2 PROPOSED PROJECT

This chapter describes the Lower Klamath Project License Surrender (Proposed Project) pursuant to the requirements of CEQA Guidelines Section 15124.

2.1 Project Objectives

The State Water Board has identified the following Proposed Project objectives, as required under CEQA Guidelines, section 15124, subdivision (b):

In a timely manner:

1. Improve the long-term water quality conditions associated with the Lower Klamath Project in the California reaches of the Klamath River, including water quality impairments due to *Microcystis aeruginosa* and associated toxins, water temperature, and levels of biostimulatory nutrients.
2. Advance the long-term restoration of the natural fish populations in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation.
3. Restore volitional anadromous fish passage in the Klamath Basin to viable habitat currently made inaccessible by the Lower Klamath Project dams.
4. Ameliorate conditions underlying high disease rates among Klamath River salmonids.

These objectives further the underlying purpose of timely improving water quality related to the Lower Klamath Project within and downstream of the current Hydroelectric Reach and restoring anadromous access upstream of Iron Gate Dam (the current barrier to anadromy).

2.2 Project Location

The Proposed Project is located on the Klamath River in Siskiyou County, California and in Klamath County, Oregon (Figure 2.2-1). The nearest city to the California portion of the Proposed Project is Yreka, which is located 20 miles southwest of the downstream end of the Proposed Project.

The California portion of the Proposed Project includes the following three dams and associated facilities: Iron Gate Dam (RM 193.1), Copco No. 1 Dam (RM 201.8), and Copco No. 2 Dam (RM 201.5). The Klamath Basin—comprised of the Upper Klamath Basin, Mid-Klamath Basin, and Lower Klamath Basin—and the mainstem Klamath River reaches are shown in Figure 2.2-2. For purposes of this draft EIR, the California portion of the Klamath River system has been divided into four (4) reaches as follows: Hydroelectric Reach, Middle Klamath River, Lower Klamath River, and Klamath River Estuary. The Hydroelectric Reach extends into Oregon, where upstream reaches of the Klamath River also include the Upper Klamath River, Keno Reservoir, Lake Ewauna, and Link River (Figure 2.2-3).

The State Water Board has identified the Project Boundary as inclusive of the Proposed Project “Limits of Work” as well as PacifiCorp lands immediately surrounding the Lower Klamath Project (“Parcel B lands”) that would be transferred as part of the Proposed

Project. The boundary for the entire Proposed Project, including the Oregon portion of the Proposed Project surrounding the J.C. Boyle Dam and associated facilities and the California portion of the Proposed Project surrounding the Iron Gate, Copco No. 1, and Copco No. 2 dams and associated facilities, are shown in Figure 2.2-4. The California portion of the Project Boundary is shown in Figure 2.2-5. The transfer and disposition of Parcel B lands under the Proposed Project is discussed further in Section 2.7.10 *Land Disposition and Transfer* of this EIR.

Throughout this EIR, information concerning the Oregon portion of the Proposed Project is provided for context, although CEQA does not apply to impacts or actions Oregon except to the extent that there are emissions or discharges that would significantly impact the California environment (see also Section 1.1.1 *CEQA Guidance Regarding State Boundaries*).

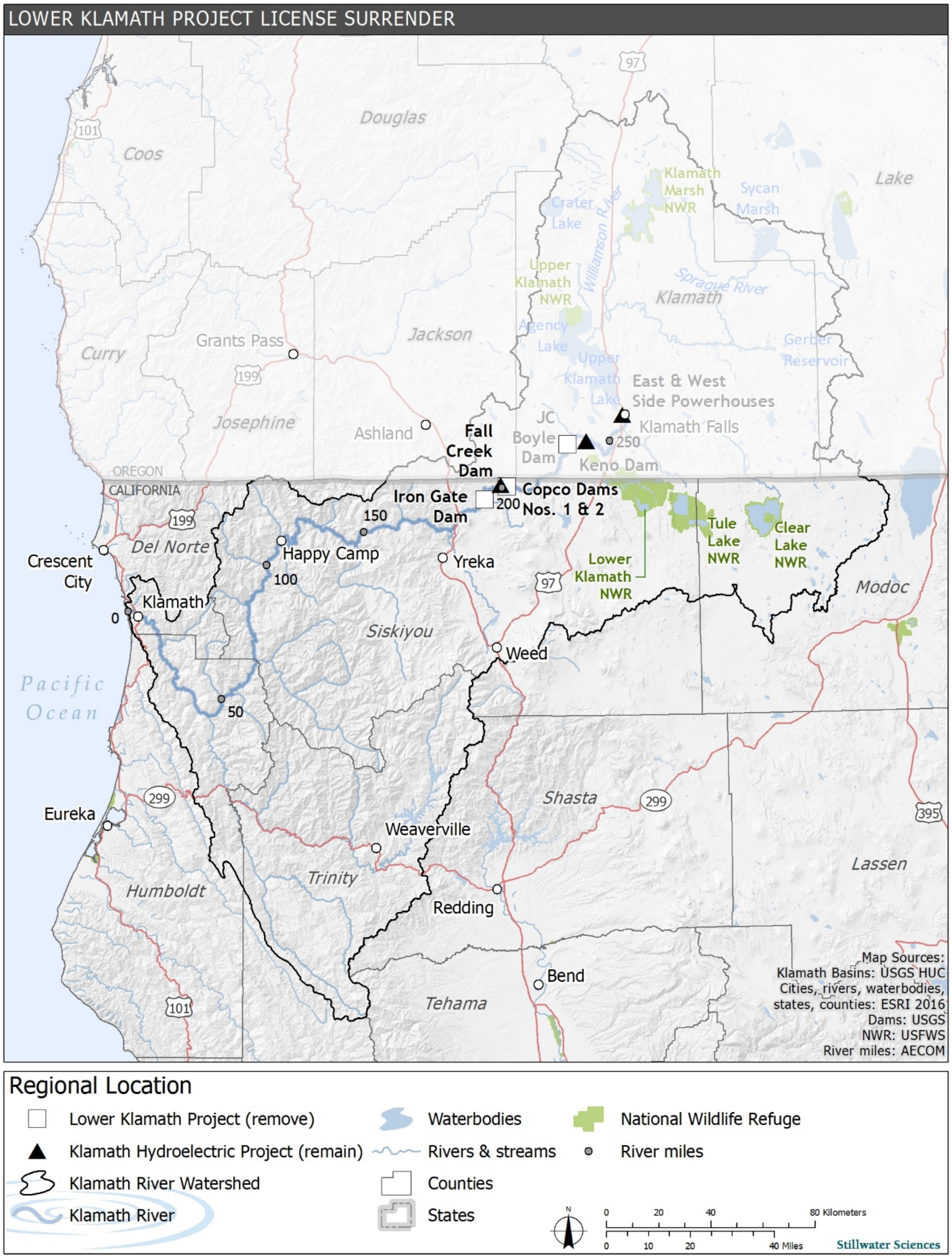

Figure 2.2-1. Regional Location.

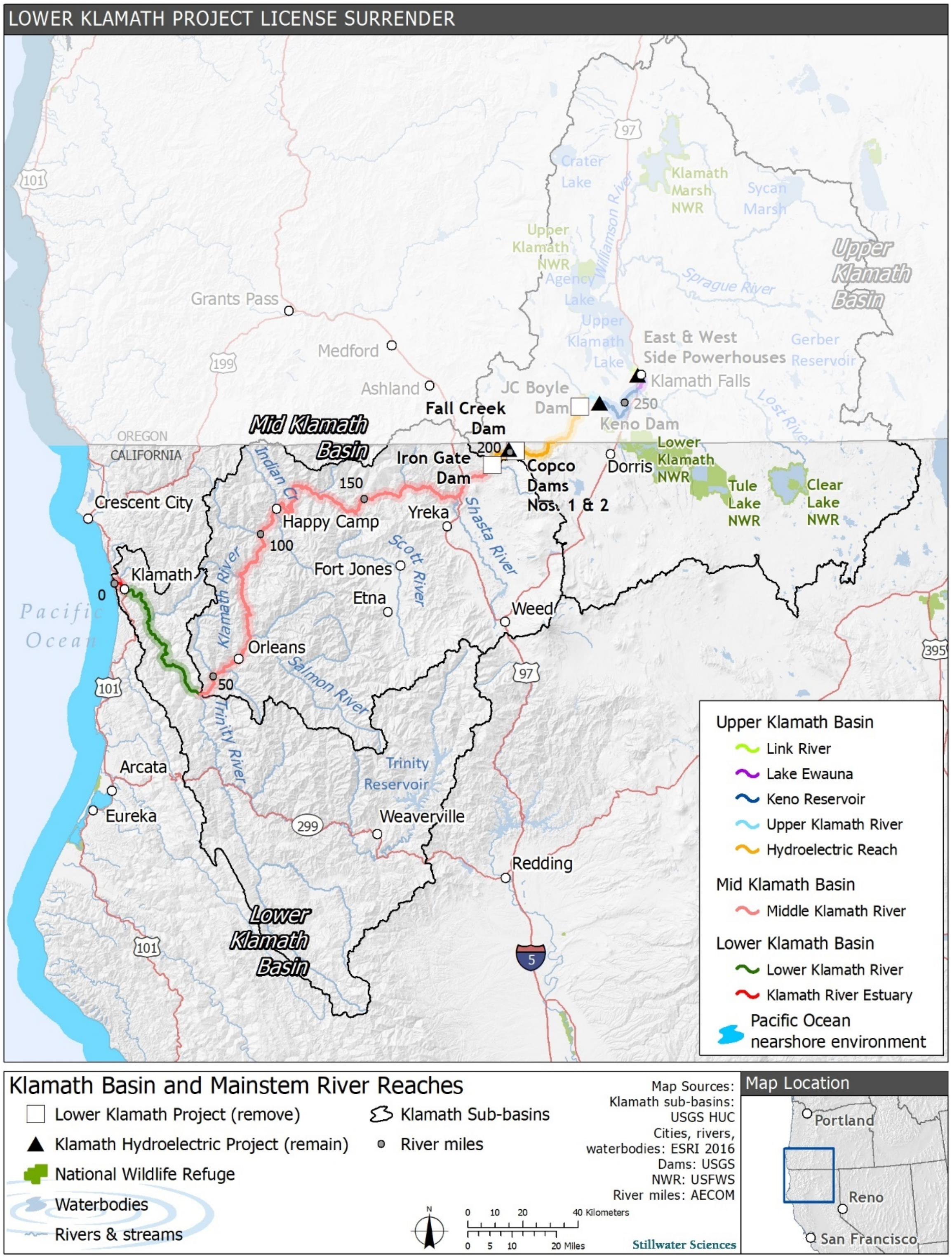

Figure 2.2-2. Klamath Basin and Mainstem River Reaches.

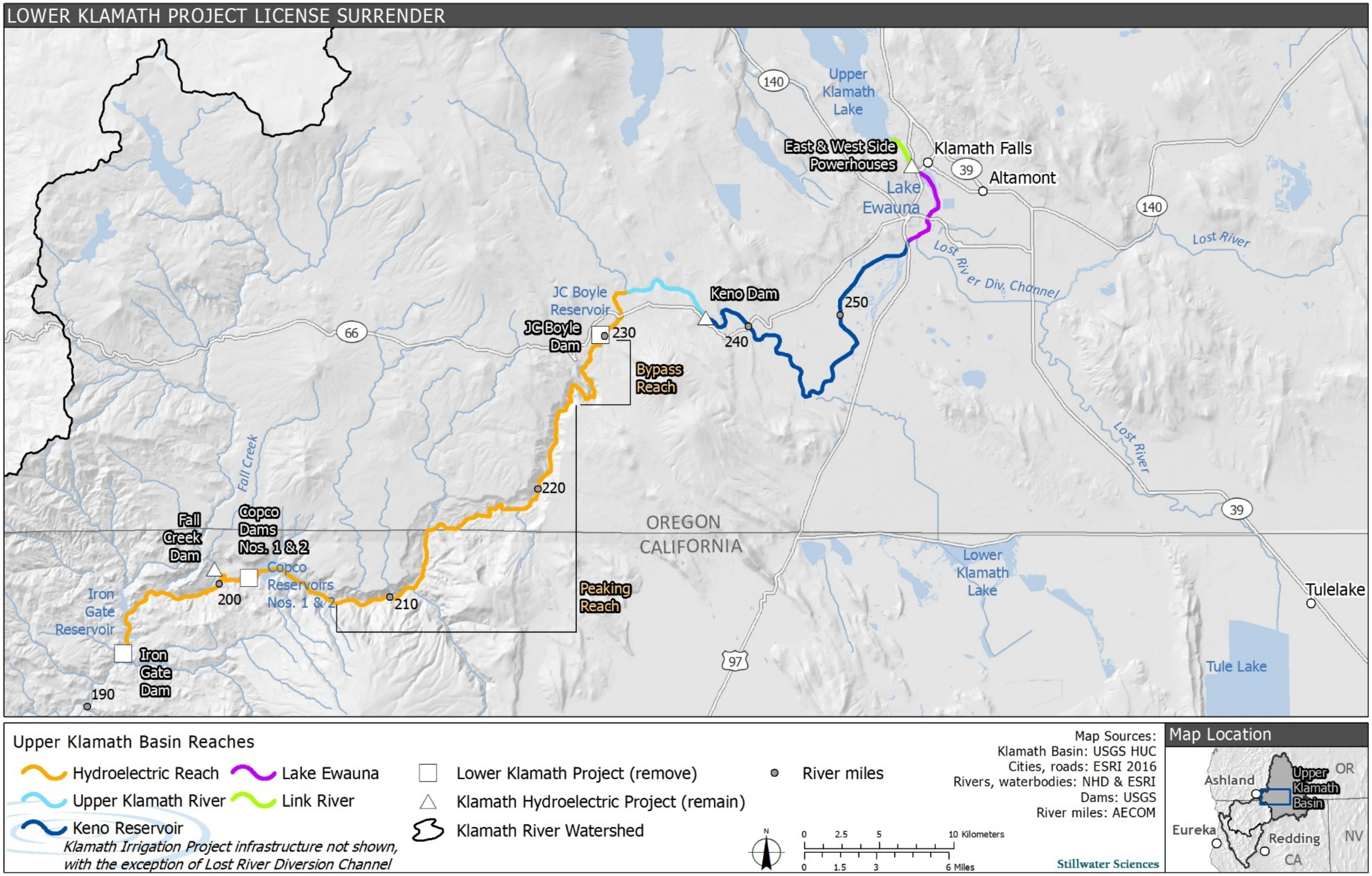

Figure 2.2-3. Upper Klamath Basin Reaches.

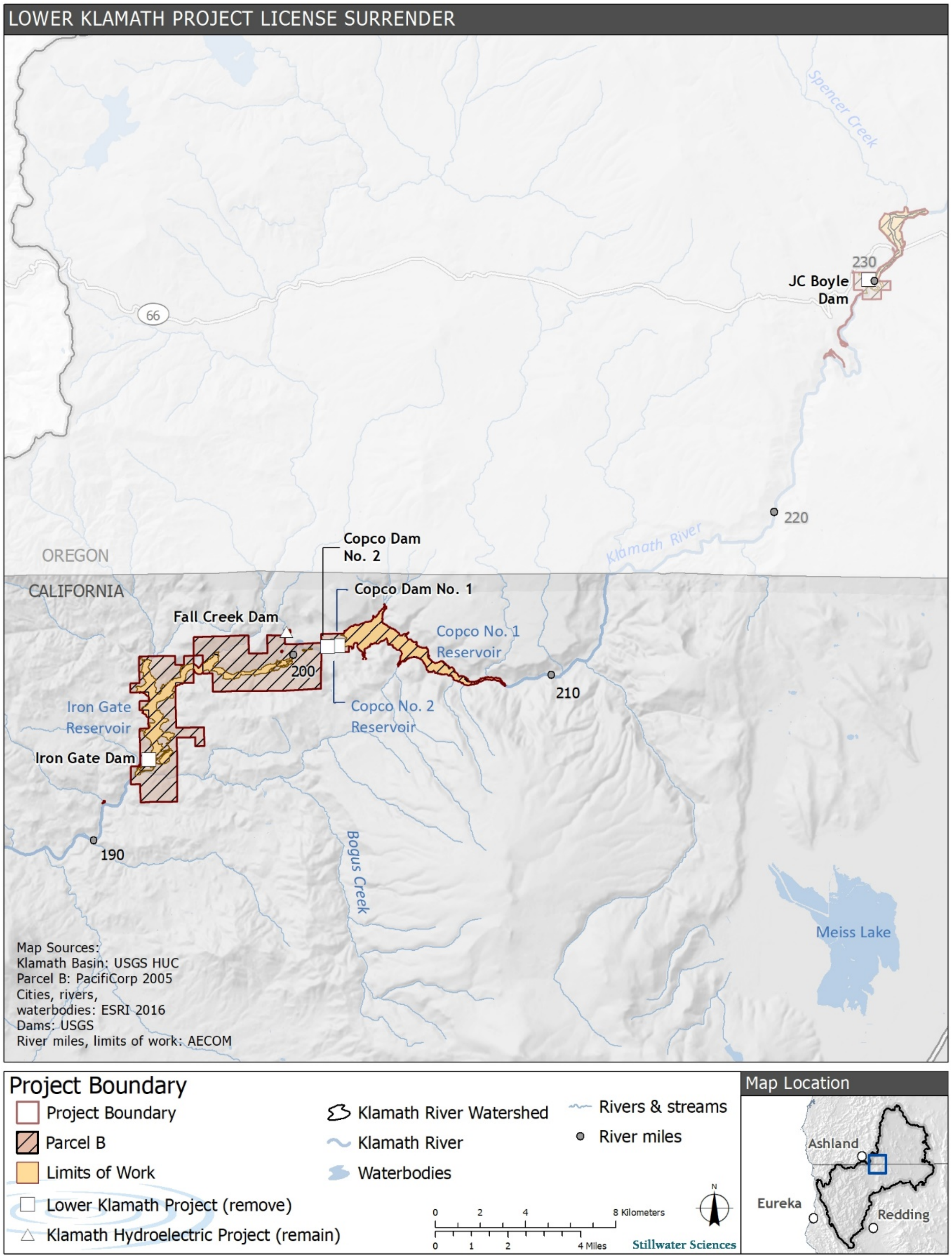

Figure 2.2-4. Proposed Project Boundary.

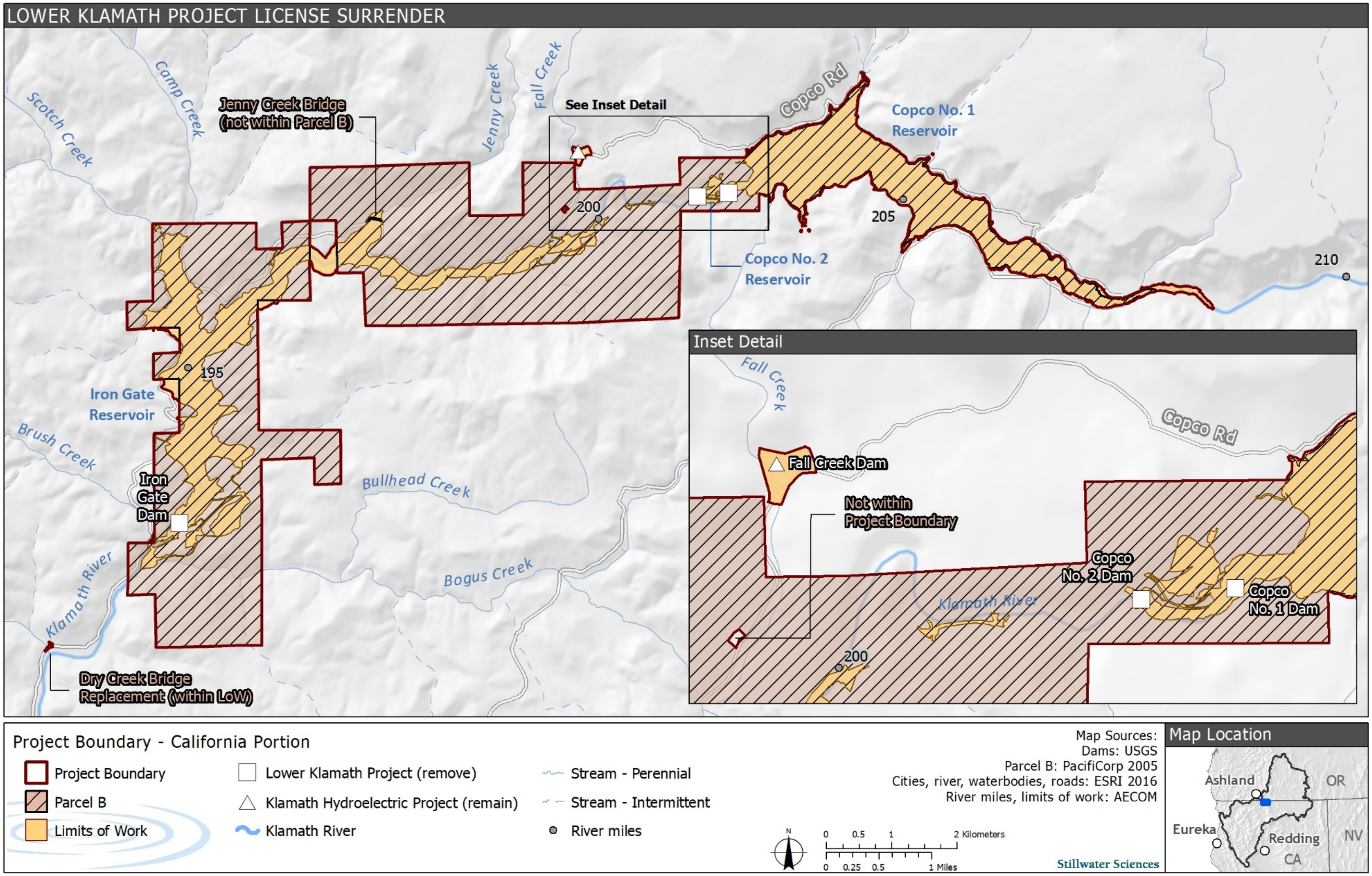

Figure 2.2-5. Proposed Project Boundary – California Portion.

2.3 Existing Lower Klamath Project Features

Basic features of the Lower Klamath Project (e.g., dams and powerhouse components) are summarized in Table 2.3-1 and described in the following sections. A brief description of J.C. Boyle Dam and its associated facilities, which are located in Oregon, is provided to inform any evaluations of impacts to resources in California that are affected by the portion of the Proposed Project that is in Oregon (see also Section 1.1.1 *CEQA Guidance Regarding State Boundaries*).

Table 2.3-1. Lower Klamath Project Dam and Powerhouse Components.

	J.C. Boyle	Copco No. 1	Copco No. 2	Iron Gate
Dam type	Concrete and earthfill embankment	Concrete	Concrete	Earthfill embankment
Dam maximum height	68 feet	133 feet	32 feet	189 feet
Dam crest length	430 feet	410 feet	305 feet	740 feet
Reservoir surface area	350 acres	972 acres	N/A	942 acres
Reservoir storage volume	2,267 acre-feet	33,724 acre-feet	70 acre-feet	50,941 acre-feet
Type of facility to allow water to flow past dam	Overflow spillway with control gates and diversion culvert	Overflow spillway with larger control gate and modified diversion tunnel	Overflow spillway with control gates	Uncontrolled overflow spillway and diversion tunnel

Source: Appendix B: *Definite Plan*. Note that component dimensions have been adjusted from those reported in FERC 2007 and USBR 2012a based on available data (e.g., as-built drawings, aerial photographs, topographic information).

2.3.1 J.C. Boyle Dam and Associated Facilities

The J.C. Boyle Dam (RM 229.8) and associated facilities are in Oregon on the mainstem of the Klamath River at the upstream end of the Hydroelectric Reach. J.C. Boyle Dam is a 68-foot tall concrete and earthfill dam that was completed in 1958. The dam impounds approximately 2,267-acre feet of water in a narrow reservoir with a surface area of approximately 350 acres, with a fish ladder along its concrete spillway[8] (Figure 2.3-1). J.C. Boyle Reservoir supplies water through a conveyance system that extends 2.5 miles from the dam to a 98-megawatt (MW) powerhouse. Water diversions for hydropower generation at J.C. Boyle Dam create a sub-reach of the Hydroelectric Reach called the Bypass Reach, which is located immediately downstream of the dam and extends to the powerhouse at RM 225.2 (Figure 2.3-1). The Bypass Reach contains less flow than other sections of the Klamath River due to water diversions for J.C. Boyle hydropower operations. Article 34 of the 1957 amended license requires a reasonable minimum flow, which was later set to 100 cfs by FERC, to be maintained in the Bypass

[8] The existing concrete upstream fish ladder on the north side of the J.C. Boyle Dam spillway does not meet current design criteria and must be replaced because of its configuration and poor structural condition (2012 KHSA EIS/EIR).

Reach. After diverted water runs through the J.C. Boyle power generation facilities, it rejoins the Klamath River (RM 225.2).

Another sub-reach of the Hydroelectric Reach is located downstream of the J.C. Boyle Powerhouse and is referred to as the Peaking Reach because the powerhouse is generally operated as a peaking facility to generate power during peak demand periods. During peaking operations, water stored in J.C. Boyle Reservoir is diverted around the Bypass Reach to the powerhouse to provide enough flow to generate hydropower and to take advantage of the cost difference between peak and off-peak power generation. Peaking occurs at J.C. Boyle Powerhouse when there is not sufficient river flow to sustain continuous hydropower operations, especially during the summer and fall low flow period. Power demand peaks during weekday afternoons in the summer, thus peaking power generation occurs in the late afternoons and early evenings to meet this demand. J.C. Boyle Reservoir refills during the night when power demand is minimal. Figure 2.3-2 illustrates early summer flows in 2011 as an example of how peaking operations affect flow downstream from the powerhouse, fluctuating rapidly to meet demand and peaking operations for power generation. During peaking operations, the rise or fall of the Klamath River is increased or decreased gradually at a rate not to exceed 9 inches per hour at a point located 0.5 miles downstream of the J.C. Boyle Powerhouse. Peaking operations result in a rise or fall of the river over a period of three to four hours. The Peaking Reach crosses from Oregon into California and ends at the Copco No. 1 Reservoir (RM 208.3).

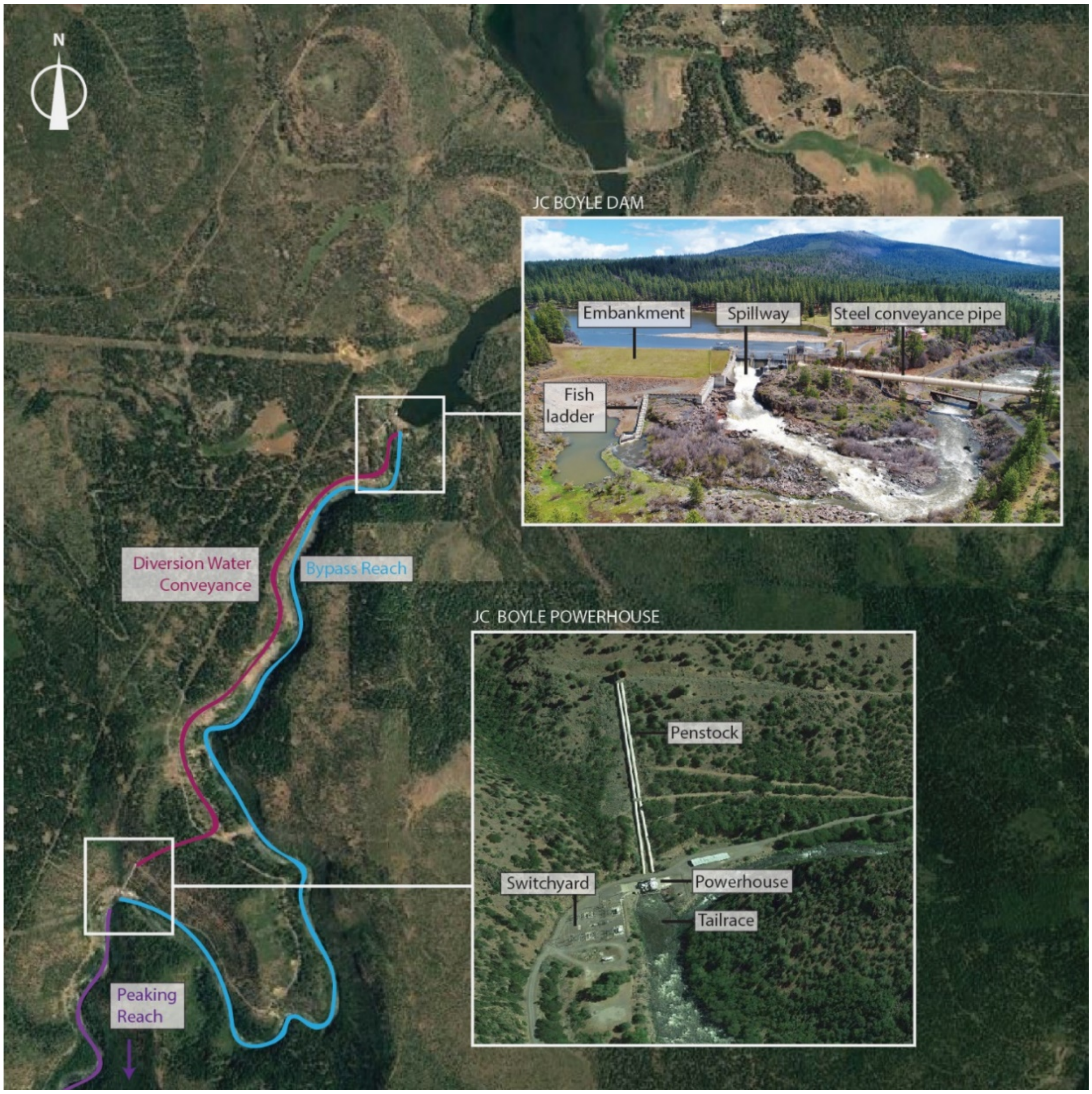

Figure 2.3-1. J.C. Boyle Dam and Associated Facilities.

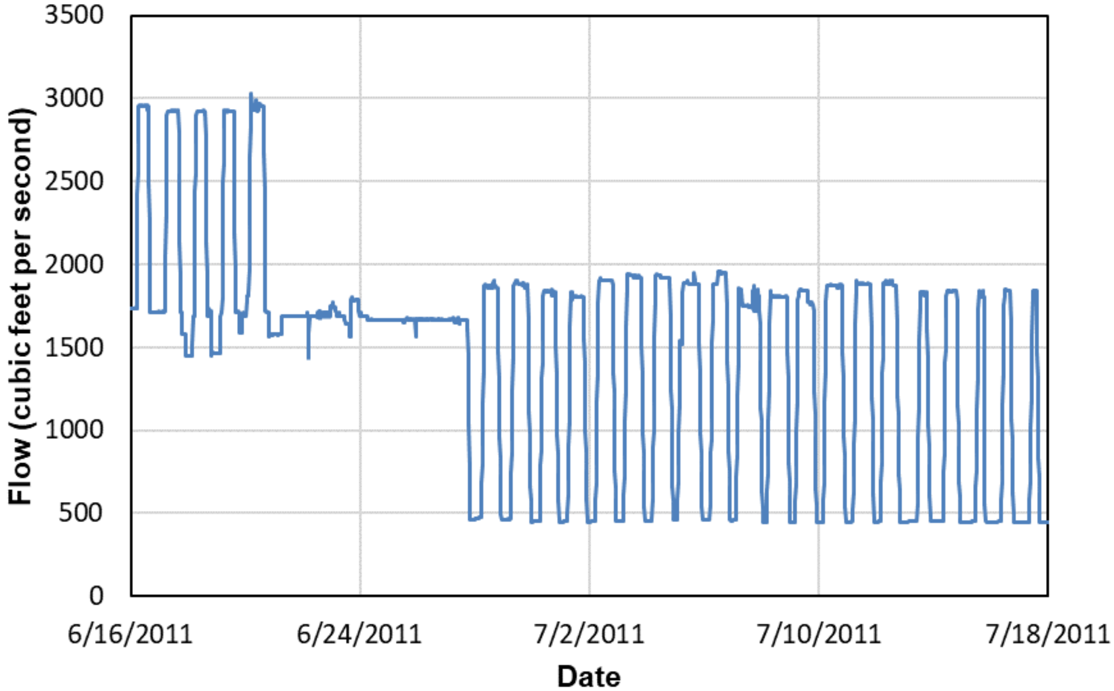

Figure 2.3-2. Example Flows in Peaking Reach downstream from J.C. Boyle Powerhouse (USGS station 11510700). Source: USGS 2011.

2.3.2 Copco No. 1 Dam and Associated Facilities

The Copco No. 1 dam and associated facilities (Figure 2.3-3) are located on the Klamath River between RM 201.8 and RM 208.3 in Siskiyou County, California. Copco No. 1 Dam was completed in 1918. The dam and associated facilities consist of the following:

1. A 33,724-acre-feet reservoir (Copco No. 1 Reservoir);
2. A 135-foot tall concrete gravity arch dam with a gated spillway (Copco No. 1 Dam);
3. A diversion tunnel capable of diverting approximately 12,000 cubic feet per second (cfs), but currently is non-operational and unable to divert any flow;
4. A switchyard with 3.03 miles of 69-kV transmission lines;
5. A water conveyance system consisting of a powerhouse intake structure, two gate houses on the right abutment, and three steel penstock pipes: one 10-foot diameter, 172-foot long, one 10-foot diameter, 194-foot long, and one 14-foot diameter, 228-foot long penstock pipes;
6. An approximately 9,800-square foot, 20-MW Copco No. 1 Powerhouse; and
7. The developed reservoir-associated recreation facilities Mallard Cove and Copco Cove. Each facility has one boat launch, one dock, and two toilets. Mallard Cove has eight picnic tables and parking for approximately 25 vehicles, while Copco Cove has two picnic tables and parking for approximately five vehicles.

There is no bypass reach for this dam.

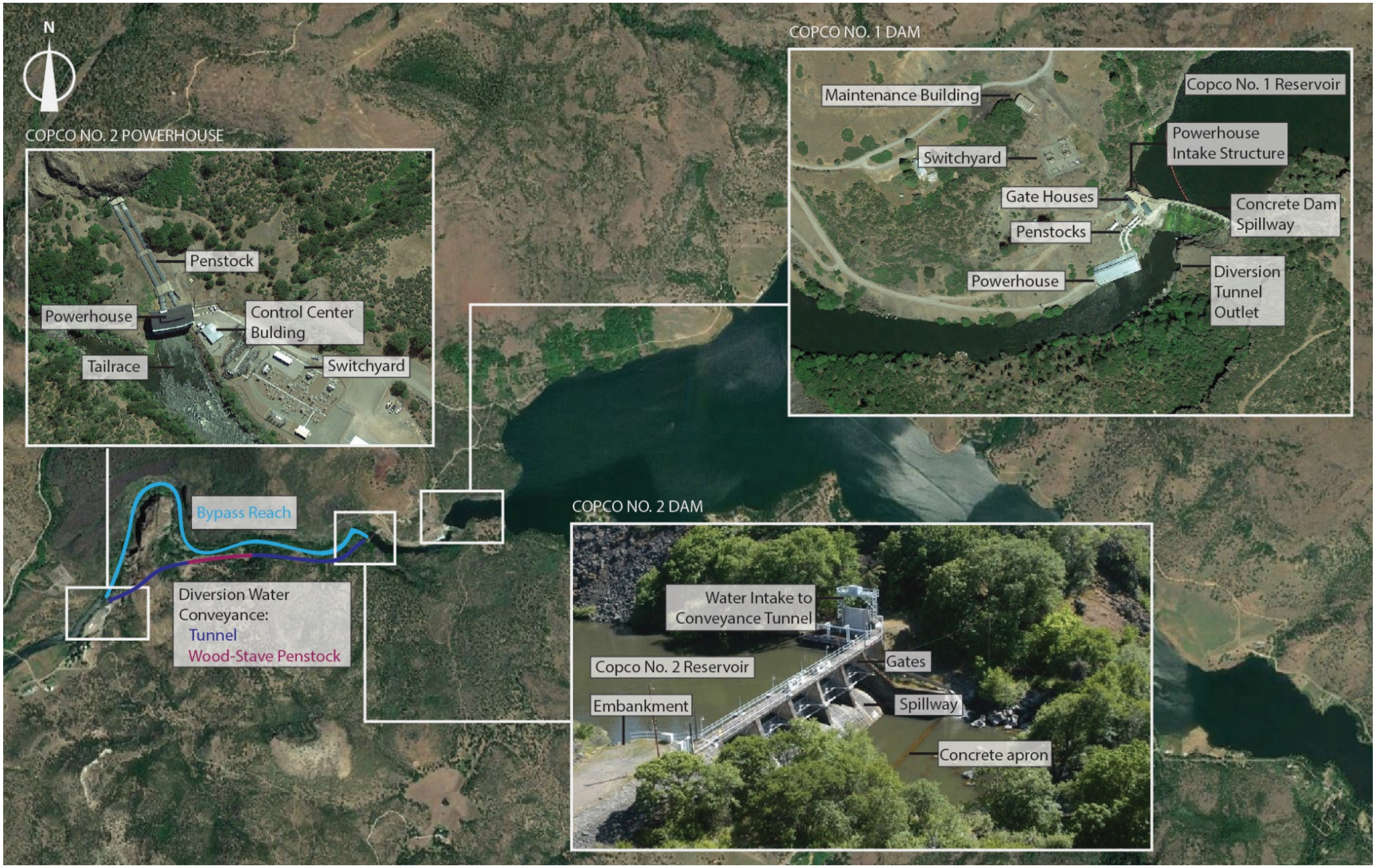

Figure 2.3-3. Copco No. 1 Dam and Copco No. 2 Dam and Associated Facilities.

2.3.3 Copco No. 2 Dam and Associated Facilities

The Copco No. 2 Dam and associated facilities (Figure 2.3-3) are located on the Klamath River between RM 201.5 and RM 201.8 in Siskiyou County, California. The Copco No. 2 Dam was completed in 1925. The dam and associated facilities consist of the following:

1. A 70-acre-feet reservoir (Copco No. 2 Reservoir);
2. A 32-foot tall concrete diversion dam (Copco No. 2 Dam) including a gated spillway, basin apron, end sill, and a remnant cofferdam upstream of the concrete dam below the normal water surface elevation of the reservoir;
3. An approximately 15,000-square foot earthen embankment section with a gunite cutoff wall along the river right sidewall;
4. A diversion water conveyance system consisting of 3,610 feet of concrete-lined, 16-foot diameter conveyance tunnel, 1,330 feet of a 16-foot diameter wooden-stave penstock, an underground surge tank, a 405.5-foot long, 16-foot diameter steel penstock, and a 410.6-foot long, 16-foot diameter steel penstock;
5. A 7,000-square foot, 27-MW Copco No. 2 Powerhouse;
6. A 1,900-square foot control center building;
7. A 4,500-square foot maintenance building;
8. A 650-square foot oil and gas storage building; and
9. The nearby mostly vacant historical Copco Village, with a total structure area of 32,200 square feet, consisting of a cookhouse, bunkhouse, storage building, bungalow, three modular houses, four old style ranch houses, and a schoolhouse/community center.

Copco No. 2 Dam is located approximately 0.25 miles downstream of Copco No. 1 Dam and has no associated recreation facilities. Water diversions for hydropower generation at Copco No. 2 Dam create a 1.5-mile-long Bypass Reach in the Klamath River between the Copco No. 2 Dam and the Copco No 2. Powerhouse (Figure 2.3-3).

2.3.4 Iron Gate Dam and Associated Facilities

The Iron Gate Dam and associated facilities (Figure 2.3-4) are located on the Klamath River between RM 193.1 and RM 200.0 in Siskiyou County, California. The Iron Gate Dam was completed in 1965. The dam and associated facilities consist of the following:

1. An approximately 50,900-acre-feet reservoir (Iron Gate Reservoir);
2. A 189-foot tall earthen embankment dam with a clay core on a basalt rock foundation and cutoff walls (Iron Gate Dam);
3. A 45-foot tall, free-standing, reinforced concrete penstock intake structure, its adjoining footbridge, and a 12-foot diameter, welded steel penstock with concrete supports;
4. The Iron Gate Fish Hatchery, which raises steelhead, coho salmon, and Chinook salmon. The hatchery includes a warehouse, a hatchery building, four fish-rearing ponds, a fish ladder, a visitor center, and four employee residences;
5. A fish trapping and holding facility including a fish ladder, holding tanks, and a processing facility at the downstream base of Iron Gate Dam;

6. A cold-water supply to Iron Gate Hatchery including an aerator, one 30-inch pipe, one 18-inch pipe, and two 24-inch pipes located below Iron Gate Dam and Powerhouse;
7. An ungated side-channel spillway capable of discharging 26,200 cfs;
8. A reinforced concrete diversion tunnel capable of diverting 2,700 cfs from the reservoir to the Klamath River and a footbridge to the gate control building;
9. A 9,000-square foot 18 MW powerhouse (excluding adjoining fish facilities);
10. 6.5 miles of 69-kV transmission lines;
11. Additional ancillary facilities, such as communication buildings, restrooms, and two residences; and
12. Recreation facilities, including the developed sites at Fall Creek, Jenny Creek, Wanaka Springs, Camp Creek, Juniper Point, Mirror Cove, Overlook Point, and Long Gulch, four small dispersed shoreline recreation sites (Iron Gate 1, 2, 3, and Long Gulch Bluff), and the recreation facilities associated with the Iron Gate Fish Hatchery. The recreation sites have a combined total of 57 picnic tables, 16 toilets, 6 boat launches, 7 docks, 1 RV dump station, and parking for approximately 200 vehicles with Camp Creek having the most facilities of all the sites. Additionally, some sites also have informal or developed campsites, a storage building, a well house, or timber shelters.

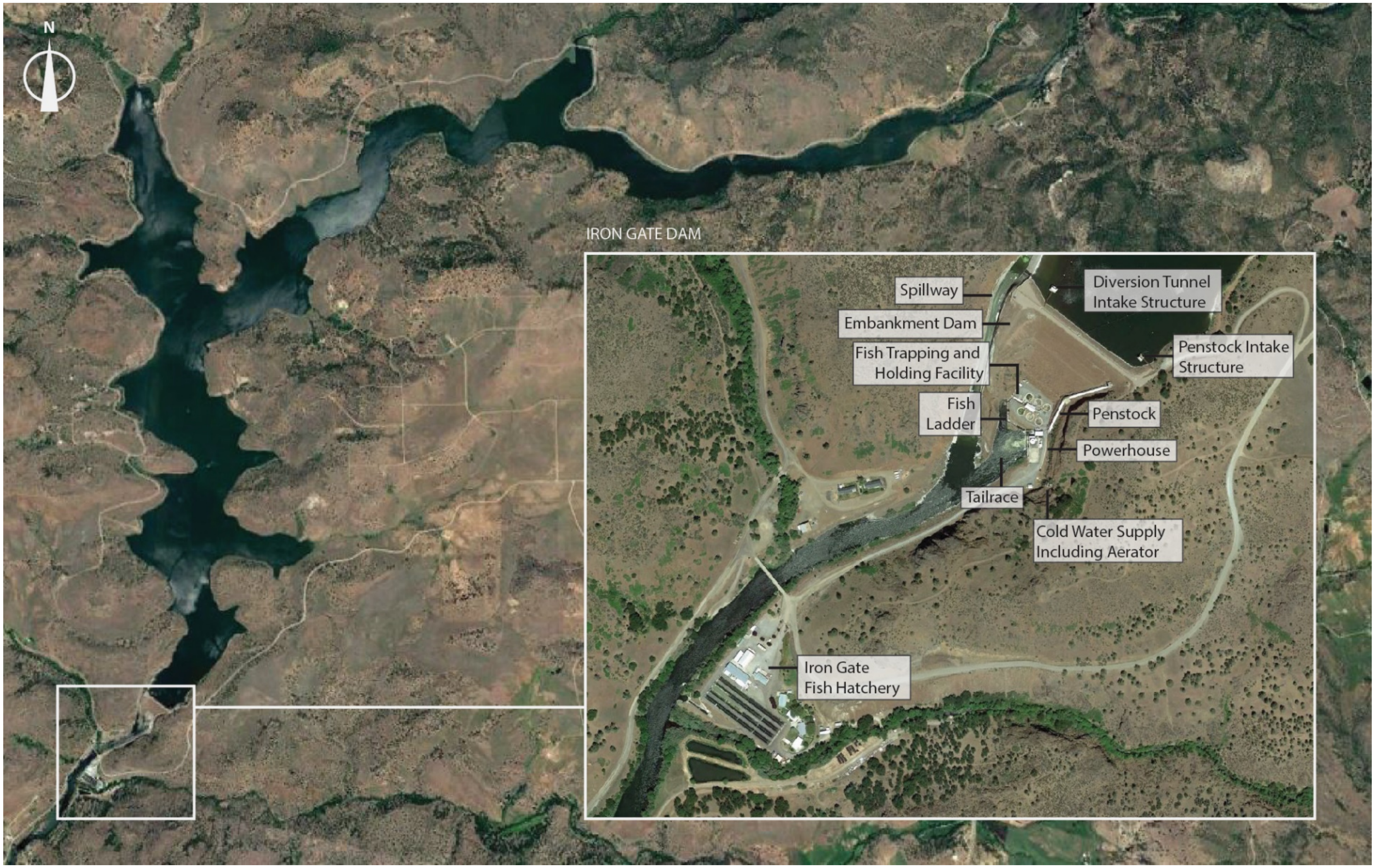

Figure 2.3-4. Iron Gate Dam and Associated Facilities.

2.4 Surrounding Land Ownership and Land Use

Land ownership within and proximal to the Project Boundary in California includes Bureau of Land Management (BLM), USDA Forest Service, State of California, PacifiCorp, and other privately-owned land (Figure 2.5-1). Further discussion of land ownership is presented in Section 3.14.2.1 *Land Ownership.*

Major Siskiyou General Plan zoning classifications surrounding the Proposed Project are Open Space – Natural Resources, Forest Resources, Agriculture – Grazing, Rural Vacant, and Rural Residential, with most of the land uses devoted to grazing and open space and conservation (Figure 2.5-2). The closest urban areas to the Proposed Project are the City of Yreka, California, and Klamath Falls, Oregon. A small amount of local land use is devoted to hydroelectric operations and recreation sites, although these activities are not specified by specific land use categories in Figure 2.5-2. There are also small residential communities and individual residences adjacent to portions of Iron Gate and Copco No. 1 reservoirs (e.g., Copco Village), and downstream.

2.5 Surrounding Land Cover

The primary land cover types within and surrounding the Proposed Project in California are Grassland/Herbaceous, Shrub/Scrub, and Evergreen Forest, along with smaller amounts of Deciduous Forest, Mixed Forest, Pasture/Hay, and Cultivated Crops (Figure 2.5-3). Developed land is generally limited to areas near existing roadways.

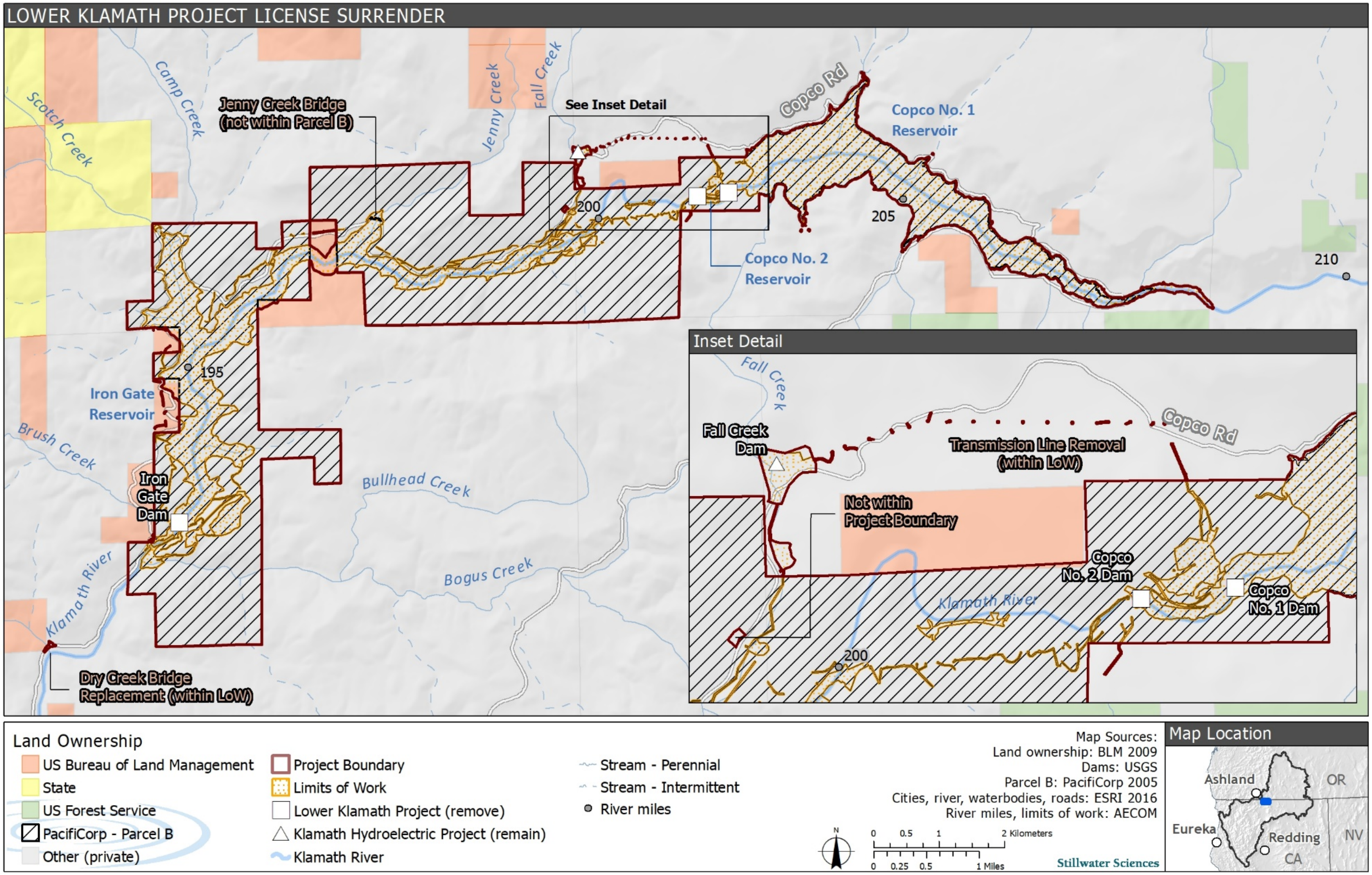

Figure 2.5-1. Surrounding Land Ownership.

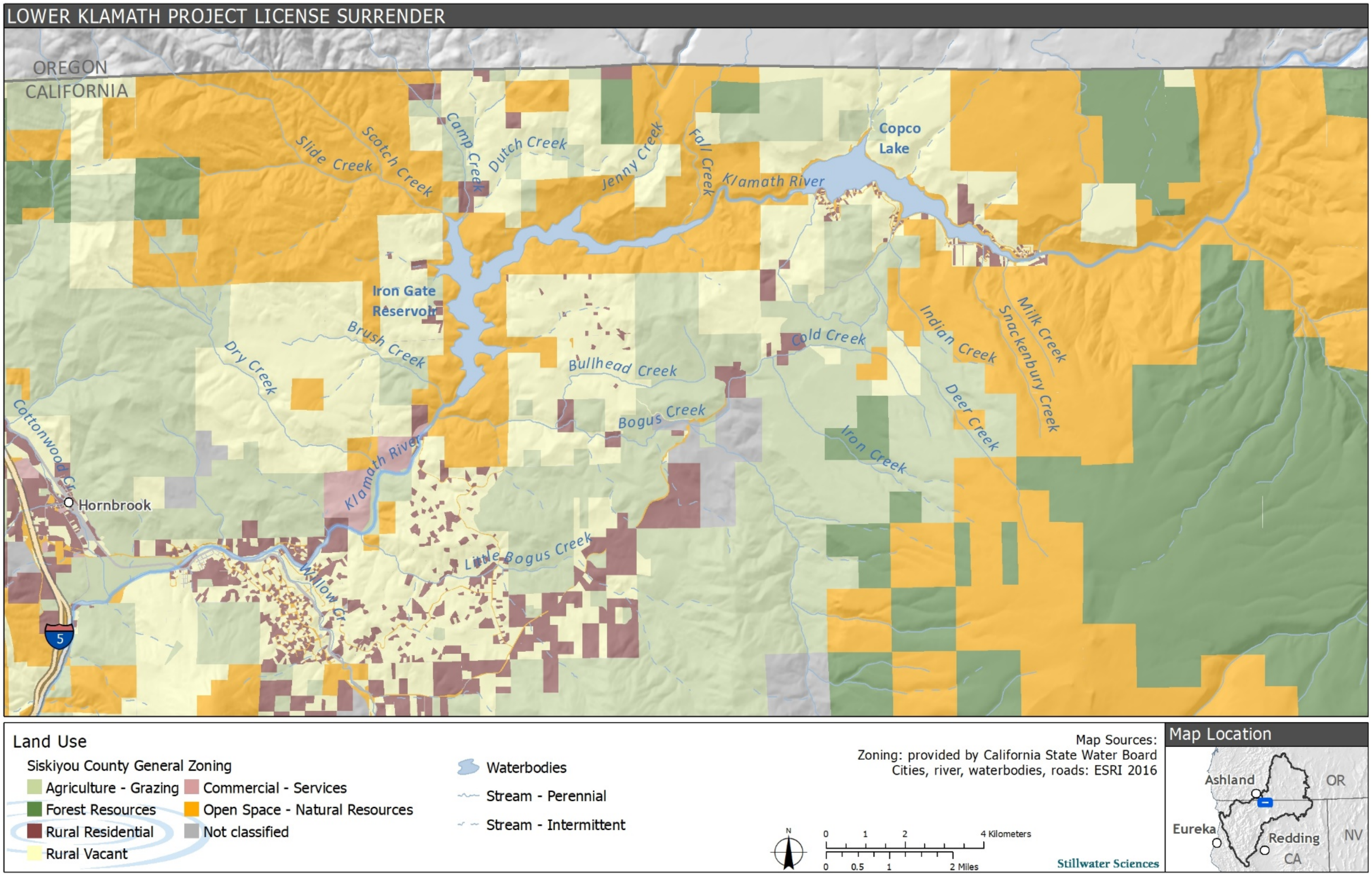

Figure 2.5-2. Surrounding Siskiyou General Plan Zoning Classifications.

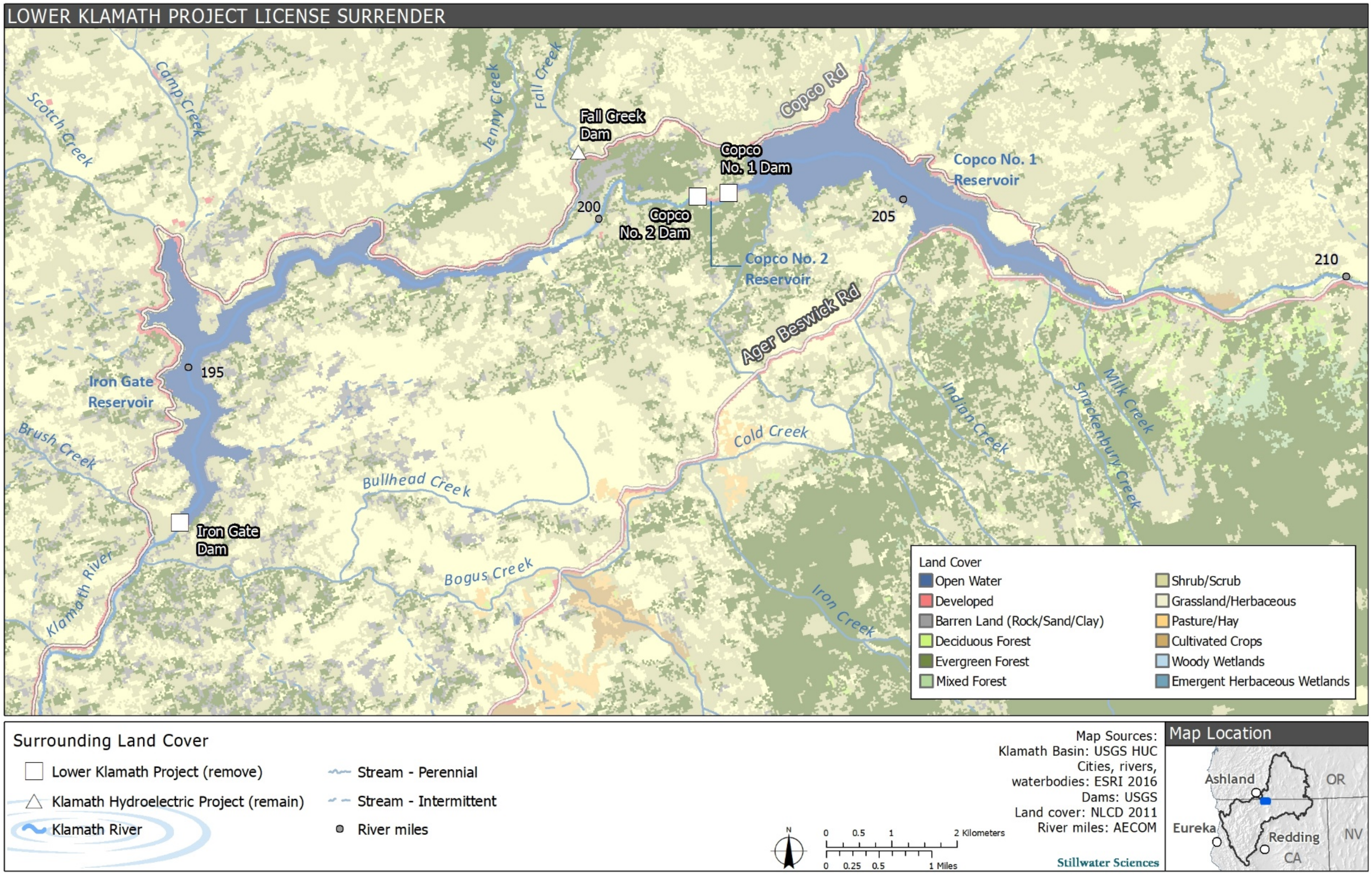

Figure 2.5-3. Surrounding Land Cover.

2.6 Project Background

2.6.1 Water Conflicts in the Klamath River Basin

Water-related disputes, including competing uses for water, water quality concerns, and impacted fisheries (commercial, tribal, and recreational) are difficult issues in the Klamath Basin. Below are some highlights of major water-related milestones and issues in the Klamath Basin over approximately the last few decades:

1957	Klamath River Basin Compact between the states of Oregon and California, ratified by the states and consented to by Act of Congress including integrated and comprehensive development of water use for equitable distribution between the two states and the Federal Government, with uses identified for domestic, irrigation, protection and enhancement of fish, wildlife and recreational resources, industrial and hydroelectric power production, and for navigation and flood prevention.
1975	Comprehensive basin plan adopted for the Klamath River in California including multiple beneficial use designations such as cold freshwater habitat, aquatic organism migration, spawning, reproduction, and/or early development for protected fish, water contact recreation, agricultural supply, and hydropower generation.
1996	Klamath River from the California/Oregon state line to Iron Gate Dam and from the confluence with the Scott River to the Klamath River Estuary added to the Clean Water Act Section 303(d) list for nutrients and temperature. Klamath River from its confluence with the Trinity River to the Klamath River Estuary added to the Clean Water Act Section 303(d) list for sediment. Klamath River from Iron Gate Dam to its confluence with the Scott River added to the Clean Water Act Section 303(d) list for organic enrichment/low dissolved oxygen.
1997	Coho salmon listed as Federally threatened under the Endangered Species Act (ESA).
1998	Lost River and shortnose sucker listed as endangered under the ESA.
1998	Klamath River from the California/Oregon state line to Iron Gate Dam and from the confluence with the Scott River to the Klamath River Estuary added to the Clean Water Act Section 303(d) list for organic enrichment/low dissolved oxygen. Klamath River from Iron Gate Dam to its confluence with the Scott River added to Clean Water Act Section 303(d) list for nutrients and temperature.
2001	(Spring) For the first time ever at a Federal reclamation (USBR) project, water deliveries from Upper Klamath Lake to Klamath Irrigation Project irrigators (and wildlife refuges) in California and Oregon did not occur in order to comply with requirements to protect ESA-listed fish (Lost River and shortnose suckers in the Upper Klamath Lake and coho salmon in the Lower Klamath River) during a severe drought (Braunworth et al. 2002).
2002	(Late summer/fall) Major fish die-off in in the Lower Klamath River of more than 33,000 adult salmon (primarily fall-run Chinook salmon) and steelhead during a disease outbreak (CDFG 2004).
2002	Coho salmon listed as threatened under the California ESA (CESA).

2003	Native American cultural use adopted as a beneficial use of the Klamath River from the Seiad Valley Hydrologic Subarea downstream to the Klamath Glen Hydrologic Subarea.
2004	First documented toxic bloom of the blue-green algae (cyanobacteria) *Microcystis aeruginosa* in Copco No. 1 Reservoir (Kann and Corum 2006).
2005	Public health warnings to avoid contact with water in Copco No. 1 and Iron Gate reservoirs due to toxic algae blooms began being posted annually.
2006	Low abundance of Klamath Basin Chinook salmon lead to severe restrictions on commercial and recreational harvest along 700 miles of the California and Oregon coast, as well as major reductions in Klamath River recreational and tribal fisheries. Broad commercial and recreational restrictions on the coast because of Klamath Basin Chinook returns were repeated in 2008, 2009, 2010, 2016, and 2017, including complete closure of commercial and recreational fisheries.
2006	Copco No. 1, Copco No. 2, and Iron Gate reservoirs identified by the USEPA for inclusion on the Clean Water Act Section 303(d) list for blue-green algae (cyanobacteria)-produced microcystin toxin as an additional cause of water quality impairment.
2010	Water deliveries from Upper Klamath Lake to Klamath Irrigation Project irrigators (and wildlife refuges) in California and Oregon significantly reduced in order to comply with requirements to protect ESA-listed suckers and provide flow augmentation for ESA-listed coho downstream of Iron Gate Dam, given dry hydrologic conditions.
2010	The Klamath Tribes limited their harvest of suckers to ceremonial use for the 25th consecutive year and experienced their 92nd year without access to salmon.
2010	Siskiyou County Advisory Election Vote on November 2, 2010 (Measure G). The Siskiyou County ballot asked, “Should the Klamath River Dams (Iron Gate, Copco 1, and Copco 2) and associated hydroelectric facilities be removed – Yes or No?” 78.84 percent of voters expressing an opinion voted “no” to dam removal, while 21.86 percent voted “yes”.
2010	Copco No. 1 Reservoir identified by the USEPA for inclusion on the California Section 303(d) List for mercury as an additional cause of water quality impairment.
2010	Klamath River from the California/Oregon state line to its confluence with the Trinity River added to the Clean Water Act Section 303(d) list for blue-green algae (cyanobacteria)-produced microcystin toxin. Iron Gate Reservoir added to the Clean Water Act Section 303(d) list for mercury.
2010	North Coast Regional Board established: (1) Site specific water quality objectives for the Klamath River; (2) an Action Plan for the Klamath River Total Maximum Daily Loads (TMDLs) addressing temperature, dissolved oxygen, nutrient, and microcystin impairments in the Klamath River; and (3) an Implementation Plan for the Klamath and Lost River Basins.
2010	USEPA approved TMDLs for the Klamath River in California.
2011	Improved abundance forecasts for Klamath River fall-run Chinook allowed for the first substantial ocean salmon fisheries off of California and Oregon to occur since 2007.
2013	NMFS and USFWS 2013 Joint Biological Opinion for the Klamath Irrigation Project, including increased minimum daily flow targets for Iron Gate Dam

	in spring and early summer months, clarifications to operations criteria for meeting requirements for minimum flows and high flows, and an adaptive management approach for minimizing fish disease.
2012–2014	In 2012, an estimated 10,000 to 15,000 migrating birds died in the Klamath Basin National Wildlife Refuge due to less water available to create wetland habitat, crowding of waterfowl during migration periods, and lethal disease outbreaks. In 2013, an estimated 9,000 migrating birds died and in 2014 an estimated 20,000 migrating birds died for the same reasons.
2012	Yurok harvest timing restrictions (Klamath River Technical Team 2013).
2013	Yurok harvest timing restrictions (Klamath River Technical Team 2014).
2016	No Yurok Tribe commercial fishery due to low returns of fall-run Chinook salmon.
2017	U.S. District Court of the Northern District of California ordered the USBR to release flushing flows from Iron Gate Dam to mitigate the effects of a parasite called *Ceratanova shasta* on outmigrating juvenile salmon and continue to implement flushing flows in future years based on specific triggers or until formal federal consultation is completed.
2017	Estimated 12,000 fall-run Chinook salmon were projected to return the Klamath River making it the smallest run on record resulting in closures of the fall-run Chinook recreational fishery and restrictions on the spring-run chinook fishery in the Klamath and Trinity rivers since record.
2017	No Yurok Tribe commercial fishery due to low returns of fall-run Chinook salmon.
2017	Karuk Tribe suspended ceremonial Chinook salmon harvest due to projected low chinook returns.

The role of the Lower Klamath Project dams in the various water quality and resource impacts listed above is part of this EIR, particularly in the description of the environmental setting for the various resource areas. As with the impacts of other facilities and actions on the Klamath River and outside the basin, the role of the dams is debated, with different stakeholders interpreting information in differing ways (see, for example, "*Fish, Farms, and the Clash of Cultures in the Klamath Basin" (*Doremus and Tarlok 2003).

2.6.2 Relationship with Klamath Hydroelectric Project

PacifiCorp currently owns and operates the Lower Klamath Project (FERC Project No. 14803) as part of the Klamath Hydroelectric Project (Klamath Hydroelectric Project) (FERC Project No. 2082). FERC exercises broad authority over most hydroelectric developments under the Federal Power Act. Among other authorities, FERC must approve and set conditions for the construction, operation, transfer of ownership and decommissioning of these hydroelectric facilities. FERC issued the original license for the Klamath Hydroelectric Project in 1956, for a term of 50 years. On March 1, 2006, the original FERC license expired. Since then, PacifiCorp has continued to operate the Klamath Hydroelectric Project (including the Lower Klamath Project complex) under annual licenses issued by FERC while PacifiCorp pursued relicensing. On June 16, 2016, at PacifiCorp's request, FERC issued an order placing the Klamath Hydroelectric Project relicensing process in abeyance.

On September 23, 2016, PacifiCorp and the KRRC filed a joint license transfer application with FERC, which seeks to transfer the J.C. Boyle, Copco No. 2, Copco No. 1, and Iron Gate dams and associated facilities to the KRRC. Concurrent with the license transfer application, the KRRC filed a license surrender application with FERC to decommission the Lower Klamath Project. The Lower Klamath Project license transfer and surrender processes are subject to FERC's approval.

2.6.3 Klamath Settlement Agreements

During the FERC relicensing process for PacifiCorp's Klamath Hydroelectric Project, a number of parties, with a range of interests including but not limited to PacifiCorp; state and federal agencies[9]; tribal governments; agriculture communities; fishery and conservation groups; local governments; and special interest groups executed several settlement agreements intended to resolve some of the problems in the Basin:

- Klamath Hydroelectric Settlement Agreement (KHSA), February 18, 2010, (later amended April 6, 2016)[10]
- Klamath Basin Restoration Agreement (KBRA), February 18, 2010
- Upper Klamath Basin Comprehensive Agreement (UKBCA), April 18, 2014
- Klamath Power and Facilities Agreement (KPFA), April 6, 2016

Among other things, the settlement agreements:

- Provided a decision-making framework and process for removal of J.C. Boyle, Copco No. 2, Copco No. 1, and Iron Gate dams and associated facilities;
- Addressed water supply and allocation issues; and
- Set forth water quality improvement and land restoration measures for the Upper Klamath Basin.

The water supply, restoration, and water quality issues all hinged on removal of the four mainstem Klamath River dams. Federal legislation was to provide much of the funding for the restoration and water supply portions of the agreements.

As originally executed, the KHSA proposed federal legislation that would have withdrawn the Klamath Hydroelectric Project from FERC's relicensing process. Instead of following the process set forth in the Federal Power Act, the original KHSA terms sought legislation to grant the Secretary of the Interior the authority to make a "Secretarial Determination" whether removing the J.C. Boyle, Copco No. 2, Copco No. 1, and Iron Gate dams and associated facilities was in the public interest and would advance salmon restoration. The agreement anticipated that the governor of each state would then be able to concur or not with the Secretarial Determination.

Federal legislation to enact the settlement agreements did not pass, and on December 31, 2015, the KBRA terminated, and on December 28, 2017 the UKBCA terminated. On April 6, 2016, some of the parties to the KHSA and KBRA executed the Klamath Power and Facilities Agreement to address the disposition of specific Oregon facilities on the Klamath River, and to commit to continue negotiations regarding certain issues addressed in the KBRA.

[9] The State Water Board is not a signatory to any of the settlement agreements.
[10] PacifiCorp is a signatory solely to the KHSA.

On April 6, 2016, the KHSA was amended to remove the need for Congressional authorization, and instead contemplate dam removal through the FERC license surrender process. The KHSA set forth the process for the signatories to form a "dam removal entity"—now the KRRC—as a non-profit organization that will, upon approval by FERC, receive ownership of the Lower Klamath Project facilities and undertake the necessary steps to remove the facilities. Pursuant to the KHSA, KRRC and PacifiCorp have initiated the FERC process, and the KRRC is now the applicant for the Proposed Project analyzed in this EIR.

2.6.4 Prior/Related Environmental Reviews

In November 2007, FERC released a final Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) for the Klamath Hydroelectric Project. The 2007 FERC EIS for the Klamath Hydroelectric Project examines the probable effects of a range of alternatives, including continued operations of the Lower Klamath Project dam complexes with or without fish passage improvements, and removal of some or all of the four dams and associated facilities that compromise the Lower Klamath Project. The 2007 FERC EIS is available online at: https://www.ferc.gov/industries/hydropower/enviro/eis/2007/11-16-07.asp

In accordance with the original KHSA, the 2012 KHSA EIS/EIR was prepared to support Klamath Hydroelectric Project dam removal and to inform the Secretarial Determination. On September 22, 2011, the United States Department of Interior (DOI) and the former California Department of Fish and Game, now California Department of Fish and Wildlife (CDFW) released the Draft 2012 KHSA EIS/EIR to analyze removal of four Klamath Hydroelectric Project dams for public comment. The agencies circulated the Final 2012 KHSA EIS/EIR, but DOI never entered a Record of Decision and CDFW never certified the document.

Similar to FERC's 2007 EIS, the 2012 KHSA EIS/EIR evaluated a range of project alternatives, including continued operation of the dams and associated facilities, with and without fish passage improvements, as well as removal of some or all of the dams that make up the Lower Klamath Project. The 2012 KHSA EIS/EIR is available online at: https://klamathrestoration.gov/Draft-EISEIR/download-draft-eis-eir.

In 2016, USBR developed the Klamath Facilities Removal EIS/EIR Supplemental Information Report (SIR) to summarize new information relevant to facilities removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams (USBR 2016).

The 2012 KHSA EIS/EIR, FERC's 2007 NEPA document, and USBR's 2016 SIR provide a great deal of information regarding the existing Klamath Hydroelectric Project, the various alternatives for the future of the hydroelectric facilities, and the potential impacts of and mitigation measures for these alternatives. After careful consideration and review of past environmental documents prepared for the Klamath Hydroelectric Project, the State Water Board determined it should develop a separate EIR, rather than adopting one of the existing reviews, for the following reasons:

- The State Water Board's EIR will represent its independent judgement and analysis of the KRRC's Proposed Project.

- The KRRC's Proposed Project is different enough from the project considered in the previous environmental documents that further analysis was needed. It was clearer to address these changes as part of a comprehensive project than as supplements to existing evaluations.
- Since development of the previous environmental documents, new scientific information has been published about the Klamath River that warrants consideration. Again, it was clearer to address this new information in a manner integrated with prior information, rather than as a supplement to existing evaluations.
- The KBRA expired. The KBRA was evaluated in the 2012 KHSA EIR/EIS as a connected action to the then dam removal proposal. The KBRA is not part of the KRRC's Proposed Project.
- The State Water Board received multiple comments during the scoping phase that requested it perform additional environmental review of the Proposed Project.

2.7 Proposed Project

To meet the stated project objectives (Section 2.1), KRRC proposes to remove the Iron Gate, Copco No. 1, Copco No. 2, and J.C. Boyle dams and associated facilities. The Detailed Plan (USBR 2012a) and the Definite Plan (AECOM et al. 2018) constitute the applicant's Proposed Project. The Detailed Plan is available online at the following links:

https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/krrc_detail_1.pdf

https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/krrc_detail_2.pdf

The Definite Plan is presented in Appendix B of this EIR. To the extent that there is conflicting information in the Definite Plan relative to the Detailed Plan, the KRRC has indicated that information in the Definite Plan supersedes the information in the Detailed Plan.

A summary overview of the Proposed Project is presented in this section of the EIR, including an overall project schedule (Table 2.7-1), information regarding dam and powerhouse deconstruction activities (Section 2.7.1), and the proposed approach to reservoir drawdown (Section 2.7.2).

The Proposed Project would result in large sediment releases as water and sediment stored behind the Lower Klamath Project dams are released during, and to a lesser extent, following decommissioning activities. The Lower Klamath Project schedule proposes to minimize flood risks and downstream impacts due to the release of impounded reservoir sediments, as described in Section 2.7.3. For sediment deposits that remain in the reservoir footprint, the KRRC has proposed a set of reservoir restoration activities (Section 2.7.4), as well as restoration activities for upland areas (Section 2.7.5).

As part of the Lower Klamath Project, the KRRC proposes modifying fish hatchery facilities downstream of Iron Gate Dam on the Klamath River and upstream of Iron Gate

Dam on Fall Creek, and continuing operation of the hatcheries for eight years following dam removal, consistent with the Amended KHSA Section 7.6.6. Further discussion of hatchery operations is presented in Section 2.7.6 of this EIR. The Proposed Project also includes relocating the City of Yreka's water supply line for its Fall Creek diversions, which is described in Section 2.7.7 of this EIR. Environmental, safety, and quality of life measures associated with the Proposed Project are described in Section 2.7.8. The estimated Lower Klamath Project workforce is presented in Section 2.7.1.5 *Estimated Deconstruction Workforce and Work Shifts,* and land disposition and transfer associated with the Proposed Project is discussed in Section 2.7.10. Where greater detail regarding the Proposed Project is important to the analysis of specific environmental impacts, the additional description is presented in the relevant environmental impact section(s) of this EIR.

Table 2.7-1 provides the proposed schedule for facilities drawdown and removal along with associated Proposed Project activities before and after removal. Drawdown timing for J.C. Boyle, Copco No. 1, and Iron Gate reservoirs was selected to minimize impacts to salmonids and other aquatic species. Based on the distribution and life-history timing of aquatic species in the Klamath Basin, only a portion of fish populations are likely to be present in the mainstem Klamath River during the periods of greatest sediment transport between January and March (Figure 2.7-1). Most species are in tributaries which would be unaffected by the Proposed Project or are further downstream during this time where river conditions would be less influenced by sediment transport by the Proposed Project due to dilution by tributary inflows. Additionally, the timing of drawdown coincides with periods of naturally high suspended sediment in the Klamath River, to which aquatic species have adapted through avoidance and tolerance.

Table 2.7-1. Proposed Lower Klamath Project Schedule.

Task	Pre-dam Removal Years 1-3	Dam Removal Year 1												Dam Removal Year 2												Post-Dam Removal Year 1												Post-Dam Removal Years 2-5	Post-Dam Removal Years 6-10
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Pre-dam removal activities																																							
Seed collection, propagation, container plant material procurement	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																		
Pre-construction activities (e.g., staging area preparation)[1]		■	■	■	■	■	■	■	■	■	■	■	■																										
Invasive exotic vegetation (IEV) control	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Iron Gate Hatchery modifications including water supply replacement[2]		■	■	■	■	■	■	■	■	■	■																												
Fall Creek Hatchery modifications including water supply[2]		■	■	■	■	■	■	■	■	■	■																												
Construction access road, bridge, and culvert improvements[3]		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Recreation area facilities removal					■	■	■	■	■																														
Flood improvements					■	■	■	■																															
Yreka water supply[4]						■	■	■	■	■																													
J.C. Boyle Dam																																							
Modify canal prepare for drawdown[1]											■	■	■																										
Power generation[1]	■	■	■	■	■	■	■	■	■	■	■	■	■																										
Drawdown														■																									
Dam removal														■	■	■	■	■	■	■	■	■																	
Power generation facilties removal														■	■	■	■	■	■	■	■																		
Transmission line demolition														■	■	■																							
Copco No. 1 Dam																																							
Modify diversion tunnel, prepare for drawdown[1]							■	■	■	■	■	■	■																										
Power generation[1]	■	■	■	■	■	■	■	■	■	■	■																												
Dam modifications							■	■	■	■	■	■	■																										
Drawdown[5]												■	■	■	■	■																							
Dam removal												■	■	■	■	■	■	■	■	■	■	■	■																
Power generation facilities demolition[1,6]											■	■	■																										
Transmission line demolition[7]																			■	■																			
Copco No. 2 Dam																																							
Power generation[1]	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																						
Drawdown[1,8]																		■																					
Dam removal																		■	■	■	■	■	■																
Power generation facilities demolition																		■	■	■	■	■	■																
Transmission line demolition																		■	■																				
Iron Gate Dam																																							
Power generation[1]	■	■	■	■	■	■	■	■	■	■	■	■	■																										
Dam modifications							■	■	■	■																													
Drawdown[9]														■	■	■																							
Dam removal														■	■	■	■	■	■	■	■	■	■																
Fish holding tanks and spawning building demolition[10]														■	■	■	■	■	■																				
Power generation facilities demolition																			■	■	■																		
Transmission line demolition[11]																			■																				
Restoration																																							
Fluvial sediment and habitat[12]																			■	■	■	■	■																
Revegetation activities															■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
Aerial pioneer crop seeding															■	■	■																						
Salvage and plant existing riparian veg															■	■	■	■	■																				
Pole cutting installation 2021															■	■	■	■																					
Pole cutting installation 2022																											■	■	■	■									
New recreation area facilities development																										░	░	░	░	░	░	░	░	░	░	░	░	░	

Dark grey shading indicates planned activities. Stippled shading represents planning for activities still under development.

1 Definite Plan Section 8.6 Construction Schedule does not explicitly list these tasks. Timing for these tasks provided in KRRC (2018).
2 While the specific timeline is not proposed, Iron Gate Hatchery and Fall Creek Hatchery must be operational prior to reservoir drawdown.
3 Definite Plan - Section 8.6 Construction Schedule does not explicitly list all of the proposed road access improvement items, however they would occur before, during, and after dam removal, as needed.
4 Proposed pipeline relocation would have to occur before Iron Gate Dam removal. The KRRC proposes that the outage associated with the final connections would preferably occur during the winter to avoid disruption to Yreka's water supply.
5 Scheduled from November 3 to March 8.
6 Scheduled from September 30 to December 7.
7 Scheduled from June 18 to July 30.
8 Copco No. 2 Dam drawdown will occur on one day (May 1, 2021)
9 Scheduled from January 1 to March 2.
10 Scheduled from January 4 to June 7.
11 Scheduled for one week from June 1 to June 7.
12 Refers to movement of additional sediment in the reservoir footprints to provide tributary connectivity and create wetlands, floodplain and off-channel habitat features. Also includes placement of large woody debris (LWD) features.

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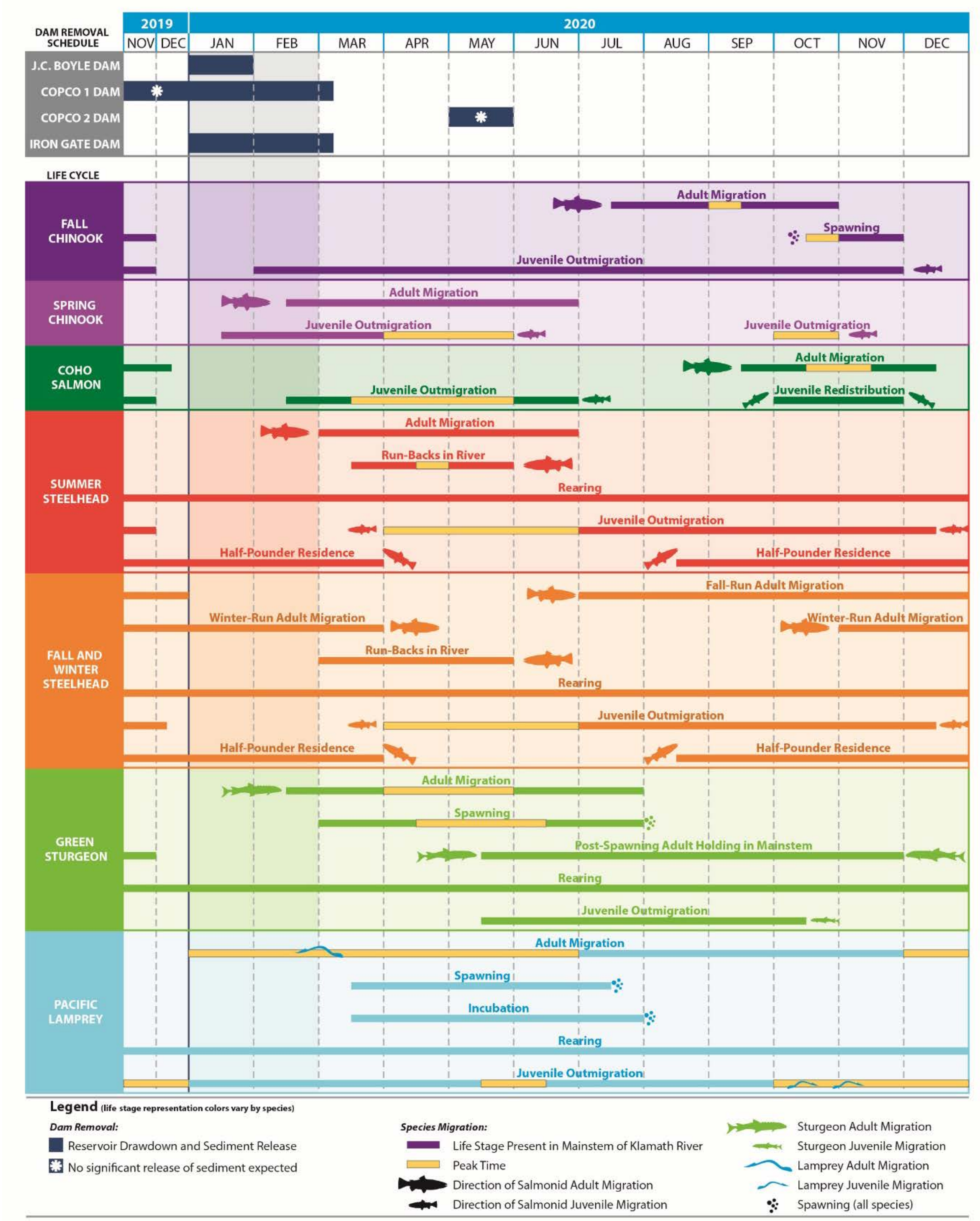


Figure 2.7-1. Distribution and Life-History Timing of Aquatic Species in the Klamath Basin. Source: CDM Smith.

2.7.1 Dam and Powerhouse Deconstruction

2.7.1.1 J.C. Boyle Dam and Powerhouse

The KRRC proposes removal of the J.C. Boyle dam, spillway and gates, powerhouse, powerhouse equipment, and concrete fish ladder. The applicant further proposes removal of ancillary facilities, such as the canal and pipeline that convey water to the powerhouse. The complete removal of the embankment section and concrete cutoff wall to the bedrock foundation are proposed to ensure long-term stability of the site and to prevent the development of a potential fish barrier in the future. In order to access the dam for deconstruction, the KRRC would perform a controlled reservoir drawdown using the spillway gates, conveyance pipeline and canal, and diversion conduit. J.C. Boyle Dam and Powerhouse features to be removed and removal plans are detailed in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)*.

2.7.1.2 Copco No. 1 Dam and Powerhouse

Deconstruction Activities

Features to be removed for Copco No. 1 Dam and Powerhouse are summarized in Table 2.7-2. An overview of the facilities and removal plans is found below. Additional details are presented in Appendix B: *Definite Plan*.

The Detailed Plan (USBR 2012a) included sequential notching of Copco No. 1 Dam as part of reservoir drawdown and dam deconstruction, where the notching option would have included making releases through a combination of modifications to the existing diversion tunnel to restore operation through three existing 6-foot-diameter pipes in the diversion tunnel intake structure, in addition to a series of 13 notches sequentially excavated in the left abutment of the dam. Successful reservoir drawdown using the notching option would be highly dependent on successful dam demolition and notching during January and February, with the following identified constructability and schedule risks: safety of construction workers operating on narrow, steep access roads during winter months with wet and icy conditions; weather delays that are likely to be worse in the wettest years when reservoir drawdown would rely on notching more than in dry years; and incomplete reservoir drawdown during wet years if notching is not complete. Due to these risks, KRRC is no longer proposing notching as the preferred plan for demolition of this dam (Appendix B: *Definite Plan*).

Instead, as a necessary first step for removal of Copco No. 1 Dam, the KRRC's Proposed Project would install a new, larger (14- by 16-foot) roller gate on the downstream end of the existing diversion tunnel, to be used as the primary mechanism for reservoir drawdown. Modifications to the diversion tunnel would begin by June of the year prior to reservoir drawdown (Table 2.7-1). The KRRC then proposes the complete removal of the concrete gravity arch dam between the left abutment rock contact and the concrete powerhouse intake structure on the right abutment (Figure 2.7-2, 1 of 4) to ensure long-term stability of the site. So that river bed sediment mobilization through natural channel processes does not expose the concrete foundation of the dam and create a fish passage barrier or prevent bedload movement in the active bed layer, removal of Copco No. 1 Dam would occur to 20 feet below the pre-dam streambed at the dam, or to the approximate elevation of 2,463.5 feet (Appendix B: *Definite Plan*).

The KRRC's Proposed Project indicates dam demolition would occur over approximately four months using blasting, hydraulic excavators, conventional or diamond-wire sawcutting, and drilling to remove the dam in sections from the top of the dam to 20 feet below the streambed level at the dam. After May 15 of dam removal year 2 (Table 2.7-1), conventional drilling and blasting methods would remove the dam in horizontal sections (lifts) with each section estimated to be approximately 12 feet high. Drilling would likely require the most time during the demolition and control the overall rate of dam removal so drill crews would work two 10-hour shifts, 5 days per week. Blasting is estimated to occur an average of between three and six shots per day for up to 16 weeks. Concrete rubble from the dam removal would be dropped to the base of the dam to form a temporary access road between the dam base, the powerhouse, and the powerhouse intake structure, then hauled by truck to the disposal site on the right abutment. The temporary access road would be removed once it is no longer necessary.

Table 2.7-2. Copco No. 1 Dam and Powerhouse Decommissioning and Removal Proposal.

Feature[1]	KRRC Proposal
Concrete Dam	Remove to elevation 2,463.5 feet, which is 20 feet below original river channel bottom
Spillway Gates and Operators, Deck, Piers	Remove
Penstocks	Remove
Powerhouse Intake Structure	Remove
Gate Houses on Right Abutment	Remove
Diversion Control Structure	Remove[2]
Tunnel Portals[3]	Retain the tunnel, plug the tunnel portals with reinforced concrete
Powerhouse (including mechanical and electrical equipment)	Remove
Powerhouse Hazardous Materials (transformers, batteries, insulation)	Remove
Four 69-kv Transmission Lines (3.03 miles total) (including poles and transformers)	Remove
Switchyard	Remove
Warehouse and Residence[4]	Remove

1 Feature as presented in Appendix B: *Definite Plan – Table 5.3-1*.
2 The existing diversion control structure includes gate hoists, stems, and wire ropes, which would be demolished along with unstable concrete as part of modifying the diversion structure prior to reservoir drawdown. Proposed features to modify the diversion control structure (i.e., new downstream tunnel gate and portal, new upstream blind flanges) would be removed as part of reservoir drawdown and dam deconstruction.
3 Refers to the Diversion Tunnel shown in Figure 2.7-2.
4 Refers to the Maintenance Building and the North and South Residences shown in Figure 2.7-2.

The spillway components would be removed as the reservoir is drawn down to below the spillway crest (to be completed by January 1 of dam removal year 2). Once the reservoir is drawn down to an approximate elevation of 2,590 feet, a barge-mounted crane would be used to remove spillway gates and operators, the spillway bridge deck, and the spillway gate piers in the dry. The barge-mounted crane would then be removed from the site.

The KRRC proposes that the powerhouse removal would occur as the reservoir is drawn down through the new large gate structure at the downstream end of the diversion tunnel. Gate houses and penstocks would be demolished, and mechanical and electrical equipment would be removed from the powerhouse. The above grade portion of the powerhouse would be demolished and prepared for use as a part of a temporary construction access road between the dam base, the powerhouse, and the powerhouse intake structure. The KRRC proposes to construct and maintain temporary cofferdams in the river channel and to use sump pumps as required to enable dewatered conditions during the removal of the remaining powerhouse portions, the diversion control structure, and concrete in the powerhouse intake structure on the right abutment. The cofferdams would be supported using re-purposed on-site concrete rubble from Copco No. 1 Dam, plus as-needed source material from an existing borrow site located on the hillslope above Copco No. 1 village, where the borrow site was used during dam construction. Sump pumps and cofferdams would be removed from the river channel when they are no longer needed.

The KRRC proposes to plug the upstream diversion tunnel intake, then demolish the new diversion gate structure and plug the downstream portal of the diversion tunnel with concrete.

Site demobilization would occur after the dam site, staging areas, and concrete disposal site are restored, including topsoil and seed placement, where required as explained in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)* and the KRRC's Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*).

<u>Construction Access and Road Improvements</u>

An overview of construction access roads required for removal of Copco No.1 Dam and Powerhouse, and associated work, are shown in Figure 2.7-2. Existing conditions of the highways, local roads, and structures to be used were observed in the field to identify deficiencies and determine if improvements are necessary for mobilization and/or hauling during construction and demolition activities. The Proposed Project in the KRRC's Definite Plan *(*Appendix B: *Definite Plan*) details the below road, bridge, and culvert improvements to facilitate access for dam removal vehicles and equipment, to ensure safety for public and project road users during dam deconstruction activities, and to return roads used by the Proposed Project related vehicles in an acceptable state, mitigating any potential reduction in function attributed to the dam removal work. For additional details, see Appendix B: *Definite Plan − Table 7.4.1, Sections 5.2.2, 5.3.2, 5.4.2* and *5.5.2*, and *Appendix K*.

Road and Bridge Improvements/Replacements

- Copco Road from I-5 to Ager Road—some pavement rehabilitation
- Copco Road from Ager Road to Lakeview Road—poor condition, some pavement rehabilitation
- Copco Road Bridge—potential erosion protection to abutments/ pier
- Dry Creek Bridge—to be replaced, strengthened, or provided with a temporary crossing
- Copco Road between Lakeview Road and Daggett Road—poor condition, some pavement rehabilitation
- Jenny Creek Bridge—to be replaced post-construction
- Copco Road from Daggett Road to Copco Access Road—some road surface rehabilitation during construction

- Fall Creek Bridge—to be replaced
- Copco Access Road—grading and clearing required
- Barge Access to Copco Lake—minor access improvements for barge/crane, boat ramp extension
- Ager Beswick Road—minor access improvements for barge/crane, boat ramp extension at Mallard Cove
- Daggett Road—some road surface rehabilitation during construction
- Daggett Road Bridge—to be replaced, strengthened or provided with a temporary crossing.
- Lakeview Road Between Copco Road and Disposal Site—some road surface rehabilitation during construction
- Lakeview Road Bridge—to be replaced, strengthened or provided with a temporary crossing.
- Powerhouse Access Road—some road surface rehabilitation during construction
- Upstream Left Abutment Access Road—to be re-established then reclaimed post-construction
- Access Road from Long Gulch Recreational Facility to Lakeview Road—some road surface rehabilitation during construction.
- Access Road from Overlook Point Recreational Facility to Copco Road—some road surface rehabilitation during construction.

Culvert Replacements

- Copco Road at Beaver Creek, East Fork Beaver Creek, Raymond Gulch, West Fork Unnamed Creek, Scotch Creek, 200 feet east of Scotch Creek, small cross-culverts between Brush Creek and Scotch Creek, Camp Creek
- Patricia Avenue at East and West Forks Unnamed Creek
- Deer Creek
- Indian Creek
- Daggett Road at Fall Creek

For Copco No. 1 specifically, three roads would have pavement or road surface rehabilitation as necessary during or post-construction, temporary traffic controls during road improvements, and construction signage; two bridges would be replaced; one road would be regraded and cleared; and two boat ramps would be extended. The delivery of off-road construction equipment, including cranes, large excavators, loaders, and large capacity dump trucks would be by special tractor-trailer vehicles operating under “wide load” restrictions and at appropriate speeds.

Staging Areas and Disposal Sites

Construction staging areas and a disposal site for removal of Copco No.1 Dam and Powerhouse are shown within the Limits of Work in Figure 2.7-2. The contractor would need to mobilize construction equipment to the site by approximately June of the year prior to drawdown to prepare the staging areas and disposal site and construct the diversion tunnel improvements.

The primary 2.3-acre staging area for the Copco No. 1 Dam complex would be located on the right abutment near the existing Copco No. 1 switchyard (Figure 2.7-2, tile 1 of 4). Two smaller staging areas are in the near vicinity (0.6 acre across the road and 0.5 acre near the penstocks) (Figure 2.7-2, tile 1 of 4).

A single 3.5-acre disposal site, located on the right abutment at the current location of a maintenance building and the vacant south residence (Figure 2.7-2, tile 1 of 4), would be used for concrete debris generated from the removal of the dam and powerhouse as detailed in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)*. The disposal site would be graded as a hill (maximum fill height of about 55 feet) contoured to blend into the surrounding topography. Preparation of the disposal area would include clearing of vegetation, demolition of the two structures, removal of transmission lines, and stripping and stockpiling of excavated topsoil for later use. After placement of the concrete debris (without rail and rebar), the on-site disposal area would be covered with topsoil and the excavated embankment material from Copco No. 2 Dam (see Section 2.7.1.3 *Copco No. 2 Dam and Powerhouse*), graded, sloped for drainage, and hydroseeded. Compaction of materials placed in the disposal area other than by bulldozers spreading the materials and equipment travel would not be required.

Erosion monitoring would be completed on an annual basis for five years following placement to assess whether significant erosion and slope deterioration has occurred. If significant erosion occurs, the eroded area shall be repaired.

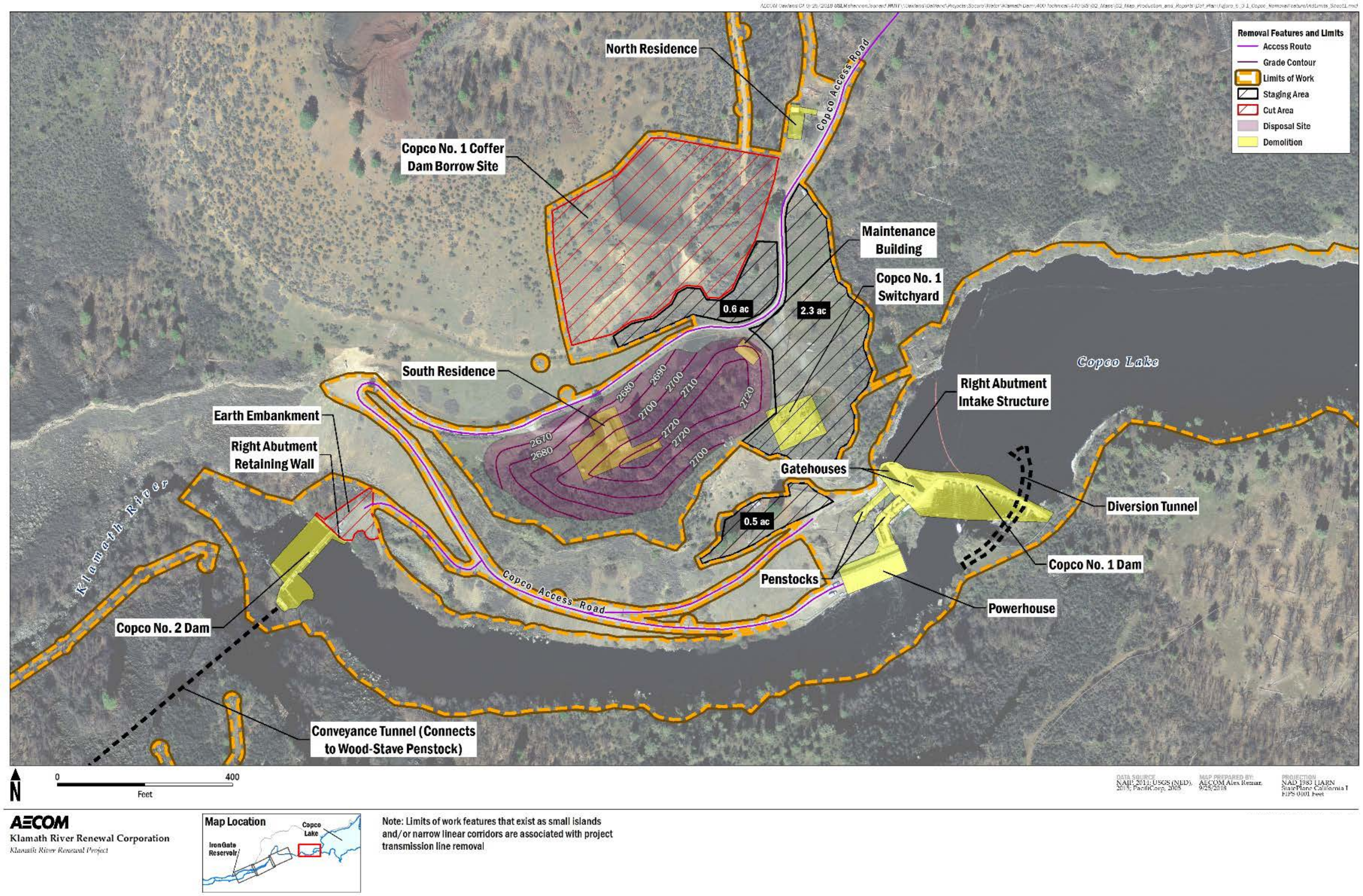


Figure 2.7-2. Copco No. 1 and Copco No. 2 Dam Removal Features and Limits of Work (1 of 4).

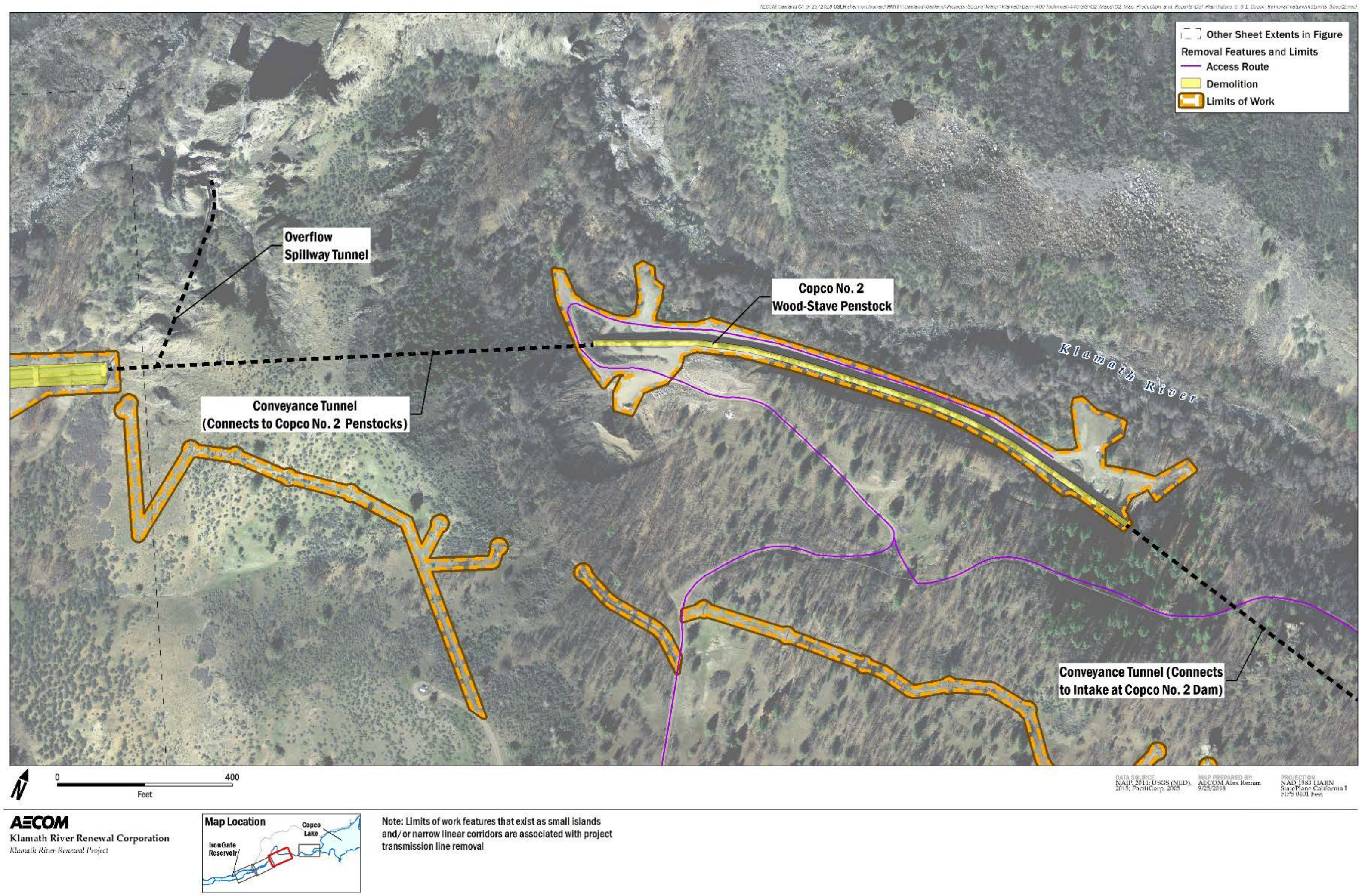


Figure 2.7-2. Copco No. 1 and Copco No. 2 Dam Removal Features and Limits (2 of 4).

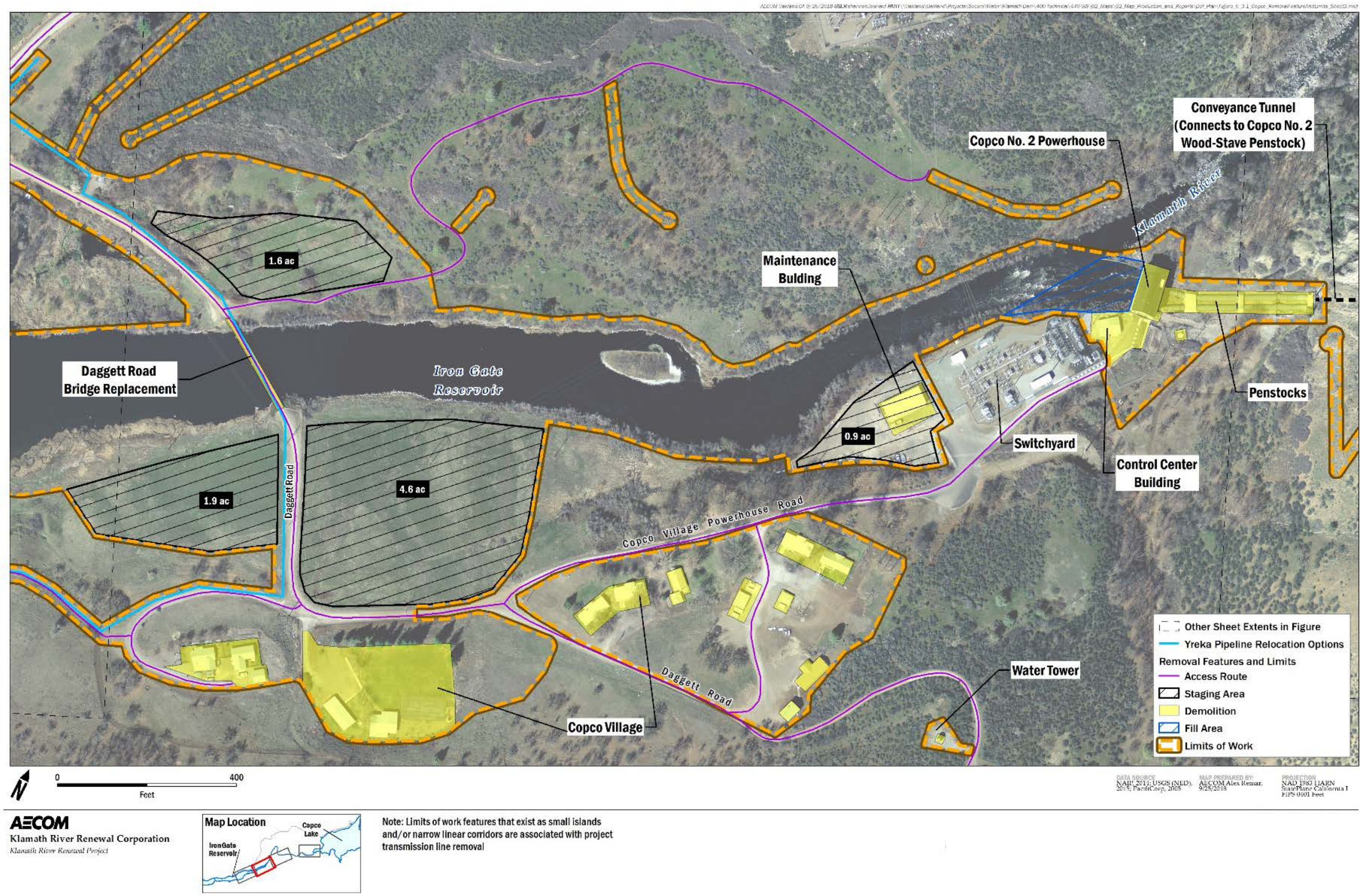


Figure 2.7-2. Copco No. 1 and Copco No. 2 Dam Removal Features and Limits of Work (3 of 4).

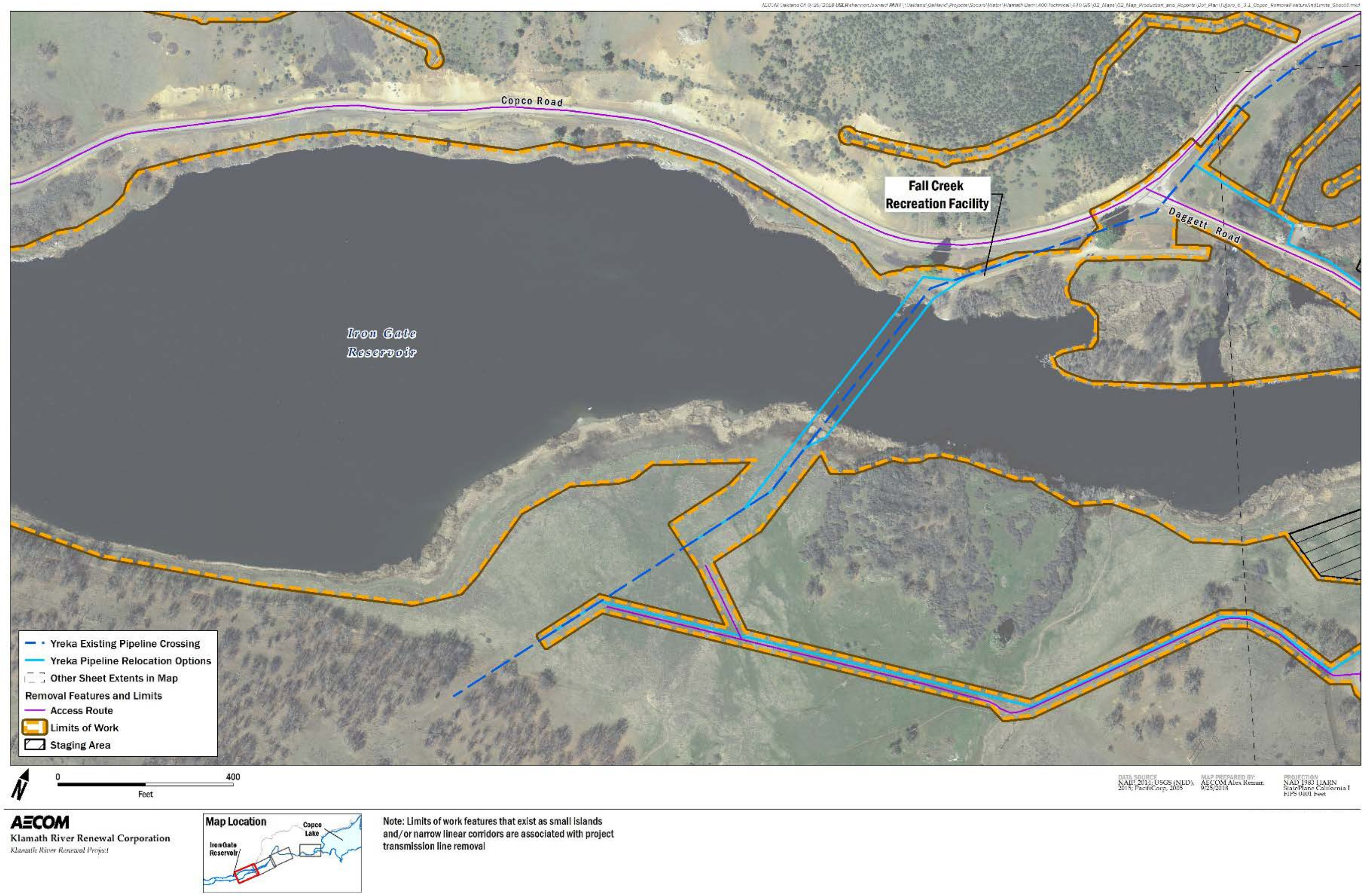


Figure 2.7-2. Copco No. 1 and Copco No. 2 Dam Removal Features and Limits of Work (4 of 4).

Imported Materials and Waste Disposal

The most likely import materials for supporting dam removal include gravel surfacing from a commercial quarry for temporary haul roads, sheetpile or H-piles for construction of cofferdams (in addition to the concrete rubble and borrow pit materials described above), topsoil, seed and mulch materials, and minor quantities of ready-mix concrete and reinforcing steel from local commercial sources for tunnel plugs. Additional imported materials would be necessary for culverts, pavement or road surface improvements, signage, and bridge replacements. Construction of the new gate structure for Copco No. 1 in dam removal year 1 would require importing mechanical equipment, additional reinforcing steel, and potentially ready-mix concrete for lining the diversion tunnel, if inspections determine it is necessary.

Estimated quantities of materials generated during removal of Copco No. 1 Dam and Powerhouse, numbers of truck trips, and approximate haul distances for waste disposal in miles per round trip (miles RT) are detailed in Table 2.7-3 based on the information itemized in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 7 Road Improvements)* and updated by KRRC based on further investigations since the release of the Definite Plan (S. Leonard, AECOM as KRRC Technical Representative, pers. comm., November 2018). Excavated concrete would be placed in the on-site disposal site described above. Rail and reinforcing steel would be separated from the concrete prior to placement in the disposal area and hauled to a local recycling facility. All mechanical and electrical equipment would be hauled to a suitable commercial landfill or salvage collection point (e.g., Yreka Transfer Station, Yreka, CA). The estimated haul distances for waste disposal not on-site assumed the Yreka Transfer Station in Yreka, CA. The Yreka Transfer Station is a Class III sanitary landfill with a remaining capacity of approximately 3,924,000 yd^3 (2010) that accepts construction, demolition, and mixed municipal waste and a medium volume transfer station accepting metals and mixed municipal recyclable materials.

Table 2.7-3. Estimated quantities of waste disposal for full removal of Copco No. 1 Dam.

Waste Material	In-Situ Quantity	Bulk Quantity[1]	Disposal Site[2]	Peak Daily Trips[3]	Total Trips[4]
Concrete	75,900 yd^3	104,00 yd^3	On-site	2 units/50 trips (unpaved road)	4,430 trips (2 miles RT)
Rebar	1,100 tons	--	Transfer station near Yreka, CA	1 units/5 trips (Copco Road)	110 trips (62 miles RT)
Mech. and Elec.	1,100 tons	--	Transfer station near Yreka, CA	1 units/5 trips (Copco Road)	140 trips (62 miles RT)
Building Waste	7 buildings; 7,500 ft^2	1,700 yd^3	Transfer station near Yreka, CA	1 units/5 trips (Copco Road)	90 trips (62 miles RT)
Power Lines	4.3 miles of 69-kV and smaller	--	Transfer station near Yreka, CA	--	5 trips (62 miles RT)
Wood Utility Poles	120 poles	--	Transfer station near Yreka, CA	--	8 trips (62 miles RT)

Source: S. Leonard, AECOM as KRRC Technical Representative, pers. comm., November 2018

1 Volumes increased 30 percent for concrete rubble from reinforced concrete and 40 percent for concrete rubble from mass concrete.

2 Currently, solid waste is transferred approximately 45 miles from the Yreka Transfer Facility to the Dry Creek Landfill facility near White City Oregon.

3 Peak daily trips for each site are based on the number of vehicles (units) shown, operating within one 8-hour shift.

4 Total trips of concrete assume off-highway articulated trucks with a nominal load capacity of 22 yd^3. Total trips for hauling rebar using truck tractor-trailers is based on 10 tons per trip. Total trips for hauling mechanical and electrical items using truck tractor-trailers is based on 8 tons per trip. Total trips for building waste using truck tractor-trailers is based on 10 yd^3 per trip. Mileage is reported in miles per round trip (miles RT).

Potential hazardous materials at Copco No. 1 Dam and Powerhouse include asbestos, batteries, bearing and hydraulic control system oils, treated wood, flammable gases, nonflammable gases, flammable and combustible liquids, mercury in older light switches, contaminated soils near painted exterior equipment, and coatings containing heavy metals in the powerhouse, on the exterior surfaces of the steel penstocks, air vents, and other painted materials. All hazardous materials would be handled and disposed of as hazardous waste at an approved hazardous waste facility in accordance with applicable federal and state regulations. Additional details and their disposal are provided in the KRRC's Hazardous Material Management Plan (Appendix B: *Definite Plan – Appendix O3*) and discussed in Section 3.21 *Hazards and Hazardous Materials* of this EIR.

2.7.1.3 Copco No. 2 Dam and Powerhouse

Deconstruction Activities

The KRRC's Proposed Project would remove the Copco No. 2 Dam, the unnamed reservoir associated with the Copco No. 2 Dam (hereinafter referred to as Copco No. 2 Reservoir), the Copco No. 2 Powerhouse, and their associated structures and equipment (Table 2.7-4). Additional details are presented in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)*. The KRRC proposes to remove the Copco No. 2 dam, the associated structures, and drain the reservoir in dam removal year 2 by lowering the reservoir water surface elevation, constructing temporary cofferdams to dry out sections of the construction area, removing the structures in sections under dry conditions, and restoring the dam site after the structures are removed.

The KRRC proposes to begin preparing for deconstruction of Copco No. 2 Dam on about May 1 of dam removal year 2 by closing the caterpillar gate at the power penstock intake structure to stop releases to Copco No. 2 Powerhouse and cease power generation. Controlled releases would be made through the gated spillway during the low flow period to draw the reservoir down from reservoir water surface elevation 2,486.5 feet to reservoir water surface elevation 2,481.5 feet in one day using the two right-hand side spillway gates.

The KRRC's Proposed Project would begin physical deconstruction of Copco No. 2 Dam with the removal of equipment and the concrete pad from the dike crest to provide room for demolition equipment and for construction access as described in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)*. A temporary cofferdam would be constructed within the river channel to isolate the two left-hand spillway bays and the power penstock intake structure (Figure 2.7-2, tile 1 of 4). The spillway gates, hoists, bridge deck, and concrete crest structure would be removed to elevation 2,457.5 feet in the dry. The spillway gates and hoists would be removed by a large crane for loading onto highway trucks and heavy-haul trailers. The reinforced concrete spillway bridge deck and piers could be removed in pieces by hydraulic excavators, or in sections by conventional or diamond-wire sawcutting. Removal of the remainder of the spillway concrete structure would likely be performed using conventional drilling and blasting methods as each portion is dewatered.

For the conveyance tunnel, trash racks, a caterpillar gate, and a concrete structure would be removed, and the tunnel would be plugged "in the dry" (i.e., dewatered conditions). The left river bank would be restored, the temporary cofferdam would be removed, and the reservoir water surface would be allowed to stabilize at approximately elevation 2,463.5 through the left-hand dam breach.

Subsequently, the KRRC proposes a second temporary cofferdam would be constructed within the river channel to isolate the three remaining spillway bays on the right-hand side as described in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)*. The spillway gates, hoists, bridge deck, and concrete crest structure would be removed to elevation 2,457.5 feet in the dry. Removal methods for the right-hand side spillway section would be similar to the removal of the left-hand side spillway section with a large crane removing the spillway gates and hoists, hydraulic excavators or sawcutting removing the reinforced spillway bridge deck and piers in pieces, and conventional drilling and blasting for the remainder of the spillway concrete structure as each portion is dewatered. After removal of the right-hand side spillway section is completed, the earth embankment and temporary cofferdam would be removed.

Similar to cofferdams at Copco No. 1, the Copco No. 2 cofferdams would be constructed using concrete rubble from Copco No. 1 Dam, plus borrow material from the existing site located on the hillslope above Copco No. 1 village that was used during dam construction and could be reactivated for cofferdam source material.

Table 2.7-4. Copco No. 2 Dam and Powerhouse Removal Proposal.

Feature[1]	KRRC Proposal
Concrete Dam	Remove
Spillway Gates, Structure	Remove
Power Penstock Intake Structure and Gate	Remove
Tunnel Portals[2]	Retain the tunnel, plug the tunnel portals with reinforced concrete
Embankment Section and Right Sidewall	Remove
Basin Apron and End Sill	Remove
Remnant Cofferdam Upstream of Dam	Remove
Wood-stave Penstock	Remove
Concrete Pipe Cradles	Remove
Steel Penstock, Supports, Anchors	Remove
Powerhouse (including mechanical and electrical equipment)	Remove
Powerhouse Hazardous Materials (transformers, batteries, insulation)	Remove
Powerhouse Control Center Building, Maintenance Building, Oil and Gas Storage Building	Remove
69-kV Transmission Line, 0.14 mile	Remove
Switchyard	Retain – the switchyard is not part of the Proposed Project
Tailrace Channel	Backfill
Copco Village (including former cookhouse/bunkhouse, garage/storage building, bungalow with garage, 3 modular houses, 4 ranch-style houses, and school house/community center)	Remove

[1] Feature as presented in Appendix B: *Definite Plan – Table 5.4-1*.
[2] Refers to Conveyance Tunnel and Overflow Spillway Tunnel shown in Figure 2.7-2.

The KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)* proposes that removal of the wooden-stave penstock and Copco No. 2 Powerhouse (Figure 2-7.2, tiles 2 of 4 and 3 of 4) would occur following closure of the caterpillar gate and shutdown of the powerhouse on or near May 1 of dam removal year 2. The wooden-stave penstock would be plugged with reinforced concrete at the tunnel portal at each end of the penstock. A third cofferdam would be constructed in the Copco No. 2 Powerhouse tailrace channel for removal of the powerhouse in the dry and during the low flow period. Sump pumps would be used to dewater the area and would be removed when they are no longer needed. The cofferdam would remain in place within the tailrace channel and would be backfilled to restore the left river bank. KRRC proposes to source cofferdam material from two areas near the powerhouse: (a) the wide bench/terrace where the maintenance shop to be demolished is located and/or (b) the toe of the hillslope nearest the powerhouse.

Site demobilization would occur after the dam site, staging areas, and concrete disposal site are restored, including topsoil and seed placement, where required as explained in the KRRC's Definite Plan (Appendix B: *Definite Plan – Section 5 Dam Removal Approach*) and the KRRC's Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*).

Construction Access and Road Improvements

The KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)* details several road improvements to facilitate access for dam removal vehicles and equipment, to ensure road safety for the public during dam deconstruction activities. The KRRC proposes to return roads used for the Proposed Project to an acceptable state, including mitigating any potential reduction in function attributed to the dam removal work. The majority of the construction access roads and associated improvements that would be required for removal of Copco No. 2 Dam and Powerhouse would be the same as for the Copco No. 1 Dam and Powerhouse (Figure 2.7-2). In addition to the road improvements, the removal of Copco No. 2 Powerhouse and the wooden-stave penstock specifically would require one bridge replacement, road surface maintenance as necessary during or post-construction, temporary traffic controls during road improvements, and construction signage for one road. The construction access roads for the removal of Copco No. 2 Powerhouse and the wooden-stave penstock are shown within the Limits of Work on Figure 2.7-2, tiles 2 of 4 and 3 of 4. The delivery of off-road construction equipment, including cranes, large excavators, loaders, and large capacity dump trucks would be by special tractor-trailer vehicles operating under "wide load" restrictions and at appropriate speeds.

Staging Areas and Disposal Sites

The KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)* proposes the staging areas and disposal sites for removal of Copco No. 2 Dam and Powerhouse would be the same as for Copco No. 1 Dam and Powerhouse. The staging areas and disposal sites for removal of Copco No. 2 Powerhouse and the wooden-stave penstock are shown within the Limits of Work on Figure 2.7-2, tiles 2 of 4 and 3 of 4. Equipment staging areas for removal of the wooden-stave penstock and the powerhouse would be as shown in Figure 2.7-2, tile 3 of 4. Concrete rubble generated from removal of Copco No. 2 Dam would be permanently buried (without rail and rebar) in the disposal site described for Copco No. 1 Dam. After placement of the concrete debris, earth materials generated from removal of Copco No. 2 Dam would be used as cover over the concrete rubble at the disposal site. The disposal site would then be graded, sloped for drainage, and hydroseeded as detailed in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)*.

Erosion monitoring would be completed on an annual basis for 5 years following placement to assess whether significant erosion and slope deterioration has occurred. If significant erosion occurs, the eroded area shall be repaired.

Imported Materials and Waste Disposal

Imported materials and waste disposal for removal of Copco No. 2 Dam and Powerhouse would be the same as for Copco No. 1 Dam and Powerhouse (Section 2.7.1.2 *Copco No. 1 Dam and Powerhouse*). In Table 2.7-5 below are the estimated quantities of materials generated during removal of Copco No. 2 Dam and Powerhouse, numbers of truck trips, and approximate haul distances for waste disposal in miles per round trip (miles RT) based on the information itemized in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)* and updated by KRRC based on further investigations since the release of the Definite Plan (S. Leonard, AECOM as KRRC Technical Representative, pers. comm., November 2018).

Table 2.7-5. Estimated quantities of waste disposal for full removal of Copco No. 2 Dam.

Waste Material	In-Situ Quantity	Bulk Quantity[1]	Disposal Site[2]	Peak Daily Trips[3]	Total Trips[4]
Earth	1,800 yd^3	2,100 yd^3	On-site	2 units/50 trips (unpaved road)	100 trips (2 miles RT)
Concrete at Dam	6,600 yd^3	8,500 yd^3	On-site	2 units/50 trips (unpaved road)	390 trips (2 miles RT)
Concrete at Powerhouse	6,300 yd^3	8,100 yd^3	Tailrace area	Dispose at site (no hauling)	0
Rebar at Dam	300 tons	--	Transfer station near Yreka, CA	1 units/5 trips (Copco Road)	30 trips (62 miles RT)
Rebar at Powerhouse	100 tons	--	Transfer station near Yreka, CA	1 units/5 trips (Copco Road)	10 trips (56 miles RT)
Mech. and Elec. at Dam	300 tons	--	Transfer station near Yreka, CA	1 units/5 trips (Copco Road)	40 trips (62 miles RT)
Mech. and Elec. at Powerhouse	2,600 tons	--	Transfer station near Yreka, CA	1 units/5 trips (Copco Road)	320 trips (56 miles RT)
Building Waste	14 buildings 43,000 ft^2	9,500 yd^3	Transfer station near Yreka, CA	1 units/5 trips (Copco Road)	480 trips (56 miles RT)
Treated Wood (Wood-Stave Penstock)	700 tons	--	Landfill near Anderson, CA	1 units/2 trips (Interstate 5)	70 trips (280 miles RT)
Power Lines	6.7 miles of 69-kV and smaller	--	Transfer station near Yreka, CA	--	7 trips (62 miles RT)
Wood Utility Poles	100 poles	--	Transfer station near Yreka, CA	--	7 trips (62 miles RT)

Source: S. Leonard, AECOM as KRRC Technical Representative, pers. comm., November 2018

1 Volumes increased 30 percent for concrete rubble from reinforced concrete and 20 percent for loose earth materials.

2 Currently, solid waste is transferred approximately 45 miles from the Yreka Transfer Facility to the Dry Creek Landfill facility near White City Oregon.

3 Peak daily trips for each site are based on the number of vehicles (units) shown, operating within one 8-hour shift.

4 Total trips of earthfill or concrete assume off-highway articulated trucks with a nominal load capacity of 22 yd^3. Total trips for hauling rebar using truck tractor-trailers is based on 10 tons per trip. Total trips for hauling mechanical and electrical items using truck tractor-trailers is based on 8 tons per trip. Total trips for building waste using truck tractor-trailers is based on 10 yd^3 per trip. Mileage is reported in miles per round trip (miles RT).

Potential hazardous materials at Copco No. 2 Dam and Powerhouse include creosote-treated wooden-stave (redwood) penstock, treated wood, asbestos, batteries, bearing and hydraulic control system oils, flammable and nonflammable gases, flammable and combustible liquids, mercury in older light switches, contaminated soils near painted exterior equipment, coatings containing heavy metals in the powerhouse, on the exterior surfaces of the steel penstocks, air vents, and other painted materials, a fueling facility containing above-ground gasoline (1,000 gallon) and diesel (500 gallon) tanks, and underground septic systems used for seven residences near the powerhouse. All hazardous materials would be handled and disposed of as hazardous waste at an approved hazardous waste facility in accordance with applicable federal and state regulations. Additional details are provided in the KRRC's Hazardous Material Management Plan (Appendix B: *Definite Plan – Appendix O3*) and discussed in Section 3.21 *Hazards and Hazardous Materials* of this EIR.

2.7.1.4 Iron Gate Dam and Powerhouse

Deconstruction Activities

The KRRC's Proposed Project would remove the Iron Gate Dam, the Iron Gate Powerhouse, and associated structures and equipment as described in the KRRC's Definite Plan (Appendix B: *Definite Plan – Section 5 Dam Removal Approach)*. The KRRC proposes removal between June 1 and September 30 of dam removal year 2 by lowering the reservoir water surface elevation, removing the fish facilities near the base of the dam, excavating the dam, removing the Iron Gate Dam associated structures and their equipment summarized in Table 2.7-6, and restoring the dam site after construction activities are completed. Modifications to Iron Gate Hatchery, including removal of the fish trapping and holding facilities located on random fill downstream of the dam, would be completed prior to drawdown activities so that Iron Gate Hatchery operations would continue during reservoir drawdown.

Features to be removed or retained for Iron Gate Dam and Powerhouse are summarized in Table 2.7-6 and are discussed briefly below. Additional details are presented in the KRRC's Definite Plan (Appendix B: *Definite Plan – Section 5 Dam Removal Approach)*.

Table 2.7-6. Iron Gate Dam and Powerhouse Removal and Decommissioning Proposal.

Feature[1]	KRRC Proposal
Embankment Dam, Cutoff Walls	Remove
Penstock Intake Structure and Footbridge	Remove
Penstock	Remove
Water Supply Pipes and Aerator	Remove
Spillway Structure	Retain and bury to extent practicable
Powerhouse (including mechanical and electrical equipment)	Remove
Powerhouse Hazardous Materials (transformers, batteries, insulation)	Remove
Powerhouse Tailrace Area	Backfill
Fish Trapping and Holding Facilities on Dam (fish ladder and trapping and holding facilities)	Remove
Iron Gate Fish Hatchery	Fish ladder and holding tanks at the toe of the dam would be removed, as would the cold-water supply for the hatchery; these facilities would be relocated such that the hatchery remains operational for eight years after the removal of Iron Gate Dam (see also Section 2.7.6)
Switchyard	Remove
69-kV Transmission Line, 0.5 mi	Remove
Diversion Tunnel Intake Structure and Footbridge	Remove
Diversion Tunnel and Portals	Retain the tunnel, plug the tunnel portals with reinforced concrete

Feature[1]	KRRC Proposal
Diversion Tunnel Control Tower, Hoist, and Gate	Remove above finished-grade portion and retain below finished-grade portion
Additional Ancillary Facilities (e.g., Communication Buildings, Restrooms and Two Residences)[3]	Remove

[1] Feature as presented in Appendix B: *Definite Plan – Table 5.5-1*.
[2] Features to be partially removed would involve long-term maintenance costs, including the preservation of any exposed items with coatings containing heavy metals.
[3] These facilities are discernible in Figure 2.7-4 although they not itemized in Appendix B: *Definite Plan – Table 5.5-1.*

The KRRC proposes to remove Iron Gate Dam and its associated facilities following spring runoff of dam removal year 2 (approximately June 1). The embankment dam crest would be retained at a level needed for flood protection, with a minimum flood release capacity of approximately 7,000 cfs in July (reservoir water surface elevation 2,242.3 feet) and 3,000 cfs in August and September (reservoir water surface elevation 2,194.3 feet), in order to accommodate the passage of at least a 1 percent probable flood for that time of year. Excavation of the embankment section at Iron Gate Dam would not begin before June 1 of dam removal year 2, and it would be complete by September 30 to minimize the risk of flood overtopping. During excavation, rockfill would be temporarily stockpiled for placement on the downstream slope of a temporary cofferdam. Throughout excavation, access would be provided to the gate control house at the base of the intake tower for flow control.

The fish hatchery facilities near the downstream toe of embankment, including the fish ladder and the holding tanks, would be removed once the area is dry. The water supply features for the fish hatchery facilities would be removed as well. Note: modifications to Iron Gate Hatchery would be completed prior to drawdown activities so that Iron Gate Hatchery operations would continue during reservoir drawdown.

A cofferdam would be constructed in the tailrace channel to facilitate removal of the Iron Gate Powerhouse. The cofferdam would be comprised of remaining portions of the Iron Gate Dam embankment (i.e., the dam embankment would be excavated height wise and widthwise until only the cofferdam remains). Sump pumps would be used to dewater the area and then would be removed following construction activities. The Iron Gate cofferdam would be breached prior to the J.C. Boyle cofferdam-breach so that the sediment released by the upstream breach is not trapped at the Iron Gate cofferdam and subsequently released in a larger, combined event. Breaching of the Iron Gate cofferdam would occur by notching below the reservoir level (expected to be below reservoir water surface elevation 2,186.3 feet). The maximum breach outflow from the cofferdam at Iron Gate Dam is estimated to be approximately 5,000 cfs. Following the cofferdam breach, any remaining embankment materials would be removed from the river channel while the river channel is wet, during the low flow period. The diversion tunnel intake structure and topple gate control tower would be removed and the tunnel and shaft portals would be plugged with reinforced concrete. The cofferdam materials would then be removed.

As explained in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)* and the KRRC's Reservoir Area Management Plan (Appendix B: *Definite Plan − Appendix H*), site demobilization would occur after restoration of the dam site, right abutment disposal site, staging areas and concrete disposal site. This restoration would include topsoil and seed placement where appropriate.

Construction Access and Road Improvements

An overview of construction access roads required for removal of Iron Gate Dam and Powerhouse, and associated work, are shown in Figure 2.7-4. Existing conditions of the highways, local roads, and structures to be used were observed in the field to identify deficiencies and determine if improvements are necessary for mobilization and/or hauling during construction and demolition activities. The KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)* details several road improvements to facilitate access for dam removal vehicles and equipment and to ensure public safety during dam deconstruction activities. The KRRC proposes to return roads used for the project to an acceptable state, including mitigating any potential reduction in function attributed to the dam removal work.

The road improvements identified for the removal of Copco No. 1 are also required for access to Iron Gate Dam (see Section 2.7.1.2 *Copco No. 1 Dam and Powerhouse – Construction Access and Road Improvements*). In addition, the Iron Gate Dam removal would require surface maintenance of two roads during or post-construction, temporary traffic controls during road improvements, and construction signage at one bridge. The delivery of off-road construction equipment, including cranes, large excavators, loaders, and large capacity dump trucks would be performed by special tractor-trailer vehicles operating under "wide load" restrictions and would travel at appropriate speeds.

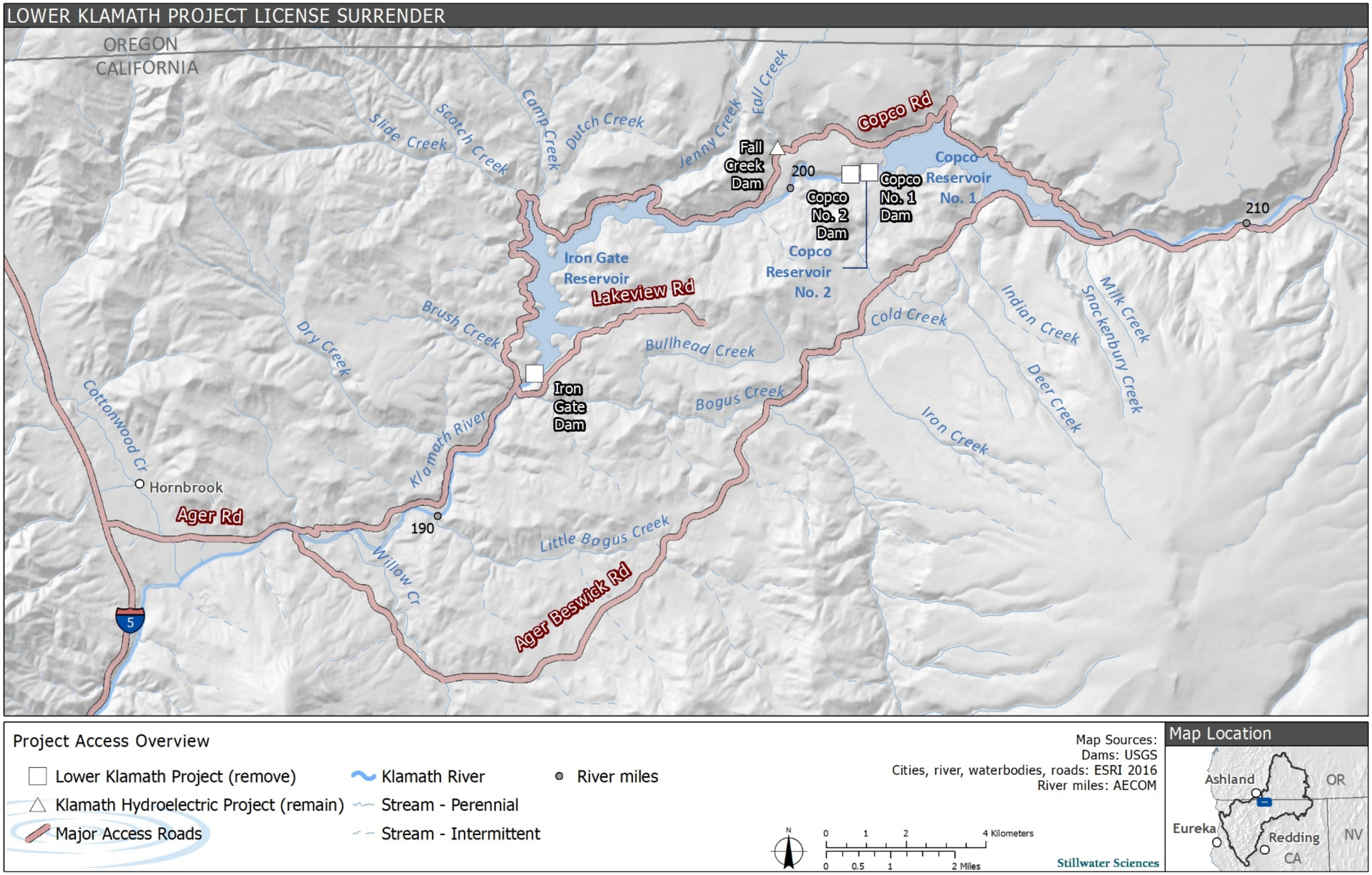


Figure 2.7-3. Lower Klamath Project Access Overview.

Staging Areas and Disposal Sites

The KRRC's Proposed Project construction staging areas and a disposal site for removal of Iron Gate Dam and Powerhouse are shown within the Limits of Work in Figure 2.7-4 and detailed further in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)*. Equipment or material staging areas at the Iron Gate Dam site include 7.7 acres above the left abutment of the dam, 1.4 acres southwest of the disposal site, and 1.4 acres northeast of the disposal site (Figure 2.7-4, tiles 1 of 2, 2 of 2). A 1.9-acre area near the right abutment downstream of the dam (currently occupied by two PacifiCorp residences and outbuildings) could be used for construction offices. The staging areas would be prepared by clearing vegetation and minor grading, and would be restored by minor grading, decompaction, and hydroseeding consistent with the upland planting zones in the KRRC's Reservoir Area Management Plan (Appendix B: *Definite Plan − Appendix H*). Staging of mechanical and electrical debris would likely occur at the downstream toe of the dam in the parking area and the area of the fish collection facilities (Figure 2.7-4, tile 1 of 2).

The KRRC proposes that most of the earth materials and all of the concrete rubble generated from removal of the Iron Gate facilities would be permanently buried on-site in a disposal area covering approximately 36 acres located on PacifiCorp property approximately 1 mile south of the dam (Figure 2.7-4, tile 1 of 2). The disposed material would be placed to a maximum fill height of about 50 feet and graded to conform to the existing topography. Concrete rubble would be covered by a minimum of 3 feet of earth materials. Final grading of the disposal site would include relatively flat slopes (8H:1V to 5H:1V) to reduce the potential for erosion. Preparation of the disposal site would require clearing of vegetation and stripping and stockpiling of topsoil for later use during restoration of the disposal site. After final grading for drainage and aesthetics, the disposal site would be covered with topsoil and hydroseeded. Erosion monitoring would be completed on an annual basis for five years following placement to assess whether significant erosion and slope deterioration has occurred. If significant erosion occurs, the eroded area shall be repaired to the satisfaction of the appropriate regulatory agency. Additional details for the KRRC's Proposed Project disposal sites for Iron Gate Dam are provided in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)*.

Earth materials excavated from the dam would be placed in the existing concrete-lined side-channel spillway, chute, and flip-bucket terminal structure (located on the right abutment of the dam) to the extent practicable for restoration. Finished grades of the backfill would be no steeper than approximately 4H:1V. Following backfilling, the uphill portion of the spillway excavation would still be visible. After final grading for drainage and aesthetics, the disposal site would be covered with topsoil and hydroseeded. Compaction other than by equipment travel would not be necessary.

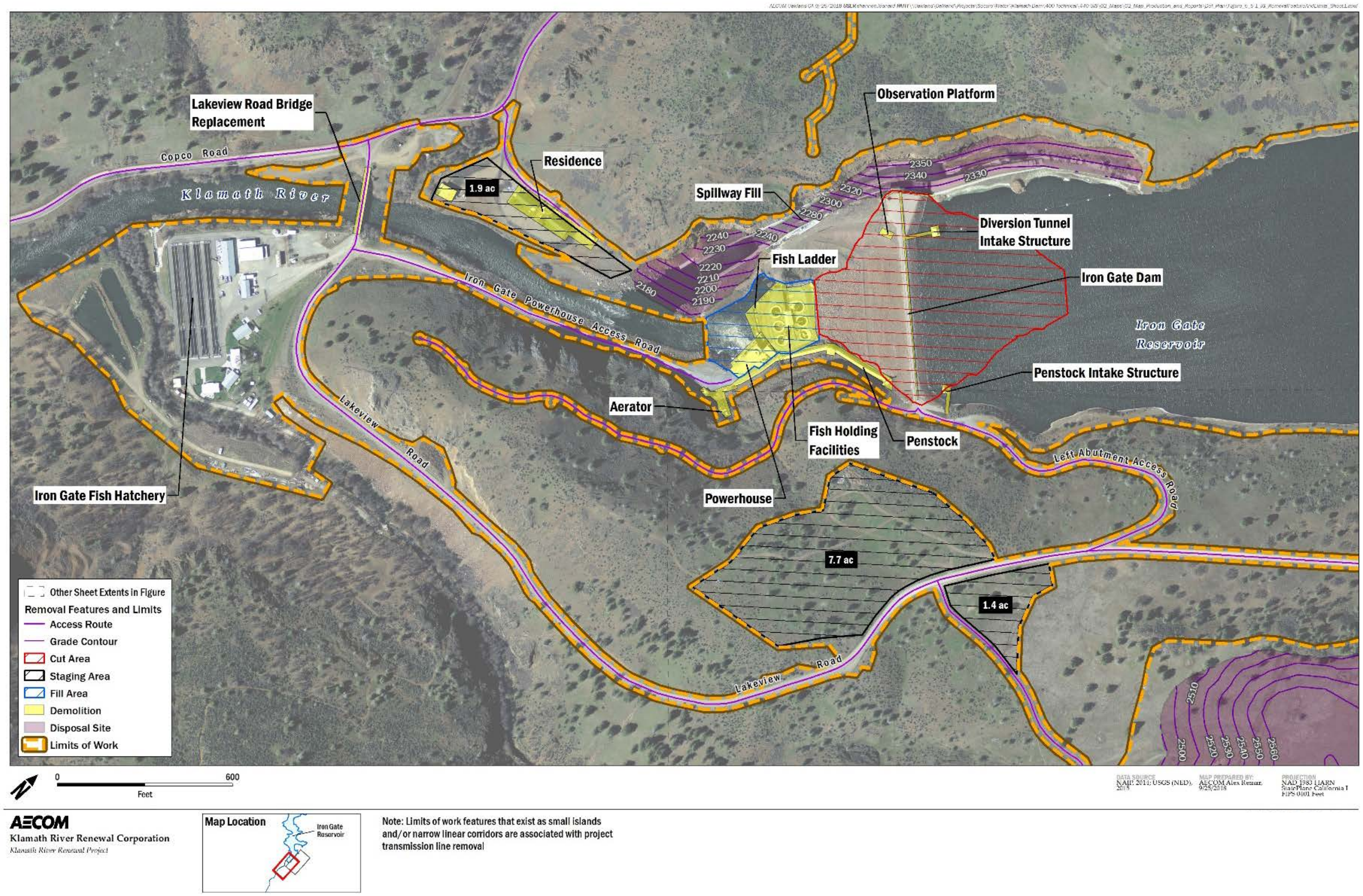


Figure 2.7-4. Iron Gate Dam Removal Features and Limits of Work (1 of 2).

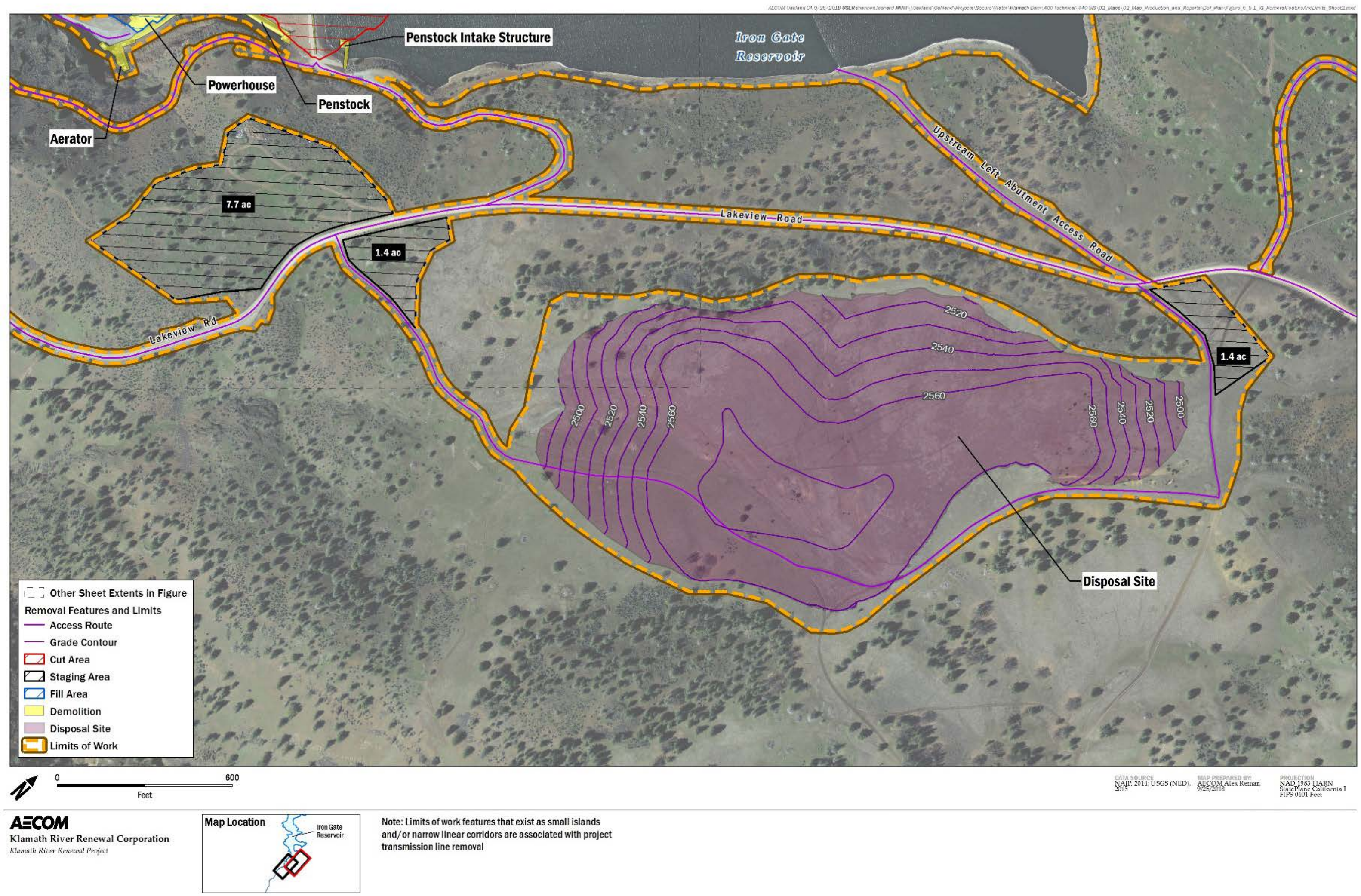


Figure 2.7-4. Iron Gate Dam Removal Features and Limits of Work (2 of 2).

Imported Materials and Waste Disposal

KRRC proposes to import some materials to support dam removal. Those materials include gravel surfacing from a commercial quarry for temporary haul roads, topsoil, seed and mulch materials, and minor quantities of ready-mix concrete and reinforcing steel from local commercial sources for tunnel plugs. Additional imported materials would be necessary for road surface improvements, signage, and the bridge replacement. The KRRC's Proposed Project modification of the diversion tunnel and installation of a new gate in the existing gate structure would require importing mechanical equipment, as well as additional reinforcing steel and potentially ready-mix concrete for lining the diversion tunnel if inspections determine it is necessary.

Estimated quantities of materials generated during removal of Iron Gate Dam and Powerhouse, numbers of truck trips, and approximate haul distances for waste disposal in miles per round trip (miles RT) are detailed in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)* and updated information on waste disposal details has been provided by KRRC based on further investigations since the Definite Plan was released (S. Leonard, AECOM as KRRC Technical Representative, pers. comm., November 2018). Please see Table 2-7.7 for a summary of the updated information on waste disposal. Excavated earth would be disposed on-site at either the spillway fill area or the main disposal site. Excavated concrete would be placed in the on-site disposal site. Rail and reinforcing steel would be separated from the concrete prior to placement in the disposal area and hauled to a local recycling facility. All mechanical and electrical equipment would be hauled to a suitable commercial landfill or salvage collection point (e.g., Yreka Transfer Station, Yreka, CA).

Table 2.7-7. Estimated quantities of waste disposal for full removal of Iron Gate Dam.

Waste Material	In-Situ Quantity	Bulk Quantity[1]	Disposal Site[2]	Peak Daily Trips[3]	Total Trips[4]
Earth	155,000 yd^3	170,000 yd^3	On-site spillway fill area	12 units/ 800 trips (unpaved road)	8,640 trips (0.5 miles RT)
Earth	912,000 yd^3	1,087,000 yd^3	On-site	12 units/ 800 trips (unpaved road)	48,640 trips (2 miles RT)
Concrete	15,800 yd^3	20,700 yd^3	On-site	2 units/ 50 trips (Copco Road)	950 trips (2 miles RT)
Rebar	1,000 tons	--	Transfer station near Yreka, CA	1 units/5 trips (Copco Road)	100 trips (54 miles RT)
Mech. and Elec.	1,200 tons	--	Transfer station near Yreka, CA	1 units/5 trips (Copco Road)	150 trips (54 miles RT)
Building Waste	8 buildings; 10,400 ft^2	2,300 yd^3	Transfer station near Yreka, CA	1 units/5 trips (Copco Road)	120 trips (54 miles RT)
Power lines	0.5 miles of 69-kV	--	Transfer station near Yreka, CA	--	1 trip (54 miles RT)

Waste Material	In-Situ Quantity	Bulk Quantity[1]	Disposal Site[2]	Peak Daily Trips[3]	Total Trips[4]
Wood Utility Poles	30 poles	--	Transfer station near Yreka, CA	--	2 trips (54 miles RT)

Source: S. Leonard, AECOM as KRRC Technical Representative, pers. comm., November 2018

1 Volumes increased 30 percent for concrete rubble and 20 percent for loose earth materials.

2 Currently, solid waste is transferred approximately 45 miles from the Yreka Transfer Facility to the Dry Creek Landfill facility near White City Oregon.

3 Peak daily trips for each site are based on the number of vehicles (units) shown, operating within one 8-hour shift.

4 Total trips of earthfill or concrete assume off-highway articulated trucks with a nominal load capacity of 22 yd^3. Total trips for hauling rebar using truck tractor-trailers is based on 10 tons per trip. Total trips for hauling mechanical and electrical items using truck tractor-trailers is based on 8 tons per trip. Total trips for building waste using truck tractor-trailers is based on 10 yd^3 per trip. Mileage is reported in miles per round trip (miles RT).

Potential hazardous materials at Iron Gate Dam and Powerhouse include asbestos, batteries, bearing and hydraulic control system oils, treated wood, flammable and nonflammable gases, flammable and combustible liquids, mercury in older light switches, contaminated soils near painted exterior equipment, coatings containing heavy metals in the powerhouse, on the exterior surfaces of the steel penstocks, air vents, and other painted materials, and underground septic systems in use for the restroom and two residences near the dam. All hazardous materials would be handled and disposed of as hazardous waste at an approved hazardous waste facility in accordance with applicable federal and state regulations. Additional details and their disposal are provided in the KRRC's Hazardous Material Management Plan (Appendix B: *Definite Plan – Appendix O3*) and disposal is discussed in Section 3.21 *Hazards and Hazardous Materials* of this EIR.

2.7.1.5 Estimated Deconstruction Workforce and Work Shifts

The size of the deconstruction workforce at each site would vary, and the peak times for construction would be staggered. Table 2.7-8 presents a summary of the projected workforce needed for the Proposed Project.

Table 2.7-8. Workforce Projections for Dam Removal for the Proposed Project.

Dam	Estimated Average Deconstruction Workforce	Duration	Estimated Peak Workforce	Peak Period
J.C. Boyle*	30 people	9 months	45 people	Jun−Sep dam removal year 2
Copco No. 1	35 people	12 months	55 people	Apr–Nov dam removal year 2
Copco No. 2	30 people	6 months	40 people	Apr−Sept dam removal year 2
Iron Gate	40 people	10 months	80 people	Jun−Sep dam removal year 2

* J.C. Boyle Dam is included in this table as some of the traffic flow may use roads in California (e.g., I-5 to OR 66)

Source: Appendix B: *Definite Plan – Section 5*

The Proposed Project includes two shifts of workers to deconstruct each of the three California dams (Copco No. 1, Copco No. 2, and Iron Gate). At each dam the first work shift would be 6 a.m. to 4 p.m. and the second work shift would be 6 p.m. to 4 a.m. This would allow for 2-hour breaks between shifts for refueling and maintenance. Blasting would occur at each dam (see Sections 2.7.1.2 through 2.7.14) and would be restricted to the period from 8 a.m. to 6 p.m. (S. Leonard, AECOM as KRRC Technical Representative, pers. comm., September 2018).

2.7.2 Reservoir Drawdown

The KRRC proposes that drawdown of J.C. Boyle, Copco No. 1 (Copco Lake), and Iron Gate reservoirs would take place between November 1 of dam removal year 1 and March 15 of dam removal year 2, as detailed in the KRRC's Reservoir Drawdown and Diversion Plan (Appendix B: *Definite Plan*). Copco No. 1 Reservoir drawdown would occur from November 1 of dam removal year 1 to March 15 of dam removal year 2, while the drawdown of J.C. Boyle and Iron Gate reservoirs would occur from January 1 to March 15 of dam removal year 2. Drawdown of Copco No. 2 Reservoir would not be necessary until after Copco No. 1 Dam has been breached to final grade in May of dam removal year 2 because it will not impound a significant volume of water or sediment.

KRRC proposes to begin drawdown of Copco No. 1 Reservoir beginning on November 1 of dam removal year 1. Copco No. 1 is the largest Lower Klamath Project reservoir. The drawdown is expected to be completed by March 15 of dam removal year 2, at which point the Klamath River would most likely re-occupy its historical active channel (Figures 2.7-5 and 2.7-6). The proposed drawdown period is integral to the project in that it would provide for power generation revenues for the period specified in the KHSA and it would undertake reservoir drawdown at a period when winter flows and levels of suspended sediment are naturally high in river and only a portion of fish populations are likely to be present in the mainstem Klamath River immediately downstream of the Hydroelectric Reach (Figure 2.7-1). Most fish are in tributaries or further downstream during the period when mainstem concentrations of suspended sediments due to dam removal would be the highest, and in general many native aquatic species are adapted to naturally high levels of suspended sediment during the winter through avoidance and tolerance behaviors. Additional proposed measures to reduce sediment-related impacts to salmonids during and following Proposed Project drawdown activities are discussed in Section 2.7.8.1 *Aquatic Resource Measures*.

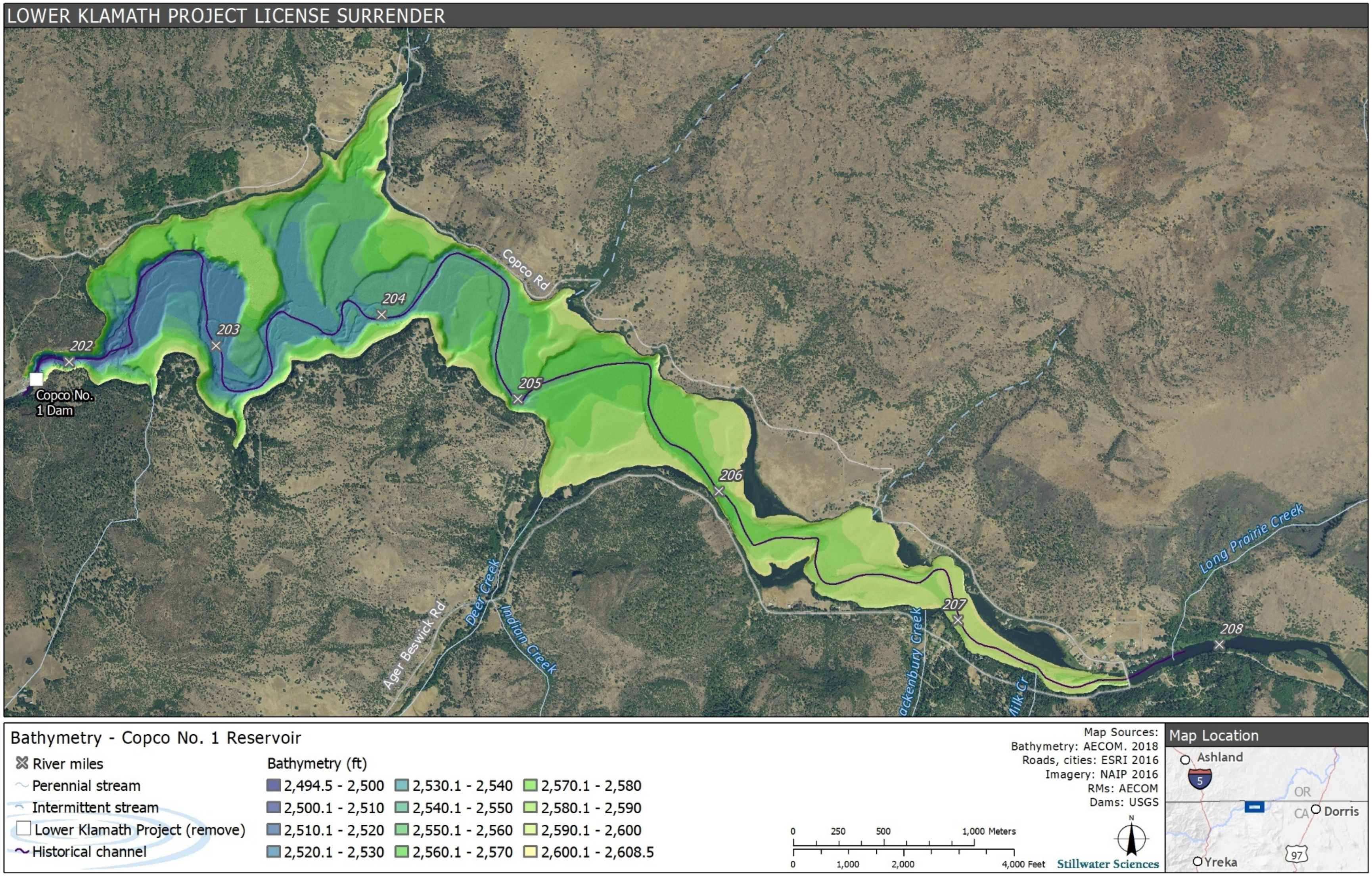


Figure 2.7-5. Copco No. 1 Reservoir Bathymetry.

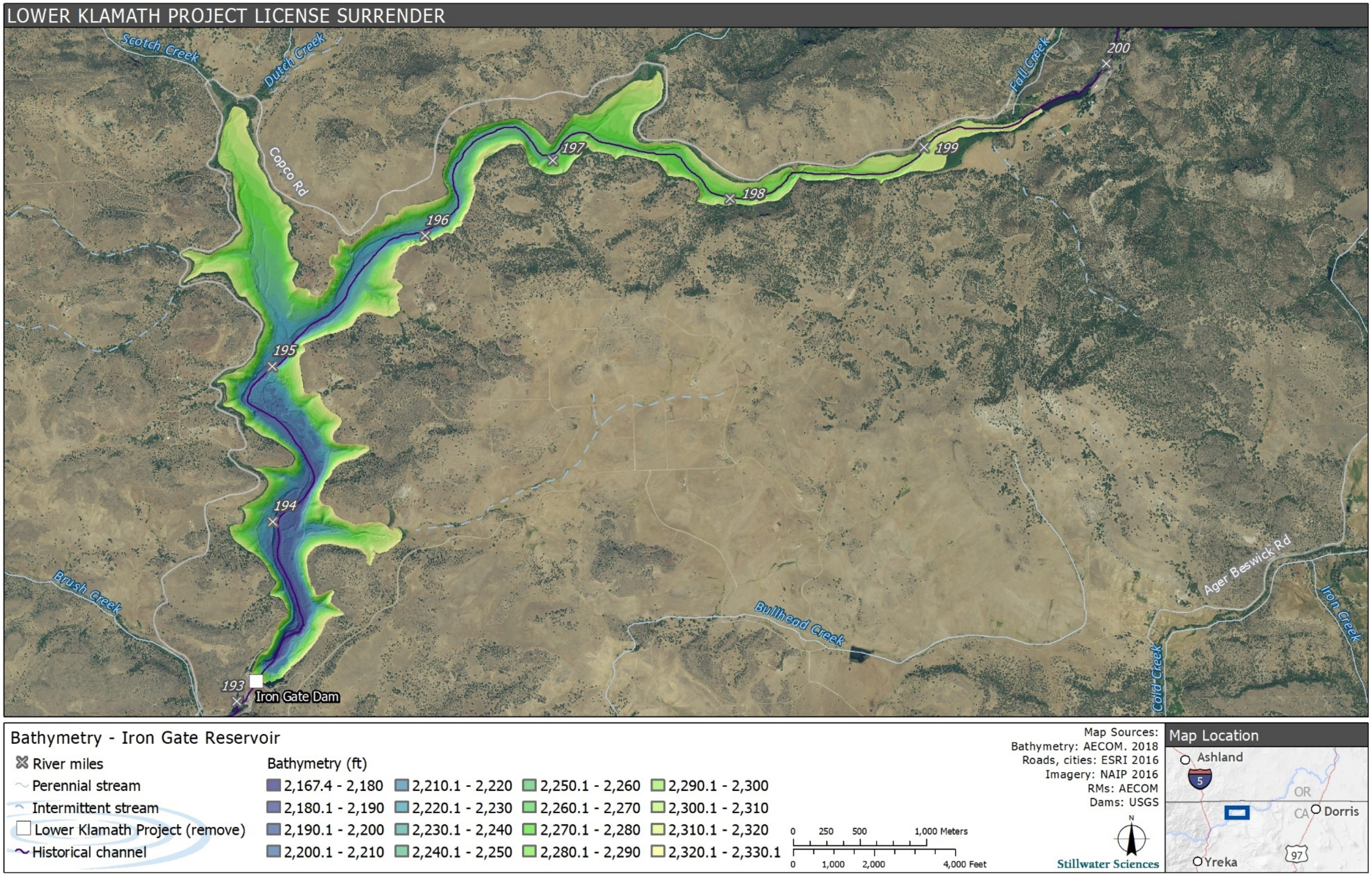


Figure 2.7-6. Iron Gate Reservoir Bathymetry.

For J.C. Boyle and Iron Gate Dams, power generation would end on January 1 of dam removal year 2. Power generation at Copco No. 1 Dam would end after the reservoir reaches the minimum operating level at reservoir surface elevation 2,604.5 feet, in November of dam removal year 1. To offset lost revenue from shutting down Copco No. 1 Powerhouse prior to January 1 of dam removal year 2, power generation at Copco No. 2 Dam could continue for up to four months after January 1 of dam removal year 2 (or until May 1 of dam removal year 2), if Copco No. 2 power generating equipment proves capable of operating under sediment-laden flow conditions. This EIR assumes continued production at Copco No. 2, as the need to halt production is speculative. If the Copco No. 2 Powerhouse is not capable of operating under sediment-laden conditions, then drawdown of this reservoir would still use the penstock. Reservoir drawdown below the minimum operating level would commence at each dam once power generation has ceased.

For all reservoirs, the minimum drawdown rate would be 2 feet per day and the maximum drawdown rate would be 5 feet per day, until drained. Although the new gates at Copco No. 1 and Iron Gate dams would be able to accommodate higher drawdown rates, the maximum drawdown rate of 5 feet per day is proposed by KRRC as a conservative value based upon slope stability analyses conducted for each of the Lower Klamath Project reservoirs.

According to the KRRC's Reservoir Drawdown and Diversion Plan (Appendix B: *Definite Plan*), the drawdown of Copco No. 1 and Iron Gate reservoirs would be managed through automated gate control systems with operator oversight, where inputs to determine the amount of gate opening at each reservoir would include continuous measurement of reservoir levels by remote sensor. The gate control system would incrementally open (or close) the gate to increase (or decrease) flow through the diversion tunnel (14-foot by 16-foot) to maintain the reservoir drawdown at an approximately constant rate. This will allow the project to maintain embankment and reservoir rim stability even as reservoir inflows vary. For example, flows may vary due to storms or changes in upstream reservoir releases.

Once the Copco No. 1 and Iron Gate reservoirs have been fully drawn down, the gates would remain in the fully open position to limit reservoir refilling during storm events. Any storm inflows large enough to cause partial refilling of the reservoir would pass through the spillway, unless spillway outflows reach a pre-determined level (13,000 cfs for Copco No. 1 and 15,000 cfs for Iron Gate). If these levels are reached the gates would be closed until the flow drops below this level to avoid high water levels that would impact the Copco No. 2 Powerhouse (which could still be operating until May 1).

During dam removal, the drawdown of Iron Gate Reservoir would need to maintain enough capacity to pass a 1 percent probable flood for that time of the year to reduce the potential for flow to overtop the dam embankment. The following minimum flood release capacities by month would be maintained during drawdown of Iron Gate Reservoir:

- June—approximately 7,700 cfs
- July—approximately 7,000 cfs
- August/September—approximately 3,000 cfs

Drawdown of J.C. Boyle Reservoir would be initially controlled by the capacity of the opened spillway, followed by the capacity of the opened power intake. Once the reservoir stabilizes with spillway and intake fully open, the diversion culverts would be opened, and drawdown would only be controlled by the capacity of the diversion culverts, which is approximately 6,000 cfs at the spillway elevation. For storm flows that refill the reservoir before deconstruction, higher discharge rates would be experienced over the spillway. Drawdown of J.C. Boyle Reservoir would maintain a minimum flood release capacity of 3,500 cfs, in order to accommodate the passage of at least a 1 percent probable flood for September and prevent flood overtopping of the dam embankment during dam removal.

The resulting range of release flows due to drawdown of the three larger reservoirs is provided in Table 2-7.8. Release flows would add water to the otherwise existing flows in the river (i.e., Keno Reservoir releases and tributary inflows). The percent increase in the Klamath River caused by the minimum average and maximum average release flows compared to the 2-year and 10-year peak flows in the Klamath River at individual locations for each reservoir are also detailed in Table 2-7.8. The 2-year and 10-year peak flows are calculated from the available USGS flow gage data in the Klamath River below J.C. Boyle Dam for J.C. Boyle Reservoir, in the Klamath River downstream of Fall Creek at the upstream end of Copco No. 1 Reservoir, and in the Klamath River downstream of Iron Gate Dam for Iron Gate Reservoir. Details for the release flow modeling and the associated assumptions are provided in Section 3.6.5.1 *Flood Hydrology* of this EIR.

Table 2.7-9. Range of Release Flows from Reservoirs due to Drawdown.

Reservoir	Reservoir Depth[1] (feet)	Reservoir Volume[2] (acre-feet)	Minimum Average Release Flow (cfs)[3]	Minimum Average as Percent of 2-Year Peak Flow in Klamath River[4]	Minimum Average as Percent of 10-Year Peak Flow in Klamath River[5]	Maximum Average Release Flow (cfs)[6]	Maximum Average as Percent of 2-Year Peak Flow in Klamath River[4]	Maximum Average as Percent of 10-Year Peak Flow in Klamath River[5]
J.C. Boyle	41.5	2,267	19	0.4	0.2	138	3	1
Copco No. 1	111.5	33,724	288	5	3	762	13	7
Iron Gate	155	50,941	435	7	3	828	14	6

[1] Reservoir depth is the difference between the initial water surface elevation (normal operating level at J.C. Boyle or spillway elevation at Copco No. 1 and Iron Gate) and invert elevation of the reservoir diversion structure.

[2] Reservoir volume based on a 2003 bathymetric survey (Eilers and Gubala 2003).

[3] Minimum assumes 59 days to drain reservoir.

[4] 2-Year peak flow (4,736 cfs for J.C. Boyle, 5,974 cfs for Copco, and 5,942 cfs for Iron Gate) based on flood frequency results in the Klamath River below J.C. Boyle Dam for J.C. Boyle, in the Klamath River downstream of Fall Creek at the upstream end of Copco No. 1 Reservoir for the Copco No. 1, and in the Klamath River below Iron Gate Dam for Iron Gate. Period of record 1932–2017 for J.C. Boyle, 1932–2017 for Copco No. 1, and 1961–2016 for Iron Gate (AECOM et al. 2017).

[5] 10-Year peak flow (9,438 cfs for J.C. Boyle; 11,340 cfs for Copco; and 14,912 cfs for Iron Gate) based on flood frequency results in the Klamath River below J.C. Boyle Dam for J.C. Boyle, in the Klamath River downstream of Fall Creek at the upstream end of Copco No. 1 Reservoir for the Copco No. 1, and in the Klamath River below Iron Gate Dam for Iron Gate. Period of record 1932–2017 for J.C. Boyle, 1932–2017 for Copco No. 1, and 1961–2016 for Iron Gate (AECOM et al. 2017).

[6] Maximum assumes continuous 5 feet per day drawdown.

For J.C. Boyle Reservoir, the increase in flow to the Klamath River due to drawdown is expected to range from less than 1 percent to approximately 3 percent of the 2-year peak flow in the Klamath River below J.C. Boyle Dam. For Copco No. 1 Reservoir, the increase is expected to be between 5 percent and 13 percent of the 2-year peak flow in the Klamath River downstream of Fall Creek near the upstream end of Copco No. 1 Reservoir. The increase in flow from Iron Gate Reservoir is expected to be between 7 percent to 14 percent of the 2-year peak flow in the Klamath River below Iron Gate Dam. The maximum additional discharge in the Klamath River during drawdown of all the Lower Klamath Project reservoirs combined would be approximately 6,000 cfs. The minimum drawdown rate (and minimum average release flows) would likely occur during large storm events, such that the increase in flow to the river due to dam removal would be a small percentage of the 2-year peak flow (i.e., less than 1 to 7 percent) and an even smaller percentage of the 10-year peak flow (i.e., less than 1 to 3 percent) (Table 2.7-8). During dry periods, the reservoirs could be drawn down more quickly, resulting in a larger percent increase in Klamath River flows due to drawdown releases compared to the 2-year peak flow (i.e., 3 to 14 percent) or the 10-year peak flow (i.e., 1 to 7 percent). In comparison to the magnitude of the 2-year and 10-year peak flows, the incremental increase in flow due to reservoir drawdown would be minimal.

2.7.3 Reservoir Sediment Deposits and Erosion During Drawdown

J.C. Boyle, Copco No. 1, and Iron Gate reservoirs contain a significant amount of highly erodible sediment with approximately 1/3 to 2/3 of this sediment anticipated to be transported downstream with the water during drawdown. Over 80 percent of the reservoir sediments are fine sediment (organics, silts, and clays), which are expected to remain suspended in the Klamath River flow as it moves downstream and out into the Pacific Ocean. Coarse sediment (i.e., sand and larger) transport would occur more slowly depending on the hydrologic conditions with deposition of coarser sediment from dam removal expected to primarily occur between the reservoirs and the confluence of the Klamath River and the Shasta River. Sediment transport from dam removal would not be expected to have a significant effect on the streambed downstream of Shasta River (USBR 2012b).

Sediment in the Lower Klamath Project reservoirs is primarily composed of silt-sized particles of organic material from dead algae, silt, and clay (fine sediment) with lesser amounts of cobble and gravel (coarse sediment) (USBR 2012a). The distribution of sediment deposits varies within each of the reservoirs. In J.C. Boyle Reservoir, sediment primarily resides in the area nearest the dam, with measured sediment thicknesses ranging from 0 feet in the middle and upper portions of the reservoir to over 20 feet near the dam. Figure 2.7-7 presents the estimated average sediment thickness throughout the reservoir based on measurements. Both Copco No. 1 and Iron Gate reservoirs have generally even distributions of sediment with thicknesses increasing towards the dams. Figures 2.7-8 and Figure 2.7-9 show the estimated average sediment thickness based on position in the reservoir. The measured thickness of Copco No. 1 Reservoir sediment ranges from approximately 1.2 feet to approximately 10 feet. The maximum deposition within the thalweg (original river channel) of Iron Gate Reservoir is around 5 feet, with a measured deposition thickness of nearly 10 feet in the Jenny Creek arm of the reservoir, while the minimum measured sediment thickness is approximately 0.3 feet near the upstream end of the reservoir.

No detailed measurements (bathymetry or sediment sampling results) are available for the smaller (approximately 73 acre-feet) Copco No. 2 Reservoir. Sediment sampling was attempted in Copco No. 2, but no samples were collected due to the absence of accumulated sediment deposits (USBR 2011b). This condition likely results from the presence of the larger, upstream Copco No. 1 Dam that was completed seven years prior to Copco No. 2 Dam, cutting off upstream sediment supply to the Copco No. 2 Reservoir. Although there appears to be a lack of historical sediment deposits in Copco No. 2 reservoir under current conditions, during drawdown of the two upstream reservoirs J.C. Boyle and Copco No. 1, a large volume of sediments would be transported into Copco No. 2 Reservoir. Estimates of the particle trapping efficiency of Copco No. 2 Reservoir can be made over a range of grain sizes using known relations between reservoir geometry, the range of expected flows during drawdown, and assumptions regarding mixing conditions (Nazaroff and Alvarez-Cohen 2001). Given an expected flow range of 1,000 cfs to 13,000 cfs within Copco No. 2 Reservoir during drawdown operations, estimated settling velocities suggest that no particle trapping would occur in this reservoir for particles smaller than 0.2 millimeters (fine sand) and 1.0 millimeters (coarse sand). While coarser substrates may be trapped in Copco No. 2 Reservoir between 1,000 cfs to 13,000 cfs, because the intake of the diversion tunnel to the power house is located on the floor of Copco No. 2 Reservoir, regular scour along the thalweg would occur, limiting any potential sediment deposits to calm areas along the channel margins and areas nearest the dam face.

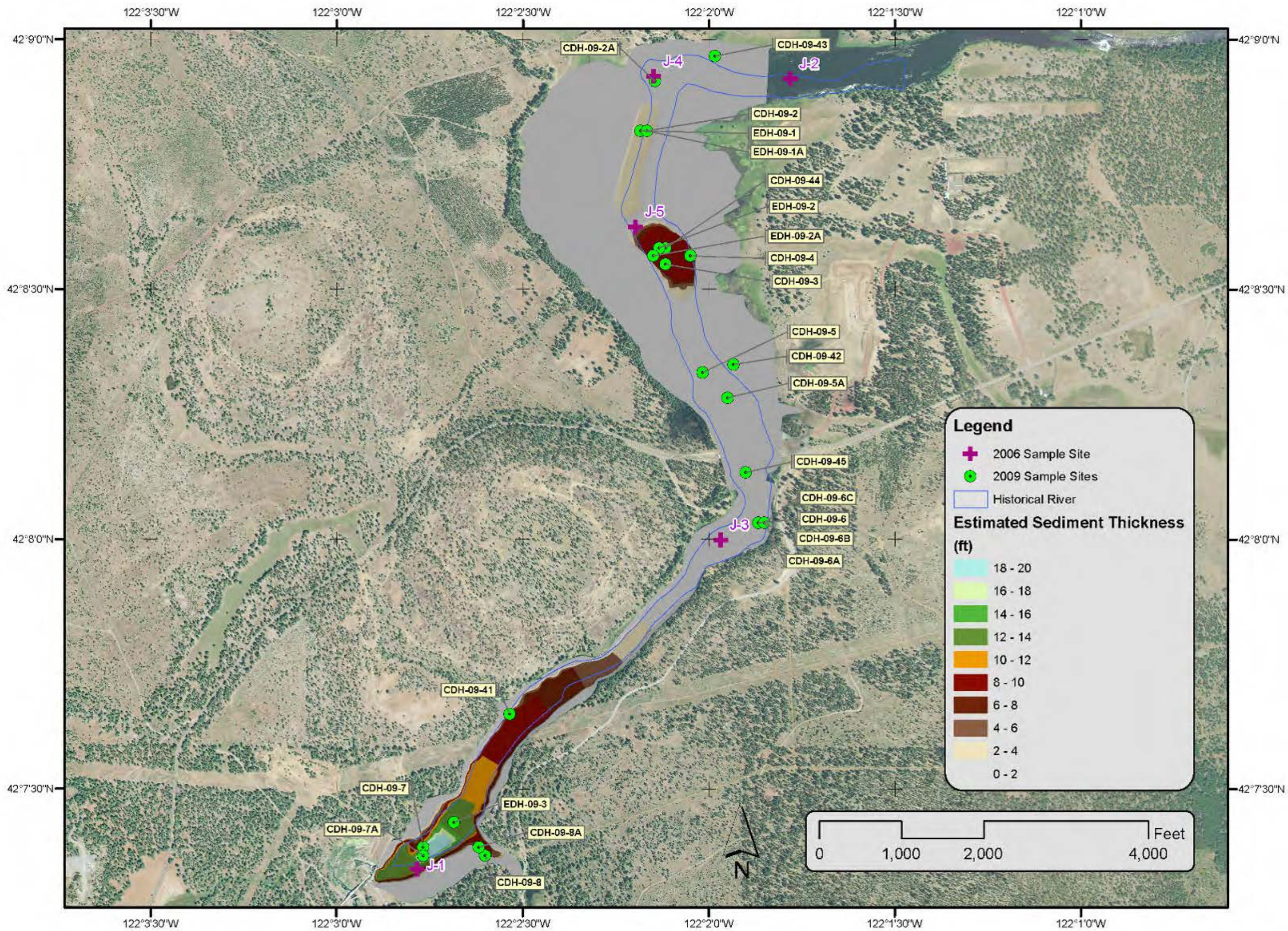


Figure 2.7-7. J.C. Boyle Reservoir Estimated Average Sediment Thickness and Sample Site Locations.

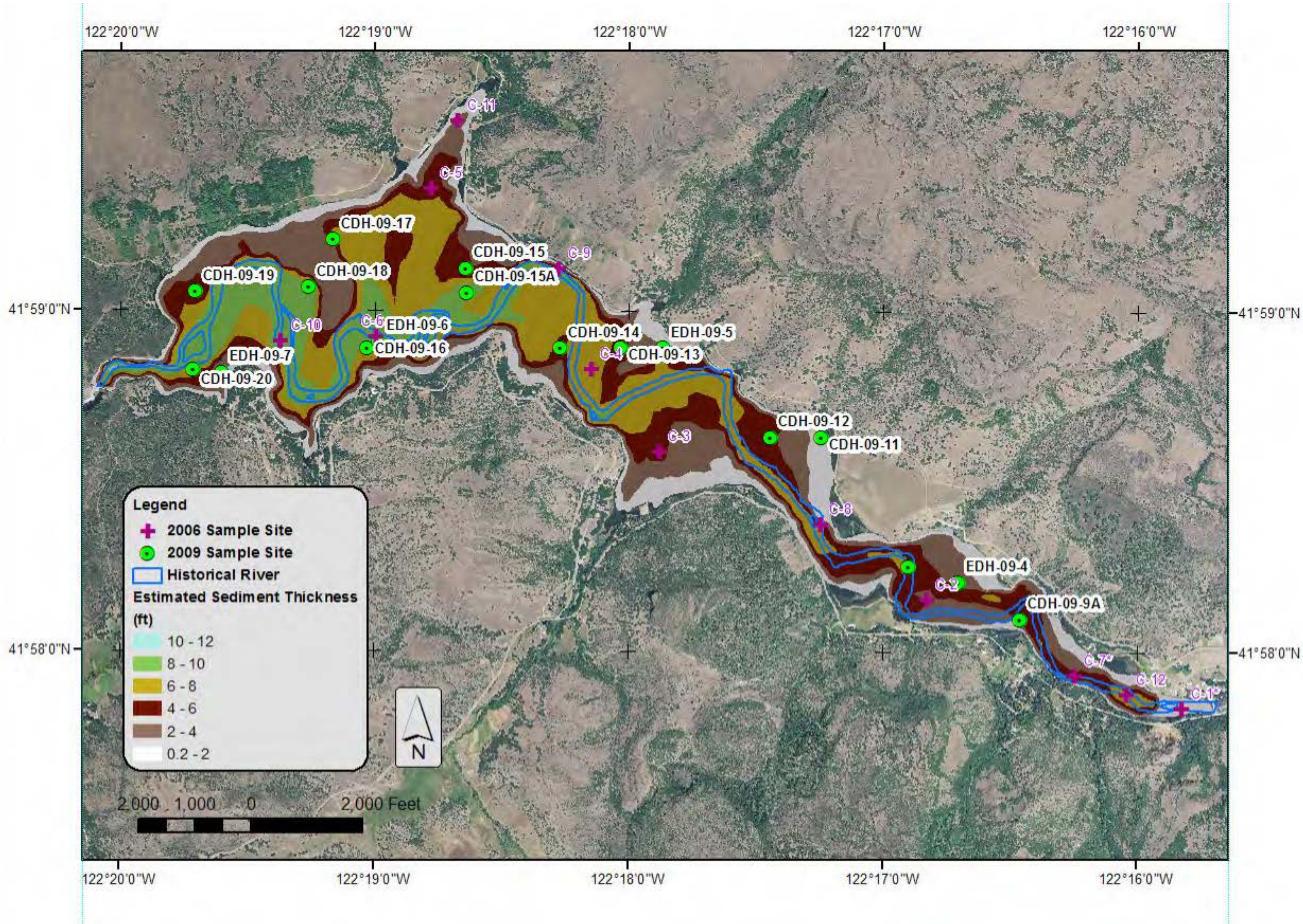


Figure 2.7-8. Copco Reservoir Estimated Average Sediment Thickness and Sample Site Locations.

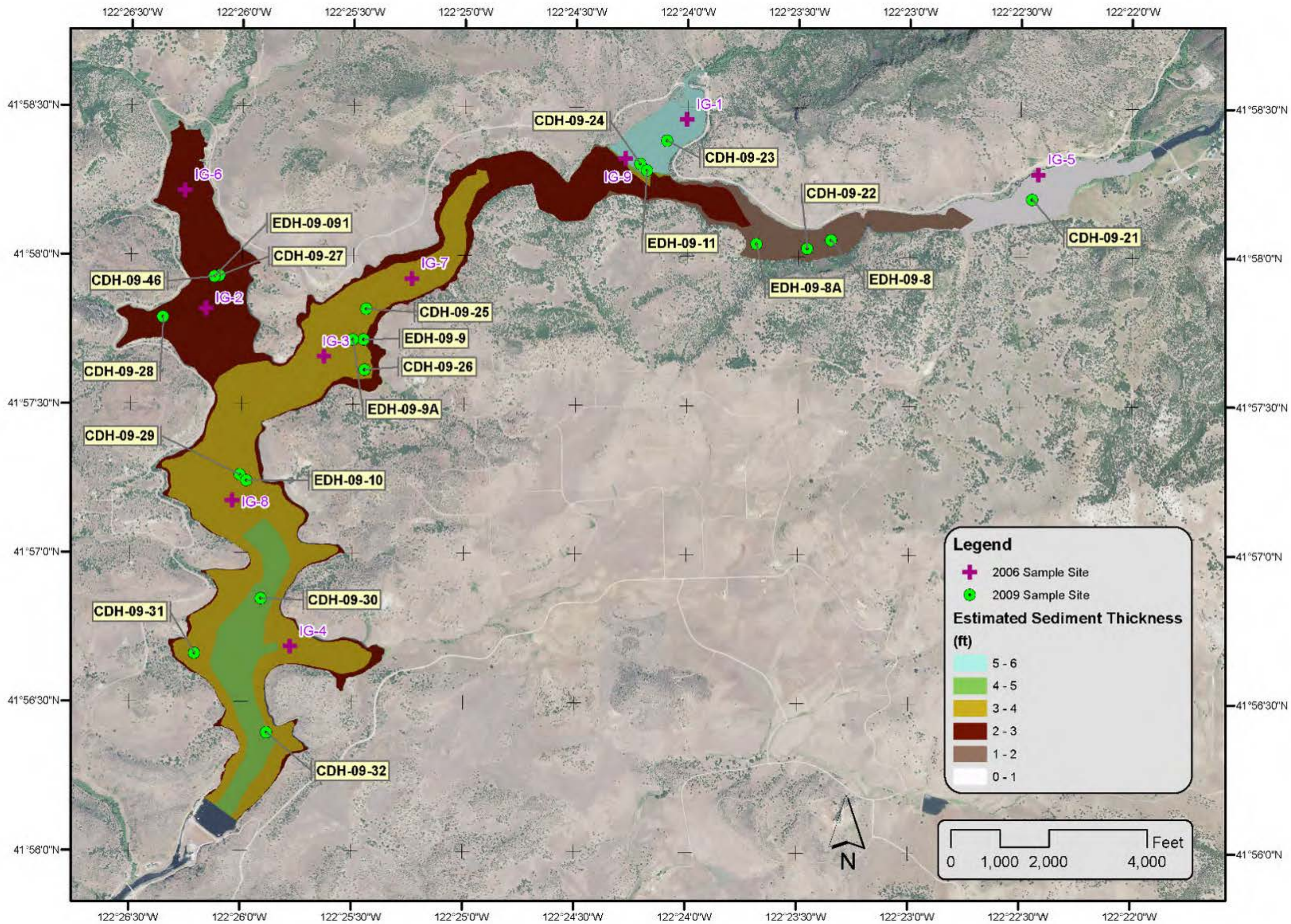


Figure 2.7-9. Iron Gate Reservoir Estimated Average Sediment Thickness and Sample Site Locations.

The current volume and weight of sediment for each reservoir is presented in Table 2.7-9. The uncertainty in the sediment volume estimates is due to interpolation between the 28 to 31 drill holes in each reservoir (USBR 2012a). While the uncertainty in the sediment volume estimate is noticeable, the analysis of sediment erosion potential for the reservoirs is not sensitive to the degree of uncertainty in the volume estimates. Whether the actual reservoir sediment volumes are on the higher end or the lower end of the uncertainty estimate, the dam removal approach and the significance of potential impacts due to sediment transport during reservoir drawdown would remain the same. Sediments as they are deposited in the reservoirs are generally presented in terms of volume, since the sediment volume was measured by the sediment cores taken in each reservoir. However, sediments are typically discussed in terms of mass once they are transported from the reservoir footprints, since the sediment mass would remain constant.

Based on estimated annual sediment deposition rates, an approximately 15.13 million cubic yards (4.16 million tons [dry weight][11]) of sediment would be present behind the dams by 2020[12] (USBR 2012b) (Table 2.7-10). Because the trapped sediments consist primarily of organic material (e.g., dead algae), silts, and clays, they would be easily eroded and flushed out of the reservoirs into the Klamath River, and would continue to be suspended in the river downstream to the Pacific Ocean. Two-dimensional sediment transport modeling of Copco No. 1 Reservoir during drawdown indicates sediments are mobilized from across the reservoir footprint, but the sediments in the historical Klamath River channel would be most likely to erode (USBR 2012b). Coarser reservoir sediment is primarily sand with negligible amounts of larger sediment sizes (i.e., gravel or cobble) which would be transported more slowly depending on the hydrologic conditions. Coarser sediment from dam removal would be expected to primarily deposit between the reservoirs and the confluence of the Klamath River and the Shasta River with an insignificant effect on the streambed downstream of the Shasta River (USBR 2012b).

During drawdown, erosion and transport of sediments deposited within the Copco No. 1 and Iron Gate reservoir footprints would be supported by using barge-mounted pressure sprayers to jet water onto newly exposed reservoir-deposited sediments as the water level decreases, a process called sediment jetting. Sediment jetting would increase the erosion of reservoir-deposited sediments on the historical floodplain areas, especially the historical two-year floodplain, during drawdown and in order to reduce the potential for reservoir sediment erosion outside of the reservoir drawdown period. Additionally, removal of reservoir-deposited sediments with sediment jetting would promote riparian bank and floodplain connectivity by increasing river inundation on the historical floodplain during high flow events and is intended to reduce manual excavation and grading of sediments from proposed restoration sites after drawdown completes. Sediment jetting would be focused in the six areas where restoration actions are proposed within the Copco No. 1 Reservoir footprint (Figure 2.7-11) and the three areas

[11] Ton, dry weight is defined as equal to 2,000 pounds.

[12] Since submitting the original application, KRRC has revised its projection for the year of primary drawdown to be 2021, rather than 2020. Between 2020 and 2021, the sediment volume present behind the dams is expected to increase by approximately 81,300 cubic yards in Copco No. 1 Reservoir and approximately 100,000 cubic yards in Iron Gate Reservoir based on estimates of annual sedimentation rates for each reservoir (USBR 2012b). The expected increase in sediment volume between 2020 and 2021 is an order of magnitude less than the range of the 2020 total sediment volume estimates, so model results using the 2020 sediment volumes would still be applicable to the Proposed Project.

where restoration actions are proposed within the Iron Gate Reservoir footprint (Figure 2.7-12).

While the anticipated amount of sediment to be eroded varies somewhat by reservoir, during reservoir drawdown approximately 36 to 57 percent of the total 2020 volume across J.C. Boyle, Copco No. 1, and Iron Gate reservoirs, or an estimated 5.4 to 8.6 million yd^3 (1.2 to 2.3 million tons [dry weight]) of reservoir sediment, would be eroded and flushed downstream during the drawdown period (Table 2.7-11). Large quantities of sediment would remain in place after dam removal in each of the former reservoir beds, primarily on areas above the active channel. The remaining sediments would consolidate (dry out and decrease in thickness). Studies of the existing sediments in J.C. Boyle Reservoir show an anticipated change in sediment depth of up to 61 percent of original depth (USBR 2012a). A higher degree of shrinkage of the sediment layers is expected for Copco No. 1 and Iron Gate reservoirs due to the increased organic matter content in the sediment deposits of these two downstream reservoirs.

The range in estimated erosion volume in each reservoir is primarily dependent upon whether the prevailing hydrology during reservoir drawdown corresponds to a dry hydrologic year or a wet hydrologic year. The majority of the sediment erosion would occur during the reservoir drawdown process and would be a combination of direct erosion of the sediment by moving water, slumping of the fine sediment along the reservoir sides toward the river, and sediment jetting of some areas of reservoir-deposited sediments during drawdown. In a dry hydrologic year, reservoir pool levels can be drawn down steadily and relatively quickly, resulting in a shorter period of interaction between the flow and sediment deposits, and thus less overall sediment erosion. In a wet hydrologic year, the reservoir pool may experience cycles of drawdown followed by periods of refilling during high flow events, resulting in longer period of interaction between the flow and the sediment deposits, and thus more overall sediment erosion.

The rate of reservoir drawdown would also affect the amount of erosion of the sediment deposit. A faster drawdown rate would reduce the time of interaction between the flow and reservoir sediment deposits, thus reducing the overall amount of sediment erosion, whereas a slower drawdown rate would increase the time of interaction between the flow and reservoir sediment deposits, thus increasing the overall amount of sediment erosion. It is expected that increasing the previously modeled maximum drawdown rate of 2.25 to 3 feet per day (USBR 2012b) to the Proposed Project maximum drawdown rate of 5 feet per day (Appendix B: *Definite Plan – Appendix P*) would slightly decrease the total amount of sediment erosion that occurs during drawdown. The previously modeled maximum drawdown rate would result in 36 to 57 percent of erosion of the sediment deposit from the reservoirs (Table 2.7-11) and increasing the drawdown rate to 5 feet per day would most likely result in an amount of erosion toward the lower end of the estimated range or slightly lower. However, the Proposed Project also includes sediment jetting in some locations in Copco No. 1 and Iron Gate reservoirs, which would tend to push the percent of eroded sediment to the higher end of the range (see discussion in Potential Impact 3.2-3 Although no measurements (bathymetry or sediment grain size) are available for Copco No. 2 reservoir (USBR 2011b), continuous operation of the outlet tunnel located on the reservoir bottom suggests little if any accumulation of sediments arriving from upstream would occur during drawdown operations.

Reservoir sediment field sampling and laboratory testing in 2012 (USBR 2012b) and 2018 (Appendix B: *Definite Plan – Appendix H*) indicates that sediments remaining in the reservoir footprint would strengthen as they dry out, but wetting and drying cycles of unvegetated reservoir sediment would cause the sediment to produce erodible fine particles and aggregates. There is the potential for unvegetated sediments to cause short-term elevated suspended sediment concentrations during fall rain events if not stabilized with vegetation, especially from Iron Gate Reservoir where the highest levels of fine sediment and particles were produced in response to the laboratory wetting and drying cycles. These results are consistent with suspended sediment modeling results (USBR 2012b) indicating that SSCs can periodically increase under storm conditions. Tests of sediment from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs showed that vegetation reduces the production of erodible fine particles during wetting and drying cycles in the Copco No. 1 reservoir sediments.

Additionally, the KRRC's Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*) details restoration activities planned for the reservoir areas during reservoir drawdown including seeding (via ground equipment, barge, or aerial application) and native plantings to further anchor remaining sediments. As the system returns to riverine conditions within the reservoir footprints, erosion and sediment transport rates are anticipated to return to natural background rates for this portion of the watershed (USBR 2012b).

Table 2.7-10. Stored Sediment in the Klamath Hydroelectric Project, Fall 2009.

Reservoir	Total Sediment Volume[1] (yd^3)		Total Sediment Mass[2,3,4] (tons, dry weight)	Fine Sediment Mass[2,4,5] (tons, dry weight)	Sand Sediment Mass[2,4,6] (tons, dry weight)	Percent Fine Sediment by Mass[8]	Percent Sand Sediment by Mass[8]
J.C. Boyle	990,000	+/- 300,000	290,000	190,000	100,000	66 percent	34 percent
Copco No. 1[7]	7,440,000	+/- 1,500,000	1,880,000	1,630,000	260,000	86 percent	14 percent
Iron Gate[7]	4,710,000	+/- 1,300,000	1,430,000	1,210,000	230,000	84 percent	16 percent
Total[7]	13,150,000	+/- 2,000,000	3,600,000	3,020,000[6]	590,000	84 percent	16 percent
Total Copco No. 1 and Iron Gate[7]	**12,150,000**	**+/- 2,000,000**	**3,320,000**	**2,830,000[6]**	**490,000**	**85 percent**	**15 percent**

Source: Modified from USBR 2012a, as noted in the below footnotes.

[1] Uncertainty resulted from interpolation between drill holes and is calculated as a volume with a +/- amount shown in the table (USBR 2012a).

[2] Amount of sediment with a diameter greater than 2 millimeters is negligible (< 0.5 percent) for all the reservoirs and within the uncertainty of the sediment estimates.

[3] Average dry densities vary between reservoirs and within the reservoir depending upon compaction and grain size distribution. The dry unit weight varies between 44.4 and 16.3 lb/ft^3 (USBR 2012a).

[4] Ton, dry weight is defined as equal to 2000 pounds.

[5] Fine sediment is sediment with a diameter less than 0.063 millimeters.

[6] Sand sediment is sediment with a diameter between 0.063 and 2 millimeters.

[7] Amounts of sediment (volumes and masses) from individual reservoirs may not equal the total amounts indicated because all volumes and masses taken from USBR (2012a) were rounded to the nearest 10,000 yd^3 (volume) or 10,000 tons, dry weight (mass). Copco No. 2 Reservoir does not retain measurable amounts of sediment and therefore is not included in the estimates of total stored sediment.

[8] Percent sediments are calculated from the masses listed in the table and rounded so the percent fine sediment and the percent sand sediment sum to 100 percent.

Table 2.7-11. Estimated Amount of Sediment in the Lower Klamath Project Reservoirs in 2020.

Reservoir	Estimated 2020 Total[1]			
	Total Sediment Volume (yd^3)	Total Sediment Mass[2,3] (tons, dry weight)	Fine Sediment Mass[3,4] (tons, dry weight)	Sand Sediment Mass[3,5] (tons, dry weight)
J.C. Boyle	1,190,000	340,000	220,000	120,000
Copco No. 1	8,250,000	2,090,000	1,800,000	290,000
Iron Gate	5,690,000	1,730,000	1,460,000	280,000
Total[6]	**15,130,000**	**4,160,000**	**3,480,000**	**680,000[4]**
Total Copco No. 1 and Iron Gate[6]	**13,940,000**	**3,820,000**	**3,260,000**	**560,000[4]**

Source: Modified from USBR 2012a, as noted in the below footnotes.

1 Between 2020 and 2021 (i.e., dam removal year 2 when drawdown would primarily occur), the sediment volume present behind the dams would increase by approximately 81,300 cubic yards in Copco No. 1 Reservoir and approximately 100,000 cubic yards in Iron Gate Reservoir based on estimates of annual sedimentation rates for each reservoir (USBR 2012b). The increase in sediment volume between 2020 and 2021 be an order of magnitude less than the uncertainty of the 2020 total sediment volume estimates, so model results using the 2020 sediment volumes would still be applicable to the Proposed Project.

2 Amount of sediment with a diameter greater than 2 millimeters is negligible (< 0.5 percent) for all the reservoirs and within the uncertainty of the sediment estimates.

3 Ton, dry weight is defined as equal to 2000 pounds.

4 Fine sediment is sediment with a diameter less than 0.063 millimeters.

5 Sand sediment is sediment with a diameter between 0.063 and 2 millimeters.

6 Amounts of sediment (volumes and masses) from individual reservoirs may not equal the total amounts indicated because all volumes and masses taken from USBR (2012a) were rounded to the nearest 10,000 yd^3 (volume) or 10,000 tons, dry weight (mass). Copco No. 2 Reservoir does not retain measurable amounts of sediment and therefore is not included in the estimates of total stored sediment.

Table 2.7-12. Estimated Amount of Sediment Anticipated to Erode with Dam Removal.

Reservoir[1]	Percent Erosion[2]		Fine Sediment Mass[3,4,5] Erosion		Sand Sediment Mass[3,4,6] Erosion	
	Minimum Erosion (percent)	Maximum Erosion (percent)	Minimum (tons, dry weight)	Maximum (tons, dry weight)	Minimum (tons, dry weight)	Maximum (tons, dry weight)
J.C. Boyle	27 percent	51 percent	60,000	110,000	30,000	60,000
Copco No. 1	45 percent	76 percent	820,000	1,370,000	130,000	220,000
Iron Gate	24 percent	32 percent	350,000	460,000	70,000	90,000
Total[4]	36 percent	57 percent	1,230,000	1,950,000	230,000	370,000
Total Copco No. 1 and Iron Gate[4]	36 percent	56 percent	1,170,000	1,830,000	200,000	300,000

Source: Modified from USBR 2012a, as noted in the below footnotes.

1 Amount of sediment with a diameter greater than 2 millimeters is negligible (< 0.5 percent) for all the reservoirs and within the uncertainty of the sediment estimates.

2 Erosion would primarily occur during the drawdown period. The erosion rates are based on hydrologic conditions recorded for the March to June flow volume at Keno gage on the Klamath River from water year 2001 (90 percent exceedance) and 1984 (10 percent exceedance). Additional erosion and sediment transport could occur in the following year that would be indistinguishable from the background sediment regime.

3 Ton, dry weight is defined as defined as equal to 2,000 pounds.

4 Estimated amount of sediment mass eroded with dam removal based on estimated sediment amount in the reservoirs in 2020. Amounts of sediment masses from individual reservoirs may not equal the total amounts indicated because masses taken from USBR (2012a) were rounded to the nearest 10,000 tons, dry weight (mass). Copco No. 2 Reservoir does not retain measurable amounts of sediment and therefore is not included in the estimates of sediment anticipated to erode with dam removal.

5 Fine sediment is sediment with a diameter less than 0.063 millimeters

6 Sand sediment is sediment with a diameter between 0.063 and 2 millimeters.

2.7.4 Restoration Within the Reservoir Footprint

The KRRC's Proposed Project includes establishing native vegetation within the reservoir footprints to stabilize newly exposed reservoir sediments and support a functioning ecosystem. Additional information on planned restoration efforts during and following dam removal can be found in the KRRC's Reservoir Area Management Plan (Appendix B: *Definite Plan − Appendix H*).

2.7.4.1 Revegetation Activities

The following sequence describes the activities that would be implemented in the former reservoir footprints to manage remaining sediment deposits and restore habitats. Pre-dam removal restoration activities (i.e., one to two years before drawdown) would occur on the upland areas outside of the reservoir footprints; accordingly, these activities are discussed below in Section 2.7.5 *Restoration of Upland Areas Outside of the Reservoir Footprint*. See additional detail in KRRC's Reservoir Area Management Plan (Appendix B: *Definite Plan − Appendix H*).

1. *Pre-dam Removal* (pre-dam removal year 3, and dam removal year 1): collect and propagate seed and control invasive plants.

2. Reservoir drawdown (January to March, dam removal year 2): amend sediment as necessary and stabilize sediments and exposed areas with hydroseeding13. To stabilize remaining reservoir sediment, the newly exposed reservoir areas would be revegetated during and following reservoir drawdown with native species through pioneer hydroseeding (via ground equipment, barge, or aerial application). Acorns, shrub seedlings, and pole cuttings would be installed early, as feasible.
3. Post-drawdown first summer/fall (dry season immediately after drawdown during dam removal year 2): monitor and rectify any non-natural fish passage barriers in the Klamath River's mainstem and tributaries, conduct additional fall overseeding application (overseeding application would involve a ground-based broadcast seeder, to be applied over mowed or rolled vegetation that grows in from the pioneer seeding) where needed on exposed reservoir areas, manual removal/treatment of invasive exotic vegetation, and installation of riparian trees and shrubs. Irrigation would be installed in the Riparian Bank Zone to support survival of planted riparian species. Plants below this zone would obtain water from the river and irrigation runoff. For plants above the Riparian Bank Zone, seedlings would be provided water by planting the seedling in a 'cocoon' which is a donut shaped container that surrounds the seedling and is made out of biodegradable paper mâché. If initial restoration efforts are unsuccessful in the upland areas, a temporary irrigation system would be installed. Riparian pole cuttings and other wetland plants would be harvested from on-site areas that would no longer support riparian species
4. Post-removal (post-dam removal year 1): maintain vegetation, continue to remove and treat invasive exotic vegetation, install floodplain and off-channel habitat features such as large wood to enhance complexity and stabilize banks or bury brush, limbs and wood to roughen the floodplain to enhance establishment of vegetation and organic materials. Monitor and rectify any non-natural fish passage barriers in mainstem and tributaries.
5. Establishment period (post-dam removal years 2 through 5): continued monitoring and maintenance of vegetation, removal of invasive exotic vegetation, fish passage monitoring, and enhancement of habitat features as needed.
6. Long term (years 5 through 10 post-dam removal): continued monitoring and adaptive management, removal of invasive exotic vegetation, and fish passage monitoring.

KRRC proposes to restore the former reservoir footprints with native plant species, trees and shrubs. The natives would be planted in upland, riparian, and wetland zones. To facilitate the restoration of this area and growth of planted vegetation, about 34.5 miles of permanent cattle exclusion fencing would be installed around the reservoir areas (Appendix B: *Definite Plan – Appendix H*) prior to drawdown or shortly after the pioneer seeding. It is unknown if this fencing would remain following the transfer of Parcel B

[13] Although not currently anticipated by KRRC, the Proposed Project may also include hydroseeding from a barge on exposed reservoir terraces as the water recedes during reservoir drawdown. Hydroseeding from a barge would be accomplished by placing a ground rig on one barge with another boat used to ferry materials from shore. A moveable pier or other engineered method of accessing the supply boat as the water level recedes would also be needed. If it occurs, barge hydroseeding would occur in the higher elevation portion of the reservoir shoreline, until the reservoir levels become too low to operate (i.e., March of dam removal year 2).

lands. Cattle currently free-range around reservoirs, and the purpose of cattle exclusion fencing is to prevent cattle from grazing on newly restored vegetation. The fencing would be wildlife-friendly and allow for the movement of deer, turtles, etc., while preventing access of cattle. Herbivore deterrent (e.g., screens, fencing, chemical deterrents) would be placed around planted riparian vegetation.

Proposed native seed mixes and plants along with information on the goals and objectives associated with the restoration activities are provided in KRRC's Reservoir Area Management Plan (Appendix B: *Definite Plan − Appendix H*). The management techniques for invasive exotic vegetation (IEV) may include manual weed extraction, solarization (covering of ground areas with black visqueen), tilling, and use of herbicides. See additional detail in KRRC's Reservoir Area Management Plan (Appendix B: *Definite Plan − Appendix H).* In order to effectively eradicate IEV in the Limits of Work to the extent feasible and prevent the spread of IEV into restoration areas, KRRC would begin active control of IEV several years before drawdown and would continue until the required performance criteria are met. The KRRC began IEV surveys in fall 2017, between the existing water line and the boundary of the Limits of Work, to obtain information on the exact location of each invasive species and information on the diversity of invasive species. The results would be the basis for the IEV removal plan which would be initiated prior to drawdown.

The Proposed Project Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*) incorporates monitoring and metrics to evaluate success of minimizing invasive exotic vegetation and enhancing native plant diversity and survival of planted trees and shrubs. Monitoring would continue for five years or until the performance criteria has been met. In the event the performance criteria are not being met, the cause would be evaluated, data collection and performance criteria metrics would be reassessed as necessary, and the KRRC would develop a plan to address problems and initiate further monitoring. The performance criteria are the following:

- Minimize invasive exotic vegetation—percent relative cover by medium and low priority IEV shall be less than the average at designated reference locations at Year 1—25 percent, Year 2—40 percent, Year 3—55 percent, Year 4—70 percent, Year 5—90 percent, and no high-priority invasive plants present in the Limits of Work;
- Enhance native plant diversity—percent diversity compared to reference sites in Year 1—60 percent, Year 2—65 percent, Year 3—70 percent, Year 4—75 percent, and Year 5—80 percent; and
- Survival of planted trees and shrubs—percent survival in Year 1—90 percent, Year 2—85 percent, Year 3—80 percent, Year 4—75 percent, and Year 5—70 percent.

2.7.4.2 Reservoir Restoration Features

Proposed restoration activities for the reservoir footprints are supporting reservoir-deposited sediment evacuation; enhancing tributary connectivity to the Klamath River; incorporating floodplain features such as wetlands, swales, and side channels; enhancing floodplain roughness to stabilize vegetation; and stabilizing banks and enhancing channel complexity, often with the use of large wood (Figure 2.7-10).

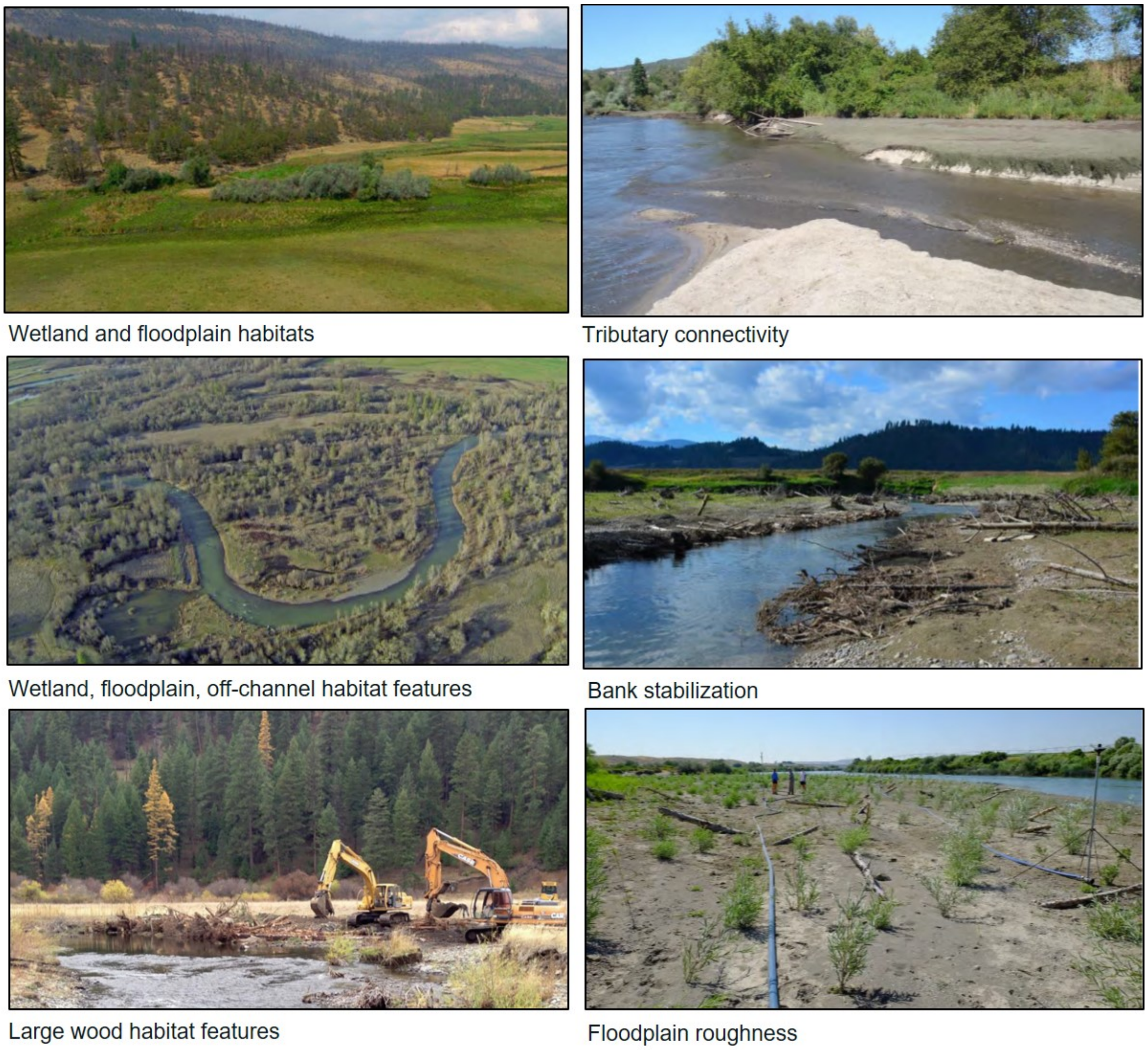


Figure 2.7-10. Examples of Restored Habitat Types and Components (Appendix B: *Definite Plan – Appendix H*).

During drawdown, a barge-mounted pressure sprayer would jet water onto newly exposed reservoir-deposited sediments (this process is called sediment jetting) as the reservoir water level decreases to support transport of reservoir-deposited sediments from the historical floodplain. The erosion of reservoir sediments from the historical floodplain, especially the two-year floodplain, would promote riparian bank and floodplain connectivity for restoration features by increasing river inundation on the floodplain during high flow events. Sediment jetting would also prepare areas for restoration by minimizing the necessary manual excavation and grading of sediments at those sites. Sediment jetting would be focused in the six areas where restoration actions are proposed within the Copco No. 1 Reservoir footprint (Figure 2.7-11) and the three areas where restoration actions are proposed within the Iron Gate Reservoir footprint (Figure 2.7-12). During the drawdown period between January and April of dam removal year 2, additional manual grading and transport of reservoir-deposited sediment would occur in proposed restoration areas near existing roads with easy access for machinery, such as bulldozers and excavators.

During and following reservoir drawdown, tributaries would flow over the area now submerged by the reservoirs toward the new riverbed of the Klamath River. Tributaries would likely transport fine sediment downstream (i.e., it would not deposit in the reservoir footprint), but some larger sediments and debris may deposit and create fish passage barriers or un-natural changes in slope in the tributary flow paths located within the reservoir footprints. KRRC proposes using light equipment and manual labor to move such barriers and enhance access and longitudinal connectivity of the tributaries with the mainstem Klamath River within the reservoir footprints (Figure 2.7-10). In addition, the KRRC may add large wood to tributaries to promote habitat complexity.

Incorporating floodplain features that create natural elevation variations (e.g., swales) into the newly exposed floodplains within the reservoir footprints is a restoration strategy that promotes habitat complexity and function. Based on historical images of the Project area, the KRRC has indicated that the following three main types of features could be supported on the newly exposed floodplain areas:

- Wetlands are low-lying features with standing water or saturated soils for a portion of the growing season sufficient to support wetland vegetation such as willows, sedges, and rushes. Wetlands provide a wide range of ecological functions such as water quality improvement, flood attenuation, and habitat for both terrestrial and aquatic organisms. Wetland restoration strategies for the reservoir areas include preservation of existing wetlands, hydrologic connection of off-channel wetlands with the river, or creation of new wetlands at lower elevations corresponding to the post-dam removal surfaces and hydrologic regime (see Figure 2.7-10).
- Floodplain swales are small depressions where floodplain vegetation can establish at slightly lower elevations (closer to the water table) than adjacent floodplain surfaces. These depressions provide storage for flood water and sediment at variable flows, in addition to broadening the range of ecological niches available on the floodplain surface to support different life stages (and behaviors) of wildlife species.
- Side channels are channels off the main channel that provide habitat for juvenile rearing and high flow refugia for other aquatic species. Like floodplains, side channels exchange water, sediment and nutrients between the main channel and off-channel areas, thus supporting diverse vegetation communities. Side channel restoration strategies are designed to improve instream habitat diversity and include modifying inlet and outlet hydraulics, improving hydraulic complexity with structures or realignment, and delivery of water to higher floodplain surfaces.

To provide a temporary replacement for the lack of established, stable vegetation in the reservoir footprints, the KRRC proposes to use ground-based equipment to ‘roughen’ the floodplain surface and partially bury wood, limbs, or brush in the sediment deposits that remain following drawdown (Figure 2.7-10). The KRRC has indicated that installing these features would create complexity and provide a location for seeds to establish, reduce erosion by reducing velocity, and promote soil development by introducing organic matter (Appendix B: *Definite Plan − Appendix H*).

To stabilize the banks and enhance the complexity of the channel fringe along the newly exposed Klamath River within the reservoir footprints, the KRRC has proposed installation of large wood features (e.g., trees, root wads) and planting of riparian vegetation (Figure 2.7-10) (Appendix B: *Definite Plan − Appendix H*). These features would reduce water velocities creating low velocity zones that would provide habitat for fish and wildlife. Placement of wood features along the river banks would be accomplished using ground-based equipment or helicopters.

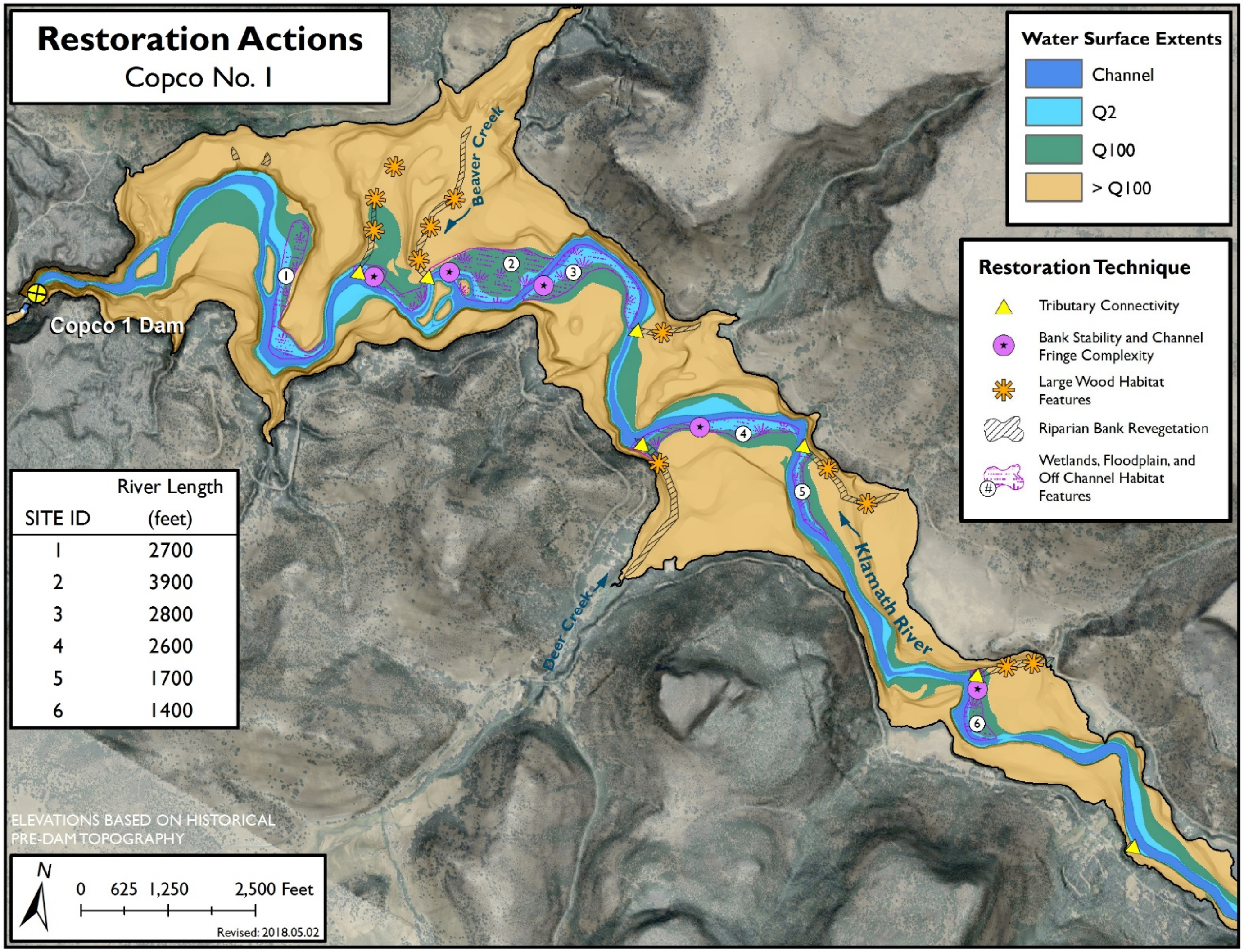
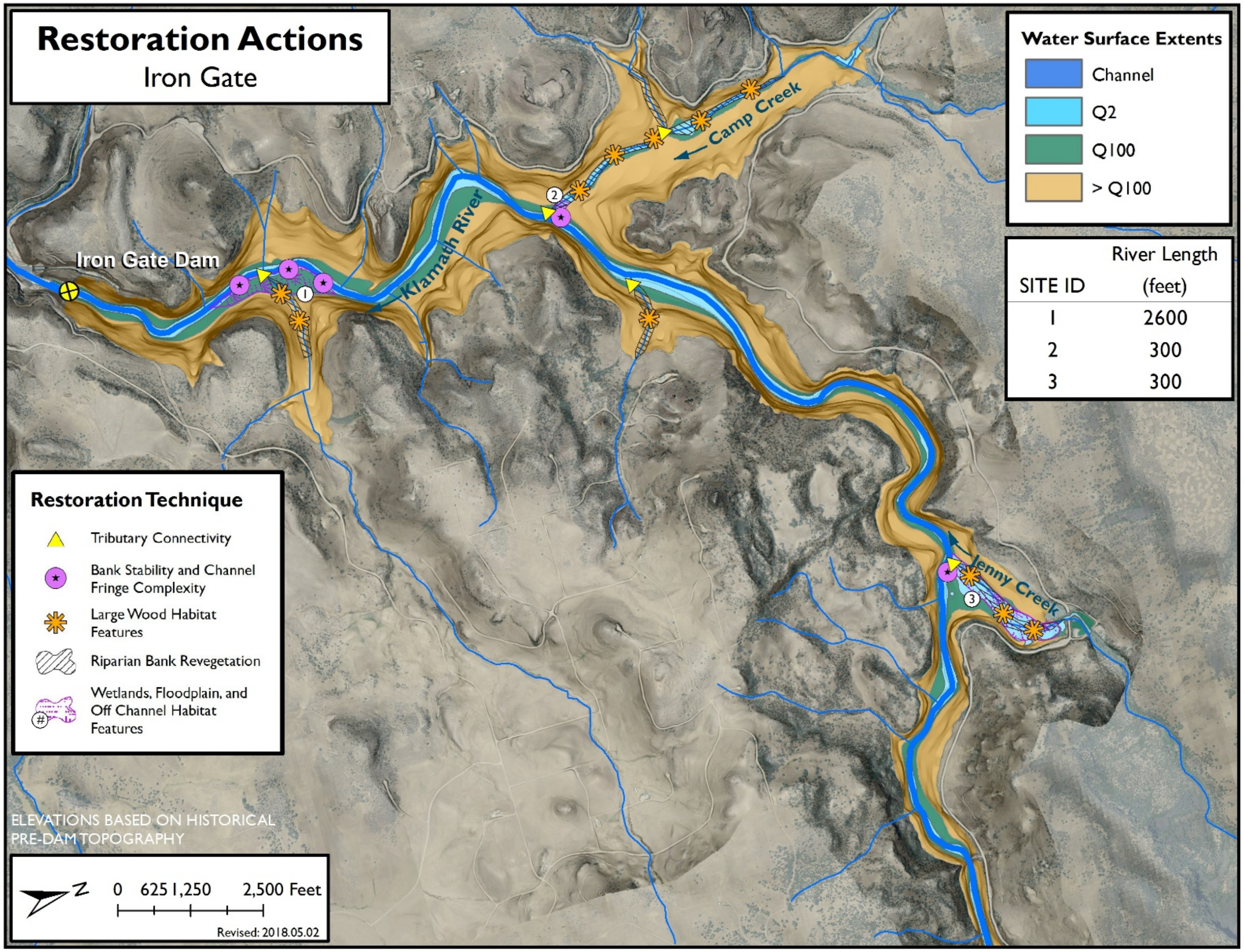


Figure 2.7-11. Restoration Actions Identified for the Copco No. 1 Reservoir Area (Appendix B: *Definite Plan – Appendix H*).



SITE ID	River Length (feet)
1	2600
2	300
3	300

Figure 2.7-12. Restoration actions identified for the Iron Gate Reservoir area (Appendix B: *Definite Plan – Appendix H*).

2.7.5 Restoration of Upland Areas Outside of the Reservoir Footprint

Restoration activities would also occur in Project-affected upland areas surrounding the reservoirs. During the pre-dam removal period, native plants would be prepared for restoration activities by collecting seeds and working with local nurseries to grow trees and shrubs. Active management of invasive exotic vegetation species would be initiated prior to drawdown and would continue until the Proposed Project completion. The management techniques for invasive exotic vegetation may include grazing with cattle, sheep, and goats, manual weed extraction, solarization (covering of ground areas with black visqueen), tilling, and use of herbicides. See additional detail in KRRC's Reservoir Area Management Plan (Appendix B: *Definite Plan − Appendix H*).

During the post-dam removal period, restoration would occur in upland areas outside of the reservoir footprints, including disposal areas used for placing embankment or concrete material, staging areas, temporary access roads, hydropower infrastructure demolition areas, and former recreation areas. Revegetation of these areas in the short term would be implemented in compliance with an approved Storm Water Pollution Prevention Plan (SWPPP)/Erosion Control Plan (see also Section 2.7.8.7 *Water Quality Monitoring*). In the long term, these areas would be revegetated similar to the upland planting zone areas, as described in the KRRC's Reservoir Area Management Plan (Appendix B: *Definite Plan − Appendix H*). Since upland soils would be highly compacted, soils would be disked and ripped (a process used to mechanically break up compacted soil layers) to prepare them for subsequent planting.

Existing native vegetation would be preserved and protected where feasible. Native trees within the Limit of Work that do not need to be removed for construction or demolition activities (as determined by KRRC authorized representative) would be retained (S. Leonard, Senior Water Resources Engineer, AECOM, pers. comm., July 2018). These native trees would be protected, to the maximum extent practical, by a work exclusion zone around the trunk with a radius equal to approximately one time the average tree canopy diameter. The work exclusion zone would be visibly demarcated in the field with non-moveable orange fencing, and adjacent protected trees may be fenced together in groupings, as appropriate. For native trees adjacent to construction and demolition activities where work exclusion zone establishment is not possible, large sheets of steel plate (minimum size of 4-foot width, 8-foot-long, 0.5-inch-tall) would be laid on the ground to distribute the potential point loads in order to prevent the crushing of tree roots underground.

2.7.6 Hatchery Operations

2.7.6.1 Iron Gate Hatchery

During demolition, the Iron Gate Hatchery facilities located at the base of Iron Gate Dam, including the adult fish ladder and holding tanks at the toe of the dam, would be removed, as would the cold-water supply and aerator for the hatchery (see also Figure 2.3-4 and Section 2.7.1.4 *Iron Gate Dam and Powerhouse*). Portions of the hatchery located downstream near the confluence of Klamath River and Bogus Creek would remain in place or would be altered, including conversion of two of the existing raceways to adult holding tanks, and construction of a new spawning facility, so limited operations could continue at the facility for eight years following dam removal. Consistent with the KHSA Section 7.6.6, the hatchery would be operated for eight years following the decommissioning[14] of Iron Gate Dam. Given that power generation at Iron Gate Powerhouse is scheduled to cease by January of dam removal year 2 (Table 2.7-1), the hatchery would operate from dam removal year 2 through post-dam removal year 7, for a total of eight years. Following the eight-year period, Iron Gate Hatchery would cease operations. It is currently unclear whether the Iron Gate Hatchery facility would be decommissioned in place, demolished, or partly or fully repurposed after the eight-year operational period.

Some operational components of Iron Gate Hatchery would be retained during dam removal (Figure 2.7-13). The operations during dam removal would include a maximum of 8.75 cfs of water to be diverted from Bogus Creek within 1,000 feet of the confluence with the mainstem Klamath River. This water would operate the Iron Gate Hatchery incubation building, two 300-foot adult holding ponds, three 400-foot raceway, and an auxiliary adult fish ladder and trap (to replace the one removed from the base of Iron Gate Dam during demolition). Iron Gate Hatchery would use between 3.75 and 8.75 cfs from October through May to rear the targeted goal of 3.4 million Chinook smolts for release in April through May of each year. The diversion for the hatchery water supply would be constructed as close to the confluence of Bogus Creek and the Klamath River as possible, in order to reduce the length of Bogus Creek rearing habitat affected by water withdrawals downstream of the diversion. An approximately 4,000 gallons per minute (gpm) screened, pump station would be used to divert water from Bogus Creek. Specific diversion rates from Bogus Creek would be as follows:

- 6.50 cfs October through November
- 8.75 cfs in December
- 3.50 cfs January through March
- 8.25 cfs April through May
- 0.00 cfs June through September

The Bogus Creek water diversion would be operated to maintain a minimum of 50 percent of the instream flow in the creek at the point of diversion. To provide context for the proposed Bogus Creek diversion rates, daily average flow rates of Bogus Creek from August 2013 to August 2017 are compared with the proposed water needs at Iron Gate Hatchery in Figure 2.7-14. In addition, Figure 2.7-14 shows the percent of Bogus Creek flow remaining after subtracting the Iron Gate Hatchery diversion, with a negative percentage indicating that there would not be enough flow in Bogus Creek to meet the Iron Gate Hatchery water needs. Between August 2013 and August 2017, the proposed flow diversions for Iron Gate Hatchery would have consistently diverted more than 50 percent of Bogus Creek flow during part of each year, especially during October, November, April, and May. In spring/early summer of 2014, Bogus Creek flows were insufficient to meet the proposed full water needs of the hatchery. These results may be due to the short duration of the dataset or drought conditions between 2013 and 2017 that may not represent long-term conditions. The KRRC proposes that if Bogus Creek flows are insufficient to meet minimum operational needs while balancing flow requirements in the creek, water reuse (recirculation) from the rearing raceways could be utilized. In addition to recirculation, early release of smolts (i.e., prior to April 1) may occur to reduce water use requirements in the hatchery. The effectiveness of

[14] Decommissioning is defined as PacifiCorp's physical removal from a facility of any equipment and personal property that PacifiCorp determines has salvage value, and physical disconnection of the facility from PacifiCorp's transmission grid (KHSA Section 1.4).

recirculation and early smolt release would be studied to determine whether they could be used to meet minimum operational flow and water temperature needs in the hatchery given annual variations in Bogus Creek flow and water temperature during the early release period.

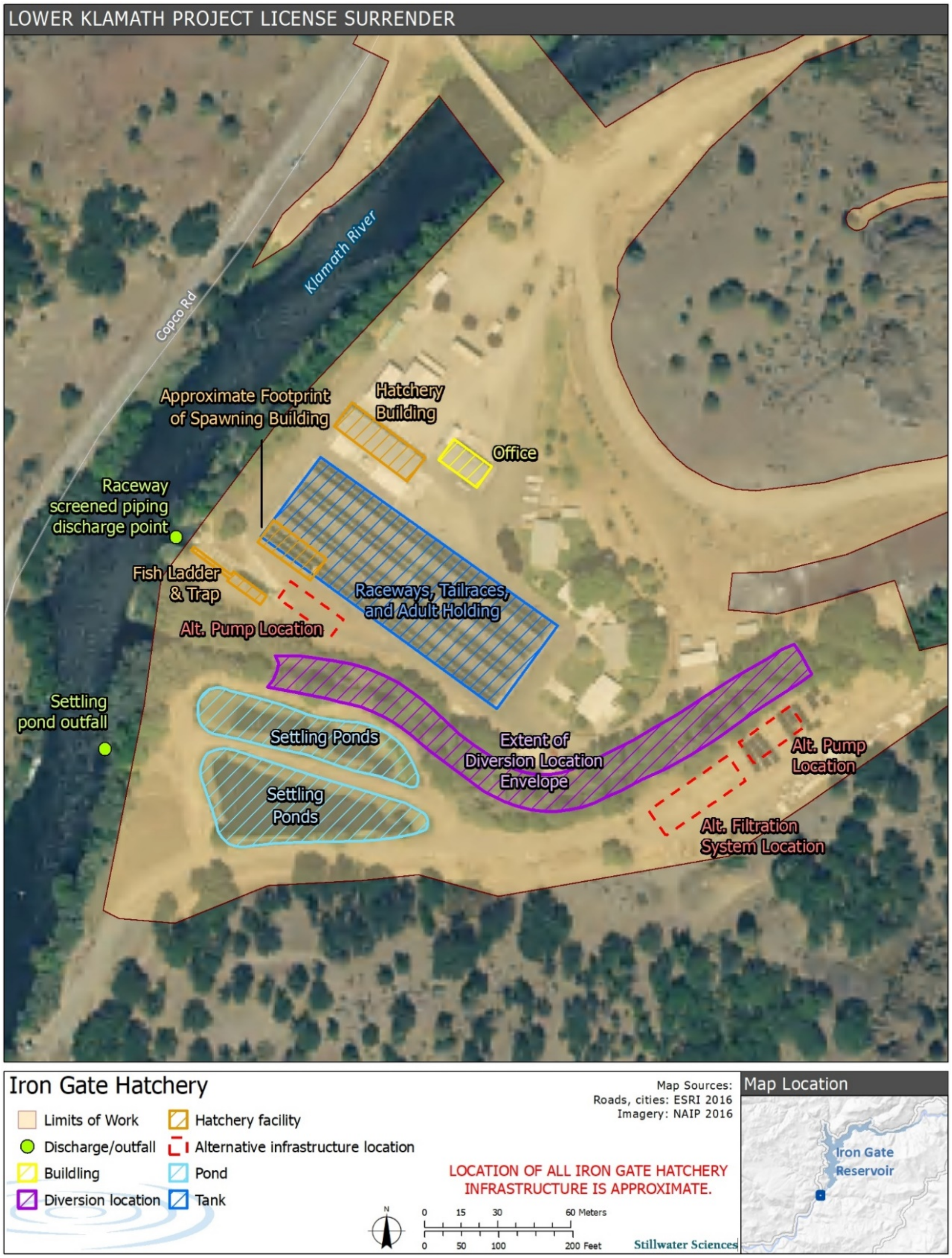


Figure 2.7-13. Iron Gate Hatchery Existing Features and Proposed Modifications.

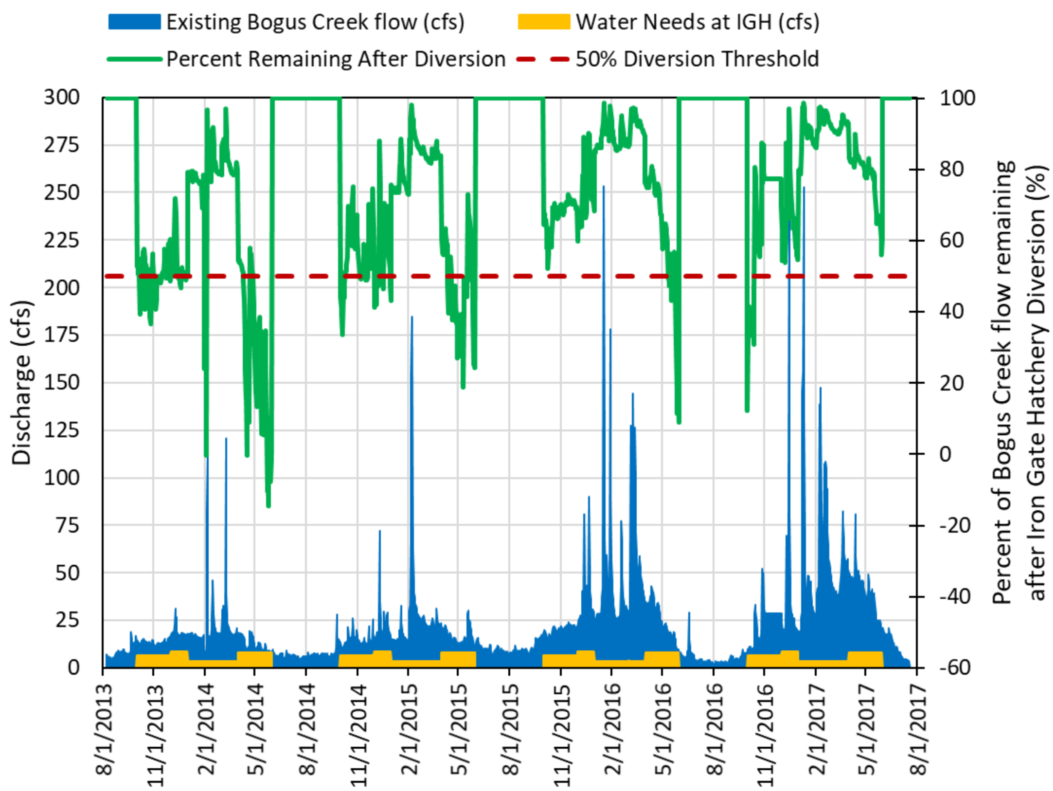


Figure 2.7-14. Bogus Creek Existing Flow and Proposed Flow Diversion to Support Production at Iron Gate Hatchery (ICH) for eight Years Following Dam Removal.

During dam removal year 2 and the subsequent seven years post-dam removal (i.e., eight years total), total hatchery production goals would be reduced from current levels (Table 2.7-13). Iron Gate Hatchery production would be limited to 3,400,000 Chinook salmon smolts, while coho salmon and Chinook salmon yearling production would cease at Iron Gate Hatchery. Steelhead production at the Iron Gate Hatchery has not occurred since 2012, and it would not be re-initiated. Fall Creek Hatchery production (see also Section 2.7.6.2 *Fall Creek Hatchery*) would include 75,000 coho yearlings and 115,000 Chinook yearlings. No Chinook smolts and no steelhead would be produced at Fall Creek Hatchery.

Table 2.7-13. Existing Goals and Proposed Hatchery Production for Operations at Iron Gate and Fall Creek Hatcheries (NMFS and CDFW 2018).

Species/Life Stage	Existing Production Goal[1] (at Iron Gate Hatchery)	Proposed Production (at Iron Gate Hatchery and Fall Creek Hatchery)
Coho Yearlings	75,000	75,000 at Fall Creek Hatchery
Chinook Yearlings	900,000	115,000 at Fall Creek Hatchery
Chinook Smolts	5,100,000	3,400,000 at Iron Gate Hatchery
Steelhead	200,000	0

[1] Ability to meet production goals varies annually based on adult returns and hatchery performance, with coho and Chinook yearling goals achieved on average since 2005 and actual Chinook Smolt production typically a million smolts less than production goals (K. Pomeroy, CDFW, pers. comm., 2018).

2.7.6.2 Fall Creek Hatchery

The KRRC also proposes to reopen the nearby Fall Creek Hatchery, as directed by NMFS and CDFW (2018). The KRRC proposes to reopen Fall Creek Hatchery with upgraded facilities (e.g., install circular tanks, UV treatment system, renovate existing raceways, upgrade plumbing, etc.) for raising coho salmon and Chinook salmon yearlings within the existing facility footprint and an area adjacent to the upper raceways (Figure 2.7-15). Additional space requirements needed for most operations (e.g., vehicle parking, pertinent buildings, tagging trailer, etc.) can be accommodated on existing developed or disturbed areas around the hatchery and powerhouse, but the settling pond would need to be located outside of this area. The settling pond would be constructed on one of two potential nearby sites located on Parcel B lands downstream of the Fall Creek Hatchery, with a minimally buried or at-grade conveyance pipeline transporting flows from the hatchery to the settling pond. Selection of the settling pond site is pending cultural resources investigations and consultation with tribes with historical and cultural connection to the area.

To operate the Fall Creek Hatchery, up to 10 cfs of water would be diverted from the PacifiCorp Fall Creek powerhouse return canal downstream of the City of Yreka's diversion facility at Fall Creek Dam A. Hatchery water would be diverted from Fall Creek Dam B to Dam A during periods when the powerhouse return canal is not flowing. While the Definite Plan specifies diverted water would be returned to Fall Creek at the fish ladder located in the lower tank area or the settling pond location (Appendix B: *Definite Plan −Section 7.8.3*), an October 2018 update specifies the upper rearing tank would discharge diverted water directly to Fall Creek, the lower rearing tank would discharge to the fish ladder adjacent to the tank, and the settling pond would discharge to Fall Creek further down, but upstream of the USGS 11512000 gage on Fall Creek (S. Leonard, AECOM as KRRC Technical Representative, pers. comm., October 2018). Fall Creek diverted water would be gravity fed and plumbed to each rearing location and all circular tanks. Specific diversion rates from Fall Creek would be as follows:

- 8.48 cfs in October
- 9.24 cfs in November
- 6.32 cfs in December
- 5.77 cfs in January
- 1.47 cfs in February
- 1.76 cfs in March
- 1.84 cfs in April
- 1.08 cfs in May
- 0.58 cfs in June
- 1.01 cfs in July
- 1.48 cfs in August
- 2.29 cfs in September

The non-consumptive water diversion for the Fall Creek Hatchery is downstream of the City of Yreka's diversions at Dam A on the PacifiCorp Fall Creek powerhouse return canal. Flows diverted for the hatchery (less evaporative losses) would be returned to

Fall Creek from the three hatchery discharge points (i.e., upper tank, fish ladder near the lower tank, and settling pond) upstream of the compliance point for the City of Yreka diversion, the USGS 11512000 gage on Fall Creek approximately 1,000 feet upstream of Daggett Road (S. Leonard, AECOM as KRRC Technical Representative, pers. comm., October 2018). At the compliance point, the City of Yreka must ensure Fall Creek has a minimum flow of 15.0 cfs, or the natural flow of Fall Creek whenever it is less than 15.0 cfs. To provide context about flows in Fall Creek, the historical daily average City of Yreka water diversion flows from October 2003 to October 2005 along with the historical daily average Fall Creek flows measured at the USGS 11512000 gage during this period are compared with the proposed Fall Creek Hatchery non-consumptive diversion flows in Figure 2.7-16. The proposed Fall Creek Hatchery diversion would not alter Fall Creek flows measured at the USGS 11512000 gage or compliance with minimum Fall Creek flow requirements since the diversion flows for Fall Creek Hatchery would be diverted and returned (less evaporative losses) to Fall Creek upstream of the USGS 1151200 gage under the Proposed Project.

Total hatchery production goals for Fall Creek Hatchery are presented in Table 2.7-13. Following the eight-year period, Fall Creek Hatchery would cease operations. As Fall Creek Hatchery is part of PacifiCorp's Klamath Hydroelectric Project No. 2082, the existing Fall Creek hatchery facilities are subject to the terms of any new FERC action for Project No. 2082. It is currently unclear whether the Fall Creek Hatchery facility would be decommissioned in place, demolished, or partly or fully repurposed after the eight-year operational period.

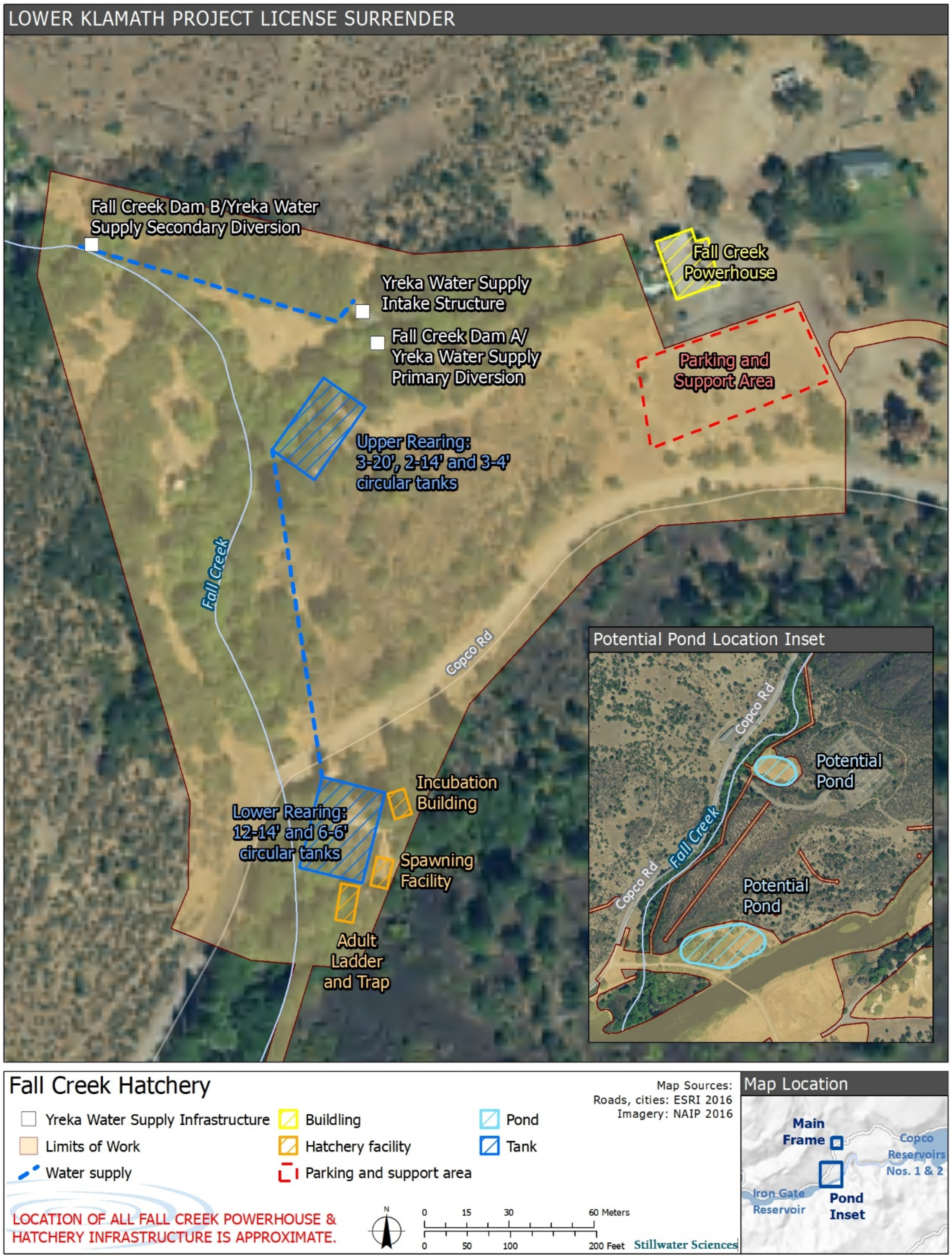


Figure 2.7-15. Fall Creek Hatchery Existing Features and Proposed Modifications.

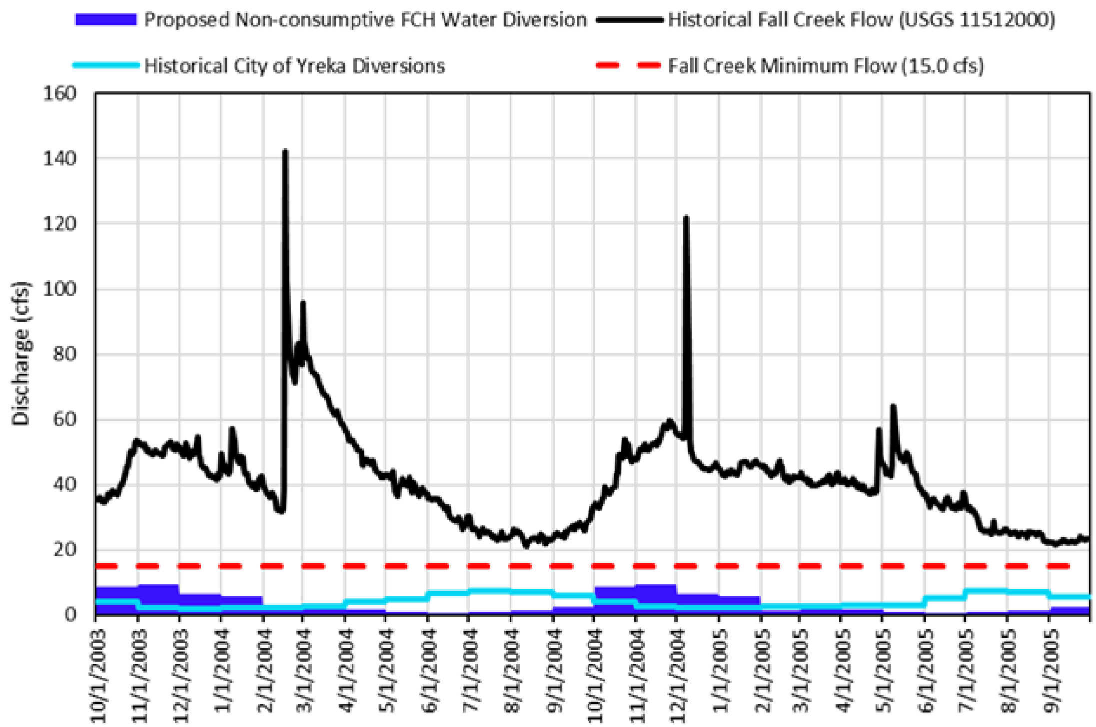


Figure 2.7-16. Proposed Non-consumptive Fall Creek Hatchery (FCH) Water Diversions to Support Production at the Fall Creek Hatchery Following Dam Removal, Historical Fall Creek Flow Measured at USGS 11512000 Downstream of the City of Yreka Diversion, Historical City of Yreka Diversion, and Fall Creek Minimum Flow Requirement (15.0 cfs) Downstream of Compliance Point (USGS 11512000).

2.7.7 City of Yreka Water Supply Pipeline Relocation

The City of Yreka receives part of its water supply from Fall Creek, which is a tributary to the Klamath River in the Upper Klamath Basin. Fall Creek is approximately 23 miles northeast of the city. The city diverts up to 15 cfs of water from Fall Creek through a 24-inch diameter steel pipe near the PacifiCorp's Klamath Hydroelectric Project Fall Creek dam complex. The primary water intake for this water pipeline is located along the PacifiCorp Fall Creek powerhouse return canal at Dam A, which diverts flow to a pumping station further downstream along Fall Creek (Figure 2.7-17). A secondary intake at Dam B on Fall Creek is used when the powerhouse is shut down and supplies water through a pipeline to the intake at Dam A. The pipeline crosses the Klamath River near the upstream end of Iron Gate Reservoir, and it extends to the City of Yreka's water distribution system.

At the upstream end of Iron Gate Reservoir, the pipeline is minimally buried in the reservoir bed (Figure 2.7-17). When Iron Gate dam is removed, the pipe would become exposed to high velocity river flows and would likely sustain damage. A replacement pipe crossing is needed before dam removal and reservoir drawdown to ensure uninterrupted water supply to the City of Yreka.

Additionally, the existing flat panel fish screens for the water supply intakes at Dams A and B may not meet current regulatory agency screen criteria for anadromous fish (USBR 2012a). These fish screens would have to meet the criteria from NMFS, USFWS, and CDFW, and would require updates, if found to be non-compliant.

Conceptual level buried and aerial relocation crossings of the pipeline across the Klamath River have been identified for feasibility and further evaluation. It is desired that any buried crossing should have adequate cover to compensate for the vertical scour during dam removal and the subsequent variations in the river flows and longitudinal profile. As the construction of the relocated crossing needs to happen prior to Iron Gate Dam removal, the cover over the pipe would likely have to exceed 12 feet. An open-cut construction approach would therefore, potentially require significant sediment and rock excavation under water and is not considered as a viable option. Considering this, the KRRC has identified and is proposing one of the following three options for the reconstruction of the Klamath River crossing of the Yreka pipeline:

1. A new buried pipeline by micro-tunneling in the immediate vicinity of the existing waterline crossing.
2. A new aerial pipeline on a dedicated utility pipe crossing in the immediate vicinity of the existing waterline crossing.
3. A new buried pipeline and an aerial pipeline crossing on the existing timber traffic bridge along Daggett Road located approximately 2,000 feet upstream of the existing waterline crossing.

The alignments for the three options are illustrated in Figure 2.7-17 and detailed in Appendix B: *Definite Plan*.

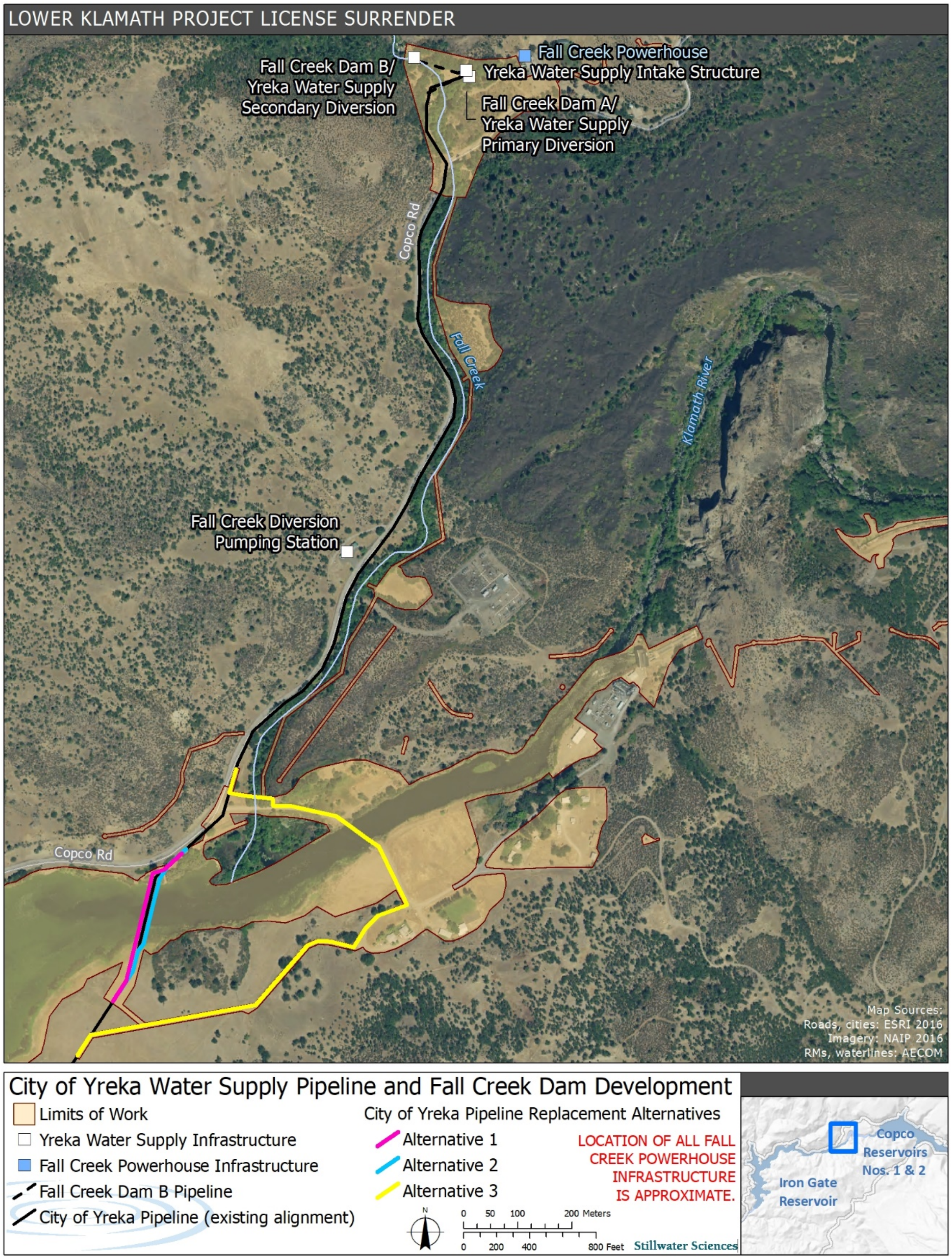


Figure 2.7-17. Alignments for Yreka Waterline Replacement - Klamath River Crossing Conceptual Alternatives.

2.7.8 Other Project Components

There are numerous Proposed Project components identified by the KRRC that fall outside of the major dam and powerhouse deconstruction, reservoir drawdown, reservoir restoration activities, hatchery operations, and City of Yreka water supply pipeline relocation activities described above. The KRRC has proposed these actions to address environmental, safety, and quality of life issues in relation to the major actions discussed above. These other project components summarized in Table 2.7-13 and discussed briefly below. Additional information, regarding these other project components are presented in the individual resource sections (see Section 3 *Environmental Setting, Potential Impacts, and Mitigation Measures*).

Table 2.7-14. Summary of Other Project Components.

Project Component		Summary Description	Location in Appendix B
Aquatic Resource Measures	Mainstem spawning	Surveys and protection measures	Definite Plan − Section 7.2 and Appendix I, including 2018 update
	Outmigrating juveniles		
	Iron Gate Fish Hatchery	Delayed release of hatchery fish to avoid poor water quality	
	Suckers	Surveys and relocation	
	Freshwater mussels	Surveys and relocation	
Terrestrial Resource Measures	Habitat restoration	Stabilization of remaining sediments and restoration of reservoir and other disturbed areas	Definite Plan − Section 7.3 and Appendix J
	Nesting birds	Surveys and avoidance and minimization measures	
	Bald and golden eagles		
	Special-status bats		
	Northern spotted owl		
	Special-status plants		
	Wetlands	Delineation, avoidance measures and restoration plan to result in no net loss	
Transportation	Construction access	Improve roads, bridges and culverts affected by the Proposed Project	Definite Plan − Section 7.4 and Appendix K
	Ongoing and post-project maintenance		

Project Component		Summary Description	Location in Appendix B
Recreation Facilities Management/ Recreation Plan	J.C. Boyle Reservoir	Removal of numerous existing recreation facilities, and restoration with native vegetation before, during, and after dam removal; initiates process to add new river-based recreation opportunities	Definite Plan − Section 7.6
	Copco No. 1 Reservoir		
	Iron Gate Reservoir		
	Dispersed Recreation Sites		
Downstream Flood Control		Maintain existing flood protection	Definite Plan − Section 7.7
Cultural Resources Plan		Framework for compliance with cultural resources protection laws	Definite Plan − Section 7.9
Traffic Management Plan		Framework and initial requirements, final plan to be developed by contractor	Definite Plan − Appendix O2
Water Quality Monitoring Plan		Water quality monitoring and analysis to support adaptive management	Definite Plan – Appendix M
Groundwater Well Management Plan		Well monitoring and return production rates of all affected groundwater wells to their pre-dam-removal condition, as necessary	Definite Plan – Appendix N
Fire Management Plan		Framework and initial requirements; final plan to be developed by contractors	Definite Plan – Appendix O1
Hazardous Material Management Plan		Framework and initial requirements; Phase 1 assessment in 2018	Definite Plan – Appendix O3
Emergency Response Plan		Framework and initial requirements; final plan to be developed by contractor	Definite Plan – Appendix O4
Noise and Vibration Control Plan		Framework and initial requirements; final plan to be developed by contractor	Definite Plan – Appendix O5

2.7.8.1 Aquatic Resource Measures

As noted above in Section 2.7 *Proposed Project*, the timing of reservoir drawdown activities was chosen to reduce impacts on anadromous fish species in the Klamath River. Additionally, the Proposed Project includes the aquatic resource (AR) measures summarized below. These measures reflect consultation with a group of fisheries scientists with established regional expertise that KRRC convened to review aquatic resources impact from the proposed project, with particular emphasis on reviewing the resources protection measures proposed in the 2012 KHSA EIS/EIR in light of new information. The ongoing feedback from the group would be used to refine and finalize the plans proposed in the AR measures. Appendix B: *Definite Plan − Appendix I* contains additional detail on background, the latest science, and proposed measures. These measures are subject to further consultation with aquatic resource agencies and the final Biological Opinions for the Proposed Project.

Mainstem Spawning (AR-1)

Short-term effects of dam removal (suspended sediment concentrations and bedload) are anticipated to result in high mortality of embryos and pre-emergent life stages of any fish species spawning in the mainstem Klamath River downstream of Iron Gate Dam during the drawdown year.

The Aquatic Resource Measure AR-1 proposes the development and implementation of a monitoring and adaptive management plan prepared with input from fishery experts to offset the impacts of sediment releases during Lower Klamath Project dam removal on mainstem spawning. The plan would include a 2-year tributary confluence monitoring effort following dam removal and active removal of potential sediment and debris obstructions related to dam removal to improve volitional upstream passage for adult fish species from the Klamath River into its tributaries (thus reducing spawning in mainstem habitat). Monitoring frequency would be variable based on the season and year.

Additionally, any 5-year flow event (estimated as > 10,895 cfs at the USGS gage no. 11516530) within the first two years following reservoir drawdown, would trigger a monitoring effort. AR-1 also includes a proposed spawning habitat evaluation on the Klamath River and its tributaries in the Hydroelectric Reach. If existing spawning habitat conditions for Chinook salmon and steelhead do not meet target metrics described in Appendix B: *Definite Plan – Appendix I*, spawning gravel augmentation would be completed on both the mainstem and key tributaries in the Hydroelectric Reach to offset impacts of Lower Klamath Project dam removal.

Outmigrating Juveniles (AR-2)

Short-term effects of dam removal (suspended sediment concentrations and bedload) are anticipated to result in mostly sublethal[15], and in some cases lethal impacts to a portion of the juvenile Chinook salmon, coho salmon, steelhead, and Pacific lamprey that are outmigrating from tributary streams to the Klamath River upstream of Trinity River (RM 43.3) during late winter and early spring of dam removal year 2.

The Aquatic Resource Measure AR-2 proposes three primary actions to reduce impacts to outmigrating juvenile fish: (1) salvaging mainstem overwintering juvenile salmonids prior to reservoir drawdown; (2) maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River (in conjunction with AR-1 efforts); and (3) developing a water quality monitoring network, trigger thresholds, and plan for salvaging and relocating juvenile fish from tributary confluence areas to cool water tributaries or nearby off-channel ponds. Details on the monitoring and adaptive management actions are provided in Appendix B: *Definite Plan – Appendix I*.

Iron Gate Fish Hatchery Management (AR-4)[16]

Hatchery produced coho salmon smolts that are released into the Klamath River during dam removal year 2, could suffer high mortality if released during periods of high suspended sediment levels (Chinook salmon and steelhead, if any, are typically released during period that are not predicted to coincide with high suspended sediment levels).

[15] Impacts on fish that may cause a behavioral response or physiological damage, without causing direct mortality.

[16] Please note that there is no proposal submitted for an AR-3. The numbering in the EIR follows that in Appendix B: *Definite Plan – Appendix I.*

Aquatic Resource Measure AR-4 proposes that hatchery-reared yearling coho salmon to be released in the spring of dam removal year 2 be held at hatchery facilities until water quality conditions in the mainstem Klamath River improve to sublethal levels. Water quality monitoring stations would be used to determine when conditions in the mainstem Klamath River are suitable. Based on suspended sediment level predictions, a delay of approximately two weeks until mid-May for release of coho salmon smolts is anticipated.

Suckers (AR-6)[17]

Short-term effects of Lower Klamath Project dam removal are anticipated to result in mostly sublethal, and in some cases lethal impacts to Lost River and shortnose suckers within Hydroelectric Reach reservoirs. Lost River and shortnose suckers are lake-type suckers and are therefore not anticipated to persist in the Klamath River following restoration of the Hydroelectric Reach reservoirs to free-flowing riverine conditions.

The Aquatic Resource Measure AR-6 proposes two primary actions to reduce the effect on suckers. The first proposed action is to sample for suckers in the Klamath River and in Hydroelectric Reach reservoirs to document the population's abundance and genetics prior to Lower Klamath Project removal. The second proposed action is to capture as many suckers as feasible (not to exceed 3,000 fish) from within the Klamath River and in Hydroelectric Reach reservoirs and place them into the isolated waterbody of Tule Lake (to ensure hybridized suckers do not mix with sucker populations designated as recovery populations in Upper Klamath Lake). Additional detail is provided in Appendix B: *Definite Plan – Appendix I*.

Freshwater Mussels (AR-7)

Freshwater mussels in the Hydroelectric Reach and in the Klamath River downstream from Iron Gate Dam are anticipated to experience deleterious effects during dam decommissioning due to high suspended sediment levels, bedload movement, and low dissolved oxygen concentrations.

The Updated Aquatic Resource Measure AR-7 (Appendix B: *Definite Plan – Updated AR-7, October 2018 Update*) proposes a salvage and relocation plan to be prepared prior to Lower Klamath Project dam removal. Actions would include completing a reconnaissance of existing freshwater mussels from Iron Gate Dam to Cottonwood Creek to document abundance and distribution and identifying potential translocation habitat downstream from the Trinity River confluence (RM 43.3), and between J.C. Boyle Dam (RM 229.8) and Copco No. 1 Reservoir (RM 208.3). Freshwater mussels would be salvaged and relocated prior to reservoir drawdown. It is anticipated based on existing data that up to 20,000 mussels would be translocated.

2.7.8.2 Terrestrial Resource Measures

The Proposed Project includes Terrestrial Resource Measures for northern spotted owl, bald eagle and golden eagle, special-status wildlife species, bats, special-status plants, and vegetation communities and wetlands. The measures include ensuring the presence of a biological monitor during construction-related activities (e.g., structure demolition, ground disturbance), biological awareness trainings for all construction

[17] Please note that there is no proposal submitted for an AR-5. The numbering in the EIR follows that in Appendix B: *Definite Plan – Appendix I.*

personnel, requirements to delineate the Limits of Work and prohibit construction-related traffic outside the boundaries, wildlife exclusion and entrapment, willow flycatcher habitat surveys, nesting bird surveys, and other wildlife surveys. These measures are briefly described below, and additional detail is presented in Appendix B: *Definite Plan – Appendix J*. Analysis of the KRRC proposed Terrestrial Resource Measures as part of the Proposed Project is included in Section 3.5 *Terrestrial Resources* of this EIR.

The KRRC has initiated surveys associated with most of the measures described below, including (a) gathering information on habitat and identifying access for subsequent wildlife surveys (spring and summer 2018); (b) implementing General Wildlife Surveys to document baseline information on the presence of special-status species and their habitats, which included documenting any wildlife signs such as bird nesting, dens, or burrows (May and June 2018); (c) conducting surveys for osprey, peregrine falcon, greater sandhill crane, and heron colonies (May 2018); (d) implementing ground- and aerial-based surveys to document bald and golden eagles (January, February, and June 2018); and (e) assessing structure use by bats (2017 and 2018).

The results of these surveys are anticipated to be available soon and would be incorporated into the final resources protection plans and into construction planning to avoid and minimize effects. It is anticipated that avoidance and mitigation measures to be incorporated into regulatory approvals would be developed in coordination with the USFWS, the CDFW, and the ODFW. The work plans and planned avoidance and minimization measures are summarized below and presented in Appendix B: *Definite Plan – Appendix J*.

Northern Spotted Owl Measures

The Proposed Project includes identifying suitable habitat for the northern spotted owl using a Relative Habitat Suitability model within one mile of Copco No. 1, Copco No. 2, and Iron Gate dams and facilities. If suitable habitat is identified within a noise disturbance distance (i.e., one mile to account for blasting at dams, 0.5 miles of the Limits of Work to account for other construction-related noise disturbance), protocol-level surveys would be conducted. Survey methodology and Relative Habitat Suitability model results are detailed in the Northern Spotted Owl section of Appendix B: *Definite Plan − Appendix J*. If any nest locations are documented, the Proposed Project includes seasonal restrictions (March 1–September 30) to minimize disturbance to young prior to fledgling. Limited operating periods can be waved in the event of nest failure if confirmed by a biologist. To prevent direct injury of young resulting from aircraft, no helicopter flights would occur within or at an elevation lower than 0.8 km (0.5 mi) of suitable nesting and roosting habitat during the entire breeding season unless the protocol level surveys identify no activity centers.

Bald and Golden Eagle Measures

The Proposed Project includes conducting ground and aerial-based surveys to identify the presence of bald and golden eagles within 2 miles of construction and demolition sites, and 0.5 miles from other areas within the Limits of Work including reservoir boundaries (conducted in January/early February 2018 and June 2018). The KRRC also proposes to re-survey the area in the year prior to drawdown to establish a baseline of normal behavior prior to implementing construction. Additionally, the KRRC would develop an Eagle Avoidance and Minimization Plan in coordination with the USFWS that identifies procedures and protocols for avoiding and minimizing impacts. Avoidance and minimization measures would include cutting of vegetation and grubbing outside of the sensitive eagle nesting season and incorporating a 0.5-mile restriction buffer if a nest is within 2 miles of the Limits of Work (the buffer may be reduced if a topographic feature reduces the line of site). Surveys methodology, preliminary results, and avoidance and minimization measures are described in the Bald Eagle and Golden Eagles Measures sections in Appendix B: *Definite Plan – Appendix J*.

Special-status Wildlife Measures

Special-status wildlife measures incorporate a field reconnaissance effort; general wildlife surveys; nest location surveys for species that use the same nest locations in subsequent years (e.g., osprey, peregrine falcon, sandhill crane, heron colonies); pre-construction nesting bird surveys (between February and July) within 300 feet of the Limits of Work, and construction monitoring. Special-status species, such as the tricolored blackbird and western pond turtle would be noted during these surveys. The measure includes avoidance and minimization measures, such as construction monitoring, environmental awareness training, wildlife exclusion, and identification of nesting buffers, including consideration of the species, noise effects, line of sight, and other site-specific considerations. Survey methodology and avoidance and minimization measures are described in the Special-Status Wildlife Species Measure section in Appendix B: *Definite Plan – Appendix J*.

Bats Measures

The Proposed Project includes components to avoid and minimize both short and long-term construction-related impacts and loss of habitat on roosting bats. The measures would include a site reconnaissance and daytime visual inspection of structures to identify presence of bats, hibernacula (winter roost) surveys, and spring migration surveys using visual observation (e.g., emergence surveys) and acoustic monitoring. Avoidance and minimization measures may include exclusion, seasonal restrictions on demolition, preservation of existing habitat, and creation of alternative replacement bat habitat. Survey methodology, preliminary results, and avoidance and minimization measures are described in the Bat Measure section in Appendix B: *Definite Plan – Appendix J*.

Special-status Plants Measures

As part of the Proposed Project, comprehensive floristic surveys would be conducted for special status-plants within the construction Limits of Work where ground-disturbing activities would occur. An established buffer, like a 100-meter buffer around disposal sites and a 10-meter buffer off of access and haul roads would also be required. If any special-status plants are documented, the project design would be modified if possible to avoid them. Where avoidance is not feasible, a combination of relocation, propagation, and establishment of new populations in designated conservation areas would be implemented, as determined in coordination with the resource agencies. Additionally, as part of the Proposed Project, invasive plant species would be controlled by implementing measures such as routine washing of construction vehicles and equipment. Survey methodology and minimization measures are described in Appendix B: *Definite Plan – Appendix E –Special Status Plant Species*.

Vegetation Communities and Wetland Measures

The Proposed Project identifies a number of pre-construction measures to reduce impacts on wetland and riparian habitats. First, a wetland delineation would be conducted within the Limits of Work around the dams and facilities, access and haul roads, and disposal sites in accordance with the 1987 USACE Wetland Delineation

Manual (USACE 1987) and applicable Regional Supplements (i.e., Western Mountains, Valleys, and Coast Region [USACE 2010] and Arid West [USACE 2008]) (Appendix B: *Definite Plan – Appendix J*). The results of the wetland delineation would be incorporated into the project design to avoid and minimize direct impacts on wetlands to the maximum extent feasible. Wetland areas adjacent to the construction Limits of Work would be fenced to prevent inadvertent entry during construction. Additionally, the Proposed Project would include pollution and dust control measures to reduce potential impacts to water quality in wetlands and other waters during construction.

The Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*) includes details for the installation of native plants that represent the vegetation communities and wetland habitats. Aerial, barge, or hand seeding would be implemented in appropriate areas to re-vegetate all areas disturbed during construction, including reservoir areas, demolition and disposal sites, staging, access and haul roads, and turn-arounds. The goal of the management plan would be no net loss of wetland or riparian habitat acreage and functions.

Wetlands established in restored areas would be monitored for five years or until the performance criteria (as defined in Appendix B: *Definite Plan – Appendix H*) have been met. To minimize the introduction of invasive plant species into construction areas, construction vehicles and equipment would be cleaned with compressed water or air within a designated containment area to remove pathogens, invasive plant seeds, or plant parts, and disposed of in appropriate disposal facilities. The plan also would contain metrics to evaluate success of minimizing invasive exotic vegetation (Section 2.7.4).

2.7.8.3 Recreation Facilities Management

While some existing recreational facilities would remain (Table 2.7-15), the Proposed Project would remove most of the existing recreational sites at Iron Gate, Copco No. 1, and J.C. Boyle reservoirs (which primarily provide fishing, boating, and reservoir day-use access) and initiates a process to add river-based recreation sites. KRRC has developed a Draft Recreation Plan which seeks to identify recreation opportunities, in coordination with stakeholders, that would offset the removal of reservoir recreation opportunities and the reduction in whitewater boating days associated with the Proposed Project (Appendix B: *Definite Plan – Appendix Q*). New river-based opportunities may include: (a) new routes and roads for river access; (b) two small to medium river recreation facilities that would accommodate 20 campsites, day use amenities, and access to the river for fishing and boating; and (c) a new trail between J.C. Boyle Dam and the Iron Gate Fish Hatchery.

The Proposed Project includes the complete removal of eight recreation sites (Table 2.7-15), including removal of structures, concrete, and pavement, and regrading and revegetating associated parking areas and trails (Appendix B: *Definite Plan – Appendix Q*). Removal of recreation sites would occur before, during, or after dam removal and the area would be planted with a native seed mix as described in the Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*).

Table 2.7-15. Recreation Facilities scheduled for removal under the Proposed Project.

Site Name	Existing Facilities
Copco No. 1 Reservoir	
Mallard Cove	Day-use picnic area, restrooms, boat launch with boarding dock, and interpretive signs
Copco Cove	Picnic area, restrooms, boat launch with boarding dock, and interpretive signs
Iron Gate Reservoir	
Wanaka Springs	Day-use area, campground, restrooms, fishing dock, and interpretive signs
Camp Creek (including Dutch or Scott Creek)	Day-use area, campground, boat and fishing dock, recreational vehicle (RV) dump station, interpretative display, and restrooms
Juniper Point	Day use area, campground, fishing dock, restroom, and interpretive signs
Mirror Cove	Day use area, campground, fishing dock, boat launch, interpretive signs, and restroom
Overlook Point	Picnic area and restrooms
Long Gulch	Picnic area, boat launch, and restrooms

Facilities at Fall Creek and Jenny Creek Day-Use Areas at Iron Gate Reservoir, and the Iron Gate Fish Hatchery Day-Use Area, would remain and may be upgraded or enhanced (Table 2.7-16, Appendix B: *Definite Plan – Appendix Q* and EIR Section 3.20 *Recreation*). Future enhancements at these locations would depend on the future ownership of Parcel B lands, where these three recreational facilities are located. Pursuant to the KHSA, Parcel B lands would be transferred to the respective states (or a designated third party) for public interest purposes such as tribal mitigation, river-based recreation, wetland restoration, etc. (see also Section 2.7.11 *Land Disposition and Transfer*).

Table 2.7-16. Recreation Facilities retained with potential modification under the Proposed Project.

Site Name	Existing Facilities	Potential Modification
Iron Gate Reservoir		
Fall Creek	Day-use area, picnic area, boat launch, restroom, and hiking trail	Potential modification to support continued and improved recreational access including reconstruction of the trail.
Jenny Creek	Day-use area, campground, restrooms, and hiking trails	Potential modification to support additional campsites and improved amenities.
Iron Gate Fish Hatchery Public Use Area	Day-use area, picnic areas, picnic shelter, visitor center, interpretive kiosks, restrooms, trail to the river, fishing dock, and boat launch	Potential modification to support additional facilities and a reconstructed boat ramp.

Sources: Appendix B: *Definite Plan – Appendix Q.*

2.7.8.4 Downstream Flood Control

The Proposed Project would alter the 100-year floodplain immediately downstream of Iron Gate Dam. KRRC proposes to work with the owners of the structures located within the altered 100-year floodplain to move or elevate legally established structures, where feasible. This EIR relies on modeled preliminary 100-year floodplain inundation from Iron Gate Dam to Happy Camp under an existing and Proposed Project condition (USBR 2012b), and on KRRC's categorization of downstream structures from Iron Gate Dam to Humbug Creek (the point downstream of which any change to the floodplain is expected to be less than 0.5 feet, as per USBR [2012b]) FEMA will make the final determination of the boundary of the 100-year floodplain after dam removal, and the KRRC is coordinating with FEMA to initiate the map revision process.

This Project Component replaces Mitigation Measure H-2 from the 2012 KHSA EIS/EIR. Please see Section 3.6 *Flood Hydrology* for further discussion.

2.7.8.5 Cultural Resources

KRRC is preparing a Cultural Resources Plan (Appendix B: *Definite Plan – Appendix L*) that would identify the cultural resources studies that KRRC has completed, those that are currently ongoing, and others that KRRC anticipates completing in order to comply with regulatory requirements under Section 106 of the National Historic Preservation Act and California Assembly Bill 52. The Draft Cultural Resources Plan, submitted with the Definite Plan CITE, describes consultation completed by the date of submission by KRRC and PacifiCorp, acting as FERC's non-federal representatives, for carrying out consultation pursuant to Section 106 and the status of consultation with affected tribes and other tribal organizations. The Draft Cultural Resources Plan also provides an update as of the date of submission regarding the status of consultation under Assembly Bill 52 with California Native American tribes. The final Cultural Resources Plan would incorporate mitigation measures developed through consultation under Assembly Bill 52. Please see Section 3.12 *Historical Resources and Tribal Cultural Resources* for more information.

2.7.8.6 Traffic Management

The Proposed Project includes an initial Transportation Management Plan (TMP) to minimize construction-related traffic delays and maintain safe movement of vehicles during project implementation. The Proposed Project would result in changes in traffic conditions from delivering construction equipment, hauling deconstructed materials for near- or off-site disposal, delivery of rehabilitation materials, worker access, fish hauling (as applicable), and road, bridge, and culvert improvements would be required to support the increased traffic (see also Section 2.7.1.2 *Copco No. 1 Dam and Powerhouse – Construction Access and Road Improvements*). The major access roads for each dam site are provided in Table 2.7-17 and Figure 2.7-3. The roads in Oregon associated with J.C. Boyle Dam are included in Table 2.7-17 given the likelihood that construction crews and equipment from one of the California dam sites may be moved to/from the Oregon J.C. Boyle Dam site.

Table 2.7-17. Major Local and Regional Access Roads.

Dam Site	Interstate Access Road	Regional Access Road	Local Access Road
Copco No. 1 and Copco No. 2	I-5 (in California)	Copco Road	Ager-Beswick Road
Iron Gate	I-5 (in California)	Copco Road	Lakeview Road

The major objectives of the initial Traffic Management Plan are to maintain efficient and safe movement of vehicles through the construction zone and to provide intensive public awareness of potential impacts to traffic on project haul routes and access roads. To reduce impacts from traffic delays resulting from planned work, KRRC proposes that implementation of the final Traffic Management Plan would maintain acceptable levels of service, traffic circulation, and safety during all work activities on the state and county highway/roadway system.

The initial Traffic Management Plan outlines the structure and key requirements that would be incorporated by the construction contractor into a final Traffic Management Plan (Appendix B: *Definite Plan – Appendix O2*). The final plan would incorporate the contractor's specific means and methods for construction, which could refine the approach to access and traffic management. KRRC proposes coordinating with Oregon Department of Transportation (ODOT), California Department of Transportation, Klamath and Siskiyou Counties, Oregon State Police, and California Highway Patrol.

The initial Traffic Management Plan proposes to incorporate the management strategies below into the final Traffic Management Plan.

- Public Information – adopt methods to share information regarding any current or upcoming interruptions with the public
- Motorist Information – provide advance notice to motorists detailing traffic delays
- Incident Management – develop a procedure to implement in the event of an incident

In addition, the KRRC proposes incorporating the construction strategies listed below into the final Traffic Management Plan.

- Roadway closures – consider road users when identifying the timing and location of long-term (i.e., more than one day) road closures.
- Traffic Handling and Stage Construction – provide signage and traffic control.
- Construction Access to Work Zones – install informational signs along the road to inform motorists of the construction presence.
- Haulage – haul waste material that would not remain on site during non-peak hour times.
- Emergency Detour Plan – identify detour routes for facilities that provide essential services in times of emergencies (e.g., hospitals, fire/police stations).
- Traffic Safety Effects – adopt best management practices of signage, traffic management, and dust control to reduce traffic safety hazards from hauling, use of blind or sharp corners, slow vehicles, reduced visibility due to dust.

- Pedestrians and Bicycles – provide signage to notify both construction vehicle drivers and non-motorized users of each other's presence and if an unacceptable level of risk to non-motorized user is deemed to persist, an appropriate detour would provide continued use.

2.7.8.7 Water Quality Monitoring and Construction BMPs

To reduce potential impacts on water quality in wetlands and other surface waters during construction, the Proposed Project includes the following construction best management practices (BMPs) to be implemented within the Limits of Work:

- Clean Water Act Section 402 National Pollutant Discharge Elimination System (NPDES) permits would be obtained from Oregon and California for construction activities.
- Pollution and erosion control measures would be implemented to prevent pollution caused by construction operations and to reduce contaminated stormwater runoff.
- Oil-absorbing floating booms would be kept onsite, and the contractor would respond immediately to aquatic spills during construction.
- Vehicles and equipment would be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they would be cleaned up immediately.
- Equipment maintenance and/or repair would be confined to one location at each project construction site. Runoff in this area would be controlled to prevent contamination of soils and water.
- Dust control measures would be implemented, including wetting disturbed soils.
- A Stormwater Pollution Prevention Plan (SWPPP) would be implemented to prevent construction materials (fuels, oils, and lubricants) from spilling or otherwise entering waterways or water bodies.

In addition, the Proposed Project includes a Water Quality Monitoring Plan, which would implement water quality monitoring for 12 months of the year from at least one year prior to dam removal until up to three years following dam removal at seven locations in the Klamath Basin. According to the Water Quality Monitoring Plan, monitoring would occur at the following seven sites along the mainstem Klamath River:

- Klamath River below Keno Dam (RM 233.4; at or near USGS gage no. 11509500);
- Klamath River below J.C. Boyle Powerplant (RM 219.7; at or near USGS gage no. 11510700);
- Klamath River above Shovel Creek (RM 206.42; upstream of Copco No. 1 Reservoir)
- Klamath River below Iron Gate (RM 189.7; at or near USGS gage no. 11516530);
- Klamath River below Seiad Valley (RM 128.5; at or near USGS gage no. 11520500);
- Klamath River at Orleans (RM 59.1; at or near USGS gage no. 11523000); and
- Klamath River near Klamath (RM 6.0; at or near USGS gage no. 11530500).

Water quality monitoring immediately downstream of Keno Dam in the Upper Klamath River would assess baseline river conditions upstream of the Proposed Project Limits of Work. The Klamath River site above Shovel Creek is located approximately three river miles downstream from the Oregon-California state line and it is considered a possible location for the state line monitoring station. The final location, specifics, and duration of operation of the state line monitoring location would be determined in consultation with the State Water Board and ODEQ.

The water quality parameters measured at each of the monitoring locations in the Water Quality Monitoring Plan is summarized in Table 2.7-18. Time-series (continuous) water quality and stream discharge data along with discrete water quality samples would be collected to assess the water quality impacts of the Proposed Project. The Water Quality Monitoring Plan also contains laboratory testing of reservoir sediment samples collected in 2017 by the USGS to develop an SSC versus turbidity relationship for the reservoir sediments, including a laboratory protocol for the SSC/turbidity relationship to identify the accuracy and reliability of the relationship along with any uncertainties and specific field verification testing necessary during dam removal.

KRRC proposes to use results of the water quality monitoring and analysis to support adaptive management decision-making during and following dam removal and regarding potential impacts to aquatic resources.

Table 2.7-18. Water Quality Monitoring Plan Parameters.

Constituent	Frequency	Type of Data
Temperature	Hourly, 12 months per year	Time-series
Dissolved Oxygen	Hourly, 12 months per year	Time-series
pH	Hourly, 12 months per year	Time-series
Conductivity	Hourly, 12 months per year	Time-series
Turbidity	Hourly, 12 months per year	Time-series
SSC	Up to 24 samples pre-drawdown; weekly during drawdown, monthly following drawdown for 36 months or until TSS equals background at Keno	Discrete (auto-sampler)
SSC	4 storm events pre-drawdown; every two weeks during and after drawdown or until TSS equals background at Keno	Depth-width integrated sample
Chemical Oxygen Demand	Monthly, daily during drawdown	Discrete
Total Nitrogen	Monthly	Discrete
Total Phosphorous	Monthly	Discrete
Microcystin [-Producing Blue-green Algae] Cell Count	Monthly	Discrete

The Water Quality Monitoring Plan also specifies that the KRRC would develop a sediment characterization plan with consistent sampling and testing protocols and procedures in consultation with California and Oregon regulatory agencies to satisfy state requirements in Section 401 Water Quality Certifications to characterize the sediment quality in reservoir and riverbed sediments upstream and downstream of the Proposed Project Lower Klamath Project reservoirs, and in the Klamath River Estuary.

The Water Quality Monitoring Plan presents the KRRC's approach to monitoring water quality parameters during dam decommissioning based on Interim Measure 15 - Water

Quality Monitoring (IM-15). The Water Quality Monitoring Plan would be revised to be consistent with the water quality monitoring requirements of the final Clean Water Act Section 401 Water Quality Certifications from California and Oregon, since the Draft Clean Water Act Section 401 Water Quality Certifications from California and Oregon were under public review when this Water Quality Monitoring Plan was developed. The information collected under this plan and the development of the SCC/turbidity relationship would assist the KRRC in making adaptive management decisions during and following dam removal, in assessing the impacts of sediment decomposition, and other biological activities, on the dissolved oxygen concentrations in the Klamath River, in determining attainment of existing health related water quality standards for microcystin producing blue-green algae cell counts, and in understanding the impacts to aquatic resources. Additional Water Quality Monitoring Plan details are presented in Appendix B: *Definite Plan – Appendix M*.

2.7.8.8 Groundwater Well Management

The Proposed Project includes a Groundwater Well Management Plan, which is intended to identify groundwater wells that may be impacted by the project and provide sufficient monitoring to understand the effects, if any, on groundwater levels and water quality. If groundwater wells are found to have been adversely impacted following dam decommissioning, the KRRC would undertake measures (e.g., well deepening) to return the production rate of any affected domestic or irrigation groundwater supply well to conditions prior to dam decommissioning. There are six steps in the KRRC's proposed Groundwater Well Management Plan:

1. Database search and agency coordination
2. Outreach to land owners and residents
3. Installation of groundwater monitoring wells
4. Groundwater monitoring
5. Post-Dam removal outreach/notification of findings
6. Proposed actions to improve production rates

If the data collected during or following dam decommissioning confirms an adverse impact (i.e., loss of supply due to lowering groundwater level or adverse effect on water quality) to any potable or irrigation well, the KRRC would act to return the water well owner's supply to pre-dam decommissioning conditions. These actions could include providing temporary water supplies until long-term measures such as motor replacement, well deepening, or full well replacement are identified and implemented. Additional details are presented in Appendix B: *Definite Plan – Appendix N.*

2.7.8.9 Fire Management

The Proposed Project includes a Fire Management Plan, which sets forth fire prevention and response methods during Proposed Project activities (Appendix B: *Definite Plan – Appendix O1*). The KRRC would designate a Safety Officer available on-call 24 hours a day and 7 days a week in the event of a fire at the Proposed Project site. This Safety Officer is responsible for immediately contacting appropriate fire dispatch units, initiating fire suppression protocols, and instructing other workers in required fire prevention, fire watch, and suppression. The prevention and response methods in the Fire Management Plan are consistent with the policies and standards in local, county, state, and federal jurisdictions. Best management practices include, but are not limited to, clearing of dried vegetation or wetting-down areas to prevent wildfires in construction and deconstruction work areas where construction activities could result in open sparks or flames; maintaining all equipment to working standards; and keeping equipment clean of flammable material. The KRRC's Fire Management Plan also requires fire suppression equipment be on-site at all times and emergency contact numbers be posted, in case of a fire.

In addition to the above measures to be implemented during Proposed Project activities, the Fire Management Plan also addresses the water supply to fight wildfires following the removal of the reservoirs. KRRC's Fire Management Plan includes the development of alternative sources of water for firefighting which include installing permanent dry hydrants from which water trucks and fire engines could draw directly from the Klamath River and larger tributaries. In addition, KRRC would develop a map for use by air-based firefighting crews identifying potential water refueling locations on the Klamath River (i.e., pool features). Additional detail is presented in Appendix B: *Definite Plan – Appendix O1*.

2.7.8.10 Hazardous Materials Management

The Proposed Project would follow the Hazardous Materials Management Plan, which includes the measures described below, that are based on data from PacifiCorp, Environmental Data Resources, Inc., and local agencies. It is possible that additional recommendations would be made following the planned Phase I-Environmental Site Assessment (ESA) visits and interviews and the following any necessary Phase II Site Investigation. The Phase I report is anticipated to be released soon.

- All structures expected to be removed would be sampled and tested for asbestos containing material, lead based paint, and polychlorinated biphenyls (PCBs). Any abated material which exceed hazardous waste criteria levels for these hazards would be handled and disposed of at approved hazardous waste facilities in accordance with applicable federal and state regulations. Remaining materials would be disposed of as non-hazardous construction debris.
- All hazardous materials removed from the sites (e.g., paints, oils, and welding gases) would be either returned to the vendor, recycled, or managed and disposed of at an approved hazardous waste facility in accordance with applicable federal and state regulations.
- Transformer oils would be tested for PCBs if no data exists.
- Any tanks which contained hazardous materials would be decontaminated prior to disposal.
- Universal hazardous waste (e.g., lighting ballasts, mercury switches, and batteries) would be handled in accordance with applicable federal and state universal waste regulations.

Additional detail is presented in Appendix B: *Definite Plan – Appendix O3*.

2.7.8.11 Emergency Response

The Proposed Project includes an Emergency Response Plan. According to the plan, the construction contractor would be required to develop written procedures to help prevent incidents, to assure preparedness in the event incidents occur, and to provide a systematic and orderly response to emergencies. This plan would be closely coordinated with the chosen contractor's Health and Safety Plan, Spill Prevention and Response Plan and Fire Management Plan. Procedures documented in the plan would apply to all personnel working on site, including reviewing of emergency response procedures with all personnel assigned to the site to the extent necessary.

The plan would address, but would not be limited to, the following:

- Medical emergency—locations of hospitals
- Fire management–procedures and contacts
- Traffic incident–protocol for notification and direction for if medical attention is required
- Hazardous material spill management–development of a Spill Prevention and Response Plan to detail procedures and documentation forms to prevent and respond to spills
- Downstream hydraulic change planning–notification to the National Weather Service River Forecast Center (federal agency that provides official public warning of floods) of any planned major hydraulic change (removal of one or more of the dams) that could potentially affect the timing and magnitude of flooding below Iron Gate
- Dam or tunnel failure–notification procedures, evacuation procedures
- Catastrophic emergency (e.g., earthquake, high wind event, etc.)–notification procedures, accountability procedures to confirm all personnel are accounted for
- Security threat–cessation of all activity, notification procedures

Additional detail is presented in Appendix B: *Definite Plan – Appendix O4.*

2.7.8.12 Noise and Vibration Control

The Proposed Project includes an initial Noise and Vibration Control Plan (NVCP). The initial NVCP identifies measures to be incorporated into the final NVCP to reduce effects from day and nighttime noise levels on sensitive receptors resulting from Proposed Project construction activities. These measures would include, but are not limited to, scheduling activities during a time that would be less impactful on residents, installing sound barriers, employing blasting techniques to minimize noise and vibration disturbance, notifying residents of activities, and promptly addressing complaints.

The final NVCP, which the chosen contractor would develop, would document noise and vibration objectives based on regulatory and industry guidelines, discuss contractor staff roles and responsibilities for noise and vibration control, define noise intensive activities and timing, clearly identify sensitive receptors, evaluate construction noise levels, and outline the monitoring program for noise and vibration. Additional detail is presented in Appendix B: *Definite Plan – Appendix O5.*

2.7.9 KHSA Interim Measures

The KHSA includes series of “interim measures” (IMs) (KHSA Appendices C, D) that have been implemented by PacifiCorp since 2010 to assess and address environmental conditions and improve fisheries prior to dam removal. The KHSA defines the interim period as the period between the date that the KHSA was originally executed (February 18, 2010) and the decommissioning of the dams, which would occur once there has been a physical disconnection of the facility from PacifiCorp’s transmission grid. (KHSA, Section 1.4.) Because the IMs were developed to offset impacts from Klamath Hydroelectric Project operations, the majority of the IMs would not continue under the Proposed Project (Table 2.7-19).

Table 2.7-19. KHSA Interim Measures Relevant to California Under Existing Conditions and the Proposed Project.

Interim Measure	Interim Conservation Plan (ICP)[1]	Description	Existing Conditions	Proposed Project
IM1 – Interim Measures Implementation Committee (IMIC)	ICP	The IMIC is comprised of representatives from PacifiCorp, other parties to the KHSA (as amended on November 30, 2016), and representatives from the State Water Board and Regional Water Board (KHSA Appendix B, Section 3.2). The purpose of the IMIC is to coordinate with PacifiCorp on ecological and other issues related to the implementation of the Non-Interim Conservation Plan Interim Measures set forth in Appendix D of the Amended KHSA.	Ongoing	Would continue separate from the Proposed Project[2]
IM2 – California Klamath Restoration Fund/Coho Enhancement	ICP	PacifiCorp would fund actions to enhance survival and recovery of coho salmon, including habitat restoration and acquisition.	Ongoing	Would not continue
IM3 – Iron Gate Turbine Venting	ICP	PacifiCorp shall implement turbine venting on an ongoing basis beginning in 2009 to improve dissolved oxygen concentrations downstream of Iron Gate Dam.	Construction complete, implementation ongoing	Would not continue[3]
IM4 – Hatchery and Genetics Management Plan	ICP	PacifiCorp would fund the development and implementation of a Hatchery and Genetics Management Plan for the Iron Gate Hatchery.	Plan development is complete, implementation ongoing	Implementation would occur for eight years after removal of Iron Gate Dam as part of the Proposed Project, see also IM19 and IM20

Interim Measure	Interim Conservation Plan (ICP)[1]	Description	Existing Conditions	Proposed Project
IM5 – Iron Gate Flow Variability	ICP	PacifiCorp and USBR would annually evaluate the feasibility of enhancing fall and early winter flow variability to benefit salmonids downstream from Iron Gate Dam. In the event that fall and early winter flow variability can feasibly be accomplished, PacifiCorp would develop and implement flow variability plans. This IM would not adversely affect the volume of water available for Reclamation's Klamath Project or wildlife refuges.	Ongoing	Would not continue
IM6 – Fish Disease Relationship and Control Studies	ICP	PacifiCorp has established a fund to study fish disease relationships downstream from Iron Gate Dam. PacifiCorp would consult with the Klamath River Fish Health Workgroup regarding selection, prioritization, and implementation of such studies.	Ongoing	Would not continue
IM7 – J.C. Boyle Gravel Placement and/or Habitat Enhancement (one-year)	Non-ICP	PacifiCorp would provide funding for the planning, permitting, and implementation of gravel placement or habitat enhancement projects, including related monitoring, in the Klamath River upstream of Copco No. 1 Reservoir.	Ongoing	Would not continue
IM8 – J.C. Boyle Bypass Barrier Removal	Non-ICP	PacifiCorp would remove the sidecast rock barrier approximately 3 miles upstream of the J.C. Boyle Powerhouse in the Bypass Reach. This IM would help with safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout.	Complete	Completed, part of existing conditions
IM9 – J.C. Boyle Powerhouse Gage	Non-ICP	Upon the Effective Date, PacifiCorp shall provide the U.S. Geological Survey with continued funding for the operation of the existing gage below the J.C. Boyle Powerhouse.	Ongoing	Would not continue

Interim Measure	Interim Conservation Plan (ICP)[1]	Description	Existing Conditions	Proposed Project
IM10 – Water Quality Conference	Non-ICP	PacifiCorp shall provide one-time funding of $100,000 to convene a basin-wide technical conference on water quality within one year from the Effective Date of the KHSA.	Complete	Completed, part of existing conditions
IM11 – Interim Water Quality Improvements	Non-ICP	PacifiCorp shall spend up to $250,000 per year to be used for studies or pilot projects developed in consultation with the Implementation Committee to improve water quality in the Klamath River. Additionally, PacifiCorp shall provide funding of up to $5.4 million for a water quality improvement project after KRRC acceptance of license surrender order, with an additional amount of up to $560,000 annually for operation and maintenance.	Studies and pilot projects ongoing	Studies and pilot projects would not continue. Water Quality Improvement Project would begin[2]
IM12 – J.C. Boyle Bypass Reach and Spencer Creek Gaging	Non-ICP	PacifiCorp shall install and operate stream gages at the J.C. Boyle Bypass Reach and at Spencer Creek.	Complete	Gage operation would not continue
IM13 – Flow Releases and Ramp Rates	Non-ICP	PacifiCorp would maintain current operations including instream flow releases of 100 cfs from J.C. Boyle Dam to the J.C. Boyle Bypass Reach and a 9-inch per hour ramp rate below the J.C. Boyle Powerhouse prior to transfer of the J.C. Boyle facility.	Ongoing	Would not continue
IM14 – 3,000 cfs Power Generation	Non-ICP	Upon approval by Oregon Water Resources Department, PacifiCorp would continue maximum diversions of 3,000 cfs at J.C. Boyle Dam for power generation.	Ongoing	Would not continue

Interim Measure	Interim Conservation Plan (ICP)[1]	Description	Existing Conditions	Proposed Project
IM15 – Water Quality Monitoring	Non-ICP	PacifiCorp shall fund long-term baseline water quality monitoring to support dam removal, nutrient removal, and permitting studies, and also will fund blue-green algae and blue-green algae toxin monitoring as necessary to protect public health. Funding of $500,000 shall be provided per year. The funding shall be made available beginning April 1, 2010 and annually on April 1.	Ongoing	Would not continue
IM16 – Water Diversions	Non-ICP	PacifiCorp shall seek to eliminate three screened diversions from Shovel (2) and Negro (1) Creeks and shall seek to modify its water rights as listed above to move the points of diversion from Shovel and Negro Creek to the mainstem Klamath River.	Not yet occurred	PacifiCorp would undertake separate from the Proposed Project – see Section 3.24 *Cumulative Effects*
IM17 – Fall Creek Flow Releases	Non-ICP	PacifiCorp would continue to provide a continuous flow release to the Fall Creek Bypass Reach targeted at 5 cfs.	Ongoing	Would continue as part of existing operations
IM18 – Hatchery Funding	Non-ICP	PacifiCorp shall fund 100 percent of Iron Gate Hatchery operations and maintenance necessary to fulfill annual mitigation objectives developed by the California Department of Fish and Wildlife in consultation with the National Marine Fisheries Service (NMFS) and consistent with existing FERC license requirements.	Ongoing	Would not continue, see IM19 and IM20

Interim Measure	Interim Conservation Plan (ICP)[1]	Description	Existing Conditions	Proposed Project
IM19 – Hatchery Production Continuity	Non-ICP	PacifiCorp will begin a study to evaluate hatchery production options that do not rely on the current Iron Gate Hatchery water supply. Based on the study results, and within six months following the DRE's acceptance of the FERC surrender order, PacifiCorp will propose a post-Iron Gate Dam Mitigation Hatchery Plan (Plan) to provide continued hatchery production for eight years after the removal of Iron Gate Dam.	Ongoing	Would be complete
IM20 – Hatchery Funding After Removal of Iron Gate Dam	Non-ICP	After removal of Iron Gate Dam and for a period of eight years, PacifiCorp shall fund 100 percent of hatchery operations and maintenance costs necessary to fulfill annual mitigation objectives developed by CDFW in consultation with NMFS.	Not yet occurred	Would occur

[1] The Interim Conservation Plan refers to the plan developed by PacifiCorp through technical discussions with NMFS and USFWS regarding voluntary interim measures for the enhancement of coho salmon and suckers listed under the ESA, filed with FERC on November 25, 2008, or such plan as subsequently modified.

[2] Per the KHSA Appendix D, Non-Interim Conservation Plan Interim Measures, following the DRE's (Dam Removal Entity or KRRC) acceptance of the license surrender order, PacifiCorp shall provide funding of up to $5.4 million for implementation of projects approved by the Oregon Department of Environmental Quality (ODEQ) and the California State and Regional Water Quality Control Boards, and an additional amount of up to $560,000 per year to cover project operation and maintenance expenses related to those projects, these amounts subject to adjustment for inflation as set forth in Section 6.1.5 of the KHSA. PacifiCorp would provide funding for these nutrient reduction projects separate from the Proposed Project (see Section 3.25 Cumulative Effects).

[3] Turbine venting at Iron Gate would not occur under the Proposed Project as the Klamath River would be restored to natural conditions that would not require turbine venting to offset the operational impacts of the Iron Gate Dam complex.

2.7.10 Land Disposition and Transfer

The Proposed Project includes the transfer of PacifiCorp lands immediately surrounding the Lower Klamath Project ("Parcel B lands") (Figure 2.7-18) from PacifiCorp to the KRRC prior to dam removal (this transfer is the subject of a separate FERC application). The Proposed Project then provides that following dam removal, the KRRC would transfer Parcel B lands to the states, or to a designated third-party transferee. The lands would thereafter be managed for public interest purposes (e.g., tribal mitigation, river-based recreation, wetland restoration, etc.) (KHSA Section 7.6.4). Pursuant to the KHSA, decisions about the land transfer would occur following dam removal, and the outcome of who the lands will ultimately be transferred to and what they will be used for is uncertain. While this draft EIR analyzes the disposition and transfer of Parcel B lands at a general level, the specific impacts associated with the transfers and any future land uses remain uncertain.

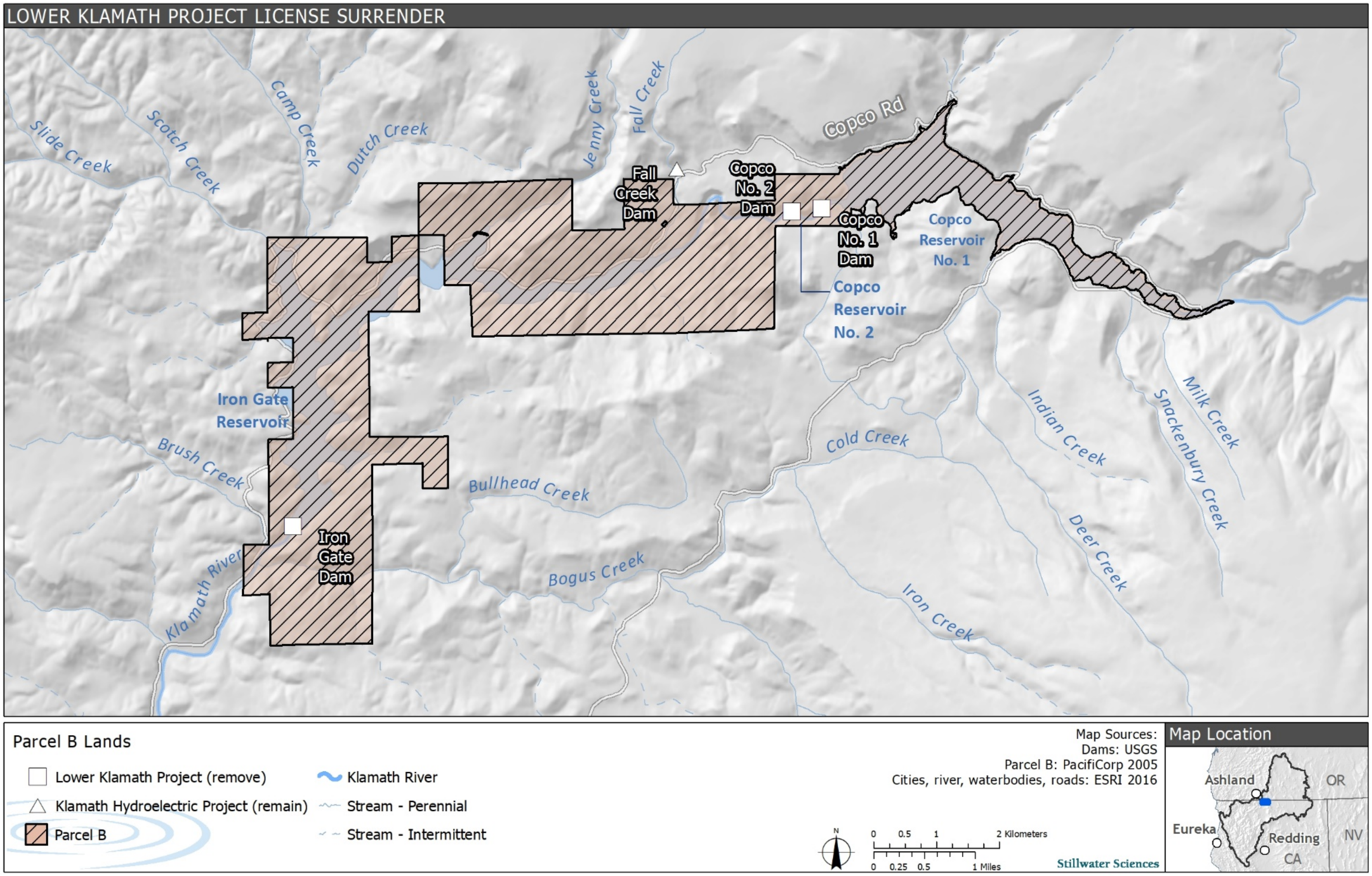


Figure 2.7-18. Parcel B Lands – California Portion.

2.8 Intended Uses of the EIR

In accordance with CEQA Guidelines section 15124, subdivision (d), this section describes the intended uses of the EIR.

The State Water Board intends to rely on this EIR for any issuance of a water quality certification for the Proposed Project under Clean Water Act section 401, including certification for a proposed decommissioning license from FERC and an anticipated application to the U.S. Army Corps of Engineers (USACE) for a discharge permit under Clean Water Act section 404. Additionally, to the extent the project requires any other water quality or water rights permits, such as any NPDES permits for hatchery operation and construction work, the State Water Board or the Regional Water Quality Control Board for the North Coast would rely on this EIR.

The Federal Power Act broadly preempts the state's authority over hydroelectric facilities. (*California v. FERC*, 495 U.S. 490 (1990); *Sayles Hydro Assocs. v. Maughan* 985 F.2d 451 (9th Cir. 1993). One of the limited exceptions to this rule is issuance of water quality certifications under Clean Water Act section 401 for FERC licensing decisions. Clean Water Act section 401 requires every applicant for a federal license or permit that could result in a discharge to the waters of a state to apply for certification from that state that their activities will be in compliance with state and federal water quality standards and other relevant requirements of state law. Conditions of a water quality certification become conditions of the federal permit or license. Thus, since there is an application before FERC to remove the Lower Klamath Project dams, the State Water Board can issue a water quality certification under certain water quality conditions or deny water quality certification based on a proposed activity's impact on the state's waters. The Federal Power Act preempts other state authority. Accordingly, the State Water Board does not anticipate that other state or local agencies would undertake permitting or other discretionary actions subject to CEQA for the proposed project. Additionally, although this draft EIR analyzes impacts of the Proposed Project to a broad range of environmental resource areas, implementation of any developed mitigation measures will depend on agreements to implement mitigation measures by the KRRC or FERC. During EIR development, this issue was discussed in multiple stakeholder forums, and this issue is discussed in greater detail throughout this draft EIR.

The California Coastal Commission has indicated that it may issue a determination of consistency with the Coastal Zone Management Act, should the KRRC prepare and submit a consistency certification and should the National Oceanic and Atmospheric Administration's (NOAA's) Office for Coastal Management grant such authority (January 31, 2017 public scoping letter, see Appendix A). The California Coastal Commission has indicated that, should it issue such a determination, the California Coastal Commission would rely on this EIR.

Multiple federal agencies would issue decisions on the Proposed Project. As previously mentioned, FERC has before it the application for decommissioning. The State Water Board anticipates that the application would also seek a "dredge and fill" permit under Clean Water Act section 404 from the USACE. The National Marine Fisheries Service and the United States Fish and Wildlife Service are the federal agencies with the authority to issue Biological Opinions on the proposed project, under the Endangered Species Act. National Marine Fisheries Service, the United States Fish and Wildlife

Service, Bureau of Land Management additionally have specific mandatory conditioning authority under sections 4(e) and 18 of Federal Power Act (16 U.S.C. § 797(e), 811). To the extent that this EIR is issued at a point in which it is useful to these federal agencies' analyses, the information contained herein may help to inform these decisions, and any environmental review under the federal National Environmental Policy Act.

Additionally, the KRRC has proposed, and FERC has approved, an Independent Board of Consultants to evaluate aspects of the KRRC's application. This EIR may provide useful information for the Board of Consultants' review.

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