitats
Agelaius tricolor	tricolored blackbird	Birds	ABPBXB0020	955	3	None	Threatened	G2G3	S1S2	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_EN-Endangered, NABCI_RWL-Red Watch List, USFWS_BCC-Birds of Conservation Concern	Freshwater marsh, Marsh & swamp, Swamp, Wetland
Archoplites interruptus	Sacramento perch	Fish	AFCQB07010	5	1	None	None	G2G3	S1	null	AFS_TH-Threatened, CDFW_SSC-Species of Special Concern	Aquatic, Sacramento/San Joaquin flowing waters, Sacramento/San Joaquin standing waters
Astragalus tener var. ferrisiae	Ferris' milk-vetch	Dicots	PDFAB0F8R3	18	1	None	None	G2T1	S1	1B.1	BLM_S-Sensitive	Meadow & seep, Valley & foothill grassland, Wetland
Athene cunicularia	burrowing owl	Birds	ABNSB10010	1989	2	None	None	G4	S3	null	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Coastal prairie, Coastal scrub, Great Basin grassland, Great Basin scrub, Mojavean desert scrub, Sonoran desert scrub, Valley & foothill grassland
Buteo swainsoni	Swainson's hawk	Birds	ABNKC19070	2518	53	None	Threatened	G5	S3	null	BLM_S-Sensitive, IUCN_LC-Least Concern, USFWS_BCC-Birds of Conservation Concern	Great Basin grassland, Riparian forest, Riparian woodland, Valley & foothill grassland
Cicindela hirticollis abrupta	Sacramento Valley tiger beetle	Insects	IICOL02106	6	1	None	None	G5TH	SH	null	null	Sand shore
Coccyzus americanus occidentalis	western yellow-billed cuckoo	Birds	ABNRB02022	156	1	Threatened	Endangered	G5T2T3	S1	null	BLM_S-Sensitive, NABCI_RWL-Red Watch List, USFS_S-Sensitive, USFWS_BCC-Birds of Conservation Concern	Riparian forest
Desmocerus californicus dimorphus	valley elderberry longhorn beetle	Insects	IICOL48011	271	7	Threatened	None	G3T2	S2	null	null	Riparian scrub
Elanus leucurus	white-tailed kite	Birds	ABNKC06010	180	1	None	None	G5	S3S4	null	BLM_S-Sensitive,	Cismontane woodland,

											CDFW_FP-Fully Protected, IUCN_LC-Least Concern	Marsh & swamp, Riparian woodland, Valley & foothill grassland, Wetland
Elderberry Savanna	Elderberry Savanna	Riparian	CTT63440CA	4	1	None	None	G2	S2.1	null	null	Riparian scrub
Great Valley Cottonwood Riparian Forest	Great Valley Cottonwood Riparian Forest	Riparian	CTT61410CA	56	1	None	None	G2	S2.1	null	null	Riparian forest
Hibiscus lasiocarpos var. occidentalis	woolly rose-mallow	Dicots	PDMAL0H0R3	173	1	None	None	G5T3	S3	1B.2	SB_RSABG-Rancho Santa Ana Botanic Garden, SB_UCBG-UC Botanical Garden at Berkeley	Freshwater marsh, Marsh & swamp, Wetland
Lasiurus cinereus	hoary bat	Mammals	AMACC05030	238	1	None	None	G5	S4	null	IUCN_LC-Least Concern, WBWG_M-Medium Priority	Broadleaved upland forest, Cismontane woodland, Lower montane coniferous forest, North coast coniferous forest
Laterallus jamaicensis coturniculus	California black rail	Birds	ABNME03041	303	1	None	Threatened	G3G4T1	S1	null	BLM_S-Sensitive, CDFW_FP-Fully Protected, IUCN_NT-Near Threatened, NABCI_RWL-Red Watch List, USFWS_BCC-Birds of Conservation Concern	Brackish marsh, Freshwater marsh, Marsh & swamp, Salt marsh, Wetland
Melospiza melodia	song sparrow ("Modesto" population)	Birds	ABPBXA3010	92	2	None	None	G5	S3?	null	CDFW_SSC-Species of Special Concern	null
Oncorhynchus mykiss irideus pop. 11	steelhead - Central Valley DPS	Fish	AFCHA0209K	31	2	Threatened	None	G5T2Q	S2	null	AFS_TH-Threatened	Aquatic, Sacramento/San Joaquin flowing waters
Oncorhynchus tshawytscha pop. 6	chinook salmon - Central Valley spring-run ESU	Fish	AFCHA0205A	13	1	Threatened	Threatened	G5	S1	null	AFS_TH-Threatened	Aquatic, Sacramento/San Joaquin flowing waters
Oncorhynchus tshawytscha pop. 7	chinook salmon - Sacramento River winter-run ESU	Fish	AFCHA0205B	2	1	Endangered	Endangered	G5	S1	null	AFS_EN-Endangered	Aquatic, Sacramento/San Joaquin flowing waters
Pogonichthys macrolepidotus	Sacramento splittail	Fish	AFCJB34020	15	1	None	None	GNR	S3	null	AFS_VU-Vulnerable, CDFW_SSC-Species of Special Concern, IUCN_EN-Endangered	Aquatic, Estuary, Freshwater marsh, Sacramento/San Joaquin flowing waters
Progne subis	purple martin	Birds	ABPAU01010	71	1	None	None	G5	S3	null	CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern	Broadleaved upland forest, Lower montane coniferous forest
Spirinchus thaleichthys	longfin smelt	Fish	AFCHB03010	46	1	Candidate	Threatened	G5	S1	null	null	Aquatic, Estuary
Symphyotrichum lentum	Suisun Marsh aster	Dicots	PDASTE8470	175	1	None	None	G2	S2	1B.2	SB_RSABG-Rancho Santa Ana Botanic Garden,	Brackish marsh, Freshwater marsh, Marsh & swamp, Wetland

											SB_USDA-US Dept of Agriculture	
Thamnophis gigas	giant gartersnake	Reptiles	ARADB36150	366	4	Threatened	Threatened	G2	S2	null	IUCN_VU-Vulnerable	Marsh & swamp, Riparian scrub, Wetland
Vireo bellii pusillus	least Bell's vireo	Birds	ABPBW01114	503	2	Endangered	Endangered	G5T2	S2	null	IUCN_NT-Near Threatened, NABCI_YWL-Yellow Watch List	Riparian forest, Riparian scrub, Riparian woodland

United States Department of the Interior

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

In Reply Refer To:
Consultation Code: 08ESMF00-2019-SLI-1867
Event Code: 08ESMF00-2019-E-05992
Project Name: American River Common Features East Sacramento Contract 1

May 08, 2019

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

To Whom It May Concern:

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

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

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

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

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

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

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

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

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

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

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

Attachment(s):

- Official Species List

Official Species List

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

This species list is provided by:

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

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
(916) 930-5603

Project Summary

Consultation Code: 08ESMF00-2019-SLI-1867

Event Code: 08ESMF00-2019-E-05992

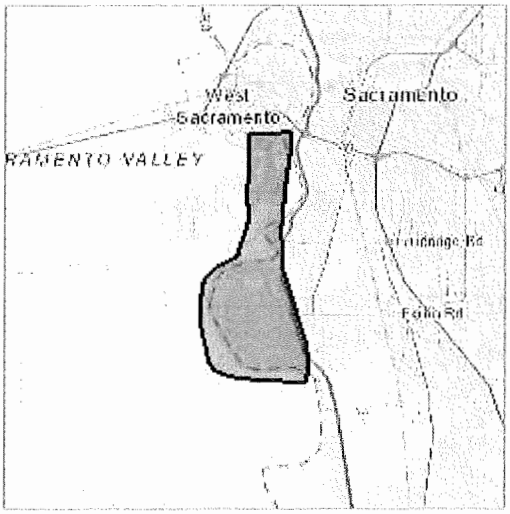
Project Name: American River Common Features East Sacramento Contract 1

Project Type: LAND - FLOODING

Project Description: Cutoff wall and seepage berm construction in April 2020 at approximately seven reaches in East Sacramento on the Sacramento River

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/38.51847170513964N121.53458974895136W



Counties: Sacramento, CA | Yolo, CA

Endangered Species Act Species

There is a total of 10 threatened, endangered, or candidate species on this species list.

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

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

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

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

Birds

NAME	STATUS
Least Bell's Vireo *Vireo bellii pusillus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5945	Endangered
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **proposed** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Giant Garter Snake *Thamnophis gigas* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4482	Threatened

Amphibians

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

Fishes

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

Insects

NAME	STATUS
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7850 Habitat assessment guidelines: https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf	Threatened

Crustaceans

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

Table 1. Special-status Plant Species with Potential to Occur in the Project Area

Species Name	Legal Status[1]	Habitat, Elevation Range, and Blooming Period	Potential for Occurrence[2]
Watershield *Brasenia schreberi*	CRPR 2B.3	Freshwater ponds, marshes, and swamps, often in association with duckweed (*Lemna* spp.), from 98 to 7,218 feet in elevation. Blooms April–October.	Unlikely to occur
Bristly sedge *Carex comosa*	CRPR 2B.1	Marshes and swamps, generally on lake margins and wet places such as ditches, sloughs, and freshwater marsh, from 0 to 2,050 feet in elevation. Blooms May–September.	Unlikely occur
Bolander's water hemlock *Cicuta maculata* var. *bolanderi*	CRPR 2B.1	Coastal, freshwater, or brackish marshes and swamps, from 0 to 650 feet in elevation. Blooms July–September.	Unlikely to occur
Peruvian dodder *Cuscuta obtusiflora* var. *glandulosa*	CRPR 2B.2	Freshwater marshes and swamps; from 49 to 919 feet in elevation. Blooms July–October.	Unlikely to occur
Woolly rose-mallow *Hibiscus lasiocarpos* var. *occidentalis*	CRPR 1B.2	Freshwater marshes and swamps, generally found on wetted river banks and low peat islands in sloughs; known from the Delta watershed, also recorded in riprap on levee slopes, from 0 to 390 feet in elevation. Blooms June–November.	Known to occur
Northern California black walnut *Juglans hindsii*	CRPR 1B.1	Riparian forest and woodland, from 0 to 1,440 feet in elevation. Although there is one documented occurrence along the Sacramento River between Freeport and Walnut Grove (CNDDB occurrence number 3), it is believed to have been extirpated and the species is believed to be extirpated from Sacramento County. Blooms April–May.	Unlikely to occur
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	CRPR 1B.2	Freshwater and brackish marshes; generally restricted to the Delta, also recorded in riprap on levee slopes, from 0 to 13 feet in elevation. Blooms May–July (rarely into September).	Unlikely to occur
Mason's lilaeopsis *Lilaeopsis masonii*	CR; CRPR 1B.1	Freshwater and brackish marshes, riparian scrub; generally found in tidal zones, on bare depositional soils in the Delta, from 0 to 33 feet in elevation. Blooms April–November.	Unlikely to occur
Delta mudwort *Limosella australis*	CRPR 2B.1	Riparian scrub, freshwater marsh, brackish marsh; generally occurs on intertidal mud banks of the Delta in marshy or scrubby riparian associations, from 0 to 10 feet in elevation. Blooms April–August.	Unlikely to occur
Sanford's arrowhead *Sagittaria sanfordii*	CRPR 1B.2	Assorted shallow freshwater marshes and swamps; generally occurs in standing or slow-moving freshwater ponds, marshes, ditches, and sloughs from 0 to 2,000 feet in elevation. Blooms May–October.	Unlikely to occur
Marsh skullcap *Scutellaria galericulata*	CRPR 2B.2	Lower montane coniferous forest, meadows and seeps, and marshes and swamps; generally occurs in swamps and wet places, also recorded on floating logs and pilings in river and slough channels, from 3,000 to 6,900 feet in elevation. Blooms June–September.	Unlikely to occur

Table 1. Special-status Plant Species with Potential to Occur in the Project Area

Species Name	Legal Status[1]	Habitat, Elevation Range, and Blooming Period	Potential for Occurrence[2]
Side-flowering skullcap *Scutellaria lateriflora*	CRPR 2B.2	Meadows and seeps, marshes and swamps; generally occurs in wet meadows and marshes in the Delta, also recorded on floating logs and pilings in river and slough channels, from 0 to 1,600 feet in elevation. Blooms May–September.	Unlikely to occur
Suisun Marsh aster *Symphyotrichum lentum*	CRPR 1B.2	Brackish and freshwater marshes and swamps; endemic to the Delta; generally occurs in marshes and swamps, often along sloughs, also recorded in riprap on levee slopes and pilings in river and slough channels, from 0 to 10 feet in elevation. Blooms May–November.	Unlikely to occur

Notes: CNDDB = California Natural Diversity Database; CRPR = California Rare Plant Rank; Delta = Sacramento–San Joaquin Delta

[1] **Legal Status Definitions**

CR = State status of Rare (legally protected).

California Rare Plant Ranks:

1B Plant species considered rare or endangered in California and elsewhere (but not legally protected under the Federal or California Endangered Species Acts).

2B Plant species considered rare or endangered in California but more common elsewhere (but not legally protected under the Federal or California Endangered Species Acts).

California Rare Plant Rank Extensions:

.1 Seriously endangered in California (greater than 80 percent of occurrences are threatened and/or have a high degree and immediacy of threat).

.2 Fairly endangered in California (20 to 80 percent of occurrences are threatened and/or have a moderate degree and immediacy of threat).

.3 Not very endangered in California.

[2] **Potential for Occurrence Definitions**:

- *No potential to occur:* Potentially suitable habitat is not present.
- *Unlikely to occur:* Potentially suitable habitat present but species unlikely to be present because of very restricted distribution and/or because it was not observed during focused surveys.
- *Known to occur:* The species was observed during focused surveys.

Sources: Baldwin et. al. 2012; CDFW 2019; CNPS 2019

Table 2. Special-Status Fishes With Potential to Occur in the Project Area

Scientific Name Common Name	Status[1] (Federal/State)	Description
Entosphenus tridentatus Pacific lamprey	–/SSC	Anadromous; expected to occur at the proposed levee improvement sites. Adults and rearing juveniles have the potential to be present year-round.
Lampetra ayresi river lamprey	–/SSC	Anadromous; though the distribution is not well known, the project area is within the species' known range and habitat is present in the Lower Sacramento River. Adults enter the streams in the fall, and spawning is believed to occur in April and May; young hatch in 2–3 weeks and remain in freshwater streams for 3–5 years (Moyle 2002).
Acipenser medirostris green sturgeon	FT, FX/SSC	Anadromous; expected to occur at the proposed levee improvement sites as adults migrating upstream to their spawning habitat (between late February and late July), and as larvae and juveniles, rearing and migrating to the ocean (year-round).
Acipenser transmontanus white sturgeon	–/SSC	Anadromous; expected to occur at the proposed levee improvement sites as adults migrating upstream to their spawning habitat (winter and spring), and as larvae moving downstream to the estuary (spring to early summer).
Mylopharadon conocephalus hardhead	–/SSC	Resident; expected to occur year-round in the Lower Sacramento River. Adults occur in deep, clear pool and run habitats, whereas juveniles are found in shallow water and along the shoreline (Moyle et al. 1982, Moyle 2002).
Pogonichthys macrolepidotus Sacramento splittail	–/SSC	Resident/semi-anadromous; expected to occur in wet years in the project area along the Lower Sacramento River as adults migrating from the Delta to flooded spawning areas in February–June, and as juveniles migrating from upstream spawning habitats to tidal habitat shortly after emergence, primarily in April and May (Sommer et al. 1997; Baxter 1999, 2000, both as cited in Moyle 2002).
Hypomesus transpacificus delta smelt	FT, FX/SE	Semi-anadromous; adults and juveniles are uncommon at the proposed levee improvement sites, but may be present in December–July, though typically restricted to the Delta and the Lower Sacramento River downstream of Isleton (RM 18); juveniles move downstream with the currents (USFWS 1996, Sommer et al. 2001a, Moyle 2002).
Spirinchus thaleichthys longfin smelt	FC/ST, SSC	Anadromous; rare migrant to the project area. Similar to delta smelt, adults and juveniles are uncommon, but may be present along the Lower Sacramento River in December–July when they enter freshwater streams to spawn, though typically restricted to the Delta and the lower Sacramento River downstream of Rio Vista (RM 12) (Moyle 2002, Baxter et al. 2008).
Oncorhynchus mykiss Central Valley steelhead	FT, FX/–	Anadromous; expected to occur in the Lower Sacramento River as adults migrating to their upstream spawning habitat, and as juveniles and smolts rearing and migrating towards the ocean. Adult migration to upstream spawning areas occurs in July–March (Hallock 1987). Juveniles typically spend 1–3 years in fresh water before migrating to the ocean, generally in December–August (McEwan 2001).
Oncorhynchus tshawytscha Central Valley spring-run Chinook salmon	FT, FX/ST	Anadromous; expected to occur in the Lower Sacramento River as adults migrating upstream in March–September, (peak May–June) (Yoshiyama et al. 1998), and as juveniles and yearlings migrating downstream from the onset of the winter storm season through June (CDFG 1998, Fisher 1994, S.P. Cramer and Associates 1995, Hill and Webber 1999, NMFS 2014).
Oncorhynchus tshawytscha Sacramento River winter-run Chinook salmon	FE, FX/SE	Anadromous; expected to occur in the Lower Sacramento River as adults, migrating upstream in December–July (peak in March) (Moyle 2002), and as juveniles migrating downstream soon after fry emerge, typically beginning in August and peaking in September and October (Vogel and Marine 1991). Juveniles and smolts (juveniles that are physiologically ready to enter seawater) may migrate through the project area in November–May (Yoshiyama et al. 1998).

Table 2. Special-Status Fishes With Potential to Occur in the Project Area

Scientific Name Common Name	Status[1] (Federal/State)	Description
Oncorhynchus tshawytscha Central Valley fall-/late fall-run Chinook salmon	FSC/SSC	Anadromous; fall-run are expected to occur throughout the project area, either as adults migrating upstream to their spawning habitat, or as juveniles and smolts rearing and migrating toward the ocean. Late fall-run are expected to occur in the Lower Sacramento River. Fall-run adults migrate through the project area in June–December. Fall-run juveniles rear in fresh water for only a few months after emerging, migrating downstream through the project area in March–July (Yoshiyama et al. 1998). Late fall-run adults migrate through the project area in October–April. Late fall-run juveniles rear in their natal stream during summer; in some streams they remain throughout the year. Late fall-run smolt outmigration can occur in November–May (Yoshiyama et al. 1998).

Notes: CDFG = California Department of Fish and Game; CDFW = California Department of Fish and Wildlife; CESA = California Endangered Species Act; Delta = Sacramento-San Joaquin Delta; ESA = Federal Endangered Species Act; NMFS = National Marine Fisheries Service; USFWS = U.S. Fish and Wildlife Service

[1] Status (CDFW 2016, NMFS 2016, USFWS 2016):

Federal

FE = endangered under the ESA
FT = threatened under the ESA
FC = candidate species for listing under the ESA
FSC = Federal sensitive, or species of concern
FX = designated critical habitat under the ESA
– = no status

State

SE = endangered under CESA
ST = threatened under CESA
SSC = CDFW Species of Special Concern
– = no status

Source: Data compiled by Stillwater Sciences in 2016

Table 3. Special-status Wildlife Species Evaluated for Potential to Occur in the Project Area

Species Name	Legal Status[1] Federal	State	Habitat Associations and Species Occurrences	Potential for Occurrence[2]
Invertebrates				
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT	–	Closely associated with blue elderberry (*Sambucus* sp.), which is an obligate host for the beetle larvae; occurrences along the Sacramento River.	Known to occur
Reptiles				
Giant garter snake *Thamnophis gigas*	FT	ST	Open water associated with marshes, sloughs, and irrigation/drainage ditches within the Central Valley; requires emergent herbaceous wetland vegetation, grassy banks, and openings in waterside vegetation, and higher elevation upland habitat. A historical occurrence is recorded from Laguna Creek (CDFW 2016), but species experts consider this record to be an error, and there is no reliable evidence of giant garter snake presence in the Upper Beach Lake area (E. Hansen, pers. comm., 2015).	Unlikely to occur
Northwestern pond turtle *Emys marmorata*	–	SSC	Permanent or nearly permanent water bodies with abundant vegetation and rocky or muddy bottoms in a variety of habitat types; also require basking sites such as logs, rocks, cattail mats, and exposed banks; documented in the levee improvements area and Upper Beach Lake area.	Known to occur
Birds				
California least tern *Sterna antillarum browni*	FE	SE	Typically found at coastal beaches, bays, estuaries, and other water bodies, but known to occur at several scattered inland sites, including very small numbers in some years at the Sacramento Regional WWTP (SRCSD 2014).	Could occur
Western snowy plover *Charadrius alexandrines nivosus*	FT	–	Primarily a coastal species, but scattered inland breeding populations exist; CNDDB occurrences of migrant individuals from several wastewater treatment facilities in the region.	Unlikely to occur
Greater sandhill crane *Grus canadensis tabida*	–	ST	Grasslands, moist croplands with stubble, and open, emergent wetlands; does not breed in the Central Valley but regularly occurs in the Sacramento Regional WWTP Bufferlands in September through March (SRCSD 2014).	Could occur
White-tailed kite *Elanus leucurus*	–	FP	Nests in woodlands and isolated trees and forages in grasslands, pasture, and agricultural fields; nests documented in the Woodlake area and adjacent to Sacramento Regional WWTP Bufferlands.	Known to occur
Swainson's hawk *Buteo swainsoni*	–	ST	Nests in woodlands and scattered trees and forages in grasslands and agricultural fields; known to nest and forage in the vicinity of the project area, including potential woodland mitigation sites.	Known to occur

Table 3. Special-status Wildlife Species Evaluated for Potential to Occur in the Project Area

Species Name	Legal Status[1] Federal	State	Habitat Associations and Species Occurrences	Potential for Occurrence[2]
Northern harrier *Circus cyaneus*	–	SSC	Nests and forages in grasslands, agricultural fields, and marshes, mostly within dense patches of vegetation no CNDDB occurrences in vicinity of project area, but this species is rarely documented in the CNDDB.	Could occur
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	FT	SE	Riparian forest with dense deciduous trees and shrubs; migrant individuals are likely to pass through the area in transit to breeding sites along the Sacramento River north of Colusa.	Could occur
Burrowing owl *Athene cunicularia*	–	SSC	Nests and forages in grasslands, agricultural lands, open shrublands, and open woodlands with natural or artificial burrows or friable soils; known to occur near the Upper Beach Lake potential woodland mitigation area (SRCSD 2000).	Could occur
Bank swallow *Riparia riparia*	–	ST	Forages in a variety of habitats and nests in vertical banks or bluffs of suitable soil, typically adjacent to water; historical CNDDB occurrences of nest colonies have been documented along the lower American River, but no documented occurrences along the Sacramento River in the vicinity of the project area.	Could occur
Purple martin *Progne subis*	–	SSC	Nests in bridges in the Sacramento urban area and forages in adjacent open habitats; nest colonies are documented in the CNDDB, but no suitable nest sites are present in the project area or vicinity.	Could occur
Loggerhead shrike *Lanius ludovicianus*	–	SSC	Forages and nests in grasslands, shrublands, and open woodlands; no CNDDB occurrences in the project area or vicinity, but this species is rarely documented in the CNDDB.	Could occur
Least Bell's vireo *Vireo bellii pusillus*	FE	SE	Typically occurs in structurally diverse riparian habitat with dense shrub layer; the subspecies is largely extirpated from the Central Valley, but has recently been documented attempting to nest in the Yolo Bypass Wildlife Area, and a migrant individual has been observed in the Sacramento Regional WWTP Bufferlands (SRCSD 2014).	Could occur
Grasshopper sparrow *Ammodramus savannarum*	–	SSC	Nests and forages in grasslands, with a mix of grasses, forbs, and scattered shrubs, on rolling hills and lowland plains; CNDDB occurrences in the project area and vicinity are limited to eastern Sacramento County.	Unlikely to occur
Song sparrow ("Modesto" population) *Melospiza melodia*	–	SSC	Nests and forages in emergent freshwater marsh and riparian scrub and woodland; several CNDDB occurrences in the Upper Beach Lake area.	Could occur
Tricolored blackbird *Agelaius tricolor*	–	SE	Nests in freshwater marsh, riparian scrub, grain crops, and other dense, low vegetation and forages in grasslands and agricultural fields; CNDDB nesting colony locations nearest to the project area are in the Natomas Basin and Yolo Bypass.	Unlikely to occur

Table 3. Special-status Wildlife Species Evaluated for Potential to Occur in the Project Area

Species Name	Legal Status[1] Federal	State	Habitat Associations and Species Occurrences	Potential for Occurrence[2]
Mammals				
Pallid bat *Antrozous pallidus*	–	SSC	Occurs in a wide variety of habitats and roosts in tree cavities and caves, as well as artificial sites (e.g., bridges and buildings); several historic and recent occurrences from Sacramento (County of Sacramento et al. 2010) and Yolo Counties.	Likely to occur
Western red bat *Lasiurus blossevillii*	–	SSC	Roosts solitarily in foliage of mature trees associated with woodland borders, rivers, and walnut orchards, especially in mature riparian corridors more than 164 feet wide; numerous historic and recent occurrences from Sacramento County (County of Sacramento et al. 2010).	Likely to occur
American badger *Taxidea taxus*	–	SSC	Arid, open grassland, shrubland, and woodland with soils suitable for burrowing; historic and recent CNDDB occurrences from Sacramento County, but none closer to the project area than the former Mather Air Force Base.	Unlikely to occur

Notes: CNDDB = California Natural Diversity Database; Sacramento Regional WWTP = Sacramento Regional Wastewater Treatment Plant; USFWS = U.S. Fish and Wildlife Service

[1] **Status Definitions:**
FT = Federally listed as Threatened under the Federal Endangered Species Act
FE = Federally listed as Endangered under the Federal Endangered Species Act
ST = State-listed as Threatened under the California Endangered Species Act
SE = State-listed as Endangered under the California Endangered Species Act
FP = State fully protected
SSC = State species of special concern
– = No status

[2] **Potential for Occurrence Definitions:**
- *No potential to occur:* Potentially suitable habitat is not present.
- *Unlikely to occur:* Potentially suitable habitat present but species unlikely to be present because of very restricted distribution.
- *Could occur:* Suitable habitat is available; however, there are few or no other indicators that the species may be present.
- *Likely to occur:* Habitat conditions, behavior of the species, known occurrences in the vicinity, or other factors indicate a relatively high likelihood that the species would occur.
- *Known to occur:* The species, or evidence of its presence, was observed during reconnaissance-level surveys or was reported by others.

Sources: CDFW 2016; CNDDB 2016; County of Sacramento et al. 2010; SRCSD 2000, 2014; USFWS 2016a

AECOM
2020 L Street
Sacramento, CA 95811
www.aecom.com

916 414 5800 tel
916 414 5850 fax

Memorandum

To	Heather Swinney, USACE; Patrick Caden, USACE; KC Sorgen, SAFCA
Subject	American River Watershed Common Features (ARCF) 2016, Sacramento River East Levee Erosion Contract 1 Standard Assessment Methodology (SAM) Analysis for Site River Mile 55.2 Left Bank
From	Kristin Asmus, AECOM; Steve Pagliughi, AECOM
Date	April 8, 2020

Introduction

This memo presents the draft project specific Standard Assessment Methodology (SAM) analysis for the American River Watershed Common Features (ARCF) Sacramento River East Levee (SREL) Project Site River Mile (RM) 55.2 Left Bank (L). With completion of the 65% design plans for SREL RM 55.2L, project impacts to relevant fish taxa were analyzed using SAM parameters measured from the specific project designs and from field surveys conducted in fall 2019 to winter 2020 to establish existing conditions. Methods and results of this analysis are presented below. Special-status fish species expected to occur at SREL RM 55.2L and included in this analysis are:

- Central Valley Spring-run Chinook Salmon (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU)
- Sacramento River Winter-run Chinook Salmon ESU
- Central Valley Fall-run Chinook Salmon ESU
- Central Valley Late Fall-run Chinook Salmon ESU
- Central Valley Steelhead (Oncorhynchus mykiss) Distinct Population Segment (DPS)

Methods

This SAM analysis was conducted consistent with the methods described in the ARCF General Reevaluation Report National Marine Fisheries Service (NMFS) Biological Opinion (BO; NMFS 2015). Default SAM life-history timing tables were used for special-status fish species expected to occur at SREL RM 55.2L. Temporal change (decay) for instream structure in both existing and 65% design conditions was added to the analysis to maintain consistency with prior SAM analyses prepared for the Lower American River.

Decay of instream structure was estimated using the data compiled in Roni et al. (2015), with a logistic regression used to fit the data and produce estimates of remaining structure at years 0, 1, 5, 15, 25, and 50 (Table 1). These estimates were used to scale down the measured values of shoreline coverage by instream structure over time.

Table 1. Estimates of Remaining Instream Structure Over the 50-Year SAM Modeling Time Period

Year	Percentage of Maximum Instream Structure Shoreline Coverage
0	100%
1	95%
5	90%
15	85%
25	80%
50	48%

For existing conditions, the SAM variables Shade and Vegetation were assumed to stay constant for 50 years to maintain consistency with the original NMFS BO. For the 65% design conditions, temporal change in the SAM variables Shade and Vegetation followed previous growth models consistent with the NMFS BO.

The 65% design plans show a flat riparian bench design. Therefore, the flat riparian bench generalized overstory planting plan's shade evolution model (USACE 2009, Table 4a) was applied for this analysis and is shown below in Table 2. On the 65% design plans, trees which will be preserved are not marked; therefore, no estimates of shade contributed from preserved trees is included in this 65% design analysis.

Table 2. Estimates of Growth in Overhanging Shade Over the 50-Year SAM Modeling Time Period

Year	Fall	Winter	Spring	Summer
0	0%	1%	2%	0%
1	0%	1%	3%	0%
5	0%	13%	40%	0%
15	100%	25%	75%	100%
25	100%	25%	75%	100%
50	100%	25%	75%	100%

Note: Percentage of Maximum Planted Overhanging Shade Shoreline Coverage

Temporal change for the SAM variable Aquatic Vegetation followed the approach used in the original NMFS BO and is shown in Table 3.

Table 3. Estimates of Growth in Aquatic Vegetation Over the 50-Year SAM Modeling Time Period

Year	Fall	Winter	Spring	Summer
0	0%	0%	0%	0%
1	10%	25%	50%	50%
5	100%	100%	100%	100%
15	100%	100%	100%	100%
25	100%	100%	100%	100%
50	100%	100%	100%	100%

Note: Percentage of Maximum Planted Overhanging Shade Shoreline Coverage

SAM Measurements

Table 4 and Table 5 show the measured values of the SAM variables at existing and 65% design conditions, respectively, for SREL RM 55.2L.

Table 4. Existing Condition Measurements (2020) of the Sam Variables for SREL RM 55.2L

Habitat Parameter	Water Year	Fall	Winter	Spring	Summer
Water Surface Elevation (Feet)	2020	10.1	14.5	14.5	10.1
	2070	10.1	14.5	14.5	10.1
Wetted Area (square feet)	2020	108,945	108,945	108,945	108,945
	2070	108,945	108,945	108,945	108,945
Shoreline Length (feet)	2020	1,392	1,392	1,392	1,392
	2070	1,392	1,392	1,392	1,392
Bank Slope (dH:dV)	2020	29.0	29.0	29.0	29.0
	2070	29.0	29.0	29.0	29.0
Floodplain Inundation Ratio (AQ2:AQavg)	2020	1	1	1	1
	2070	1	1	1	1
Bank Substrate Size (D50 in inches)	2020	0.08	0.08	0.08	0.08
	2070	0.08	0.08	0.08	0.08
Instream Structure (% shoreline)	2020	14	14	14	14
	2070	14	14	14	14
Vegetation (% shoreline)	2020	0	0	0	0
	2070	0	0	0	0
Shade (% shoreline)	2020	100	100	100	100
	2070	100	100	100	100

Source: AECOM 2020

Table 5. 65% Design Condition Measurement of the SAM variables for SREL RM 55.2L

Habitat Parameter	Water Year	Fall	Winter	Spring	Summer
Water Surface Elevation (Feet)	2020	13.5	17.0	17.0	13.5
	2070	13.5	17.0	17.0	13.5
Wetted Area (square feet)	2020	99,953	105,234	105,234	99,953
	2070	99,953	105,234	105,234	99,953
Shoreline Length (feet)	2020	1,392	1,392	1,392	1,392
	2070	1,392	1,392	1,392	1,392
Bank Slope (dH:dV)	2020	26.5	26.5	26.5	26.5
	2021	26.5	26.5	26.5	26.5
	2070	26.5	26.5	26.5	26.5
Floodplain Inundation Ratio (AQ2:AQavg)	2020	1	1	1	1
	2070	1	1	1	1
Bank Substrate Size (D50 in inches)	2020	0.08	0.08	0.08	0.08
	2021	0.08	0.08	0.08	0.08
	2070	0.08	0.08	0.08	0.08
Instream Structure (% shoreline)	2020	14	14	14	14
	2021	66	66	66	66
	2070	34	34	34	34
Vegetation (% shoreline)	2020	0	0	0	0
	2021	0	50	50	0
	2026	0	85	85	0
	2036	0	85	85	0
	2046	0	85	85	0
	2070	0	85	85	0
Shade (% shoreline)	2020	0	1	2	0
	2021	0	1	3	0
	2026	0	13	40	0
	2036	100	25	75	100
	2046	100	25	75	100
	2070	100	25	75	100

Source: AECOM 2020

WY = water year includes fall, winter, spring, and summer; rock and soil placement and instream woody material (IWM) installation assumed during summer WY 2012; revegetation planting assumed during fall WY 2013; designed conditions based on design and construction specifiifications.

SAM Results

As described in the original NMFS BO (NMFS 2015, pp. 25-26), SAM results are weighted relative response index (WRI) values that represent the difference between modeled fish response to existing (without-project) and designed (with-project) conditions. Negative WRI values indicate that existing conditions are more beneficial for fish and positive WRI values indicate that designed conditions are more beneficial for fish. WRI values are weighted by shoreline length to maintain consistency with the original NMFS BO.

WRI values do not directly represent actual lengths. However, NMFS has used WRI values as proxies to determine mitigation (NMFS 2015, p. 177). Appropriate mitigation is typically determined by identifying the maximum negative WRI for critical life stages (NMFS 2015, p. 118). By mitigating for the maximum negative WRI, lesser impacts are expected to be appropriately mitigated (NMFS 2015, p. 181).

The maximum WRI values (negative and positive) for each life stage, and by season, of each special-status fish species expected to occur at SREL RM 55.2L is shown in Table 6a-e. Only those life stages of each species expected to occur at SREL RM 55.2L during each season are shown in Table 6a-e. Please note that the SAM results suggest there are instances where there are no differences in benefits to fish between existing and designed conditions; where this occurs, “None” is entered in the cell in Table 6a-e.

Table 6a. Maximum SAM Modeled WRI Deficits and Benefits, SREL RM 55.2L–Spring-Run Chinook Salmon

Season	Life Stage	Maximum WRI Deficit (feet)	Deficit Duration (years)	Maximum WRI Benefit (feet)	Benefit Duration (years)
Fall	Adult Migration	-56	19	27	31
	Fry & Juvenile Rearing	-17	9	35	41
	Juvenile Migration	**-66***	13	63	37
Winter	Adult Migration	-54	50	None	None
	Fry & Juvenile Rearing	None	None	102	50
	Juvenile Migration	None	None	340	50
Spring	Adult Migration	-51	8	31	42
	Fry & Juvenile Rearing	None	None	157	50
	Juvenile Migration	None	None	**378****	50
Summer	Adult Migration	-56	19	27	31
	Fry & Juvenile Rearing	-17	9	35	41
	Juvenile Migration	-66	13	63	37

* indicates largest maximum deficit; ** indicates largest maximum benefit

Table 6b. Maximum SAM Modeled WRI Deficits and Benefits, SREL RM 55.2L–Winter-Run Chinook Salmon

Season	Life Stage	Maximum WRI Deficit (feet)	Deficit Duration (years)	Maximum WRI Benefit (feet)	Benefit Duration (years)
Fall	Adult Migration	-56	19	27	31
	Fry & Juvenile Rearing	-17	9	35	41
	Juvenile Migration	**-66***	13	63	37
Winter	Adult Migration	-54	50	None	None
	Fry & Juvenile Rearing	None	None	102	50
	Juvenile Migration	None	None	340	50
Spring	Adult Migration	-51	8	31	42
	Fry & Juvenile Rearing	None	None	157	50
	Juvenile Migration	None	None	**378****	50
Summer	Adult Migration	-56	19	27	31
	Fry & Juvenile Rearing	-17	9	35	41

* indicates largest maximum deficit; ** indicates largest maximum benefit

Table 6c. Maximum SAM Modeled WRI Deficits and Benefits, SREL RM 55.2L–Fall-Run Chinook Salmon

Season	Life Stage	Maximum WRI Deficit (feet)	Deficit Duration (years)	Maximum WRI Benefit (feet)	Benefit Duration (years)
Fall	Adult Migration	**-56***	19	27	31
	Fry & Juvenile Rearing	-17	9	35	41
Winter	Adult Migration	-54	50	None	None
	Fry & Juvenile Rearing	None	None	102	50
	Juvenile Migration	None	None	**340****	50
Spring	Fry & Juvenile Rearing	None	None	157	50
Summer	Adult Migration	-56	19	27	31
	Fry & Juvenile Rearing	-17	9	35	41

* indicates largest maximum deficit; ** indicates largest maximum benefit

Table 6d. Maximum SAM Modeled WRI Deficits and Benefits, SREL RM 55.2L–Late Fall-Run Chinook Salmon

Season	Life Stage	Maximum WRI Deficit (feet)	Deficit Duration (years)	Maximum WRI Benefit (feet)	Benefit Duration (years)
Fall	Adult Migration	-56	19	27	31
	Fry & Juvenile Rearing	-17	9	35	41
	Juvenile Migration	**-66***	13	63	37
Winter	Adult Migration	-54	50	None	None
	Fry & Juvenile Rearing	None	None	102	50
	Juvenile Migration	None	None	**340****	50
Spring	Adult Migration	-51	8	31	42
	Fry & Juvenile Rearing	None	None	157	50
Summer	Fry & Juvenile Rearing	-17	9	35	41

* indicates largest maximum deficit; ** indicates largest maximum benefit

Table 6e. Maximum SAM Modeled WRI Deficits and Benefits, SREL RM 55.2L–Steelhead

Season	Life Stage	Maximum WRI Deficit (feet)	Deficit Duration (years)	Maximum WRI Benefit (feet)	Benefit Duration (years)
Fall	Adult Migration	-78	14	70	36
	Fry & Juvenile Rearing	-31	9	51	41
	Juvenile Migration	**-87***	21	33	29
	Adult Residence	-78	14	70	36
Winter	Adult Migration	-74	9	33	41
	Fry & Juvenile Rearing	None	None	138	50
	Juvenile Migration	None	None	214	50
	Adult Residence	-74	9	33	41
Spring	Adult Migration	-67	4	82	46
	Fry & Juvenile Rearing	None	None	203	50
	Juvenile Migration	None	None	**253****	50
	Adult Residence	-67	4	82	46
Summer	Adult Migration	-78	14	70	36
	Fry & Juvenile Rearing	-31	9	51	41
	Adult Residence	-78	14	70	36

* indicates largest maximum deficit; ** indicates largest maximum benefit

For salmonids, most season/life stage combinations show a WRI deficit for a number of years following project completion that eventually begins to show a WRI benefit. In each instance, the benefit duration exceeds the deficit duration, often significantly. There are a number of season/life stage combinations that have a WRI benefit throughout the entire 50-year modeled time period. Chinook Salmon adult migration in winter is the only salmonid season/life stage combination that has a WRI deficit throughout the entire 50-year modeled time period, and this trend is consistent among all Chinook Salmon ESU's. The maximum WRI deficit for Spring-run, Winter-run, and Late Fall-run Chinook Salmon is -66; each occurs in fall for juvenile migration. The maximum WRI deficit for Fall-run Chinook Salmon is -56 and occurs in fall for adult migration. The maximum WRI deficit for Steelhead is -87 and occurs in fall for juvenile migration. Figure 1 and Figure 2 show the yearly WRI values by season for the Chinook Salmon juvenile migration and the Steelhead adult residence life stages, respectively. The temporal trends in each figure generally are representative of the other salmonid season/life stage combinations.

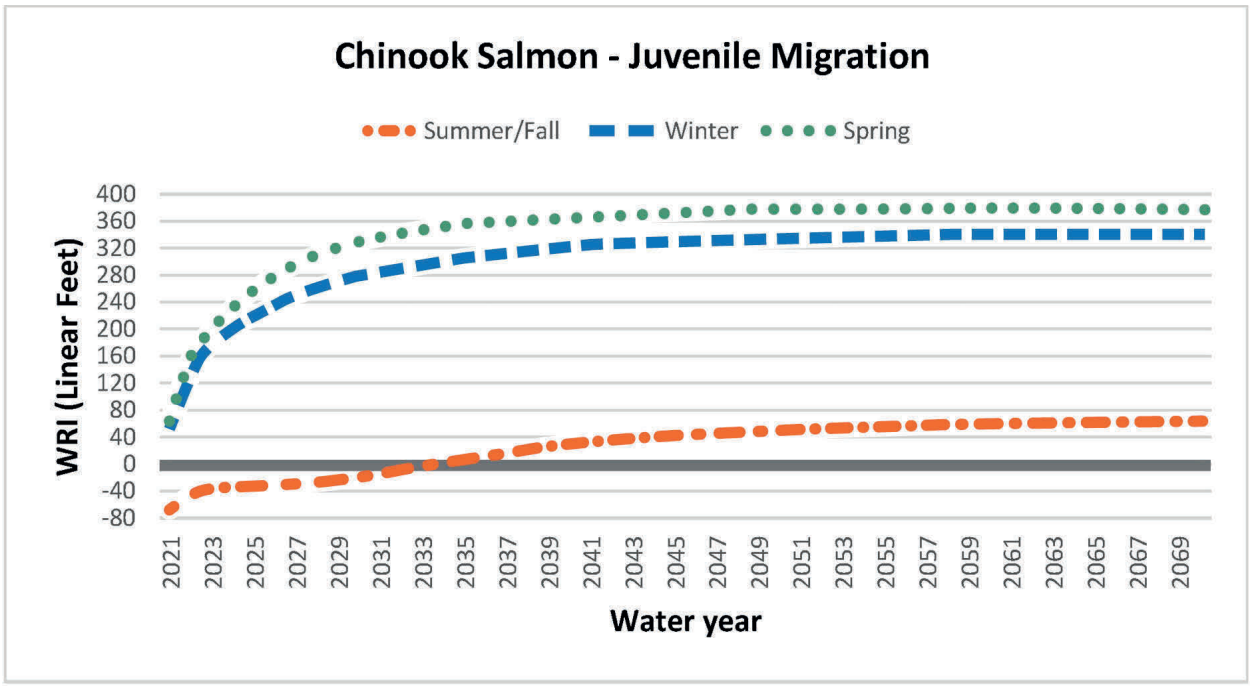

Figure 1. Yearly SAM-Modeled WRI Values for Each Season of the Chinook Salmon Juvenile Migration Life Stage, SREL RM 55.2L

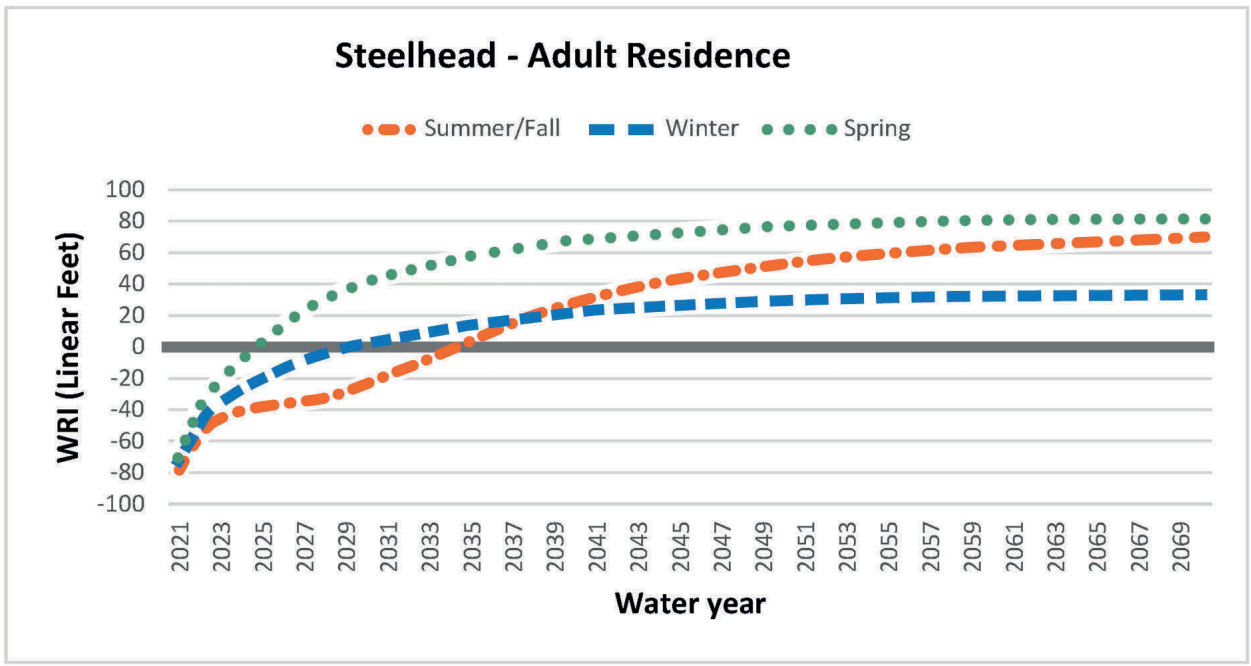

Figure 2. Yearly SAM-Modeled WRI Values for Each Season of the Steelhead Adult Residence Life Stage, SREL RM 55.2L

References

National Marine Fisheries Service (NMFS). 2015. Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response, for the American River Common Features General Reevaluation Report (Common Features GRR). 235 pp.

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Appendix B: Air Quality Modeling Results

Road Construction Emissions Model, Version 8.1.0

Daily Emission Estimates for -> 2020_SRErosion_Contract1

Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	2.70	30.46	23.90	21.31	1.31	20.00	5.33	1.17	4.16	0.06	5,376.75	1.17	0.06	5,423.35
Grading/Excavation	10.14	81.38	98.89	10.22	5.22	5.00	5.77	4.73	1.04	0.14	13,814.10	3.78	0.13	13,948.56
Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum (pounds/day)	10.14	81.38	98.89	21.31	5.22	20.00	5.77	4.73	4.16	0.14	13,814.10	3.78	0.13	13,948.56
Total (tons/construction project)	0.46	3.68	4.43	0.52	0.23	0.29	0.27	0.21	0.06	0.01	625.56	0.17	0.01	631.63

Notes:

Project Start Year ->	2020
Project Length (months) ->	4
Total Project Area (acres) ->	2
Maximum Area Disturbed/Day (acres) ->	2
Water Truck Used? ->	Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	14	0	40	0	1,000	40
Grading/Excavation	13	0	10	0	1,600	40
Drainage/Utilities/Sub-Grade	0	0	0	0	0	0
Paving	0	0	0	0	0	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> 2020_SRErosion_Contract1

Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	0.01	0.10	0.08	0.07	0.00	0.07	0.02	0.00	0.01	0.00	17.74	0.00	0.00	16.24
Grading/Excavation	0.45	3.58	4.35	0.45	0.23	0.22	0.25	0.21	0.05	0.01	607.82	0.17	0.01	556.78
Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum (tons/phase)	0.45	3.58	4.35	0.45	0.23	0.22	0.25	0.21	0.05	0.01	607.82	0.17	0.01	556.78
Total (tons/construction project)	0.46	3.68	4.43	0.52	0.23	0.29	0.27	0.21	0.06	0.01	625.56	0.17	0.01	573.01

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

Road Construction Emissions Model, Version 8.1.0

Daily Emission Estimates for -> 2020_SRErosion_Contract1

Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	2.70	30.44	23.43	21.31	1.31	20.00	5.33	1.17	4.16	0.06	5,366.10	1.17	0.06	5,412.50
Grading/Excavation	10.14	81.37	98.60	10.22	5.22	5.00	5.77	4.73	1.04	0.14	13,807.44	3.78	0.13	13,941.77
Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum (pounds/day)	10.14	81.37	98.60	21.31	5.22	20.00	5.77	4.73	4.16	0.14	13,807.44	3.78	0.13	13,941.77
Total (tons/construction project)	0.45	3.68	4.42	0.52	0.23	0.29	0.27	0.21	0.06	0.01	625.24	0.17	0.01	631.30

Notes:

Project Start Year ->	2020
Project Length (months) ->	4
Total Project Area (acres) ->	2
Maximum Area Disturbed/Day (acres) ->	2
Water Truck Used? ->	Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	14	0	40	0	1,000	40
Grading/Excavation	13	0	10	0	1,600	40
Drainage/Utilities/Sub-Grade	0	0	0	0	0	0
Paving	0	0	0	0	0	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> 2020_SRErosion_Contract1

Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	0.01	0.10	0.08	0.07	0.00	0.07	0.02	0.00	0.01	0.00	17.71	0.00	0.00	16.20
Grading/Excavation	0.45	3.58	4.34	0.45	0.23	0.22	0.25	0.21	0.05	0.01	607.53	0.17	0.01	556.51
Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum (tons/phase)	0.45	3.58	4.34	0.45	0.23	0.22	0.25	0.21	0.05	0.01	607.53	0.17	0.01	556.51
Total (tons/construction project)	0.45	3.68	4.42	0.52	0.23	0.29	0.27	0.21	0.06	0.01	625.24	0.17	0.01	572.71

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

Road Construction Emissions Model, Version 8.1.0

Daily Emission Estimates for -> 2020_SRErosion_Contract1

Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	1.57	36.07	7.32	20.40	0.40	20.00	4.47	0.31	4.16	0.06	5,366.10	1.17	0.06	5,412.50
Grading/Excavation	4.24	85.06	16.31	5.72	0.72	5.00	1.61	0.57	1.04	0.14	13,807.44	3.78	0.13	13,941.77
Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum (pounds/day)	4.24	85.06	16.31	20.40	0.72	20.00	4.47	0.57	4.16	0.14	13,807.44	3.78	0.13	13,941.77
Total (tons/construction project)	0.19	3.86	0.74	0.32	0.03	0.29	0.09	0.03	0.06	0.01	625.24	0.17	0.01	631.30

Notes:

Project Start Year ->	2020
Project Length (months) ->	4
Total Project Area (acres) ->	2
Maximum Area Disturbed/Day (acres) ->	2
Water Truck Used? ->	Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	14	0	40	0	1,000	40
Grading/Excavation	13	0	10	0	1,600	40
Drainage/Utilities/Sub-Grade	0	0	0	0	0	0
Paving	0	0	0	0	0	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> 2020_SRErosion_Contract1

Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	0.01	0.12	0.02	0.07	0.00	0.07	0.01	0.00	0.01	0.00	17.71	0.00	0.00	16.20
Grading/Excavation	0.19	3.74	0.72	0.25	0.03	0.22	0.07	0.03	0.05	0.01	607.53	0.17	0.01	556.51
Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum (tons/phase)	0.19	3.74	0.72	0.25	0.03	0.22	0.07	0.03	0.05	0.01	607.53	0.17	0.01	556.51
Total (tons/construction project)	0.19	3.86	0.74	0.32	0.03	0.29	0.09	0.03	0.06	0.01	625.24	0.17	0.01	572.71

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

Road Construction Emissions Model **Version 8.1.0**

Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with
yellow or blue background can be modified. Program defaults have a white background
The user is required to enter information in cells D10 through D24, E28 through G35, and D38 through D41 for all project type
Please use "Clear Data Input & User Overrides" button first before changing the Project Type or begin a new proje

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Input Type

Project Name	2020_SRErosion_Contract1	
Construction Start Year	2020	Enter a Year between 2014 and 2025 (inclusive)
Project Type For 4: Other Linear Project Type, please provide project specific off-road equipment population and vehicle trip data	4	1) New Road Construction : Project to build a roadway from bare ground, which generally requires more site preparation than widening an existing roadway 2) Road Widening : Project to add a new lane to an existing roadway 3) Bridge/Overpass Construction : Project to build an elevated roadway, which generally requires some different equipment than a new roadway, such as a crane 4) Other Linear Project Type: Non-roadway project such as a pipeline, transmission line, or levee constructi
Project Construction Time	4.30	months
Working Days per Month	22.00	days (assume 22 if unknown)
Predominant Soil/Site Type: Enter 1, 2, or 3 (for project within "Sacramento County", follow soil type selection instructions in cells E18 to E20 otherwise see instructions provided in cells J18 to J22)	1	1) Sand Gravel : Use for quaternary deposits (Delta/West County) 2) Weathered Rock-Earth : Use for Laguna formation (Jackson Highway area) or the Ione formation (Scott Road, Rancho Murieta) 3) Blasted Rock : Use for Salt Springs Slate or Copper Hill Volcanics (Folsom South of Highway 50, Rancho Murieta)
Project Length	0.22	miles
Total Project Area	2.00	acres
Maximum Area Disturbed/Day	2.00	acres
Water Trucks Used?	1	1. Yes 2. No

Please note that the soil type instructions provided in cells E18 to E20 are specific to Sacramento County. Maps available from the California Geologic Survey (see weblink below) can be used to determine soil type outside Sacramento County.

http://www.conservation.ca.gov/cgs/information/geologic_mapping/Pages/googlemaps.aspx#regionalseries

Material Hauling Quantity Input

Material Type	Phase	Haul Truck Capacity (yd^3) (assume 20 if unknown)	Import Volume (yd^3/day)	Export Volume (yd^3/day)
Soil	Grubbing/Land Clearing	15.00	0.00	14.00
	Grading/Excavation	15.00	13.00	0.00
	Drainage/Utilities/Sub-Grade			
	Paving			
Asphalt	Grubbing/Land Clearing			
	Grading/Excavation			
	Drainage/Utilities/Sub-Grade			
	Paving			

Mitigation Options

On-road Fleet Emissions Mitigation	No Mitigation	Select "2010 and Newer On-road Vehicles Fleet" option when the on-road heavy-duty truck fleet for the project will be limited to vehicles of model year 2010 or newer
Off-road Equipment Emissions Mitigation	No Mitigation	Select "20% NOx and 45% Exhaust PM reduction" option if the project will be required to use a lower emitting off-road construction fleet. The SMAQMD Construction Mitigation Calculator can be used to confirm compliance with this mitigation measure (http://www.airquality.org/ceqa/mitigation.shtml). Select "Tier 4 Equipment" option if some or all off-road equipment used for the project meets CARB Tier 4 Standa

The remaining sections of this sheet contain areas that require modification when 'Other Project Type' is selecte

Note: The program's estimates of construction period phase length can be overridden in cells D50 through D53, and F50 through F5

Construction Periods	User Override of Construction Months	Program Calculated Months	User Override of Phase Starting Date	Program Default Phase Starting Date
Grubbing/Land Clearing	0.30	0.43	8/1/2020	1/1/2020
Grading/Excavation	4.00	1.72	8/11/2020	1/11/2020
Drainage/Utilities/Sub-Grade	0.00	1.51		5/12/2020
Paving	0.00	0.65		5/12/2020
Totals (Months)	4		Note: You have entered a non-default starting date. Please provide starting date for all phases, or default values for other phases will be us	

Note: Soil Hauling emission default values can be overridden in cells D61 through D64, and F61 through F6

Soil Hauling Emissions User Input	User Override of Miles/Round Trip	Program Estimate of Miles/Round Trip	User Override of Truck Round Trips/Day	Default Values Round Trips/Day	Calculated Daily VMT
Miles/round trip: Grubbing/Land Clearing	40.00			1	40.00
Miles/round trip: Grading/Excavation	10.00			1	10.00
Miles/round trip: Drainage/Utilities/Sub-Grad				0	0.00
Miles/round trip: Paving				0	0.00

Emission Rates	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing (grams/mile	0.11	0.44	4.13	0.12	0.05	0.02	1,631.71	0.00	0.06	1,648.31
Grading/Excavation (grams/mile	0.11	0.44	4.13	0.12	0.05	0.02	1,631.71	0.00	0.06	1,648.31
Draining/Utilities/Sub-Grade (grams/mile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.01	0.04	0.36	0.01	0.00	0.00	143.89	0.00	0.00	145.36
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.00	0.48
Pounds per day - Grading/Excavation	0.00	0.01	0.09	0.00	0.00	0.00	35.97	0.00	0.00	36.34
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	1.58	0.00	0.00	1.60
Pounds per day - Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons per construction project	0.00	0.00	0.01	0.00	0.00	0.00	2.06	0.00	0.00	2.08

Note: Asphalt Hauling emission default values can be overridden in cells D87 through D90, and F87 through F9

Asphalt Hauling Emissions User Input	User Override of Miles/Round Trip	Program Estimate of Miles/Round Trip	User Override of Truck Round Trips/Day	Default Values Round Trips/Day	Calculated Daily VMT
Miles/round trip: Grubbing/Land Clearing				0	0.00
Miles/round trip: Grading/Excavation				0	0.00
Miles/round trip: Drainage/Utilities/Sub-Grad				0	0.00
Miles/round trip: Paving				0	0.00

Emission Rates	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing (grams/mile	0.11	0.44	4.13	0.12	0.05	0.02	1,631.71	0.00	0.06	1,648.31
Grading/Excavation (grams/mile	0.11	0.44	4.13	0.12	0.05	0.02	1,631.71	0.00	0.06	1,648.31
Draining/Utilities/Sub-Grade (grams/mile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Drainage/Utilities/Sub-Grad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Sub-Grad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons per construction projec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Worker commute default values can be overridden in cells D113 through D11

Worker Commute Emissions	User Override of Worker			
User Input	Commute Default Values	Default Values		
Miles/ one-way trip	20		Calculated	Calculated
One-way trips/day	2		Daily Trips	Daily VMT
No. of employees: Grubbing/Land Clearin	25		50	1,000.00
No. of employees: Grading/Excavatio	40		80	1,600.00
No. of employees: Drainage/Utilities/Sub-Grad			0	0.00
No. of employees: Paving			0	0.00

Emission Rates	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Grubbing/Land Clearing (grams/mile	0.02	1.08	0.11	0.05	0.02	0.00	371.46	0.01	0.00	373.08
Grading/Excavation (grams/mile	0.02	1.08	0.11	0.05	0.02	0.00	371.46	0.01	0.00	373.08
Draining/Utilities/Sub-Grade (grams/mile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grubbing/Land Clearing (grams/trip	1.00	2.55	0.20	0.00	0.00	0.00	84.03	0.01	0.01	86.84
Grading/Excavation (grams/trip	1.00	2.55	0.20	0.00	0.00	0.00	84.03	0.01	0.01	86.84
Draining/Utilities/Sub-Grade (grams/trip	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.16	2.65	0.27	0.10	0.04	0.01	828.20	0.02	0.01	832.07
Tons per const. Period - Grubbing/Land Clearing	0.00	0.01	0.00	0.00	0.00	0.00	2.73	0.00	0.00	2.75
Pounds per day - Grading/Excavation	0.25	4.25	0.44	0.17	0.07	0.01	1,325.12	0.03	0.02	1,331.31
Tons per const. Period - Grading/Excavation	0.01	0.19	0.02	0.01	0.00	0.00	58.31	0.00	0.00	58.58
Pounds per day - Drainage/Utilities/Sub-Grad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Sub-Grad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons per construction projec	0.01	0.20	0.02	0.01	0.00	0.00	61.04	0.00	0.00	61.32

Note: Water Truck default values can be overridden in cells D145 through D148, and F145 through F148.

Water Truck Emissions	User Override of	Program Estimate of	User Override of Truck	Default Values	Calculated
User Input	Default # Water Trucks	Number of Water Trucks	Miles Traveled/Vehicle/Day	Miles Traveled/Vehicle/Day	Daily VMT
Grubbing/Land Clearing - Exhaust	1		40.00		40.00
Grading/Excavation - Exhaust	1		40.00		40.00
Drainage/Utilities/Subgrade					0.00
Paving					0.00

Emission Rates	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Grubbing/Land Clearing (grams/mile	0.11	0.44	4.13	0.12	0.05	0.02	1,631.71	0.00	0.06	1,648.31
Grading/Excavation (grams/mile	0.11	0.44	4.13	0.12	0.05	0.02	1,631.71	0.00	0.06	1,648.31
Draining/Utilities/Sub-Grade (grams/mile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/mile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.01	0.04	0.36	0.01	0.00	0.00	143.89	0.00	0.00	145.36
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.00	0.48
Pounds per day - Grading/Excavation	0.01	0.04	0.36	0.01	0.00	0.00	143.89	0.00	0.00	145.36
Tons per const. Period - Grading/Excavation	0.00	0.00	0.02	0.00	0.00	0.00	6.33	0.00	0.00	6.40
Pounds per day - Drainage/Utilities/Sub-Grad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Sub-Grad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons per construction projec	0.00	0.00	0.02	0.00	0.00	0.00	6.81	0.00	0.00	6.88

Note: Fugitive dust default values can be overridden in cells D171 through D173.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing	2.00		20.00	0.07	4.16	0.01
Fugitive Dust - Grading/Excavation	0.50		5.00	0.22	1.04	0.05
Fugitive Dust - Drainage/Utilities/Subgrade			0.00	0.00	0.00	0.00

Values in cells D183 through D216, D234 through D267, D285 through D318, and D336 through D369 are required when 'Other Project Type' is selecte

Off-Road Equipment Emissions

Grubbing/Land Clearing

Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Mitigation Option: Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Default Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00			Model Default Tie	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00			Model Default Tie	Excavators	1.52	20.23	14.93	0.72	0.67	0.03	3,095.67	1.00	0.03	3,129.04
0.00			Model Default Tie	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00			Model Default Tie	Generator Sets	0.40	3.71	3.48	0.20	0.20	0.01	623.04	0.04	0.00	625.31
0.00			Model Default Tie	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Other General Industrial Equipmen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Other Material Handling Equipmen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00			Model Default Tie	Signal Boards	0.34	1.81	2.16	0.08	0.08	0.00	295.88	0.03	0.00	297.39
0.00			Model Default Tie	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00			Model Default Tie	Sweepers/Scrubbers	0.27	1.99	2.33	0.19	0.17	0.00	246.18	0.08	0.00	248.83
0.00			Model Default Tie	Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment

If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' t

Number of Vehicles	Equipment Tier	Type		ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing	pounds per day	2.53	27.73	22.90	1.19	1.12	0.05	4,260.77	1.15	0.04	4,300.57
Grubbing/Land Clearing	tons per phase	0.01	0.09	0.08	0.00	0.00	0.00	14.06	0.00	0.00	14.19

Grading/Excavation	Default Number of Vehicles	Mitigation Option	Default		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Override of Default Number of Vehicles	Program-estimate	Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Equipment Tier	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
0.00			Model Default Tie	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00			Model Default Tie	Cranes	0.89	4.14	10.55	0.43	0.40	0.01	1,093.39	0.35	0.01	1,105.18
0.00			Model Default Tie	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00			Model Default Tie	Excavators	0.51	6.74	4.98	0.24	0.22	0.01	1,031.89	0.33	0.01	1,043.01
0.00			Model Default Tie	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00			Model Default Tie	Generator Sets	0.40	3.71	3.48	0.20	0.20	0.01	623.04	0.04	0.00	625.31
2.00			Model Default Tie	Graders	1.43	9.16	14.00	0.78	0.72	0.01	1,209.88	0.39	0.01	1,222.88
0.00			Model Default Tie	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00			Model Default Tie	Off-Highway Trucks	1.32	7.58	12.58	0.46	0.42	0.03	2,544.52	0.82	0.02	2,571.93
1.00			Model Default Tie	Other Construction Equipment	0.49	4.12	5.24	0.28	0.25	0.01	598.80	0.19	0.01	605.27
2.00			Model Default Tie	Other General Industrial Equipmen	0.47	3.98	4.29	0.31	0.29	0.01	496.04	0.16	0.00	501.39
1.00			Model Default Tie	Other Material Handling Equipmen	0.30	3.74	2.79	0.14	0.13	0.01	556.35	0.18	0.01	562.34
0.00			Model Default Tie	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00			Model Default Tie	Rubber Tired Dozers	1.92	15.87	20.30	0.93	0.86	0.02	1,726.14	0.56	0.02	1,744.68
0.00			Model Default Tie	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00			Model Default Tie	Signal Boards	0.34	1.81	2.16	0.08	0.08	0.00	295.88	0.03	0.00	297.39
3.00			Model Default Tie	Skid Steer Loaders	0.24	4.17	3.19	0.14	0.13	0.01	600.51	0.19	0.01	606.98
0.00			Model Default Tie	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00			Model Default Tie	Sweepers/Scrubbers	0.27	1.99	2.33	0.19	0.17	0.00	246.18	0.08	0.00	248.83
2.00			Model Default Tie	Tractors/Loaders/Backhoes	0.42	4.61	4.25	0.27	0.25	0.01	607.74	0.20	0.01	614.28
2.00			Model Default Tie	Trenchers	0.87	5.48	7.89	0.59	0.54	0.01	678.76	0.22	0.01	686.07
0.00			Model Default Tie	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' t

Number of Vehicles	Equipment Tier	Type	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
			pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grading/Excavation	pounds per day	9.88	77.09	98.00	5.04	4.66	0.13	12,309.11	3.75	0.11	12,435.55
Grading/Excavation	tons per phase	0.43	3.39	4.31	0.22	0.20	0.01	541.60	0.16	0.00	547.16

Drainage/Utilities/Subgrade Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Mitigation Option Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Default Equipment Tier		ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00			Model Default Tie	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Excavators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Other General Industrial Equipmen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Other Material Handling Equipmen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' t

Number of Vehicles	Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Drainage/Utilities/Sub-Grade	pounds per day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drainage/Utilities/Sub-Grade	tons per phase	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Paving Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Mitigation Option Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Default Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00			Model Default Tie	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Excavators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Other General Industrial Equipmen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Other Material Handling Equipmen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			Model Default Tie	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment

If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' t

Number of Vehicles	Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

			ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
	Paving	pounds per day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Paving	tons per phase	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Emissions all Phases (tons per construction period) =			0.44	3.48	4.39	0.23	0.21	0.01	555.66	0.17	0.00	561.36

Equipment default values for horsepower and hours/day can be overridden in cells D391 through D424 and F391 through F4

Equipment	User Override of Horsepower	Default Values Horsepower	User Override of Hours/day	Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		78		8
Bore/Drill Rigs		206		8
Cement and Mortar Mixers		9		8
Concrete/Industrial Saws		81		8
Cranes		226		8
Crawler Tractors		208		8
Crushing/Proc. Equipment		85		8
Excavators		163		8
Forklifts		89		8
Generator Sets		84		8
Graders		175		8
Off-Highway Tractors		123		8
Off-Highway Trucks		400		8
Other Construction Equipment		172		8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		167		8
Pavers		126		8
Paving Equipment		131		8
Plate Compactors		8		8
Pressure Washers		13		8
Pumps		84		8
Rollers		81		8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		255		8
Rubber Tired Loaders		200		8
Scrapers		362		8
Signal Boards		6		8
Skid Steer Loaders		65		8
Surfacing Equipment		254		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		98		8
Trenchers		81		8
Welders		46		8

END OF DATA ENTRY SHEET

Barge Emissions Calculations
ARCF 2016
Sacramento River Erosion Protection - Contract 1

Basic Assumptions	
CY per Barge[1]	909
CY Imported[3]	23,000
Miles/ hr per barge	5
Extra Empty Trips	2
Total Hrs per Day	10
lbs/ tons	2000
lbs/MT	2204.62

	San Rafael to Rio Vista (in SFNA)	San Rafael to Rio Vista (in BAAQMD)	Rio Vista to Sacramento Erosion
No. of Barge in Tow	4	4	1
Miles (one-way)	10.4	45	40
Total Tow-Hours	**17**	**75**	**218**

	PM10	PM2.5	NOx	ROG	CO	SO2	CO2	CH4	N2O	CO2e (MT)
Two-Engine Push Boat Emissions (lb/hr)	1.45	1.29	35.04	2.09	8.97	0.01	1417.70	0.06	0.01	1422.56
Tug Boat Emissions (lb/hr)	0.37	0.33	8.53	0.54	1.90	0.00	456.06	0.02	0.00	457.63
Total Emissions for Push Boat - In SFNA (Tons)	0.01	0.01	0.30	0.02	0.08	0.00	12.27	0.00	0.00	11.17
Total Emission for Push Boat- In BAAQMD (Tons)[2]	0.05	0.05	1.31	0.08	0.34	0.00	53.11	0.00	0.00	48.35
Total Emissions for Tug Boat - In SFNA (Tons)	0.04	0.04	0.93	0.06	0.21	0.00	49.80	0.00	0.00	45.33
Sum of Emissions in SFNA (Tons)	**0.05**	**0.05**	**1.24**	**0.08**	**0.29**	**0.00**	**62.08**	**0.00**	**0.00**	**56.5**

Notes: [1] https://ihsmarkit.com/country-industry-forecasting.html?ID=106593483 , one barge has the capacity of 1500 tons and assuming 1.65 tons/cy of quarry rock

[2] BAAQMD NOx Threshold is 54 lb/day (Not relevent to General Conformity)

[3] Assuming All Contracts are 1.4 miles long and that 5.32L Reach is only 690 feet long; 10.7 increase in volume

Appendix C: Clean Water Act, Section 404(b)(1) Evaluation

APPENDIX C

Clean Water Act Section 404(b)(1) Evaluation

Introduction

Background

The U.S. Army Corps of Engineers (USACE) proposes to implement flood risk management improvements to the Sacramento River East Levee at river mile 55.2 under the 2016 American River Watershed Common Features General Reevaluation Report (ARCF GRR). The purpose of the ARCF Project is to improve the levee infrastructure to reduce flood risk along the American and Sacramento Rivers. Improvements encompass approximately 22 miles of American River levees, 12 miles of the Sacramento River levee, and 5.5 miles of the Natomas Cross Canal levee in Natomas.

The ARCF GRR Draft and Final Environmental Impact Statement / Environmental Impact Report (EIS/EIR) (USACE 2016) previously analyzed several alternatives and found Alternative 2 to be the preferred alternative. ARCF Water Resources Development Act (WRDA) 2016: Sacramento River, Mile 55.2 Left Bank Protection Project (RM55.2L) (Proposed Action), a component of Alternative 2, includes the installation of bank protection features within the RM 55.2L reach.

Purpose and Need

The Sacramento Metropolitan area is one of the most at risk areas for flooding in the United States. There is a high probability that flows in either the American or Sacramento Rivers will stress the network of levees protecting the Sacramento area to the point that levees could fail. The consequences of such a levee failure could be catastrophic since the area of potential inundation is highly urbanized and the flooding could be up to 20 feet deep.

A Section 404(b)(1) Guidelines analysis first requires determination of the basic purpose of the project, a description of its fundamental function to ascertain whether it is 'water dependent.' The basic purpose of the Proposed Action is to reduce flood risk to metropolitan Sacramento. Because this purpose could be achieved by non-structural means that do not involve the levee – such as improved warning systems or improved traffic planning for emergency evacuations - the basic purpose of the project is not water dependent. Consistent with the Guidelines, because the basic purpose of the project is not water dependent, USACE has evaluated alternative locations and designs so as to minimize the potential adverse effects of the project while still achieving the objectives of the project.

According to the Guidelines, the overall project purpose is defined differently than the basic project purpose. The overall project purpose serves to identify alternatives and determine whether the alternatives satisfy USACE's objectives for the project. The overall purpose of the Proposed Action is to improve existing infrastructure to better protect the large population of the greater Sacramento region from flooding.

Location

The site is located along the east (left) bank of the Sacramento River, in the Little Pocket area of the city of Sacramento, approximately 3 miles downstream of the Pioneer Bridge (Figure 1). The site begins immediately downstream (south) of the Westin Sacramento property and continues downstream approximately 1,150 feet. The Sacramento River is considered a perennial river.

Figure 1. RM 55.2L Bank Protection Project Location.

Range of Alternatives Considered

Alternative 1 - No Action

Under the No Action Alternative, the Proposed Action would not be constructed. As a result, this segment of the levee would remain susceptible to failure due to erosion and would continue to be a weak spot in the system. Levee failure at this location could lead to catastrophic flooding

of the Little Pocket area of Sacramento, which includes a number of residences, as well as Interstate 5, a major transportation artery, which is located approximately 0.1 mile away from the levee. Numerous residences and businesses lie within the potential flood inundation area. Damage to infrastructure, utility systems, and commercial and residential interests would be significant. The Sacramento metropolitan area would continue to be subject to an unacceptably high risk of levee failure and subsequent catastrophic flooding. A flood in the Sacramento metropolitan area would have substantial repercussions that would affect the entire State; the national economy; and Federal, State, and local government operations and infrastructure.

Although the No Action Alternative would have no impacts on waters of the U.S. due to construction, it does not meet the project purpose since it does not address the flood risk in the project area, and is, therefore, not retained for evaluation in determining the least environmentally damaging practicable alternatives (LEDPA).

Alternative 2 – Offsite Alternative, Launchable Rock Trench

This measure includes construction of a launchable rock filled trench, designed to deploy once erosion has removed the bank material beneath it (Figure 2). All launchable rock trenches would be constructed outside of the natural river channel. As a result, launchable rock trenches would be above the ordinary high water mark (OHWM) and fill materials would not be placed into waters of the U.S. as part of trench construction. This location would be on the water side of the levee reach at 55.2L but would be higher on the bank and would be outside of the footprint of the Proposed Action, described below.

The vegetation would be removed from the footprint of the trench and the levee slope above the trench prior to excavation of the trench, approximately 0.8 acres (ac). The project construction would be done from the landside. The trench configuration would include a 2:1 landside slope and 1:1 waterside slope and would be excavated at the toe of the existing levee. All soil removed during trench excavation would be stockpiled for reuse or disposal. The bottom of the trench would be constructed close to the summer mean water surface elevation in order to reduce the rock launching distance and amount of rock required.

After excavation, the trench would be filled with riprap that would be imported from an offsite location. After rock placement the trench would be covered with a minimum of 3 feet of the stockpiled soil to allow for planting over the trench. Rock placed on the levee slope would be covered with the stockpiled soil. All disturbed areas would be reseeded with native grasses and small shrubs where appropriate. Some vegetation could be permitted over the trench if planted outside the specified vegetation free zone required by ETL 1110-2-583. This vegetation would likely be limited to native grasses, shrubs, and trees with shallow root systems to ensure that they do not limit the functionality of the trench during a flood event.

This action would result in adverse impacts vegetation and wildlife, visual resources, infrastructure, and water quality. There are numerous trees within the footprint of this alternative that would have to be removed, more trees than the Proposed Action. Over time, as the levee erodes trees would be destabilized and fall down and lead to Shaded Riverine Aquatic (SRA) habitat loss over time therefore, increasing the temperature of the water. This will permanently remove wildlife habitat, namely Swainson's Hawk nesting and bat roosting habitat. The visual

resources of the site would be reduced for the residents on the land side of the levee and the recreationalists in the river channel. A pipe to a pump station would have to be replaced as erosion occurs or removed entirely. Water quality would be impacted due to continued erosion at the site. The levee is currently being eroded by fluvial and wave action of the Sacramento River and erosion would continue to occur removing approximately 1 acre of levee surface. Increased sedimentation and turbidity would likely be caused by the rock being launched, as designed. There would be no minimization or mitigation measures in place for this event. This alternative would not be able to be keyed into adjacent levee repair work, this could cause the hydrology and center of flow of the river channel to alter due to the levee being narrowed for 1,150 feet.

This action is considered a practicable alternative and will be retained and evaluated in determining the LEDPA.

Alternative 3 – Onsite Alternative, Bank Protection (Proposed Action)

The Proposed Action is to construct a 1,150-foot waterside rock berm to reduce the risk of levee failure due to erosion and increase slope stability. The Proposed Action includes rock bank protection and a riparian bench. The completed site would be planted with native vegetation to mitigate habitat lost through the construction process. The project footprint is 2.7 ac (at 90% designs). The entire site is below the OHWM (23.25 feet).

The rock bank protection will require the removal of up to 80 trees and may require tree trimming on the lower portion of the waterside slope because construction will occur from a barge in the river. A minimum of 2.5 feet thick layer of soil filled quarry stone (Class C) will be placed between 7 feet and 22 feet on the levee slope elevation. The planting bench will be at 7 feet on the levee slope. The top of the lower quarry stone (Class C) slope would begin at elevation 7 feet (NAVD88) and extend to the bottom of the channel. This bank protection measures includes a self-launching rock of an adequate volume to provide toe protection up to a maximum scour depth of 18 feet. A thickness of 5 feet was recommended for the launchable riprap toe design to provide erosion protection, bank stability, support the riparian bench, and launch rock for toe scour.

The bank protection design incorporates a low elevation bench into the channel along the length of the site. The bench is composed of a planting bench soil mix on Class C quarry stone that provides a surface that can support vegetation. The toe of the planting bench would set at an elevation of 7 feet and would slope upward at a 20H:1V slope towards upper quarry stone revetment. The 7-foot elevation is the average water surface elevation at the project site during the months of August, September, and October over a 67-year period of record (1948-2015). The landside edge of the bench would be approximately 2 feet higher than the river edge so that the bench will support a variety of native plant species. Plantings will consist of native species found in Central Valley riparian forests.

The general description of fill material, discharge site, and disposal method for the Proposed Action, is more specific than that for the project alternatives evaluated in 2015. This is a consequence of the Proposed Action having a more developed design than the project alternatives evaluated in 2015.

Adverse impacts to aquatic resources, such as fisheries, water quality, and SRA would be short term and less than significant. After construction is complete, sedimentation and turbidity levels would return to post construction conditions. Overtime, sediment will fill the spaces between the quarry stone and improve water quality by reducing sedimentation. As the sediment fills the quarry stone, habitat for bentic macroinvertebrates will be created. The planting bench will be maintained according to the Long Term Management Plan to ensure success of the revegetation of the site to provide habitat for fish, wildlife species, and maintain the water quality. The long term impact to the site would be a decrease in the overall tree and shrub density which will be reduced to the planting bench (0.22 acres).

This action is considered a practicable alternative and will be retained and evaluated in determining the LEDPA.

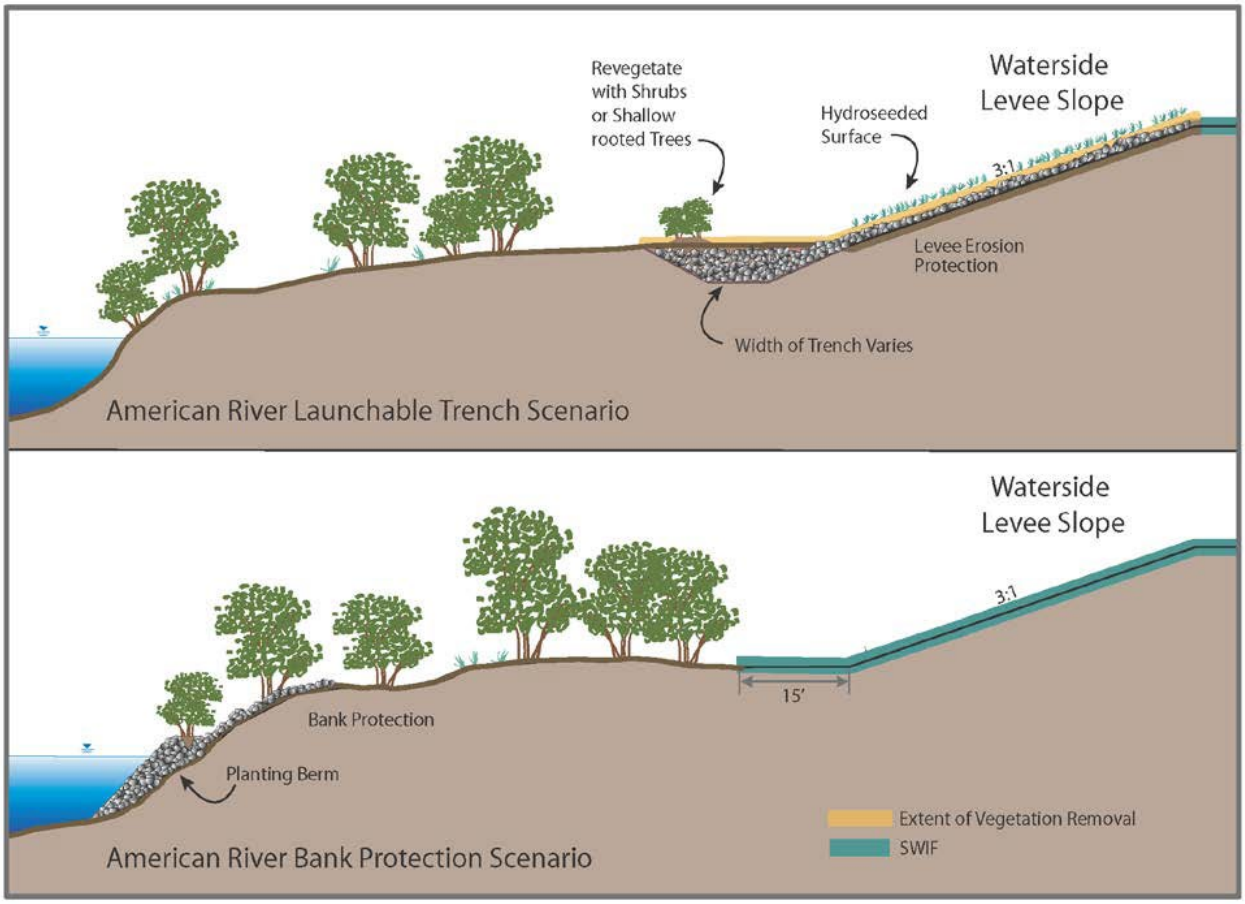

Figure 2. Bank Protection Measures Typical Design.

Alternatives Analysis

When the offsite alternative and onsite alternative were compared, the Proposed Action is the LEDPA and was selected.

The offsite alternative does not include work below the OHWM and would have adverse impacts on vegetation and wildlife, visual resources, infrastructure, and water quality. The

impacts from the off-site alternative would be greater than the on-site alternative because of long-term impacts through the gradual loss of SRA, wildlife habitat, and the visual resources. Also the continued sedimentation into the river channel would culminate in a sudden launch of rock below the OHWM which would decrease the water quality without the ability to minimize or mitigate for those impacts.

The onsite alternative is considered the LEDPA because of the adverse impacts that would affect federally listed fishes, SRA, water quality, and benthic marcoinverterbrates would be short-term and have avoidance, minimization, and mitigation measures implemented to reduce the impacts to less than significant. The impacts would be less-than-significant in the long term with mitigation measures as well. Over the life span of the bank protection, 50 years, there would be a natural erosion and migration of fill occurring at the site; however, it would occur at a slightly slower rate than natural conditions if no bank protection were in place or if the offsite alternative was constructed. Riprap established along the waterside levee toe is designed to stay in place and prevent further erosion. Therefore, this alternative would not decrease water quality due to falling rocks.

Bank Protection Measures

The Proposed Action is part of the ARCF Project, therefore the basis of this consistency analysis is an evaluation of the consistency of the Proposed Action with the determinations of the 2015 404(b)(1) evaluation and the applicability of the findings of the 2015 404(b)(1) evaluation to the Proposed Action. The source materials are:

- USACE (2015) *Draft Section 404(b)(1) Water Quality Evaluation American River Common Features General Reevaluation Report*. Appendix E in USACE (2016) American River Watershed General Reevaluation Report, Final Environmental Impact Statement / Environmental Impact Report. December. Sacramento, California. State Clearing House Number 2005072046.

- USACE (2020) *American River Watershed Common Features WRDA 2016: Sacramento River, Mile 55.2 Left Bank Protection Project Draft Supplemental Environmental Assessment/Environmental Impact Report*. Sacramento, California. State Clearinghouse Number 2005072046.

Various measures to provide bank protection, which would result in various impacts, include: bioengineered techniques, reducing footprint, rock slope protections, and a combination of measures.

Bioengineered techniques, such as live siltation and rolled erosion control product, are not sufficient to provide the bank protection and roughness required due to the high current velocities in the Sacramento River. Roughness is the measure of a material's resistance to the flow of water on the stream channel margins. The applicable project standard is to provide bank protection engineered to withstand a 200 year flood event. *This is consistent with the 2015 404(b)(1) evaluation.*

The footprint of the site has been reduced as much as possible while designing sufficient bank protection to withstand a 200 year flood event and tie in with adjacent levee reaches. The OHWM is at 23.25 feet on the levee slope, starting at 22 feet, the current upland vegetation provides adequate roughness to withstand modeled shear stresses of the design flow magnitude for the remaining 1.25 foot of levee above the rock placement. According to field observations and river surface comparisons between 2008 and 2018 completed by CBEC (a consultant firm), no erosion has occurred on the upland bench above 22 feet. Additional rocks at the upstream and downstream of the site are needed to tie in the rocks to stable ground. *This is consistent with the 2015 404(b)(1) evaluation.*

Rock slope protection is designed to provide roughness to the levee to withstand modeled shear stresses of the design flow magnitude. The minimum required toe protection below the planting bench is 5-feet thick with Class C quarry stone (18 – 36 inches large). Soil filled quarry stone will be used on the levee slope above the planting bench. Rock sizing and layer thickness are based on EM 1110-2-1601. Up to 25, 210 cubic yards (cy) of quarry stone will be needed for the project. The material would be imported from a licensed, permitted facility that meets all Federal and State standards and requirements. The material would be transported to the project site via river barge hauling. *This is consistent with the 2015 404(b)(1) evaluation.*

A combination of measures are being used to reduce impacts to water quality. The use of the quarry stone bank protection will allow for sediment traveling downstream to get trapped in the interstices between rocks. The planting bench incorporated into the levee design will be planted with native vegetation like willows and cottonwood and in-stream woody material will aid in shading the water for temperature control and as fish enhancement. *This is consistent with the 2015 404(b)(1) evaluation.*

Comparisons

Aquatic resources to be affected by the Proposed Action include shaded riverine aquatic habitat and shallow water habitat. Up to 80 trees would be removed from the water side levee and some trees may need to be trimmed, for a total loss of 1.258 canopy acreage (ac) of SRA. On site mitigation will account for .22 ac, the remaining acreage will be mitigated for offsite and be consistent with USFWS recommendations, to the extent possible. The total area of disturbance is 3 ac (at 65% designs). In water work accounts for 1.8 ac (surface area of launch rock) or 78,652 square feet (sf). *This is consistent with the 2015 404(b)(1) evaluation.*

Fish, wildlife, and sensitive species and their habitats would be impacted by the Proposed Action (sensitive species are discussed in the following paragraph). A variety of fish and wildlife occur within the project footprint, including, Pacific lamprey (*Entosphenus tridentatus*), Sacramento splittail (*Pogonichthys macrolepidotus*), rainbow trout (*Oncorhynchus mykiss*), Wood Duck (*Aix sponsa*), Common Merganser (*Mergus merganser*), and American Kestrel (*Falco sparverius*). The implementation of mitigation measures and onsite mitigation would reduce the long term impacts to fish and wildlife to less than significant. There would be significant and unavoidable impacts to vegetation and wildlife in the short term. *This is consistent with the 2015 404(b)(1) evaluation.*

Sensitive species found in the project area would be affected by the Proposed Action. Species found within the project footprint that are federally listed under the Endangered Species Act include: delta smelt (*Hypomesus transpacificus*), green sturgeon (*Acipenser medirostris*) southern distinct population segment (sDPS), Sacramento River winter-run and Central Valley (CV) spring- and fall-runs Chinook salmon (*Oncorhynchus tshawytscha*), and CV distinct population segment (DPS) steelhead (*O. mykiss*). Species found within the project footprint that are listed within the State as rare, under the California Endangered Species Act, or as a Fully Protected species include: Swainson's Hawk (*Buteo swainsoni*), White-tailed Kite (*Elanus leucurus*), pallid bat (*Antrozous pallidus*), western red bat (*Lasiurus blossevillii*), Sanford's arrowhead (*Sagittaria sanfordii*), and wooly rose-mallow (*Hibisus lasicocarpos*). Onsite mitigation of SRA and shallow water habitat will compensate for some impacts to listed species. Shallow water habitat, for salmonids would be mitigated by onsite with the restoration 2.89 ac of construction impacted habitat. 0.22 acres of delta smelt impacts would mitigated for with the onsite planting bench to replace SRA. Mitigation measures and Best Management Practices (BMPs) will be implemented to protect sensitive species to reduce impacts to less than significant in the short and long term. *This is consistent with the 2015 404(b)(1) evaluation.*

The Proposed Action is fully funded. This action is part of the American River Common Features Project which was included in the FY18 Bipartisan Budget Act (P.L.115-123) which funded $1.56B of the remaining design and construction efforts (full first cost). Receipt of full-funding accelerated project execution substantially and reduced the overall timeline to five years, with a targeted completion of all flood risk reduction features by January 2023. The construction schedule has construction of RM 55.2 improvements to be completed in 2021.

Logistically, there are no major encumbrances to completing the work. Local ordinances and real estate are not an issue for this site. Two docks that were going to be temporarily removed to accommodate construction were permanently removed by the Non-federal sponsors. A 24-inch pipe will be protected-in-place during construction.

Bank protection designs are specifically design for individual erosion sites. Therefore, techniques used at other bank protection sites may not reduce the footprint while providing the required bank protection. Revegetation within the planting bench conforms to EP 1110-2-18 which provides guidelines to ensure that landscape planting and vegetation management provide aesthetic and environmental benefits without compromising the reliability of levees, floodwalls, embankment dams, and appurtenant structures. *This is consistent with the 2015 404(b)(1) evaluation.*

Other Considerations

The contractor is responsible for selecting a disposal site located outside the construction limits. This disposal site must have current permits for operation, meet the required environmental standards, and be approved in writing by the Corps. *This is consistent with the 2015 404(b)(1) evaluation.*

A 65% design hydraulic analysis was conducted. Erosion design and scour analysis were based on the output of the 2D HEC-RAS model for 1/325 Annual Exceedance Probability (AEP) which is the American River Common Features Design maximum flow for Sacramento River

when 160,000 cubic feet per second is released from Folsom Dam on the Lower American River. The 2-Dimensional Hydraulic Engineering Center's River Analysis System (2D HEC-RAS) hydraulic model shows that adding rocks on the left back will not cause erosion on the right bank. The tree scour analysis is based on HEC-18 and computed the scour depth at 8 feet. The maximum toe scour depth is 18 feet for 1/325 AEP.

Placement of rock revetment along the riverbank below the OHWM would temporarily generate increased turbidity in the vicinity of the construction area. Additionally, placement of revetment could result in temporary sediment plumes, generated from the river bottom and levee side. The use of barges to install the revetment could cause additional turbidity in the immediate vicinity of the project. Turbidity curtains would be put in place before in-water construction begins. This would reduce the amount of suspended particulate and reduce turbidity. This mitigation measure would reduce impacts to water quality, fish, and downstream environments. After construction is complete reduced turbidity in the area may be noted because less exposed soil would erode and deposit into the river and overtime the spaces between the quarry stone would trap sediment. *This is consistent with the 2015 404(b)(1) evaluation.*

The Sacramento River at mile 55.2 consists of a sandy/silty bottom which has benthic marcoinverterbrates. The placement of rock under the OHWM would extend to the river bottom and cause temporary impacts to the river bottom. After the project is complete, the spaces between quarry stones would capture sediment traveling downstream, improving the water quality over time. Native benthic organisms would be expected to recolonize the area. *This is consistent with the 2015 404(b)(1) evaluation.*

To comply with water quality standards, prior to construction, the contractor would be required to prepare and implement a SWPPP and would obtain a National Pollution Discharge Elimination System permit (CWA 402), as applicable, and comply with all conditions of the permit. This plan would detail the construction activities to take place, BMPs to be implemented to prevent any discharges of contaminated stormwater into waterways, and inspection and monitoring activities that would be conducted. The placement of material below the OHWM requires compliance with Section 401 of the Federal Clean Water Act as amended, 33 USC 1251, et seq, prior to the start of construction. The American River Common Features project is located within the Central Valley Regional Water Quality Control Board's jurisdiction and is subject to the Basin Plan. The proposed project would implement BMPs to ensure that it will not violate State water quality standards identified in the Basin Plan. *This is consistent with the 2015 404(b)(1) evaluation.*