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EAST BAY MUNICIPAL UTILITY DISTRICT

July 30, 2026

VIA E-FILING

Debbie-Anne A. Reese, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916-085)
Revised Study Plan

Dear Secretary Reese:

East Bay Municipal Utility District (EBMUD), the licensee of the Lower Mokelumne River Hydroelectric Project (Lower Mokelumne River Project or Project), Federal Energy Regulatory Commission (FERC or Commission) No. 2916, is pleased to file the enclosed Revised Study Plan (RSP) with FERC for the relicensing of the Lower Mokelumne River Project in accordance with the requirements of Title 18 of the U.S. Code of Federal Regulations (CFR) Section 5.13 of the Commission's regulations. The current FERC license for the Project expires on March 31, 2031.

EBMUD is relicensing the Project using the Commission's Integrated Licensing Process (ILP). On December 31, 2025, the Commission issued a Notice of Commencement of Proceeding and Scoping Document 1 (SD1) following EBMUD's filing of the Notice of Intent (NOI) and Pre-Application Document (PAD) on October 20, 2025. On January 29, 2026, EBMUD hosted a site visit preceded by public scoping meetings held by the Commission on January 28, 2026. Comments on the PAD and study requests were due on February 17, 2026. The Commission issued Scoping Document 2 (SD2)[1] on April 1, 2026, identifying preliminary issues and alternatives to be addressed during their environmental review process.

EBMUD filed a Proposed Study Plan (PSP) on April 2, 2026. The PSP included 16 proposed study plans covering aquatic, terrestrial, recreation, and cultural resource areas. Pursuant to 18 CFR 5.11(e), EBMUD held a public in-person PSP meeting on Wednesday, April 29, 2026, to review comments and study requests received and to answer questions. Attendees of the PSP meeting included Amador County, Amador Trail Stewardship, California Department of Fish and Wildlife, California Sportfishing Protection Alliance, California State Water Resources Control Board, Foothills Conservancy, National Oceanic and Atmospheric Administration, Pacific Gas & Electric, Sierra Club, U.S. Bureau of Reclamation, and Woodbridge Irrigation District.

In accordance with the Commission's ILP regulations and SD2 for the Lower Mokelumne River Project, the PSP comment deadline was July 3, 2026. A general comment letter was received from Amador County concerning expanding hunting access on Project lands (Attachment B of the attached RSP). EBMUD evaluated the comments received at the PSP meeting and through subsequent discussions and consultation with interested parties and, in accordance with the Commission's regulations, has prepared the attached RSP.

EBMUD is electronically distributing the RSP to known relevant resource agencies, Tribes, local governments, non-governmental organizations, and members of the public likely to be interested in this proceeding (see attached Distribution List). EBMUD looks forward to continuing to work with Commission staff and other interested parties in the relicensing of the Lower Mokelumne

[1] FERC Accession No. 20260401-3024.

River Project. Information about the relicensing process can be found at: https://www.EBMUD.com/MokRelicense. Please contact Priyanka Jain, Senior Civil Engineer, at Priyanka.Jain@ebmud.com or 510-287-1153 with questions or concerns.

Sincerely,

Priyanka K. Jain
Senior Civil Engineer
Water Resources Planning Division

Attachments:

- Distribution List
- Revised Study Plan

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Revised Study Plan

REVISED STUDY PLAN

Lower Mokelumne River Hydroelectric Project
FERC No. 2916

East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

In partnership with:
Kleinschmidt Associates

July 2026

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LOWER MOKELUMNE RIVER HYDROELECTRIC PROJECT
FERC PROJECT NO. 2916

REVISED STUDY PLAN

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6. Reservoir Fish Habitat Study Plan (FA-3)
7. Special Status Amphibians and Aquatic Reptiles Study Plan (FA-4)
8. Chinook Salmon Egg and Juvenile Survival Study Plan (FA-5/FA-6)
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10. Botanical Resources Study Plan (TERR-2)
11. Wetland, Riparian, and Littoral Habitats Study Plan (TERR-3)
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Terms and Abbreviations

C	
CFR	U.S. Code of Federal Regulations
Commission	Federal Energy Regulatory Commission
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
I	
ILP	Integrated Licensing Process
ISR	Initial Study Report
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
N	
NOI	Notice of Intent
P	
PAD	Pre-Application Document
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
R	
RM	River Mile
RSP	Revised Study Plan
S	
SD1	Scoping Document 1
SD2	Scoping Document 2
U	
USR	Updated Study Report

1.0 Introduction

The East Bay Municipal Utility District (EBMUD) is the licensee, owner, and operator of the Federal Energy Regulatory Commission (FERC or Commission) licensed Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916; Lower Mokelumne River Project or Project). EBMUD currently operates the Project under a 50-year license that was issued by FERC on March 10, 1981. The license will expire on March 31, 2031.

The 38-megawatt Lower Mokelumne River Project consists of two developments on the Lower Mokelumne River in Amador, Calaveras, and San Joaquin counties within the state of California, including: Pardee Dam, located at approximate River Mile (RM) 76.4; and Camanche Dam, located at approximate RM 63.9. EBMUD is seeking a license renewal to continue to operate and maintain the Project and intends to file an application for a new license with FERC on or before April 2, 2029. EBMUD is using FERC's Integrated Licensing Process (ILP) for relicensing, as found in Title 18 of the U.S. Code of Federal Regulations (CFR), Part 5.

2.0 Relicensing Process to Date

EBMUD filed a Pre-Application Document (PAD) and Notice of Intent (NOI) for the Project on October 20, 2025, pursuant to Section 15 of the Federal Power Act (United States Code, Title 16, Section 808(b)) and 18 CFR Section 5.5. More detailed information on Project facilities, operations, and potentially affected resources can be found in the PAD.[1] An appendix containing initial draft study plans, under consideration by EBMUD, was included with the PAD.

On December 31, 2025, FERC issued its Scoping Notice and Scoping Document 1 (SD1), outlining the potential scope of their National Environmental Policy Act analysis, to be completed following the submittal of EBMUD's Final License Application. Scoping meetings and a site visit were held for the Lower Mokelumne River Project on January 28 and 29, 2026, respectively. The PAD comment period and opportunity for study requests deadline was February 17, 2026. EBMUD received comments on the PAD/studies from the California Department of Fish and Wildlife, California State Water Resources Control Board, California Sportfishing Protection Alliance, Foothills Conservancy, United States Environmental Protection Agency, and United States Fish and Wildlife Service. On April 1, 2026, FERC issued Scoping Document 2 (SD2),[2] identifying additional preliminary issues and alternatives to be addressed during their environmental review process, and on April 2, 2026, EBMUD filed the Proposed Study Plan (PSP).

EBMUD held a public in-person PSP meeting on Wednesday, April 29, 2026. At the meeting, EBMUD provided an overview of the PSP, reviewed submitted study comments, and answered questions related to the PSP. Attendees of the PSP meeting included Amador County, Amador Trail Stewardship, California Department of Fish and Wildlife, California Sportfishing Protection Alliance, California State Water Resources Control Board, Foothills Conservancy, National Oceanic and Atmospheric Administration, Pacific Gas & Electric, Sierra Club, U.S. Bureau of Reclamation, and Woodbridge Irrigation District. The FERC PSP comment period and opportunity for study requests deadline was July 3, 2026.

[1] FERC Accession Number 20251021-5125.
[2] FERC Accession Number 20260401-3024.

3.0 Revised Study Plan

This Revised Study Plan (RSP) outlines the Project nexus, study goals, schedules, and methodologies for studies in each relevant resource area. EBMUD is not proposing any changes to Project operations or facilities at this time; therefore, the studies focus on characterizing existing conditions relative to applicable management objectives and statutory requirements. Potential resource issues associated with the Project that are listed in subsections herein were identified from the following:

- Review and synthesis of readily available, relevant information;
- Discussions and early engagement meetings with interested parties and EBMUD personnel knowledgeable about Project operations, maintenance activities, and local resources; and
- Comments submitted by agencies and interested parties on the NOI, PAD, FERC's SD1 and SD2, and the PSP.

EBMUD has identified the 16 study plans listed below (as proposed in the PSP), each including study goals and objectives, methodology, implementation schedule, and consultation history. The studies have been updated and modified since the PSP, based on input received during development of the study plans, discussion and comments received at the PSP meeting, and through subsequent discussions and consultation with interested parties. No new studies were requested for the RSP.

1. Water Quality Study Plan (WR-1)
2. Water Temperature Study Plan (WR-2)
3. Hydrology and Operations Modeling Study Plan (WR-3)
4. Fish Population Study Plan (FA-1)
5. Instream Flow Study Plan (FA-2)
6. Reservoir Fish Habitat Study Plan (FA-3)
7. Special Status Amphibians and Aquatic Reptiles Study Plan (FA-4)
8. Chinook Salmon Egg and Juvenile Survival Study Plan (FA-5/FA-6)
9. Wildlife Resources Study Plan (TERR-1)
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12. Environmental Justice Study Plan (EJ-1)

13. Recreation Facilities Inventory and Condition Assessment Study Plan (REC-1)
14. Recreation Use and Needs Study Plan (REC-2)
15. Cultural Resources Study Plan (CR-1)
16. Tribal Ethnography Resources Study Plan (CR-2)

This RSP is being distributed to interested parties who, per FERC's SD2, will have until August 18, 2026, to file comments on the RSP. The Commission is expected to issue its Study Plan Determination by September 1, 2026.

3.1. Study Implementation Schedule

Pursuant to 18 CFR Section 5.11(b)(2) and 5.11(b)(3), EBMUD has outlined a detailed schedule to conduct the 16 proposed studies within each study plan in Attachment A. The overall study schedule includes two study seasons beginning in October 2026 and concluding by August 2028.

Pursuant to 18 CFR Section 5.15, EBMUD will file an Initial Study Report (ISR) by September 1, 2027, following the first study season, and an Updated Study Report (USR) by August 31, 2028, following the second study season. Meetings to present study results and the progress of ongoing studies will follow the ISR and USR submittals, as specified in 18 CFR Section 5.15 and the ILP Plan and Schedule. Schedules for the proposed individual studies and associated study reports are provided in each corresponding study plan (Attachment A).

4.0 Additional Comments and Requests

Study-specific comments have been incorporated into the consultation record portion of specific study plans, attached to this RSP. If a comment relates to multiple studies, it has been duplicated into the study plan of each relevant affected study plan's consultation section. No general comment letters were received.

Attachment A

Revised Study Plans

WATER QUALITY STUDY PLAN (WR-1)

Lower Mokelumne River Hydroelectric Project
FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

WATER QUALITY STUDY PLAN (WR-1)

Lower Mokelumne River Hydroelectric Project
FERC Project No. 2916

East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

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Terms and Abbreviations

°C	degrees Celsius
µg/L	micrograms per liter
µS/cm	microsiemens per centimeter
B	
Bac-T	bacteriological
BGA-PC	blue-green algae – phycocyanin
C	
Commission	Federal Energy Regulatory Commission
CRWQCB	California Regional Water Quality Control Board
CRWQCB Basin Plan	CRWQCB, Central Valley Region, 2019 Water Quality Control Plan
CTR	California Toxics Rule
D	
Draft Bay-Delta Plan	Water Quality Control Plan for the San Francisco Bay/Sacramento San Joaquin Delta Watershed
DO	dissolved oxygen
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
FR	Federal Register
ft	foot/feet
H	
HAB	harmful algal bloom
hrs	hours
G	
GPS	global positioning system
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
M	
m	meter
mg/L	milligrams per liter

msl	mean sea level
mV	millivolt
N	
NTR	National Toxics Rule
NTU	nephelometric turbidity unit
O	
OEHHA	Office of Environmental Health Hazard Assessment
ORP	oxidation-reduction potential
P	
PAD	Pre-Application Document
ppm	parts per million
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
Q	
QA/QC	quality assurance/quality control
S	
SCADA	supervisory control and data acquisition
SD1	Scoping Document 1
SD2	Scoping Document 2
SM	Standard Methods for the Examination of Water and Wastewater
State Water Board	California State Water Resources Control Board
T	
TWG	Technical Working Group
U	
U.S. EPA	United States Environmental Protection Agency
W	
WIDD	Woodbridge Irrigation District Dam

1.0 Introduction

This Water Quality Study (WR-1) plan addresses water quality monitoring at the Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916; Lower Mokelumne River Project or Project). The WR-1 results will be used to assess water quality in relation to standards and objectives set by the California Regional Water Quality Control Board (CRWQCB), Central Valley Region, 2019 Water Quality Control Plan (CRWQCB Basin Plan) and the Water Quality Control Plan for the San Francisco Bay/Sacramento San Joaquin Delta Watershed (Draft Bay-Delta Plan; California State Water Resources Control Board [State Water Board] 2025). WR-1 will also be used to provide water temperature inputs to the Water Temperature Study (WR-2).

2.0 Project Nexus and Study Rationale

Project operations and maintenance activities could affect water quality in Project-affected stream reaches and Project reservoirs. The WR-1 results will inform the development of the Project's Draft License Application.

3.0 Study Goals and Objectives

The goals and objectives of WR-1 are as follows:

- Characterize existing Project water quality of Project reservoirs and Project-affected river reaches.
- Collect water quality data to supplement existing information.
- Assess water quality conditions in relation to the objectives/criteria of the CRWQCB Basin Plan (2019) and other water quality standards.

4.0 Relevant Resource Management Goals

Existing management plans will be used to develop a baseline understanding of the current management goals and objectives for the Project vicinity. Relevant management goals include compliance with the following:

- CRWQCB Basin Plan (2019) beneficial uses and water quality objectives.
- State Water Board Draft Bay-Delta Plan (2025), including the Healthy Rivers and Landscapes Program.
- East Bay Municipal Utility District (EBMUD) P-2916 license (FERC 1981).
- California Toxics Rule (CTR) “Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California” (65 Federal Register [FR] 31682).
- National Toxics Rule (NTR) “Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants” (57 FR 60848).

5.0 Geographic Scope

The geographic scope of this study includes the Mokelumne River inflow to Pardee Reservoir, through the outflow of Camanche Reservoir, downstream to Mackville Road. Figure 7-1 and Figure 7-2 present the location of river and reservoir monitoring locations, respectively.

6.0 Existing Information and Need for Additional Information

Extensive water quality data have been collected in the Project area by EBMUD as part of their P-2916 license (FERC 1981), including the following:

- Reservoir water quality monitoring stations
    - Water temperature, dissolved oxygen (DO), pH, specific conductivity, chlorophyll, blue green algae, phycocyanin concentration, and turbidity
- River/facility water quality monitoring stations
    - Water temperature, DO
- Bacterial water quality sampling
    - Bacteriological (i.e., Bac-T) sampling
- Heavy metal testing
    - Copper, Zinc, Cadmium (Total and Dissolved), and Hardness as CaCO3

Further information, including the duration and frequency of sampling, is detailed in the Pre-Application Document (PAD).

7.0 Study Methodology

The following describes the water quality sampling field program, which includes seasonal in-situ water quality measurements; seasonal water quality grab sampling; reservoir/lake profiles; and laboratory analysis and reporting.

A Water Resources Technical Working Group (TWG) will convene as needed to collaborate and provide input on the water resources studies (WR-1, WR-2, and WR-3) throughout study implementation.

7.1. Water Quality Sampling Locations

- Existing water quality sampling locations will be sampled in study Year 1, as identified in Table 7-1 (river reaches) and Table 7-2 (reservoirs), and depicted on Figure 7-1 (river reaches) and Figure 7-2 (reservoirs).
- Exact sampling locations will be determined in the field based on sampling suitability (i.e., well-mixed and deep enough for representative sampling) and accessibility.
- Sampling locations will be documented using handheld global positioning system (GPS) units.

Table 7-1. Proposed river reach water quality sampling locations.

Station Name	Brief Description	River Mile Location	Proposed Parameters to be Measured	Latitude/ Longitude
HWY49 U.S. Geological Survey station Mokelumne R NR Mokelumne Hill CA (11319500).	Upper Mokelumne River at Highway 49 crossing	TBD	In-situ Probe; General Water Quality Grab Sample	38°18’45.7”N 120°43’12.8”W
Middle Bar Boating Takeout	Boating takeout area on the Mokelumne River above Pardee Reservoir	TBD	Bacteria	TBD
Below Camanche	Mokelumne River below Camanche Dam at Mokelumne Day Use Area	TBD	In-situ Probe; General Water Quality Grab Sample; Bacteria	TBD
Mackville	Lower Mokelumne River at Mackville Road via Stillman Magee Park public access	TBD	Bacteria	38°10'12"N 121°01'05"W

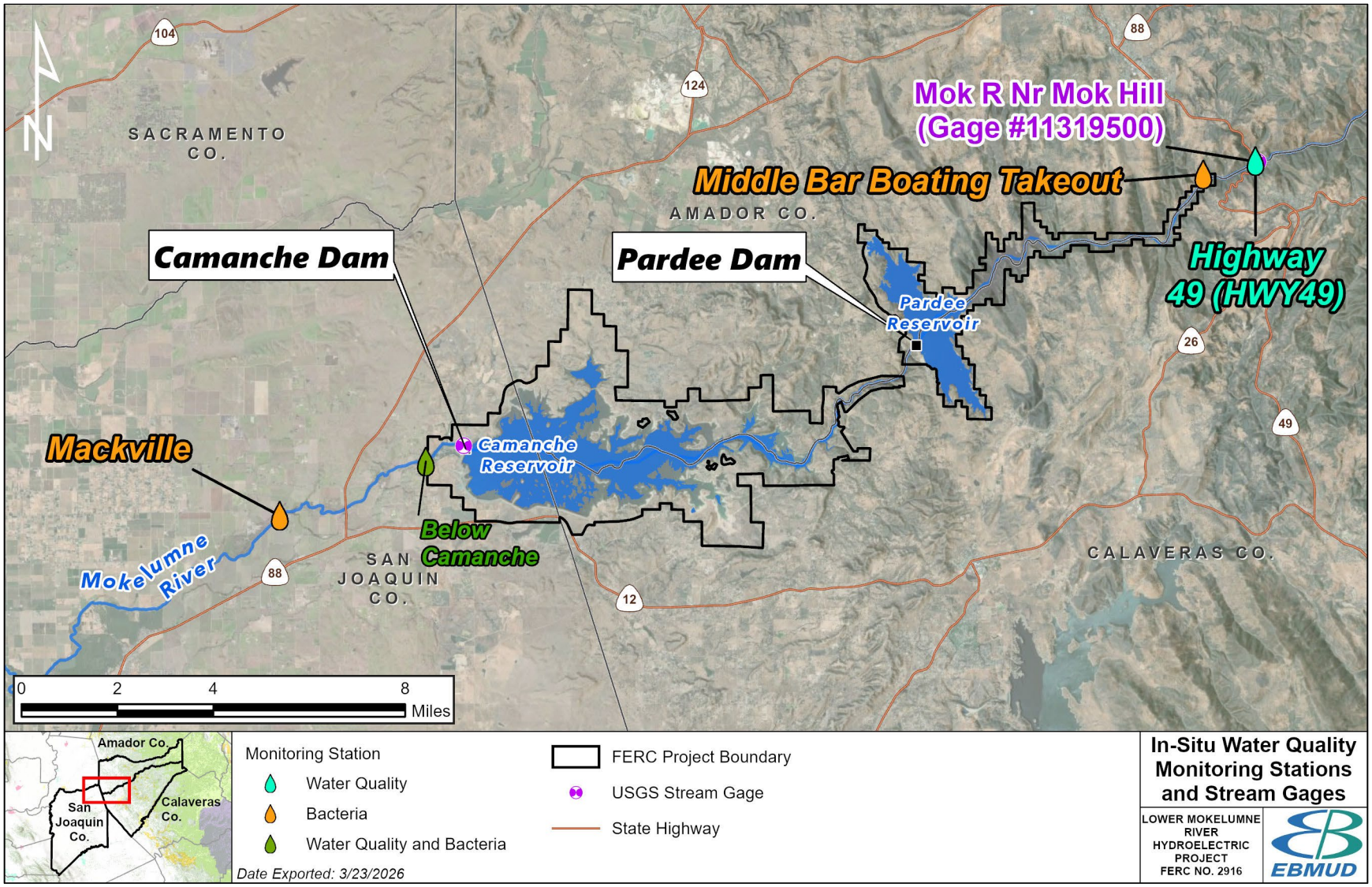


Figure 7-1. Proposed Lower Mokelumne Project in-situ water quality monitoring stations and stream gages.

Table 7-2. Proposed reservoir sampling locations.

Station Name	Brief Description	Proposed Parameters to be Measured	Latitude/ Longitude
Pardee Reservoir			
LOGBOOM	Upstream reservoir inlet at floating log boom used to block debris flows into the reservoir	In-situ Profile; General Water Quality Grab Sample	TBD
PARI	Reservoir interior water quality station adjacent to small creek inflow	In-situ Profile; General Water Quality Grab Sample	TBD
PARBR	Reservoir near boat ramp	Bacteria	TBD
PATW	Pardee Reservoir at Intake Tower	In-situ Profile; General Water Quality Grab Sample Harmful Algae / Cyanotoxins	TBD
PADA	Pardee Dam	In-situ Profile; General Water Quality Grab Sample	TBD
Camanche Reservoir			
CAMA	Upstream station accessible in most years	In-situ Profile; Cu; Cd; Zn (T)+(D) General Water Quality Grab Sample Hardness as CaCO3	TBD
PENN	Adjacent to abandoned Penn Mine	Continue Existing Protocol Mine Drainage Sampling; Cu; Cd; Zn (T)+(D); Hardness as CaCO3	TBD
CAMI	Interior reservoir	In-situ Profile; General Water Quality Grab Sample	TBD
CAMNS-1 CAMNS-2	Adjacent to north shore recreation area	Bacteria	TBD
CAMCA-1	Location with visible or documented recent cattle use near north shore recreation area	Bacteria	TBD
CAMSS-1 CAMSS-2	Adjacent to south shore recreation area	Bacteria	TBD
CAMCA-2	Location with visible or documented recent cattle use near south shore recreation area	Bacteria	TBD
BEACH HB	South shore near water treatment plant floating intake platform	Bacteria	38°13’29.5”N 120°55’35.1”W
BEACH COVE	South shore near water treatment plant floating intake platform	Bacteria	38°13’21.1”N 120°55’35.1”W
CAMD	Camanche Dam	In-situ Profile; General Water Quality Grab Sample	TBD

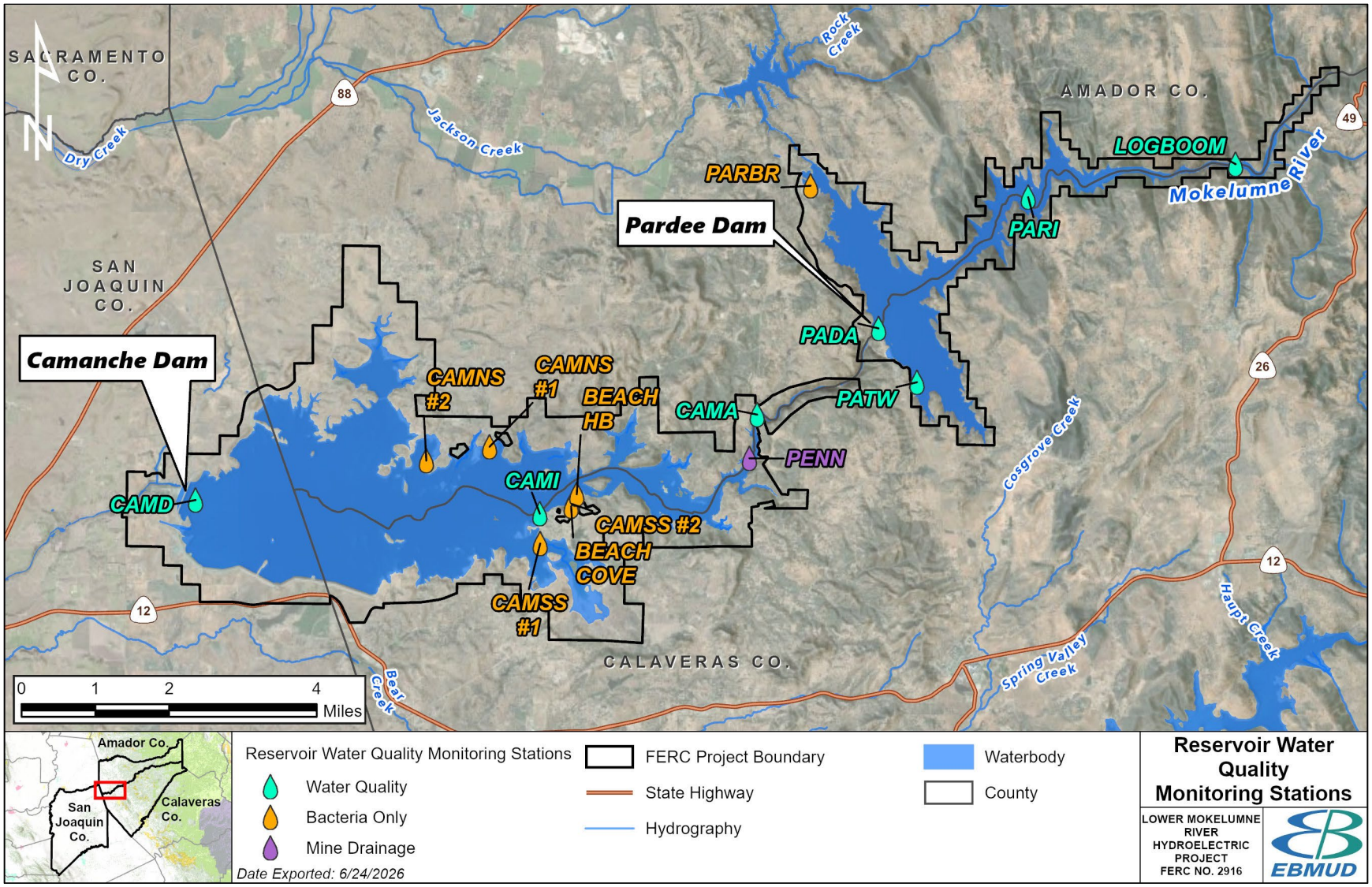


Figure 7-2. Proposed Lower Mokelumne Project reservoir water quality monitoring stations.

7.2. Spring/Fall In-situ Field Measurements

7.2.1. River Reaches

- Collect the following in-situ water quality measurements: DO (milligrams per liter [mg/L] and percent saturation), pH, specific conductance (microsiemens per centimeter [µS/cm]), alkalinity (mg/L), turbidity (nephelometric turbidity unit [NTU]), and water temperature (degrees Celsius [°C]).
    - Discrete samples will be collected once during the late spring/early summer (May/June) during high flow, and once during the late summer/early fall baseflow period (September/October).
    - At the stream sampling locations, measurements will be made approximately 0.1 meter (~3.9 inches) beneath the surface in flowing, well-mixed riffle or run areas.
    - Samples will be collected using a multi-parameter water quality meter (HydroLab, YSI, or similar DataSonde), and field kit (e.g., alkalinity).
    - Pre- and post-sampling calibration of in-situ instrumentation will be conducted following the manufacturer's instructions.

7.2.2. Reservoirs

- Collect reservoir/lake profiles (DO, pH, specific conductance, turbidity, and water temperature).
- Collect samples monthly in April through October.
- Water quality profiles in the reservoirs/lake will be based on a ≤1-meter (~3.3-foot) sampling interval through the entire water column.
- Collect Secchi disk depth measurements of water clarity in each reservoir/lake.
- Collect samples using a multi-parameter water quality meter.
- Conduct pre- and post-sampling calibration of in-situ instrumentation following the manufacturer's instructions.

7.3. Spring/Fall Water Quality Grab Samples

- Collect water quality grab samples at Project-affected stream segments and reservoirs.
    - Samples will be collected once during the late spring/early summer (May/June) during high flow, and once during the late summer/early fall baseflow period (September/October).

  - At stream sampling locations, grab samples will be collected approximately 0.1 meter (~3.9 inches) beneath the surface in flowing, well-mixed riffle or run areas.
  - At lake sampling locations, grab samples will be collected from the epilimnion (1 meter/3.3 feet deep) and hypolimnion (mid-depth between the thermocline and lake bottom). If the lakes are not stratified, then water grab samples will be collected approximately 1 meter from the surface and at mid-depth from the surface to lake bottom.

- Collect samples consistent with the protocol for each analyte (see Section 7.7, Laboratory Analysis) and consistent with general water quality sampling methods (U.S. Geological Survey 2019).
  - The sampling team shall employ a strict quality assurance/quality control (QA/QC) program, including the collection of equipment blanks, field blanks, and field replicates.
  - Water quality samples will be decanted into laboratory-supplied sample containers and analyzed at a state-certified water quality laboratory.
  - The sample containers will be labeled with the date and time that the sample is collected and the sampling site or identification label.
  - The sample container will be preserved (as appropriate), stored, and delivered to a state-certified water quality laboratory for analyses in accordance with maximum holding periods.
  - A chain-of-custody record will be maintained with the samples at all times.

7.4. Bacterial Sampling

- Collect surface water Bac-T samples at five relatively evenly spaced times during the month of July for total and fecal coliform and *Escherichia coli* at the locations in Table 7-1 and Table 7-2. Sampling locations include recreational sites as well as adjacent areas showing visible or documented recent cattle use (e.g., trampling, dung, or disturbed shorelines) at sites CAMCA-1 and CAMCA-2, specific locations to be determined in the field.

7.5. Fish Mercury Testing

- Test up to 10[1] each of edible-sized sport fish (black bass [*Micropterus spp.*], rainbow trout [*Oncorhynchus mykiss*], brown trout [*Salmo trutta*], common carp

[1] Up to 125 legal-sized or edible-sized fish will be retained for T-Hg and Me-Hg mercury analysis.

[*Cyprinus carpio*], green sunfish [*Lepomis cyanellus*], redear sunfish [*Lepomis microlophus*], bluegill [*Lepomis macrochirus*], channel catfish [*Ictalurus punctatus*]) captured in each reservoir (Pardee and Camanche) during fish surveys conducted under the Fish Population Study (FA-1) for concentrations of both total mercury (T-Hg) and methylmercury (Me-Hg). Fish will be placed in clean, labeled bags or containers for transport to the laboratory using chain-of-custody procedures (U.S. EPA 2000).

- Testing fish in the Lower Mokelumne River (downstream of Camanche Dam) is not proposed. The existing Office of Environmental Health Hazard Assessment (OEHHA) advisory for anadromous fish and other sportfish in the Lower Mokelumne River (OEHHA 2022) will be used to provide consumption advisories downstream of Camanche Dam.

7.6. Harmful Algae Blooms/Cyanotoxins

- Continue EBMUD's existing sampling regime for Pardee Reservoir and Camanche Reservoir for harmful algal blooms and cyanotoxins, with visual inspections for algal blooms conducted at key recreational areas during the summer and heightened attention during holiday weekends and periods of heavy recreational use. In addition, between visual inspections, EBMUD monitors the HAB Satellite Analysis Tool (https://fhab.sfei.org/#?p=cyano&c=7daymax&d=20260305). If algal blooms are observed in one or both reservoirs, additional testing for cyanotoxins will be carried out. If the presence of cyanotoxins is suspected or confirmed, appropriate signage will be posted in the area to warn visitors of the danger. All algal bloom occurrences (or lack thereof) within the Project boundary will be reported in the Initial Study Report.

7.7. Laboratory Analysis

- Water quality samples collected during the field program will be processed by a state-certified laboratory approved by the State Water Board for chemical analysis.
- The parameters to be analyzed by the analytical laboratory are provided in Table 7-3.
- The laboratory will report each chemical parameter analyzed with the laboratory method detection limit, reporting limit, and practical quantification limit. The laboratory will attempt to attain reporting detection limits that are at or below the applicable regulatory criteria.

- Compare the water quality sampling results to the water quality objectives/criteria identified in the CRWQCB Basin Plan and with other relevant water quality standards (e.g., CTR, NTR).
- Submit fish samples to an analytical laboratory for individual muscle tissue analysis (fillets). Results will be summarized in a table including fish identifier, collection date and time, total and fork length, weight, and total and methylmercury concentrations. Average total and methylmercury concentrations by species will be calculated. Mercury results will also be plotted relative to fish weight in graphical format and compared to appropriate OEHHA and/or U.S. EPA screening guidelines.

Table 7-3. Water quality sampling parameters.

Parameter	Analysis Method	Sample Holding Times	Sample Locations to be Analyzed
Water Quality Monitoring Parameter			
In-Situ Measurements			
DO	Water Quality Meter	Not Applicable	All
Secchi Depth (Clarity)	Secchi Disk	Not Applicable	Reservoir
pH	Water Quality Meter	Not Applicable	All
Water Temperature	Water Quality Meter	Not Applicable	All
Specific Conductance	Water Quality Meter	Not Applicable	All
Laboratory Analysis Parameter			
General Grab Sample Parameters			
Nitrate/Nitrite	U.S. EPA – 300.1	48 hours	All
Ammonia as N	U.S. EPA - 350.1	28 days	All
Total Kjeldahl Nitrogen	U.S. EPA – 350.1[2]	28 days	All
Total Phosphorus	SM 4500-P F-2011	28 days	All
Ortho-phosphate	U.S. EPA - 365.1	48 hours	All
Total Dissolved Solids	SM 2540 C-2015	7 days	All
Total Suspended Solids	SM 2540 D-2015	7 days	All
Total Alkalinity	SM 2320 B-2011	14 days	All
Hardness as CaCO3	SM 2340 C-2011	6 months	CAMA and PENN only

[2] *The EBMUD lab uses a modified EPA 350.1 procedure for TKN that involves a digestion step and are officially accredited to use this process. The standard EPA 350.1 protocol typically does not include digestion and therefore does not measure TKN.*

Parameter	Analysis Method	Sample Holding Times	Sample Locations to be Analyzed
Metals			
Copper, Total Recoverable	U.S. EPA – 200.8	6 months	CAMA and PENN only
Copper, Dissolved	U.S. EPA – 200.8	6 months	CAMA and PENN only
Cadmium, Total Recoverable	U.S. EPA – 200.8	6 months	CAMA and PENN only
Cadmium, Dissolved	U.S. EPA – 200.8	6 months	CAMA and PENN only
Zinc, Total Recoverable	U.S. EPA – 200.8	6 months	CAMA and PENN only
Zinc, Dissolved	U.S. EPA – 200.8	6 months	CAMA and PENN only
Bacteria			
Total Coliform	SM 9223 B-2016 (Colilert 18 QT)	8 hours	Recreation Locations
Fecal Coliform	SM 9222 D-2015 (MF)	8 hours	Recreation Locations
E. coli	U.S. EPA - SM9223 B-2016 (Colilert 18 QT)	8 hours	Recreation Locations
Fish Tissue Mercury			
Methylmercury	U.S. EPA – 1630	48 hours	All
Mercury - Total	U.S. EPA – 1631E	48 hours	All

Note: U.S. EPA methods are described in 40 C.F.R. 136 and SM methods in Lipps, et. al. (2023).

7.8. Continuous Monitoring

- Collection of additional continuous water quality data is not proposed as part of WR-1 because existing monitoring programs already provide comprehensive, long-term datasets that meet the study's objectives. Data collected from these continuous monitoring locations during the study's data collection period will be compiled and presented alongside other study data to identify seasonal patterns and facilitate direct comparison across monitoring types and locations. The Project-related locations with ongoing continuous monitoring are summarized in Table 7-4.

Table 7-4. Continuous water quality monitoring stations.

Location / Station	Equipment / System	Parameters Measured	Frequency / Operating Notes
Highway 49 (HYW49) Mokelumne River	Automated Water Quality Monitoring Station	Water Temperature (°C); pH; DO (mg/L); Conductivity (µS/cm); ORP (mV); Chlorophyll (µg/L); BGA–PC (µg/L); Turbidity (NTU); Fluorescence	Continuous monitoring; real-time telemetry (installed Oct 2022)
Mokelumne River near Mokelumne Hill CA	U.S. Geological Survey Gage No. 11319500	Water Temperature (°C)	15-minute data. Dataset extends from 1993 to present
Pardee Reservoir – PADA	Fixed Elevation Thermocouples (eight sensors integrated with SCADA)	Water Temperature (°C) at fixed elevations	Eight sensors installed at 550, 500, 450, 400, 375, 350, 300, and 271 ft msl; provides real-time temperature via SCADA; hourly and daily records archived; dataset extends from Nov 17, 2009, to present
Pardee Reservoir – PATW	Automated Vertical Profiler at Pardee Tower Outlet	Water Temperature (°C); pH; DO (mg/L); Conductivity (µS/cm); ORP (mV); Chlorophyll (µg/L); BGA–PC (µg/L); Turbidity (NTU); Fluorescence (at 1-m depth intervals)	Conducts two profiles per day; collects vertical profile measurements at 1-m intervals. Data extends from 2023 to present
Camanche Reservoir – CAMD	Automated Vertical Profiler (Buoy anchored auto-profiler)	Depth (m); Water Temperature (°C); Specific Conductivity (µS/cm); pH; DO (ppm and % saturation); Chlorophyll; Battery Voltage	Typically collects four profiles per day (~every 6 hrs); deployed spring–late fall; removed after turnover; dataset available from 2006 to present, seasonal with occasional outages
Camanche Valve House - CAMC	North/South Camanche conduits in valve house (SCADA System)	Water Temperature (°C); pH; DO (mg/L); Conductivity (µS/cm); ORP (mV); Turbidity (NTU).	Continuous; Data available from 1994 to present
Station 11	Downstream of Mokelumne River Fish Hatchery	DO (mg/L)	Continuous (seasonal – typically installed in spring and removed in winter [after stratification]); Data available from 2011 to 2025
Mackville	Lower Mokelumne River at Mackville Road	Water Temperature (°C)	15-minute data; Dataset extends from 1993 to present

µg/L = micrograms per liter; BGA-PC = blue-green algae – phycocyanin; ft = foot/feet; hrs = hours; m = meter(s); msl = mean sea level; mV = millivolt; ORP = oxidation-reduction potential; SCADA = supervisory control and data acquisition

7.9. Additional Sampling (if needed)

- If water quality sampling results indicate exceedances of objectives/criteria identified in the CRWQCB Basin Plan or with other relevant water quality standards, EBMUD will consult with the State Water Board, resource agencies, and the TWG, and, if appropriate, will implement a second year of water quality sampling (2028) focused on those parameters that were exceeded. The specific sampling approach will be developed in consultation with the State Water Board, resource agencies, and the TWG.

7.10. Reporting

- Document study methods and results in a Water Quality technical study report, and will include summary tables and maps, as appropriate.
- Upon request, provide data to resource agencies and interested parties in a Microsoft Excel spreadsheet (electronic format).

8.0 Schedule, Periodic Reporting, and Consultation

WR-1 is proposed as a single-year study and will include a technical study report to be filed with FERC as part of the Initial Study Report for review and comment. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Water Quality Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
April 2027 – April 2028	Conduct Study
September 2027	File Initial Study Report
October 2027 – July 2028	Collect Second-Year Water Quality Data for Select Parameters (if needed)
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. Table 8-2 lists the interested party comments and EBMUD responses relevant to WR-1.

Table 8-2. EBMUD response to comments received on study plans.

Date of Comment	Interested Party	Comment	EBMUD Response
02/17/2026	CA State Water Board	1. Page (pg.) 12 of the PSP WR-1 (Water Quality Study) states that in-situ water quality samples will be collected once during the late spring/early summer (May/June) during high flow, and once during the late summer/early fall baseflow period (September/October) for the following constituents: dissolved oxygen, pH, specific conductance, alkalinity, turbidity, and water temperature. It is unclear how long these water quality parameters will be monitored for in the study. State Water Board staff recommend that EBMUD update the PSP to monitor the specified water quality parameters in the reaches for sufficient time to capture seasonal and any project related changes in the spring/early summer and during late summer/early fall.	It is proposed that these in-situ measurements be discreet measurements, rather than continuous monitoring, and the PSP has been updated to clarify this. Continuous water quality monitoring is currently being carried out at eight locations within the Project area as part of other data collection efforts. The PSP has been updated to provide details on all these locations, including the period of record and parameters measured. The abundance of continuous water quality data already being collected at Project inflow, Project outflow, and several in-reservoir locations should be sufficient to characterize seasonal and Project-related changes within the Project area.
02/17/2026	CA State Water Board	2. Pg. 11 of the PSP WR-1 (Water Quality Study), Figure 7-2, displays the Lower Mokelumne Project reservoir water quality monitoring stations. CAMNS # 1 and #2 and CAMSS #1 and #2 in Camanche Reservoir are for monitoring bacteria only. As seen at the January 29, 2026 site visit, livestock have the potential to enter or graze near certain areas of the Camanche Reservoir. State Water Board staff request clarification on whether there are any livestock exclusion measures implemented during the summer recreation months around Camanche Reservoir. If not, State Water Board staff recommend EBMUD update the PSP WR-1, so that the study report includes a qualitative assessment of any livestock influence on recreational water quality within Camanche Reservoir.	Limited exclusion fencing for cattle is in place to prevent cattle access to developed recreation areas. Grazing is seasonal, and cattle are generally present from late August through early June, although the exact timing varies by year. Given the potential for livestock to influence water quality at recreation areas in Camanche, EBMUD intends to add an additional two bacterial testing sites adjacent to the north and south shore recreation areas that have visible or documented recent cattle use. The exact locations will be determined at the time of testing. The PSP has been updated to reflect these additional sites.

Date of Comment	Interested Party	Comment	EBMUD Response
02/17/2026	CA State Water Board	5. River/Facility Water Temperature and Quality Monitoring Stations, Section 4.3.5.2, states several river or facility in-situ water quality stations are established where water temperature and/or dissolved oxygen data are collected either continuously or at 15-minute intervals. As discussed in Section 3.4.5.1, it appears that there is historical turbidity data within the Project reservoirs, but it is unclear if the same extensive historical data exists for the Lower Mokelumne River below Camanche Dam. State Water Board staff request EBMUD provide any historical data in the Lower Mokelumne River below Camanche Dam that exists for turbidity and an explanation for how the existing data, along with the proposed water quality data to be collected as part of the WR-1 Water Quality Study Plan is sufficient to establish existing conditions in the Lower Mokelumne River below Camanche. If this is not available, State Water Board staff recommend EDMUD implement additional turbidity and dissolved oxygen monitoring station between Camanche Dam and Woodbridge Irrigation District Dam (WIDD).	EBMUD proposes DO/turbidity monitoring downstream of Camanche Dam at the McIntire Gage site during the study plan implementation period, and the PSP has been updated to reflect this addition.

Date of Comment	Interested Party	Comment	EBMUD Response
02/17/2026	CA State Water Board	6. Toxic Algae Sampling, Section 4.3.5.4 of the PAD, provides an overview of EBMUD's Cyanotoxin Management Plan. State Water Board staff request clarification on the following topics: • Field staff conduct regular visual inspections of all EBMUD source water reservoirs to identify visible algae blooms or odors for signs of algal blooms. How often are these inspections conducted, and do they occur during certain times of year (i.e., summer months)? State Water Board staff recommend performing these visual inspections on a consistent basis around summer holiday weekends in particular when recreators are more likely to be present in order to create a continuous period of record of algal bloom occurrences, or lack thereof, within the Project boundary and report such occurrences along with other water quality monitoring in the Initial Study Report.	The PSP has been updated to specify visual inspections during busy summer periods.

Date of Comment	Interested Party	Comment	EBMUD Response
02/17/2026	CA State Water Board	When discussing the presence of algae with cyanotoxin-producing potential in Camanche Reservoir, the PAD states such toxin-producing algae have not been detected in the main body of Camanche Reservoir at sufficient concentrations to trigger additional laboratory sampling. When have algae with cyanotoxin-producing potential been detected within Camanche Reservoir?	Harmful algal blooms (HABs) with verified presence of cyanotoxins have occurred in the Rabbit Creek arm of Camanche Reservoir, during the 2015-2016 drought, as well as small ponds in the hills north of Camanche Reservoir on EBMUD property. In 2016, EBMUD developed a comprehensive Cyanotoxin Management Plan. Field staff (typically Watershed staff) conduct regular visual inspections of all EBMUD source water reservoirs to identify visible algae blooms or odors for signs of algal blooms. When blooms or odors are detected, a semi-quantitative Abraxis “dipstick” test kit is used to quickly determine the presence of cyanotoxins. If the test indicates the presence of toxins, a water sample is collected and submitted for laboratory analysis to identify and quantify the toxin.
02/17/2026	CA State Water Board	CEQA Guidelines define the lead agency as “the public agency which has the principal responsibility for carrying out or approving a project.” (Cal. Code Regs., tit. 14, § 15367.). It is State Water Board staff’s understanding that EBMUD will act as the CEQA lead agency for Project relicensing. The State Water Board will act as a responsible agency for the purposes of CEQA. State Water Board staff request EBMUD confirm in writing its understanding that EBMUD will be the CEQA lead agency.	EBMUD will act as lead agency under CEQA on the relicensing. EBMUD understands that the State Water Board will act as a responsible agency.

Date of Comment	Interested Party	Comment	EBMUD Response
02/17/2026	CA Sportfishing Protection Alliance	Finally, the SRT foundered against agency concerns about the possible introduction of pathogens into the Mokelumne River Fish Hatchery if salmonids were to be transported to the watershed upstream. In order to reduce or eliminate the need for a relicensing study, EBMUD should assemble and release any information EBMUD has gathered about the potential for improved filtration at the Mokelumne River Fish Hatchery. This, of course, could also have utility even in the absence of a fish passage initiative.	The requested information is not related to the relicensing of the Project, and the water quality of Project reservoirs and Project-affected river reaches.

9.0 Level of Effort and Cost

The methods and approach described in the WR-1 plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating stakeholder feedback. The estimated cost for WR-1 ranges from $240,000 to $375,000, assuming $100,000 to $200,000 of the work will be captured within existing data collection programs. Existing data collection programs include the lake profile collection, in-situ water quality collection, and grab samples.

10.0 References

(CRWQCB) California Regional Water Quality Control Board. 2019. The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region Fifth Edition – 2019. The Sacramento River Basin and The San Joaquin River Basin.

(FERC) Federal Energy Regulatory Commission. 1981. Order Issuing License for East Bay Municipal Utility District Project No. 2916. Issued March 10, 1981.

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WATER TEMPERATURE STUDY PLAN (WR-2)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

WATER TEMPERATURE STUDY PLAN (WR-2)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916

East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

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Terms and Abbreviations

B	
Basin Plan	Sacramento River Basin and San Joaquin River Basin Water Quality Control Plan
C	
Commission	Federal Energy Regulatory Commission
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
M	
MM7DADM	7-day average daily maximum
P	
PAD	Pre-Application Document
POR	period of record
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
S	
SD1	Scoping Document 1
SD2	Scoping Document 2
T	
TWG	Technical Working Group

1.0 Introduction

This study plan addresses water temperature modeling of the Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916; Lower Mokelumne River Project or Project). The study will make use of pre-existing CE-QUAL-W2 water temperature models of Pardee and Camanche reservoirs and SNTEMP/RSM4 models, as appropriate. Results of the hydrologic operations model (see Hydrology and Operations Modeling Study [WR-3] plan) will be used to provide hydrologic model inputs. Water temperature (inflow/outflow and reservoir profiles) and meteorological data will be collected/compiled to inform the modeling (see Water Quality Study [WR-1] plan). The model will be used to analyze water temperature effects of the existing Project and potential scenarios for both current conditions and future conditions.

2.0 Project Nexus and Study Rationale

Project operations and maintenance activities could affect water temperature in Project-affected river reaches and Project reservoirs. The Water Temperature Study (WR-2) results will inform the Draft License Application.

3.0 Study Goals and Objectives

The goals and objectives of the study are as follows:

- Review existing water temperature model applications for Pardee and Camanche reservoirs and the Lower Mokelumne River and update if necessary.
- Compile historical water temperature and meteorological data to calibrate and/or validate water temperature models from 1998 through 2023, the period of record (POR).
- Model water temperature for the existing Project and other potential infrastructure/hydrology operation scenarios under existing climate conditions and future conditions that will be identified prior to study plan implementation.

4.0 Relevant Resource Management Goals and/or Public Interest Considerations

Existing management plans will be reviewed and used to develop a baseline understanding of the current management goals and objectives in the Project vicinity. Relevant management goals include the following:

- Sacramento River Basin and San Joaquin River Basin Water Quality Control Plan (Basin Plan) beneficial uses and water quality objectives (California Regional Water Quality Control Board 2019).
- East Bay Municipal Utility District (EBMUD) P-2916 license compliance (FERC 1981).

5.0 Geographic Scope

The geographic scope of this study includes the Mokelumne River inflow to Pardee Reservoir, through the outflow of Camanche Reservoir downstream to the Victor Gage above Lake Lodi (Figure 5-1). The study focuses on the segments where hydraulic and thermal processes can be represented with confidence currently.

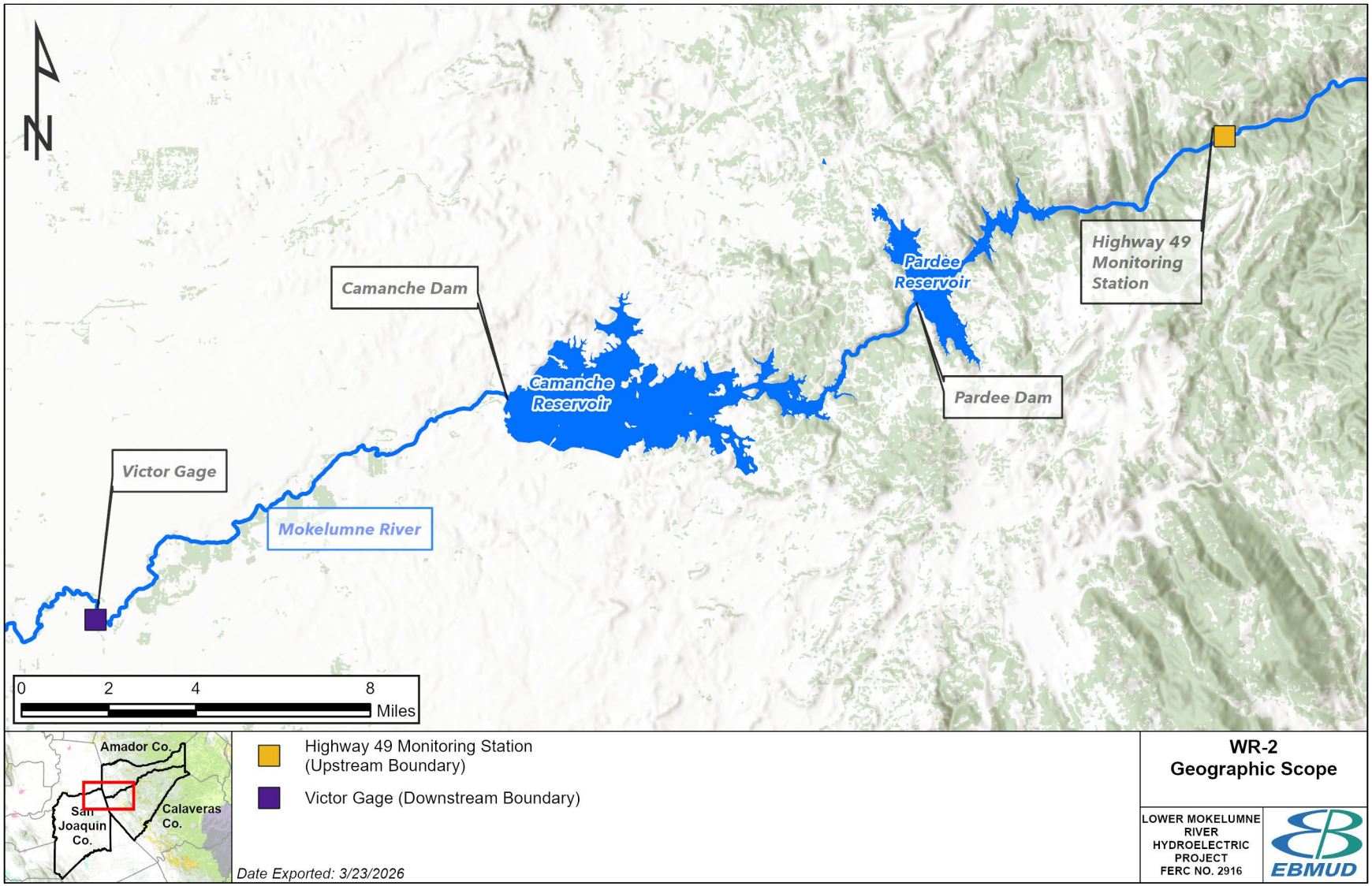


Figure 5-1. WR-2 geographic scope.

6.0 Existing Information and Need for Additional Information

Extensive water temperature data have been collected in the Project area by EBMUD as part of their P-2916 license (FERC 1981) and are detailed in the Pre-Application Document (PAD). Collection of water temperature data will continue throughout the relicensing process, and additional sites will be added if necessary for modeling purposes. Water temperature data collection includes inflow temperatures to Pardee Reservoir, in-lake profiles (Pardee and Camanche), and reservoir outflow temperatures.

In addition to water temperature data, the following information and/or tools are available for use in WR-2:

- Results of the Hydrologic and Operations Modeling Study (WR-3) will provide hydrologic inputs for the temperature models already developed by EBMUD.
- The existing CE-QUAL-W2 (Pardee and Camanche reservoirs) and SNTEMP/RSM4 (between Pardee and Camanche reservoirs) water temperature models will be used, as applicable.
- Local weather data for the model period (1998–2023) are available from local weather stations at Camp Pardee, Camanche Dam, and Stockton Airport (cloud cover). Meteorological data from other stations and weather networks might also be used to fill gaps in the existing datasets, as necessary.
- Downscaled climate change projections applicable to the Project area, including air temperature, relative humidity, and wind speed, are available from Cal-Adapt or from other studies in progress by EBMUD. These projections can be used to scale local weather data for the purpose of modeling future climate conditions.

WR-2 is needed to develop temperature modeling tools that can be used to accurately represent Project water temperature over the POR for existing Project operations and alternative Project operations. The purpose of the modeling is to analyze potential effects of alternative operations on water temperatures released from Camanche Dam.

7.0 Study Methodology

The following describes the study approach for developing the water temperature modeling and analysis.

A Water Resources Technical Working Group (TWG) will convene, as needed, to collaborate and provide input on the water resources studies (WR-1, WR-2, and WR-3) throughout study implementation.

7.1. Water Model Development

- The Water Resources TWG will help review and guide the temperature modeling approach, including scenarios under future conditions.
- Assess the suitability of existing CE-QUAL-W2 (Pardee and Camanche reservoirs) and SNTEMP/RSM4 (between Pardee and Camanche reservoirs) water temperature models to model daily water temperature. For the Lower Mokelumne River, evaluate the suitability of the existing SSTEMP model and the statistical relationship for 7-day average daily maximum (MM7DADM) water temperature to model daily average temperature. If the assessment of suitability indicates the existing models cannot simulate daily water temperatures at the level of accuracy needed for Project objectives, then EBMUD will consider updating the existing models or developing new models.
- Incorporate the capability to model alternative infrastructure at Camanche Dam that could allow better management of water releases and associated temperatures across a range of hydrologic conditions.
- Calibrate and/or validate models using historical water temperature and meteorological data.

7.2. Data Collection and Analysis

- Water Temperature Data
    - Retrieve historical water temperature data and collect water temperature data during the first and second study years as part of ongoing monitoring or supplemental monitoring as part of the Water Quality Study (WR-1) plan:
        - River Reaches
        - Downstream of Dams and/or Spillway
        - Reservoir Profiles

  - Review data for quality assurance and to ensure that field equipment records data correctly. At the conclusion of the field season, data will be evaluated for use in water temperature models.
  - Share and review the water temperature data in coordination with the Instream Flow (FA-2) and Chinook Salmon Egg and Juvenile Survival (FA-5/FA-6) fish and aquatic studies.
- Meteorological Data
  - Download data from local meteorological data stations for the modeling POR:
    - Air Temperature
    - Dew Point Temperature/Relative Humidity
    - Wind Speed
    - Wind Direction
    - Solar Radiation
    - Cloud Cover
  - Review meteorological data for quality assurance and evaluate for use in the water temperature models.
- Incorporate the air temperature/meteorological dataset(s) for modeling future conditions scenarios.

7.3. Water Temperature Modeling and Analysis

- The results of the proposed aquatic study plans (e.g., Chinook Salmon Egg and Juvenile Survival Study [FA-5/FA-6]) will be used to define specific objectives to improve downstream salmon health. If improvements are necessary to achieve objectives, various alternatives would be evaluated for meeting those objectives, including infrastructure options. Final development of infrastructure alternatives may occur after completion of this study plan; if this occurs, modeling results will be provided in the Final License Application.

7.4. Reporting

- Document the study methods and results in a Water Temperature technical study report, and will include summary tables and maps, as appropriate.
- Upon request, data will be provided to resource agencies and interested stakeholders in a digital format.

8.0 Schedule, Periodic Reporting, and Consultation

WR-2 is proposed as a 2-year study and includes a draft technical study report to be filed with FERC as part of the Initial Study Report for review and comment, and a final technical study report to be filed with FERC as part of the Updated Study Report. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Water Temperature Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
October 2026 – July 2027	Conduct First-Year Studies (Develop Model, Collect Data, and Prepare Draft Technical Study Report for Completed Study Elements)
September 2027	File Initial Study Report
October 2027 – July 2028	Conduct Second-Year Studies (Collect Data, Model the Existing Project and Alternatives, and Prepare Final Technical Study Report)
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. EBMUD then conducted additional consultation with interested parties and incorporated their input into WR-2.

Table 8-2 lists the interested party comments and EBMUD responses relevant to WR-2.

Table 8-2. EBMUD response to comments received on study plans.

Date of Comment	Interested Party	Comment	EBMUD Response
02/18/2026	Foothills Conservancy	Address Warm Temperatures Above Electra Powerhouse Discharge in the North Fork Mokelumne. A topic related to past efforts and continued interest to reintroduce chinook salmon, and to enhance existing habitat for migratory salmonids (i.e. brown trout, rainbow trout, and Kokanee salmon) moving from Pardee Reservoir upwards into and beyond PG&E's Electra Powerhouse stretch. A thorough and complete water temperature study is needed. Results of the temperature study can be used to better understand temperature stressors related to low flow water quality conditions and its relation with water diversions in the upper watershed, especially in relation to hydropower generation.	The requested information is not related to the relicensing of the Project and the effects of Project operations and maintenance on water temperatures in Project reservoirs and Project-affected river reaches. The geographic scope of the study is described above in Section 5.0.
02/17/2026	CA Sportfishing Protection Alliance	EBMUD should enter into the record any recent studies or analysis it has done related to multi-level outlet works at Camanche Dam. The additional information from such analyses may inform license conditions or simply actions undertaken by EBMUD to improve flexibility in cold-water management of Camanche Reservoir.	Comment noted. Information pertaining to the Project is publicly available and can be found in the Document Library on the Project website: https://www.ebmud.com/mokrelicense

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating stakeholder feedback. The estimated cost for WR-2 ranges from $275,000 to $560,000, assuming up to $50,000 of work will be captured within existing data collection programs. Existing data collection programs include organization and quality control of historical temperature and boundary condition data, if already performed.

10.0 References

California Regional Water Quality Control Board. 2019. The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region Fifth Edition – 2019. The Sacramento River Basin and The San Joaquin River Basin.

(FERC) Federal Energy Regulatory Commission. 1981. Order Issuing License for East Bay Municipal Utility District Project No. 2916. Issued March 10, 1981.

HYDROLOGY AND OPERATIONS MODELING STUDY PLAN (WR-3)

Lower Mokelumne River Hydroelectric Project
FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

HYDROLOGY AND OPERATIONS MODELING STUDY PLAN (WR-3)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916

East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

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Terms and Abbreviations

C	
Commission	Federal Energy Regulatory Commission
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
H	
HEC-HMS	Hydrologic Engineering Center's Hydrologic Modeling System
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
P	
PAD	Pre-Application Document
POR	period of record
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
S	
SD1	Scoping Document 1
SD2	Scoping Document 2
T	
TWG	Technical Working Group

1.0 Introduction

This Hydrology and Operations Modeling Study (WR-3) plan addresses hydrology and operations modeling of the Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916; Lower Mokelumne River Project or Project), including inflow hydrology, reservoir operations, flood control, water supply, and downstream releases. WR-3 will make use of the East Bay Municipal Utility District's (EBMUD's) existing EBMUDSIM-RW planning and operations models for the Project. Historical and perturbed hydrology inflow datasets will be incorporated into the modeling. The applicable model will be used to analyze operations of the existing Project and potential scenarios for both current and future conditions. Results of the modeling will be used to evaluate proposed conditions developed through other studies (e.g., Water Temperature Study [WR-2], Instream Flow Study [FA-2]). This is a potentially iterative process, requiring careful balancing of existing constraints and conditions with proposed biologically derived targets and the availability of hydrologic resources.

2.0 Project Nexus and Study Rationale

Project operations and maintenance activities affect hydrology in Project-affected reservoirs and Project stream reaches. The WR-3 study results will inform the input into other studies that will then inform the Draft License Application.

3.0 Study Goals and Objectives

The goals and objectives of WR-3 are as follows:

- Model the existing Project physical characteristics, operational criteria, and hydrology.
- Model potential hydrology/operational alternatives and evaluate resulting changes from the baseline (existing Project operations) and/or the ability to meet targeted goals across the range of hydrologic conditions.

4.0 Relevant Resource Management Goals

Existing management plans such as the Water Control Manual, Joint Settlement Agreement, D-1641, and Urban Water Management Plans/Water Shortage Contingency Plan, as well as relevant water rights will be reviewed and used to develop a baseline understanding of the current management goals and objectives in the Project vicinity. Relevant management goals include the following:

- Sacramento River Basin and San Joaquin River Basin Water Quality Control Plan (Basin Plan) beneficial uses and water quality objectives (California Regional Water Quality Control Board 2019).
- EBMUD P-2916 license compliance (FERC 1981).
- Urban Water Management Plans.
- Water Shortage Contingency Plan.

5.0 Geographic Scope

The geographic scope of this study begins at the Mokelumne River inflow to Pardee Reservoir, through the outflow of Camanche Reservoir downstream to the Woodbridge Irrigation District Dam (Figure 5-1).

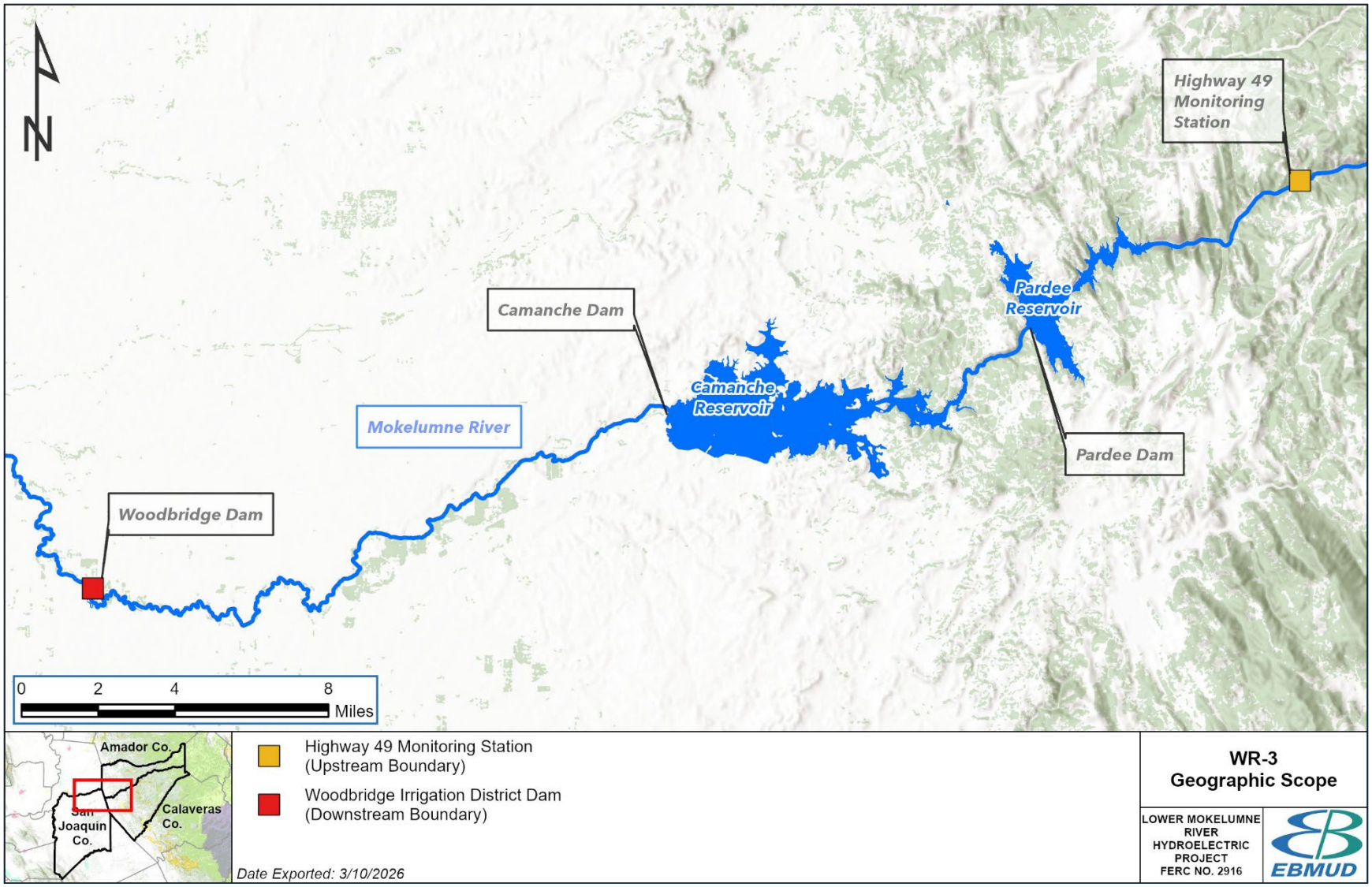


Figure 5-1. WR-3 geographic scope.

6.0 Existing Information and Need for Additional Information

Extensive data on hydrology and operations have been collected in the Project area by EBMUD as part of their P-2916 license (FERC 1981) and are detailed in the Pre-Application Document (PAD). Collection of these data will continue throughout the relicensing process.

The primary sources of hydrologic and operational data for this study include the following:

- U.S. Geological Survey gages (Gage Nos. 11319500, 11323500, and 11325500)
- EBMUD's historical records:
    - Pardee and Camanche reservoir storage operations
    - Diversions for municipal water supply
    - Reservoir releases, including minimum instream flow requirements

7.0 Study Methodology

The following describes the WR-3 study approach for developing Project hydrology and operations models.

A Water Resources Technical Working Group (TWG) will convene as needed to collaborate and provide input on the water resources studies (WR-1, WR-2, and WR-3) throughout study implementation.

7.1. Hydrology Model Development

- The Water Resources TWG will help review and guide the hydrology modeling approach.
- Use the 1998–2023 period of record (POR) for hydrological modeling to align with the model period being used in the Water Temperature Study (WR-2).
- Use EBMUD's existing EBMUDSIM-RW operations model to characterize the existing Project and other potential scenarios' daily average flow hydrology for the POR based on TWG input, as appropriate.
- The model combines physical attributes of each component of the Project with operational guidelines and practices. Physical constraints include reservoirs' stage-storage relationships, spillway elevations and discharge capacities, and conveyance capacities. Operational criteria include flow release requirements and reservoir elevation targets. Calculations are prioritized to first limit results within the physical constraints and then to follow operational criteria.
- The model uses inflow hydrology datasets to calculate daily reservoir storage and releases on a daily temporal resolution.
- Model calibration is based on closely matching the results of the existing operational conditions and practices with a reflective historical POR, using the corresponding hydrologic dataset as the input.
    - Include all existing constraints on the river and reservoirs such as flood control requirements, water supply demand, instream flow requirements, and water rights.
- Identify the best available hydrology data/modeling applicable to the Mokelumne watershed (e.g., EBMUD Urban Water Management Plan climate change analysis study). Incorporate the data into the hydrology model (United States Army Corps of Engineers Hydrologic Engineering Center's Hydrologic Modeling System [HEC-

HMS]) developed by EBMUD to characterize future hydrology conditions (existing Project and other potential hydrology/operations scenario[s]) over the term of the Project license (e.g., 50 years).

7.2. Hydrologic Alteration Analysis

- Analyze and compare existing Project and other potential hydrology/operations scenario(s) using established hydrologic methods (e.g., Richter et al. 1996). This analysis will be conducted for select Project-affected stream segments downstream of Camanche Dam (see Figure 5-1)
    - Monthly flow exceedance plots/tables for the POR
    - Time-series plots for the POR
    - January to December (annual) plots/tables showing mean daily and 95 percent, 90 percent, 75 percent, 50 percent (median), 25 percent, 10 percent, and 5 percent exceedance flows
    - Tables and summary analysis showing the following metrics of interest:
        - Monthly timing and magnitude of mean and median flow conditions (e.g., high and low flows)
        - Magnitude, duration, and timing of annual high flow and low flow conditions (1-day, 3-day, 7-day, monthly, etc.), including the presence of pulse flow events
        - Rate, timing, and frequency of hydrograph changes (e.g., rate and timing of the declining limb of the spring high flow hydrograph)

7.3. Reporting

- Document the study methods and results in a Hydrology and Operations Modeling technical study report, and include summary tables and maps, as appropriate.
- Upon request, data will be provided to resource agencies and interested parties in a Microsoft Excel spreadsheet (electronic format).

8.0 Schedule, Periodic Reporting, and Consultation

WR-3 is proposed as a 2-year study and includes a draft technical study report to be filed with FERC as part of the Initial Study Report for review and comment, and a final technical study report to be filed with FERC as part of the Updated Study Report. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Hydrology and Operations Modeling Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
October 2026 – July 2027	Develop Model and Prepare Draft Technical Study Report (for completed study elements)
September 2027	File Initial Study Report
September 2027 – July 2028	Complete Additional Model Alternative Analyses and Prepare Updated Final Technical Study Report (if needed)
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. There were no comments received relevant to WR-3.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating feedback from interested parties. The estimated cost for WR-3 ranges from $240,000 to $495,000, assuming up to $30,000 of work will be captured within existing data collection programs. Existing data collection programs include organization and quality control of historical flow and operations data if already performed.

10.0 References

California Regional Water Quality Control Board. 2019. The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region Fifth Edition – 2019. The Sacramento River Basin and The San Joaquin River Basin.

(FERC) Federal Energy Regulatory Commission. 1981. Order Issuing License for East Bay Municipal Utility District Project No. 2916. Issued March 10, 1981.

Richter, B.D., J.V. Baumgartner, J. Powell, and D.P. Braun. 1996. A method for assessing hydrologic alteration within ecosystems. Conservation Biology 10:1163-1174.

FISH POPULATION STUDY PLAN (FA-1)

Lower Mokelumne River Hydroelectric Project
FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

FISH POPULATION STUDY PLAN (FA-1)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916

East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

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Terms and Abbreviations

°	degrees
°C	degrees Celsius
C	
Commission	Federal Energy Regulatory Commission
CPUE	catch per unit effort
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
G	
GPS	global positioning system
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
P	
PAD	Pre-Application Document
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
R	
RM	river mile
RST	rotary screw trap
S	
SCP	Scientific Collecting Permit
SD1	Scoping Document 1
SD2	Scoping Document 2
State Water Board	California State Water Resources Control Board
T	
TWG	Technical Working Group
W	
WIDD	Woodbridge Irrigation District Dam

1.0 Introduction

This Fish Population Study (FA-1) plan for the Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916, Lower Mokelumne River Project or Project) evaluates fish populations in the Project reservoirs and river reaches. The purpose of the study is to 1) document fish species composition, distribution, and relative abundance; 2) characterize fish populations (e.g., condition factor, size structure); and 3) summarize stocking and hatchery operations to provide context for interpreting fish population trends. Results of FA-1 will be used to characterize Project fish populations and fish management.

2.0 Project Nexus and Study Rationale

Project operations and maintenance activities have the potential to affect fish populations in the Lower Mokelumne Project reservoirs and river reaches. In addition, fish populations within the Project area are influenced by ongoing fish stocking and hatchery operations. Although extensive fisheries monitoring has been conducted under the existing license, updated information is needed to characterize current fish population conditions, evaluate long-term trends where appropriate, and support the assessment of Project effects on fishery resources. The FA-1 results will inform the development of the Draft License Application.

3.0 Study Goals and Objectives

The study goals and objectives of FA-1 are as follows:

- Document fish species composition, distribution, and relative abundance in the reservoirs;
- Collect fish from the reservoirs for mercury testing;
- Document fish species composition, distribution, and relative abundance in the Lower Mokelumne River;
- Characterize fish population attributes, including size structure and condition factor, where appropriate;
- Summarize historical and ongoing fish stocking activities to provide context for interpretation of fish population data;
- Summarize fish hatchery operations (e.g., species, production goals, genetics); and
- Analyze fish population data and evaluate patterns in species composition, distribution, abundance, and population characteristics within the Project area.

4.0 Relevant Resource Management Goals

The Joint Settlement Agreement and Water Quality and Resource Monitoring Program includes the following management goals:

(1) Providing, to the extent feasible, habitat quality and availability in the Lower Mokelumne River to maintain fishery, wildlife, and riparian resources in good condition;

(2) Contributing toward the state and federal fishery restoration goals; and

(3) Sustaining the long-term viability of the salmon and steelhead fishery.

5.0 Geographic Scope

The geographic scope of FA-1 primarily spans the Mokelumne River inflow to Pardee Reservoir through the outflow of Camanche Reservoir and downstream to the Woodbridge Irrigation District Dam (WIDD) (Figure 5-1).

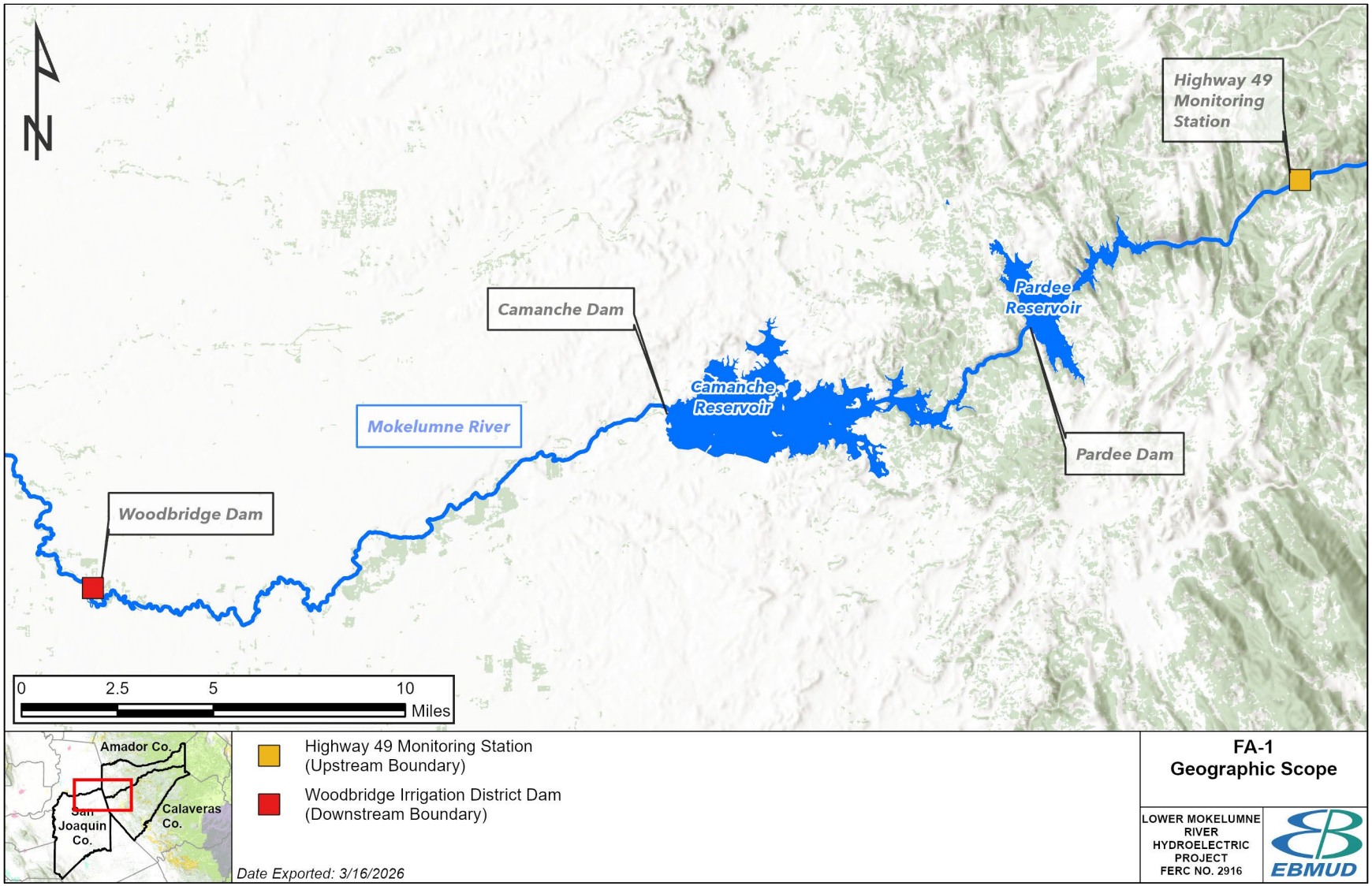


Figure 5-1. FA-1 geographic scope.

6.0 Existing Information and Need for Additional Information

Extensive data on fish populations have been collected in the Project area by the East Bay Municipal Utility District (EBMUD) as part of their P-2916 license (FERC 1981). Existing information related to fish populations and the Mokelumne River Fish Hatchery is documented in Section 4.4, Fish and Aquatic Resources, in the Pre-Application Document (PAD). This study is intended to continue fish population monitoring during the first- and second-year study seasons (e.g., 2026–2027), document the fishery in the Project-related reservoirs and river reaches, and document fish stocking and hatchery operations.

7.0 Study Methodology

Ongoing fish monitoring efforts in Pardee and Camanche reservoirs and in the Mokelumne River reaches will continue as currently and historically implemented. Historical data from previous studies will serve as baseline information for the proposed efforts. The FA-1 study methods include reservoir fish sampling, fish mercury testing, river fish sampling, fish handling, fish stocking operations, and hatchery operations.

A Fish and Aquatic Resources Technical Working Group (TWG) will convene as needed to collaborate and provide input on the fish and aquatic resources studies (FA-1, FA-2, FA-3, FA-4, and FA-5/FA-6) throughout study implementation.

7.1. Reservoir Sampling

Pardee and Camanche reservoirs will be sampled by boat electrofishing during the late summer/fall of 2026 to monitor species composition and relative abundance at the locations identified in Figure 7-1 and Table 7-1. Sampling locations and methods are consistent with historical monitoring efforts to facilitate comparison with existing datasets. Each transect will be sampled once. This includes the boat-accessible portions of upper Camanche Reservoir.

- Electrofishing transects will be sampled at night using an electrofishing boat.
    - Sampling time and distance will be recorded for catch-per-unit-effort (CPUE) calculations.
- In situ water quality data (temperature, dissolved oxygen, and turbidity) will be collected at each sampling location.

7.2. Fish Mercury Testing

The mercury testing and analysis are discussed in the Water Quality Study (WR-1) plan.

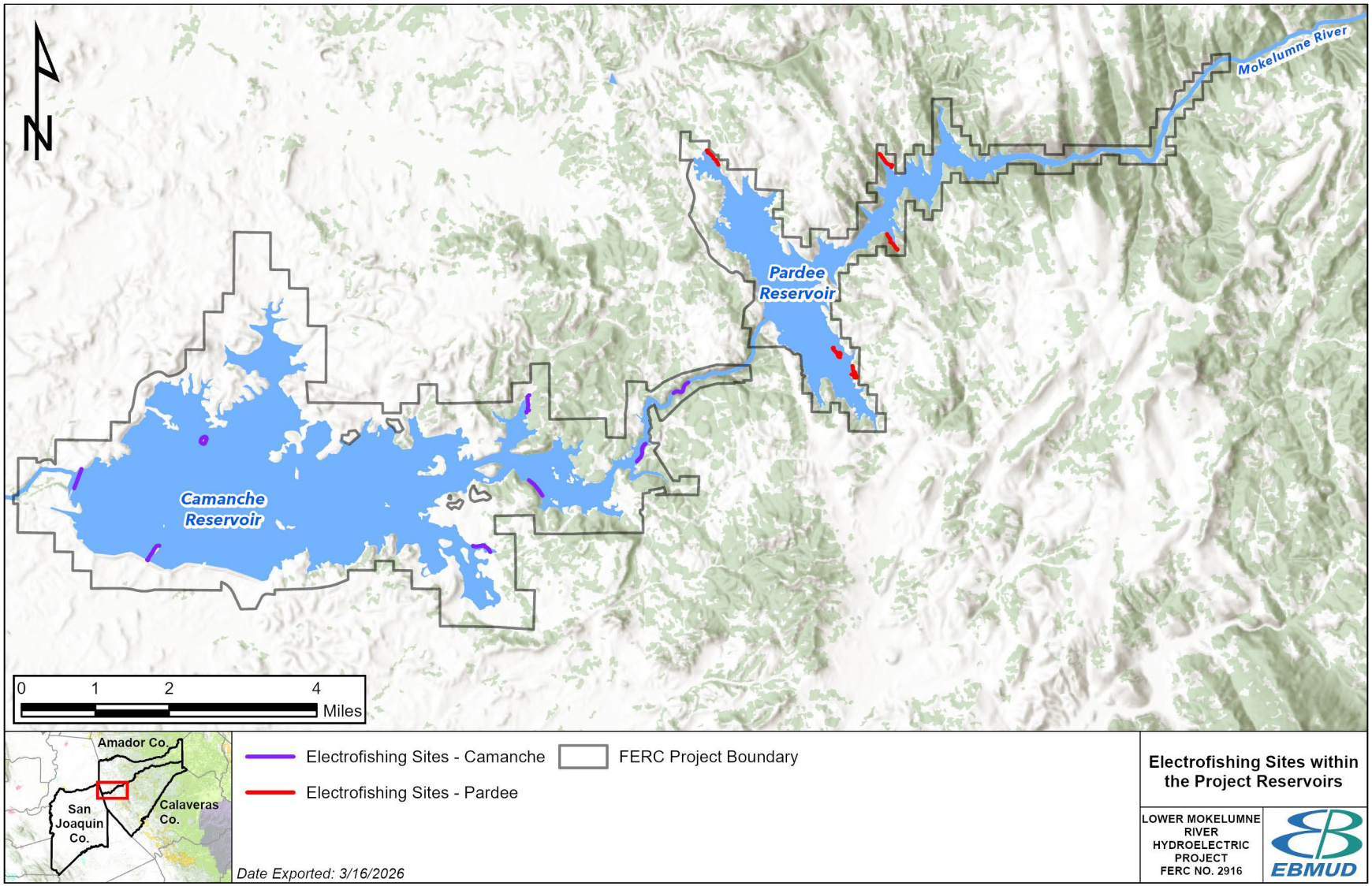


Figure 7-1. Electrofishing sites within the Project reservoirs.

Table 7-1. Locations for boat electrofishing in Pardee and Camanche reservoirs.

Site Number	START Marker GPS Location		END Marker GPS Location	
Camanche Reservoir				
CR 1	121° 1' 24.63"W	38° 13' 33.734"N	121° 1' 24.63"W	38° 13' 16.446"N
CR 2	121° 0' 4.818"W	38° 12' 31.919"N	120° 59' 59.415"W	38° 12' 53.104"N
CR 3	120° 59' 26.723"W	38° 14' 2.236"N	120° 59' 25.154"W	38° 14' 1.968"N
CR 4	120° 54' 44.367"W	38° 14' 2.236"N	120° 54' 49.724"W	38° 13' 54.942"N
CR 5	120° 55' 13.272"W	38° 13' 42.251"N	120° 54' 57.437"W	38° 13' 41.2"N
CR 6	120° 53' 7.134"W	38° 13' 40.41"N	120° 52' 55.288"W	38° 13' 55.346"N
CR 7	120° 56' 56.201"W	38° 12' 52.47"N	120° 56' 31.315"W	38° 12' 52.427"N
CR 8	120° 52' 50.805"W	38° 14' 3.559"N	120° 56' 31.315"W	38° 12' 52.427"N
Pardee Reservoir				
PR 1	120° 51' 57.331"W	38° 17' 22.534"N	120° 51' 47.559"W	38° 17' 13.399"N
PR 2	120° 49' 19.93"W	38° 17' 19.637"N	120° 49' 11.364"W	38° 17' 12.658"N
PR 3	120° 49' 6.356"W	38° 16' 14.734"N	120° 49' 17.187"W	38° 16' 27.242"N
PR 4	120° 44' 46.908"W	38° 18' 0.509"N	120° 44' 52.26"W	38° 17' 58.902"N
PR 5	120° 49' 48.269"W	38° 14' 46.659"N	120° 49' 45.401"W	38° 14' 50.014"N

7.3. River Sampling

A combination of rotary screw traps (RSTs), bypass trapping, boat electrofishing, and video monitoring will be employed to monitor fish in the Lower Mokelumne River (Figure 7-2 and Table 7-2) during first- and second-year studies (i.e., 2026 and 2027).

- Previously established sampling sites along the Lower Mokelumne River will be sampled using boat electrofishing following the methods from previous efforts (outlined in Meador et al. 1993) to ensure data standardization.
    - Each site will be sampled with three passes: one on each bank and one mid-channel.
    - Sampling will be conducted once per site in the spring.[1] Sampling time and length will be recorded for CPUE calculations.
- One RST, VINO, at River Mile (RM) 54.3 (Elliot Road Bridge), below the salmonid spawning locations, will be used to monitor salmonid production, and a

[1] Abbreviated sampling at a subset of sites in summer and winter—abbreviated due to temperatures and steelhead spawning, respectively—may also be conducted by EBMUD.

downstream RST, GOLF (RM 38.4, Lower Sacramento Road Bridge), and a smolt bypass trap at WIDD will be used to monitor salmonid emigration phenology and abundance (Table 7-2).

- Sampling will be conducted starting in December (or January) and will typically last through June.
- The traps will be fished daily, at a minimum, Monday through Friday, with estimates generated on weekends and holidays, or during unexpected trap stoppages due to debris, etc.
- While operational, traps will be checked and fish worked up daily and released downstream.
- Weekly efficiency trials will be conducted at both RST locations, as feasible. At the VINO trap, efficiency trials will be conducted weekly using natural-origin salmon, provided sufficient trap captures occur. When natural-origin salmon are not captured in sufficient numbers to conduct efficiency trials at the VINO location, hatchery-origin salmon will be used. Once natural-origin fish captures diminish in late March or April at the VINO trap, trial frequency may shift to biweekly, or when significant changes to flow and/or environmental conditions occur, depending upon how many hatchery salmon are still available for efficiency trials. At the GOLF trap, weekly efficiency trials will be conducted using hatchery salmon to ensure adequate sample sizes are achieved. Hatchery salmon used for efficiency trials will be selected to mimic the life stage and size of salmon passing the traps during that timeframe.
- Test fish for VINO efficiency trials will be released approximately 0.25 river kilometer (0.16 river mile) upstream of the trap location. Test fish for GOLF will be released below the face of WIDD, approximately 0.1 river kilometer (0.06 river mile) upstream of the trap location. The test fish will be distributed proportionally to the flow across the river at each location.

- The existing video monitoring station at WIDD will continue to be operated for monitoring run size and phenology of adult salmon and steelhead (*Oncorhynchus mykiss*, anadromous rainbow trout).
  - Monitoring will be year-round except for the period in late winter when the Woodbridge Irrigation District drains Lodi Lake at WIDD to complete maintenance. Monitoring may also cease during July, if flows below WIDD are around 35 cubic feet per second.

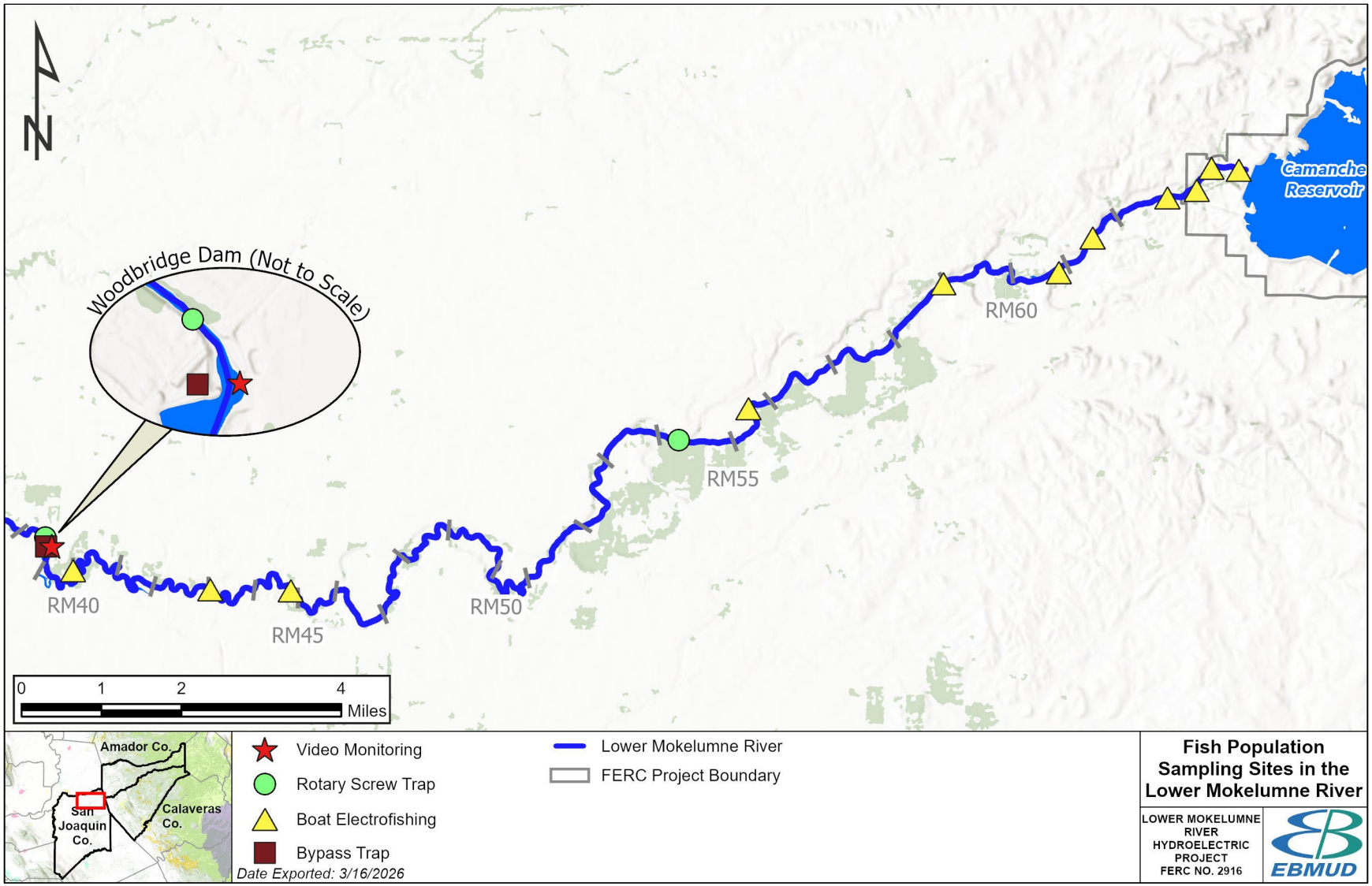


Figure 7-2. Fish population sampling sites in the Lower Mokelumne River.

Table 7-2. Sampling type and location for all fish sampling efforts in the Lower Mokelumne River.

Sampling Method	Site Number	Site Name	Latitude	Longitude	River Mile
Rotary Screw Trap	RST 1	VINO	38.17645	-121.15345	54.3
	RST 2	GOLF	38.15787	-121.29876	38.4
Bypass Trap	BT	WIDD	38.15627	-121.29859	38.6
Video Monitoring	VM	WIDD	38.15632	-121.29727	39.0
Boat Electrofishing	LMR 1	BELCAMDAM	38.22627	-121.02512	63.9
	LMR 2	VANASSENE	38.22659	-121.03141	63.5
	LMR 3	AIB	38.22257	-121.03477	63.1
	LMR 4	SPANGLER	38.22119	-121.04150	62.7
	LMR 5	AFRAMEG	38.21384	-121.05863	61.5
	LMR 6	ABOVE88BW	38.20754	-121.06636	60.9
	LMR 7	MACKVILLEG	38.20540	-121.09289	59.0
	LMR 8	BIGBENDG	38.18250	-121.13750	55.7
	LMR 9	TRAINBRIDG	38.14889	-121.24234	44.9
	LMR 10	HWY99G	38.14896	-121.26082	43.0
	LMR 11	LAKELODIE	38.15221	-121.29238	40.0

7.4. Fish Handling

Captured fish will be handled as follows:

- All fish will be kept in aerated 5-gallon buckets, the electrofishing boat live well, or similar, filled with water from the area of capture.
- Fish will be monitored for signs of stress, and holding conditions will be adjusted accordingly (lower density, more aeration, cooler water).
- All fish will be identified to species and enumerated. During electrofishing surveys, the first 50 specimens of each species will be measured (fork length, millimeters). Weight measurements (grams) may be collected of fish 200 mm or larger, consistent with historical monitoring practices. During RST and bypass trap operations, total length, fork length (millimeters), and weights of the first 50 Chinook salmon (*O. tshawytscha*) and the first 20 of every incidental species will be recorded.
- EBMUD's current California Department of Fish and Wildlife Scientific Collecting Permit (SCP) and National Marine Fisheries Service 10(a)(1)(A) permit define sampling criteria intended to minimize handling stress—water temperature in

holding containers shall be maintained within 2 degrees Celsius (°C) of the ambient water temperature in which the fish were collected and shall not exceed 18°C for electrofishing or 21°C for other methods. These criteria are sufficiently protective, and subsampling already takes place for length and weight measurements under current practices. Therefore, additional criteria for subsampling are not necessary. As necessary, fish will be anesthetized with MS-222 to minimize handling time and stress.

7.5. Fish Stocking

- Historical fish stocking records and fish stocking during the first and second study years (i.e., 2026 and 2027) will be summarized (e.g., numbers, species, size).
- Fish stocking goals and management strategies will be summarized.
- Fish stocking information will be used to provide context for interpretation of reservoir fish population data.

7.6. Hatchery Operations

- Historical hatchery operations (e.g., species, production goals, funding) will be summarized.
- Ongoing hatchery operations (e.g., species, production goals, funding) will be summarized.
- Relevant operational constraints affecting hatchery production will be summarized, where information is available.

7.7. Analysis

- Species composition, distribution, relative abundance, size structure, and condition (where sufficient data are available) will be evaluated for the study years and summarized for comparison to previous years.
- CPUE will be reported for each species and life stage classifications, where appropriate.
- Information on fish stocking and hatchery operations will be summarized to provide context for interpretation of observed fish population patterns.
- Relationships between observed fish population patterns and relevant environmental conditions (e.g., flows, water year type, water temperature) and management actions (e.g., stocking, hatchery operations, habitat restoration) will be described, where appropriate.

8.0 Schedule, Periodic Reporting, and Consultation

FA-1 is proposed as a 2-year study and includes a draft technical study report to be filed with FERC as part of the Initial Study Report for review and comment, and a final technical study report to be filed with FERC as part of the Updated Study Report. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Fish Population Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
October 2026	Begin Study
September 2027	File Initial Study Report
July 2028	Conclude Study
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. Table 8-2 lists the interested party comments and EBMUD responses relevant to FA-1.

Table 8-2. EBMUD response to comments received on study plans.

Date of Comment	Interested Party	Comment	EBMUD Response
02/17/2026	CA State Water Board	3. Pg. 9 of the PSP FA -1 (Fish Population Study) states that rotary screw traps (RST) will have multiple efficiency tests conducted throughout the season using wild fish when salmon catch is high enough to produce a group of test fish. What would be the frequency of these efficiency tests between December and June? State Water Board staff recommend that section 7.0 of the study plan be updated to include at least weekly efficiency tests using life stage appropriate marking methods.	Weekly efficiency trials will be conducted as feasible. The PSP has been updated to reflect this clarification.
02/17/2026	CA State Water Board	4. Pg. 12 of the PSP FA-1 (Fish Population Study) states if necessary to minimize handling stress, subsampling may be implemented. What are the criteria EBMUD will use to determine if subsampling is necessary to minimize handling stress? State Water Board staff recommend that the PSP is updated to include daily water temperature and dissolved oxygen testing to inform whether sub-sampling may be necessary.	Our California Department of Fish and Wildlife SCP and National Marine Fisheries Service 10(a)(1)(A) permit define sampling criteria intended to minimize handling stress and are sufficiently protective. We do not believe any additional constraints are necessary and will reference these guidelines within the study documents.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected to meet the study objectives. The study schedule and materials have been developed to build on existing information, fill data gaps, and incorporate feedback from interested parties. The estimated cost for FA-1 ranges from $200,000 to $620,000, assuming electrofishing via boat in the reservoirs and river and use of RSTs.

10.0 References

(FERC) Federal Energy Regulatory Commission. 1981. Order Issuing License for East Bay Municipal Utility District Project No. 2916. Issued March 10, 1981.

Meador, M.R., T.F. Cuffney, and M.E. Gurtz. 1993. Methods for sampling fish communities as a part of the National Water-Quality Assessment Program: U.S. Geological Survey Open-File Report 93-104. p 40.

INSTREAM FLOW STUDY PLAN (FA-2)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

INSTREAM FLOW STUDY PLAN (FA-2)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916



East Bay Municipal Utility District

375 11th Street

Oakland, California 94607

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Terms and Abbreviations

C	
Commission	Federal Energy Regulatory Commission
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
H	
HEC-RAS	Hydrologic Engineering Center's River Analysis System
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
P	
PAD	Pre-Application Document
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
S	
SD1	Scoping Document 1
SD2	Scoping Document 2
T	
TWG	Technical Working Group
W	
WIDD	Woodbridge Irrigation District Dam

1.0 Introduction

This Instream Flow Study (FA-2) plan evaluates instream flows for aquatic habitat in the Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916; Lower Mokelumne River Project or Project), particularly in the Lower Mokelumne River from the Camanche Dam to the Woodbridge Irrigation District Dam (WIDD). Results of FA-2 will be used to understand the relationship between flows and aquatic resources and inform flow regime management in the Project river reaches.

2.0 Project Nexus and Study Rationale

Project operations and maintenance activities have the potential to affect instream flows and aquatic resources in the Lower Mokelumne River. The FA-2 study results will inform development of the Draft License Application.

3.0 Study Goals and Objectives

The goals and objectives of FA-2 are to characterize instream flows for aquatic habitat in the Lower Mokelumne River, particularly from Camanche Dam to WIDD. Specific goals are as follows:

- Summarize the previous instream flow modeling.
- Establish a Fish and Aquatic Resources Technical Working Group (TWG).
- Identify the species and life stages and habitat suitability criteria for instream flow modeling.
- Use habitat versus flow relationships to develop a time series analysis of aquatic habitat under existing Project hydrology and other potential hydrology/operations scenarios.
- Identify the time periods, flow conditions, and life stages when habitat may be a limiting factor for aquatic resources (fish, benthic macroinvertebrates, other aquatic species, and riparian vegetation) for existing Project operations and other potential hydrology/operations scenarios.
- Characterize riparian flow and sediment transport conditions in the Lower Mokelumne River.

4.0 Relevant Resource Management Goals

The primary resource management goals are outlined in the Joint Settlement Agreement. The goals include:

(1) providing, to the extent feasible, habitat quality and availability in the Lower Mokelumne River to maintain fishery, wildlife, and riparian resources in good condition;

(2) contributing toward the state and federal fishery restoration goals; and

(3) sustaining the long-term viability of the salmon and steelhead fishery.

5.0 Geographic Scope

The geographic scope of this study includes the Lower Mokelumne River from Camanche Dam downstream to WIDD (Figure 5-1).



Figure 5-1. FA-2 geographic scope.

6.0 Existing Information and Need for Additional Information

Instream flow data for aquatic habitat has been developed in the Project area by the East Bay Municipal Utility District (EBMUD) as part of their P-2916 license (FERC 1981). Existing information is documented in Section 4.4, Fish and Aquatic Resources, in the Pre-Application Document (PAD). This study will characterize instream flows and their relationship to availability of aquatic resources under existing Project and other potential operational scenarios.

7.0 Study Methodology

The study methods include a review of previous instream flow modeling, establishment of a Fish and Aquatic Resources TWG, identification of target species/life stages, development of habitat suitability criteria, hydrodynamics modeling, habitat modeling, and riparian/sediment transport modeling.

A Fish and Aquatic Resources TWG will convene as needed throughout study implementation to collaborate and provide input on the fish and aquatic resources studies (FA-1, FA-2, FA-3, FA-4, and FA-5/FA-6).

7.1. Summarize Previous Instream Flow Modeling

- Summarize the instream flow modeling that has been conducted previously (data collection locations, calibration flows, target species and life stages, habitat suitability criteria, weighted usable area, rationale/criteria for establishment of current minimum instream flows).

7.2. Role of the Fish and Aquatic Resources TWG

- The Fish and Aquatic Resources TWG will provide input and technical review of modeling procedures/decisions (e.g., Habitat Suitability Criteria, hydrodynamics modeling, habitat and time series modeling).

7.3. Identify Target Species and Life Stages

- Coordinate with the Fish and Aquatic Resources TWG to identify the target species and life stages for modeling based on management importance and/or sensitivity to Project operations.
- EBMUD proposes to model fall-run Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*, anadromous rainbow trout) life stages (adult spawning, egg incubation, and juvenile rearing and outmigration).

7.4. Develop Habitat Suitability Criteria

- Coordinate with the Fish and Aquatic Resources TWG to identify habitat suitability criteria for each target species and life stages using existing information.

7.5. Hydrodynamic Modeling

- Use the existing United States Army Corps of Engineers Hydrologic Engineering Center's River Analysis System (HEC-RAS) hydrodynamic model to calculate channel hydraulics over a wide range of flows in the Lower Mokelumne River modeling reaches.

7.6. Habitat Modeling

- Use the habitat suitability criteria to model aquatic habitat over a wide range of flows in the Lower Mokelumne River modeling reaches.

- Develop a time series analysis of habitat (1997–2023) for existing conditions and potential scenarios (as appropriate) using the hydrology/operations modeling scenarios in the Hydrology and Operations Modeling Study (WR-3) for both existing and future climate.

    - Provide time series plots and monthly exceedance predictions to characterize habitat-flow relationships for each species and life stage and modeling scenario.

- Use the habitat time series and results from the Water Temperature Study (WR-2), Chinook Salmon Egg and Juvenile Survival Study (FA-5/FA-6), and Fish Population Study (FA-1) plans to identify time periods, flow conditions, and life stages when habitat may be a limiting factor for aquatic resources under existing Project operations and other potential scenarios (as appropriate) for existing and future climate hydrology.

7.7. Riparian Habitat and Sediment Transport

- Characterize riparian habitat-flow conditions in the Lower Mokelumne River (flow magnitude, frequency, and hydrograph descending limb characteristics).

    - Coordinate with the Wetland, Riparian, and Littoral Habitats Study (TERR-3) plan to select up to 10 total cross sections at representative locations along the Lower Mokelumne River.
    - Develop stage-discharge relationships over a range of flows (high to low) at each of the cross sections.
    - Coordinate with the Wetland, Riparian, and Littoral Habitats Study (TERR-3) plan to characterize the relationship between riparian vegetation and flow conditions.

- Evaluate sediment transport conditions in the Lower Mokelumne River suitable salmonid spawning habitat.

- Identify locations with suitable salmonids spawning habitat to characterize sediment transport and bankfull flow, potentially at the same locations where riparian cross-sectional data were collected.
- Characterize sediment size distributions used in salmon spawning gravel enhancement projects (e.g., D_{50}) and bankfull indicators at the study locations.
- Calculate initiation of motion flow and bankfull discharge at each study location using the HEC-RAS model.
  - Derive channel hydraulic conditions (flow depth, velocity, energy slope, and bed shear stress) over a range of high flows.
  - Determine flows necessary for initiation of sediment transport (motion) using critical shear stress for observed sediment sizes.
  - Estimate discharge at the bankfull indicators using the modeled water surface elevations.

Use the results from the Hydrology and Operations Modeling Study (WR-2) to characterize the duration and frequency of sediment transport flows under existing Project operations and other potential scenarios (as appropriate) for existing and future climate hydrology.

8.0 Schedule, Periodic Reporting, and Consultation

FA-2 is proposed as a 2-year study and includes a draft technical study report to be filed with FERC as part of the Initial Study Report for review and comment, and a final technical study report to be filed with FERC as part of the Updated Study Report. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Instream Flow Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
October 2026	Convene TWG and Summarize Previous Habitat Suitability Criteria and Instream Flow Modeling
November 2026-March 2027	Identify Target Fish Species and Life Stages and Habitat Suitability Criteria with TWG
April 2027– October 2027	Collect Riparian and Sediment Transport Data, Analysis, and Hydraulic Modeling
September 2027	File Initial Study Report
November 2027 – March 2028	Complete Habitat and Time Series Modeling
April -July 2028	Identify Potential Limiting Factors Under Existing and Future Operational Scenarios and Climatic Hydrology
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. There were no comments received relevant to FA-2.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected to meet the study objectives. The study schedule and materials have been developed to build on existing information, fill data gaps, and incorporate feedback from interested parties. The estimated cost for FA-2 ranges from $375,000 to $425,000, assuming the hydrologic model is complete.

10.0 References

(FERC) Federal Energy Regulatory Commission. 1981. Order Issuing License for East Bay Municipal Utility District Project No. 2916. Issued March 10, 1981.

RESERVOIR FISH HABITAT STUDY PLAN (FA-3)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916



East Bay Municipal Utility District

375 11th Street
Oakland, California 94607

July 2026

RESERVOIR FISH HABITAT STUDY PLAN (FA-3)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916

East Bay Municipal Utility District
375 11th Street
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Terms and Abbreviations

°C	degrees Celsius
C	
Commission	Federal Energy Regulatory Commission
CRWQCB	California Regional Water Quality Control Board
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
M	
mg/L	milligrams per liter
P	
PAD	Pre-Application Document
POR	period of record
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
S	
SD1	Scoping Document 1
SD2	Scoping Document 2
SRT	Salmonid Restoration Team
T	
TWG	Technical Working Group

1.0 Introduction

This Reservoir Fish Habitat Study (FA-3) plan evaluates reservoir fish habitat for the Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916, Lower Mokelumne River Project or Project). The study will make use of data from the Hydrology and Operations Modeling Study (WR-3) and the Water Temperature Study (WR-2) to assess cold- and warm-water fish habitat in Pardee and Camanche reservoirs over the modeling period of record (POR) 1997–2023. The study will be used to analyze reservoir fish habitat for the existing Project and alternative scenarios for both current climate and future climate change conditions.

2.0 Project Nexus and Study Rationale

Project operations have the potential to affect reservoir fish habitat in the Project reservoirs. The FA-3 results will inform the development of the Draft License Application.

3.0 Study Goals and Objectives

The goals and objectives of the study are to characterize the management of reservoir water surface elevations and its relationship to fish habitat availability under existing Project operations and other potential hydrology/operations scenarios for current and future climate conditions. This includes the following:

- Characterize existing Project operations daily water surface elevations and pool habitat volumes (cold water, warm water, dissolved oxygen) at each reservoir using the hydrology and water temperature models in the Hydrology and Operations Modeling Study (WR-3) and Water Temperature Study (WR-2) and the historical dissolved oxygen data (1998–2024).
- Characterize other potential hydrology scenarios for Project daily water surface elevation patterns and pool habitat volumes (cold water, warm water, dissolved oxygen) at each reservoir using the hydrology and water temperature models in the Hydrology and Operations Modeling Study (WR-3) and Water Temperature Study (WR-2) and the historical dissolved oxygen data (1998–2024).

4.0 Relevant Resource Management Goals

Existing management plans will be reviewed and used to develop a baseline understanding of the current management goals and objectives in the Project vicinity.

5.0 Geographic Scope

The geographic scope of this study includes the fish habitat in Pardee and Camanche reservoirs (Figure 5-1).

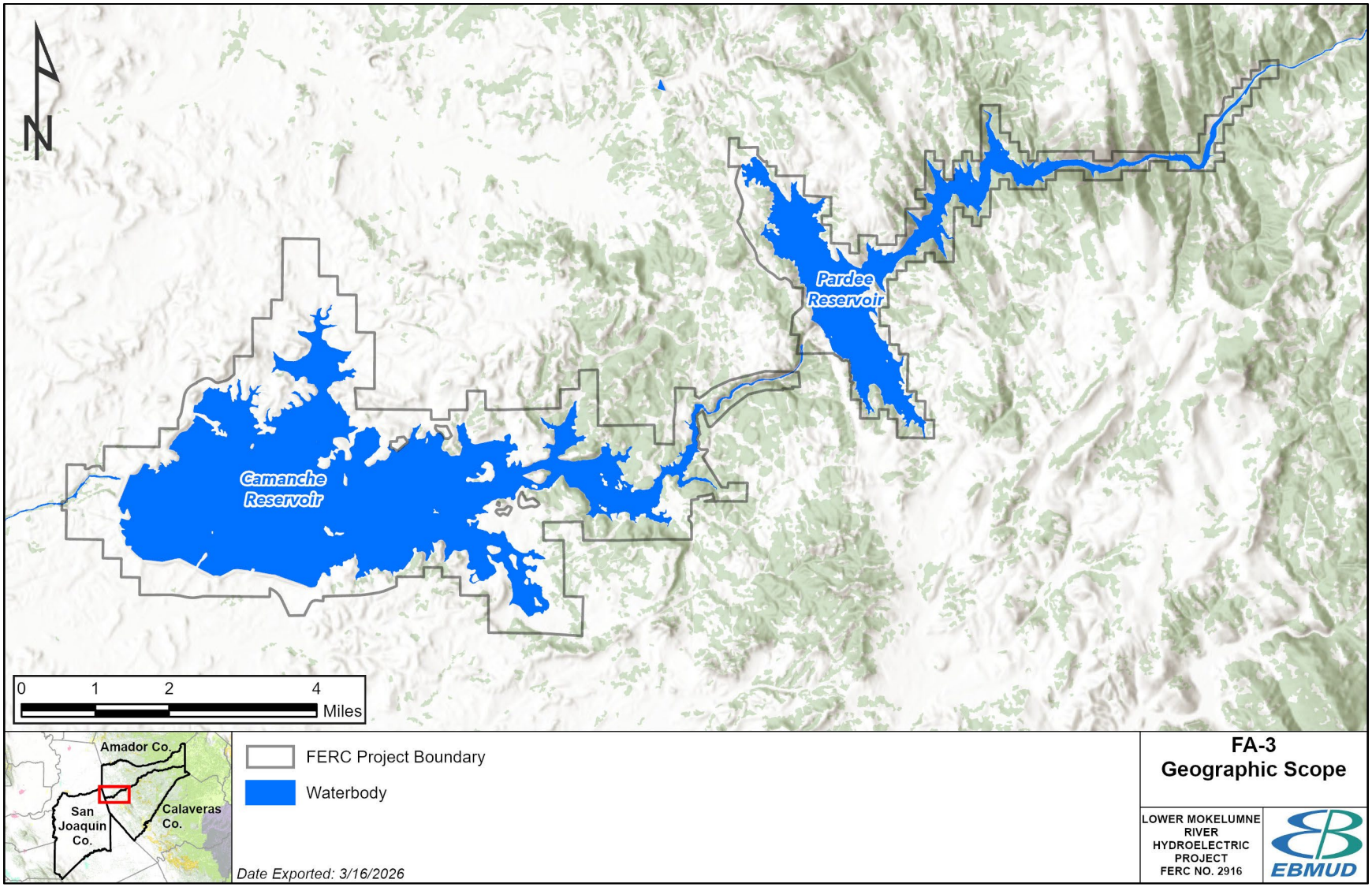


Figure 5-1. FA-3 geographic scope.

6.0 Existing Information and Need for Additional Information

Data on fish and fish habitat have been collected in the Project area by the East Bay Municipal Utility District (EBMUD) as part of their P-2916 license (FERC 1981). Existing information is documented in Section 4.4, Fish and Aquatic Resources, of the Pre-Application Document (PAD). This study is needed to characterize the management of reservoir water surface elevations and its relationship to availability of fish habitat under existing Project and potential alternative operations.

7.0 Study Methodology

The hydrology and water temperature models developed in the Hydrology and Operations Modeling Study (WR-3) and Water Temperature Study (WR-2) will be used to characterize reservoir fish habitat over the 1997–2023 POR for existing Project operations and for alternative scenarios (as appropriate) for both existing and future climate conditions.

A Fish and Aquatic Resources Technical Working Group (TWG) will convene as needed to collaborate and provide input on the fish and aquatic resources studies (FA-1, FA-2, FA-3, FA-4, and FA-5/FA-6) throughout study implementation.

7.1. Fish Assemblage

- Summarize the fish assemblage in each reservoir using information from the Fish Population Study (FA-1). Use the data to identify important reservoir fish habitat (e.g., cold-water and warm-water habitat).

7.2. Habitat Modeling

For existing Project hydrology and other potential hydrology/operations scenarios:

- Model daily reservoir hydrology (elevation, volume).
- Model daily reservoir water temperature.
- Use historical dissolved oxygen profiles to characterize dissolved oxygen profile relationships over the modeling POR by season and water year type/reservoir volume:
    - Summarize the historical dissolved oxygen profile data within the littoral zone and open-water habitats.
    - Summarize the dissolved oxygen profiles for ranges of <5 milligrams per liter (mg/L) (not suitable fish habitat), ≥5 to <7 mg/L (suitable for warm-water fish), and ≥7 mg/L (suitable for warm- and cold-water fish) by seasons and water year types/reservoir volume (California Regional Water Quality Control Board [CRWQCB] 2019).
    - Develop an approach to apply the dissolved oxygen relationships to the daily model runs.
- Quantify the daily time series of cold-water habitat (volume with water temperature ≤20 degrees Celsius [°C] and dissolved oxygen ≥7 mg/L, typical temperature and dissolved oxygen requirements for cold-water species) (e.g., Bjornn and Reiser 1991; CRWQCB 2019).

- Quantify the daily time series of warm-water habitat (volume with water temperature >20°C and dissolved oxygen ≥5 mg/L, typical temperature and dissolved oxygen requirements for warm-water species).

7.3. Analysis

Characterize the time series of cold- and warm-water fish habitat volume for each scenario over the POR:

- Develop a daily time series figure of habitat volume.
- Develop monthly exceedance plots of habitat volume for each month (January to December).
- Identify any potential habitat-limiting time periods, such as time seasons or water year types with comparatively low habitat availability.
- Compare habitat availability between existing and alternative hydrology/operations scenarios.

8.0 Schedule, Periodic Reporting, and Consultation

FA-3 is proposed as a single-year study and will include a technical study report to be filed with FERC as part of the Initial Study Report for review and comment. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Reservoir Fish Habitat Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
October 2026 – July 2027	Model Hydrology, Water Temperature, and Dissolved Oxygen
August 2027 – July 2028	Model Additional Scenarios (if needed)
September 2027	File Initial Study Report
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026, Table 8-2 lists the interested party comments and EBMUD responses relevant to FA-3.

Table 8-2. EBMUD response to comments received on study plans.

Date of Comment	Interested Party	Comment	EBMUD Response
02/18/2026	Foothills Conservancy	Salmon Restoration Above Pardee - Starting in 2011, the Conservancy has led efforts to study the restoration of salmonids to their native habitats above Pardee Reservoir. We ask that this program be considered as part of the Fish and Aquatic Resources study with the hope that salmon restoration can be included as part of FERC relicensing. Please see foothillconservancy.org/programs/watershed/mokelumne-salmon-restoration.	Comment noted. The portion of the upper Mokelumne watershed being referenced here is not within the FERC Project boundary, nor is it affected by Project operations. Habitat suitability and the potential for reintroduction of Chinook salmon (*Oncorhynchus tshawytscha*) to the upper watershed was previously studied by an interagency technical team. Publicly available information can be found in the Document Library on the Project website: https://www.ebmud.com/mokrelicense.
02/17/2026	CA Sportfishing Protection Alliance	CSPA is interested in evaluating the potential for the passage of salmon and/or steelhead to the upper Mokelumne watershed upstream of Pardee Reservoir. This necessarily involves evaluation of the quality and quantity of upper watershed habitat and of migration barriers that limit or block the access of fish to that habitat.	The portion of the upper Mokelumne watershed being referenced here is not within the FERC Project boundary, nor is it affected by Project operations. Habitat suitability and the potential for reintroduction of Chinook salmon (*Oncorhynchus tshawytscha*) to the upper watershed was previously studied by an interagency technical team. Publicly available information can be found in the Document Library on the Project website: https://www.ebmud.com/mokrelicense.

Date of Comment	Interested Party	Comment	EBMUD Response
02/17/2026	CA Sportfishing Protection Alliance	There is some existing information that can inform these issues, a “Salmonid Restoration Team” (SRT) organized by EBMUD, Foothill Conservancy, and CSPA met to explore the possibility of fish passage to the upper Mokelumne watershed.1 The SRT commissioned two reports: a barrier assessment (2014) and a fish habitat assessment (2018). These documents are cited in the PAS as Boyd 2014 and Brown et al. 2018.2 Boyd 2014 includes a history of salmonids in the Mokelumne River watershed. It states that the present natural migration limit for salmonids is near the confluence of the North Fork Mokelumne and Middle Fork Mokelumne. The document is marked “draft.” It would be useful for EBMUD to either affirm it as final or to update it into final form, and to submit the final version into the FERC record for the relicensing. The Brown et al. habitat study concluded that there are roughly 17 miles of rearing and spawning habitat for salmonids located from Middle Bar upstream to the confluence of the north and middle forks of the Mokelumne River. EBMUD should formally submit it into the record as well so the relicensing participants can rely on the information it contains.	The final Boyd 2014 document has been posted to the Document Library on the relicensing website; they can be found at: https://www.ebmud.com/mokrelicense

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected to meet the study objectives. The study schedule and materials have been developed to build on existing information, fill data gaps, and incorporate feedback from interested parties. The estimated cost for FA-3 ranges from $75,000 to $120,000, assuming a desktop analysis will be conducted with data collected from other studies.

10.0 References

Bjornn, T.C. and Reiser, D.W. 1991. Habitat Requirements of Salmonids in Streams. In: Meehan, W.R., Ed., Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats, American Fisheries Society Special Publication, 19, 83-138.

(CRWQCB) California Regional Water Quality Control Board. 2019. The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region Fifth Edition – 2019. The Sacramento River Basin and The San Joaquin River Basin.

(FERC) Federal Energy Regulatory Commission. 1981. Order Issuing License for East Bay Municipal Utility District Project No. 2916. Issued March 10, 1981.

SPECIAL STATUS AMPHIBIANS AND AQUATIC REPTILES STUDY PLAN (FA-4)

Lower Mokelumne River Hydroelectric Project
FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

SPECIAL STATUS AMPHIBIANS AND AQUATIC REPTILES STUDY PLAN (FA-4)

Lower Mokelumne River Hydroelectric Project

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Terms and Abbreviations

°	degrees
A	
Agreement	Safe Harbor Agreement
C	
CDFW	California Department of Fish and Wildlife
CNDDB	California Natural Diversity Database
Commission	Federal Energy Regulatory Commission
CRLF	California red-legged frog
CTS	California tiger salamander
E	
EBMUD	East Bay Municipal Utility District
eDNA	environmental DNA
ESA	Endangered Species Act
F	
FERC	Federal Energy Regulatory Commission
FYLF	foothill yellow-legged frog
G	
GGS	giant garter snake
GIS	geographic information system
GPS	global positioning system
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
N	
NWPT	northwestern pond turtle
P	
PAD	Pre-Application Document
Permit	enhancement of survival permit (USFWS)
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
S	
SD1	Scoping Document 1

SD2	Scoping Document 2
SHA	Safe Harbor Agreement
State Water Board	California State Water Resources Control Board
T	
TWG	Technical Working Group
U	
U.S. EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
V	
VES	visual encounter surveys
W	
WIDD	Woodbridge Irrigation District Dam
WS	western spadefoot

1.0 Introduction

This Special Status Amphibians and Aquatic Reptiles Study (FA-4) plan addresses special-status amphibians and aquatic reptiles for the Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916, Lower Mokelumne River Project or Project). The purpose of FA-4 is to document special-status amphibians and aquatic reptiles and their habitats in the study area.

2.0 Project Nexus and Study Rationale

Special-status amphibians and reptiles and their habitat are known to or could potentially occur in the FERC Project boundary. Implementation of Project operations and maintenance activities could result in direct loss or disturbance of individuals or their habitat. The FA-4 results will inform development of potential license requirements.

3.0 Study Goals and Objectives

The FA-4 study goals and objectives are as follows:

- Document the distribution and abundance of northwestern pond turtle (NWPT) (*Actinemys marmorata*) populations in the study area.
- Document the presence of potential NWPT nesting habitat near Project facilities.
- Conduct breeding habitat assessment and visual encounter surveys for breeding and young-of-year foothill yellow-legged frog (FYLF) (*Rana boylii*) in representative sites in the Lower Mokelumne River below Camanche Dam to WIDD and associated tributaries.
- Continue conducting surveys consistent with the monitoring requirements under the Safe Harbor Agreement (SHA or Agreement) for California red-legged frog (CRLF) (*Rana draytonii*) and California tiger salamander (CTS) (*Ambystoma californiense*). Continue to document the presence of western spadefoot (WS) (*Spea hammondii*) during surveys.
- Characterize habitat for giant garter snake (GGS) (*Thamnophis gigas*) and WS.

4.0 Relevant Resource Management Goals

Existing management plans will be reviewed and used to develop a baseline understanding of the current management goals and objectives in the Project vicinity.

- The East Bay Municipal Utility District (EBMUD) has entered into a SHA (or Agreement) with the purpose of (1) promoting the enhancement and management of habitat for CRLF and CTS (also valley elderberry longhorn beetle [*Desmocerus californicus dimorphus*]) on EBMUD watershed lands in San Joaquin, Amador, and Calaveras counties; and (2) providing certain regulatory assurances to EBMUD. The SHA serves as the basis for the United States Fish and Wildlife Service (USFWS) to issue an enhancement of survival permit (Permit) pursuant to Section 10(a)(1)(A) of the Endangered Species Act (ESA). The Permit authorizes the incidental taking of CRLF, CTS, and valley elderberry long-horn beetle associated with the enhancement and conservation management of these species' habitats, other lawful uses of the property (as described in Section 10 of the SHA), and the potential future return of any eligible land to pre-Agreement conditions (baseline) within the period during which the Permit is in effect.

Relevant management plans and agreements include the following:

- California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians (California Department of Fish and Wildlife [CDFW] 2015).
- Recovery Plan for the California Red-legged Frog (USFWS 2002).
- Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (USFWS 2017a).
- Recovery Plan for the Giant Garter Snake (USFWS 2017b).
- Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005).
- Safe Harbor Agreement for East Bay Municipal Utilities District Lands in San Joaquin, Amador, and Calaveras Counties, June 2009 (USFWS and EBMUD 2009).

5.0 Geographic Scope

The geographic scope (Figure 5-1) for each species is provided below:

- For NWPT, the study area spans the Pardee and Camanche reservoirs and the Lower Mokelumne River below Camanche Dam to Woodbridge Irrigation District Dam [WIDD].
- For FYLF, the study area includes representative and accessible sites within the Project boundary and in the Lower Mokelumne River below Camanche Dam to WIDD.
- For CRLF, CTS, and WS, the study area consists of ponds, vernal pools, and other seasonal wetlands within the FERC Project boundary.
- For GGS and WS habitat mapping, the study area is 1 mile around the FERC Project boundary.

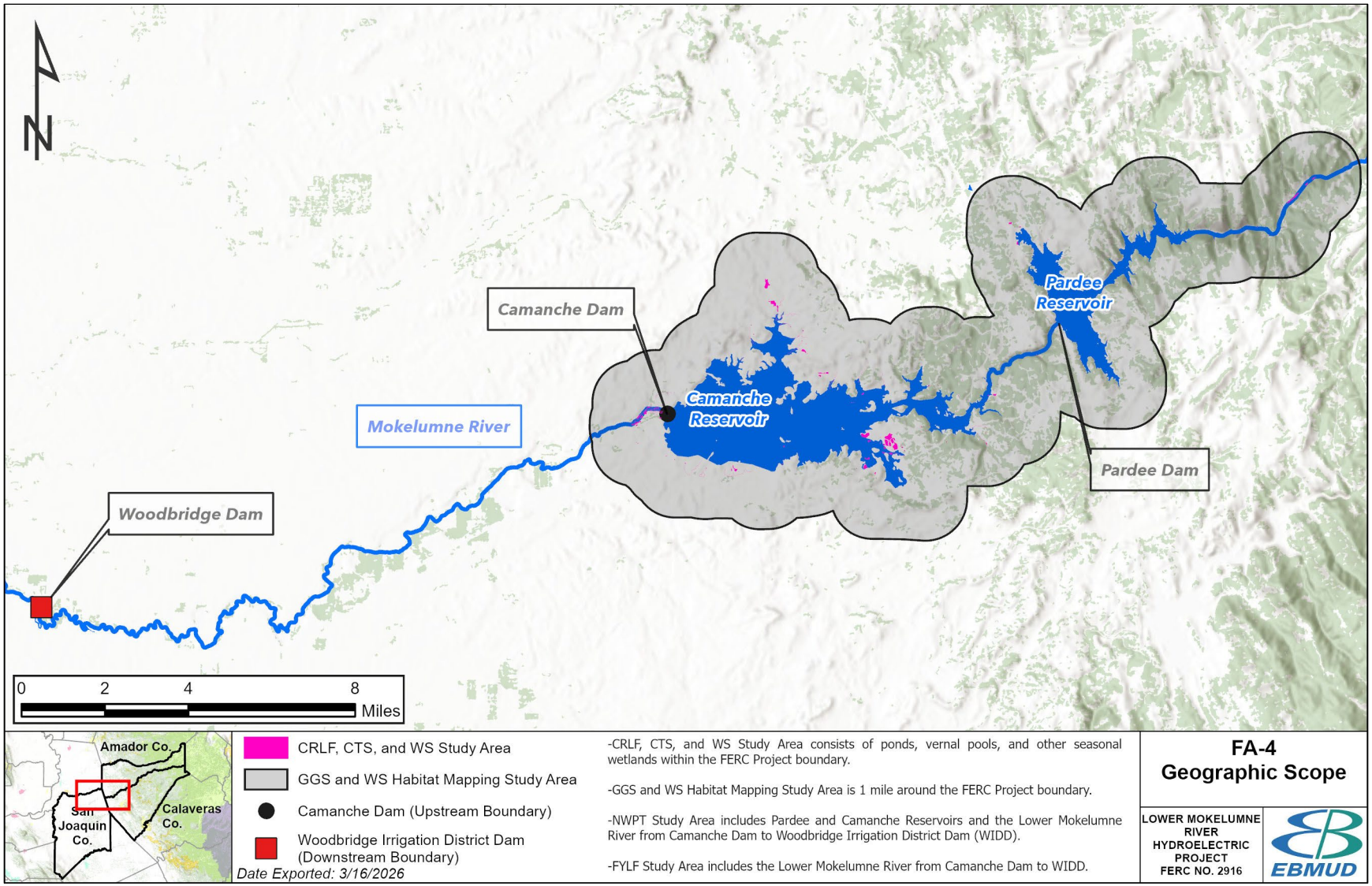


Figure 5-1. FA-4 geographic scope.

6.0 Existing Information and Need for Additional Information

Existing data on special-status amphibians and aquatic reptiles in the Project area are included in EBMUD's Lower Mokelumne River Project Pre-Application Document (PAD) (EBMUD 2025) Sections 4.4, Fish and Aquatic Resources, and 4.5, Wildlife Resources.

EBMUD has been conducting ongoing surveys required under the SHA. This includes:

- Annual CRLF and CTS habitat assessment, dip-net surveys, and visual encounter surveys (VES),
- Documentation of non-native predators and predator control activities,
- Documentation of WS when conducting annual CTS and CRLF assessments and surveys,
- Incidental observations of NWPT during annual CTS and CRLF assessments and surveys, and
- Indication that FYLF have not been observed in the Project study area.

Based on review of available information, the following steps to address potential information gaps were identified:

- Document the nesting habitat and the location of NWPT populations.
- Document the presence of FYLF in the Lower Mokelumne River below Camanche Dam to WIDD.[1]
- Document the presence/absence of CRLF, CTS, and WS.
- Document the location of suitable habitat for GGS and WS.

[1] Although the nearest known population of FYLF is approximately 12 miles upstream of Pardee Reservoir and FYLF have not been observed within the Project area during extensive aquatic monitoring and surveys, EBMUD will conduct VES during their breeding season to document potential presence.

7.0 Study Methodology

A Fish and Aquatic Resources Technical Working Group (TWG) will convene as needed to collaborate and provide input on the fish and aquatic resources studies (FA-1, FA-2, FA-3, FA-4, and FA-5/FA-6) throughout study implementation.

7.1. Northwestern Pond Turtle

7.1.1. Nesting Habitat Characterization

- Develop NWPT nesting habitat suitability criteria in cooperation with resource agencies and relicensing participants.
- Conduct a desktop analysis and develop a geographic information system (GIS) map of potential NWPT nesting habitat locations in the study area. Proposed GIS selection criteria include:
  - 500-meter (~547-yard) buffer around perennial streams and reservoirs;
  - Slope of less than 60 degrees;
  - Southeast, south, or southwest aspect;
  - Canopy cover of less than 10 percent (this criterion will be used if suitable vegetation maps exist);
  - Compacted soils of clay or loam (this criterion will be used if suitable soil maps exist); and
  - Identification of portions of habitat near Project facilities or Project areas where ground-disturbing activities may occur.
- Conduct a field reconnaissance survey of potential nesting locations identified in the GIS map near Project facilities (Table 7-1) where Project maintenance activities occur.

Table 7-1. Project facilities.

Project Facilities
Dams, Dikes, and Spillways
Pardee Dam
Pardee South Spillway
Jackson Creek Dike and Spillway
West End Dike
Camanche Dam

Project Facilities
Camanche Spillway
Dikes 1 – 6
Penstocks
Pardee Penstock
Camanche Penstock
Powerhouses and Switchyards
Pardee Powerhouse and Switchyard
Camanche Powerhouse and Switchyard
Recreation
Pardee Recreation Area
Camanche North Shore Recreation Area
Camanche South Shore Recreation Area
Camanche Hills Hunting Preserve
Mokelumne River Fish Hatchery
Mokelumne Day Use Area

7.1.2. Northwestern Pond Turtle Aquatic Surveys

- Identify and map known occurrences of NWPT within the study area based on agency consultation and a review of existing information. Preliminary information is provided in the PAD (EBMUD 2025).
- Select NWPT study sites in the vicinity of the Fish Population Study (FA-1) electrofishing sites on Pardee and Camanche reservoirs and on the Lower Mokelumne River (see Figure 7-1 and Figure 7-2; Table 7-2 and Table 7-3). Study sites will be located in areas that represent suitable habitat for NWPT (backwater areas, pools, and slow-moving water that have basking sites and terrestrial and aquatic escape cover).
- In addition to the study sites in the vicinity of the Fish Population Study (FA-1) sample sites, EBMUD proposes to add a second study site within Reach 3, based on site-specific habitat conditions, to ensure that each reach contains a minimum of two sampling sites. EBMUD also proposes to include one additional study site located downstream of Highway 49 within the Project boundary. Final site selection shall consider habitat suitability, site accessibility, and safety considerations.

- Conduct VES at the study sites using the protocol of Bury et al. (2012). The protocol involves scanning (with and without binoculars) pool habitats for basking turtles and edge habitats for turtles either on shore or entering the water. The VES should be conducted between mid-May to mid-September and consist of a minimum of three visits at each site. During surveys, emergent logs either connected to shore or surrounded by water that are large enough to provide perches for turtles will be identified.
- Collect and analyze environmental DNA (eDNA) samples for NWPT at up to six sampling locations within the study area. Sampling locations shall include one location downstream of Highway 49, within the FERC Project boundary, and up to five locations within the Lower Mokelumne River between Camanche Dam and WIDD. Final sampling locations shall be selected in coordination with EBMUD and resource agencies. Each sampling location shall be sampled up to three times during the survey period to coincide with VES. EBMUD will continue to document the occurrence of NWPT during annual CRLF and CTS surveys at 28 ponds located within the Pardee watershed and 87 ponds located within the Camanche watershed. The remaining 6 ponds in the Pardee watershed and 20 ponds in the Camanche watershed will not be sampled due to environmental hazards. Refer to Section 4.4 of the PAD for more information (EBMUD 2025).
- Prepare and submit a California Native Species Field Survey Form for all NWPT recorded to the California Natural Diversity Database (CNDDB).
- Provide an electronic database (Microsoft Excel spreadsheet) of NWPT sampling data (date, location, species) to resource agencies.
- Obtain additional NWPT presence information from incidental sightings made during implementation of other aquatic and wildlife technical studies (e.g., Water Temperature Study [WR-2], Water Quality Study [WR-1], and Fish Population Study [FA-1]).

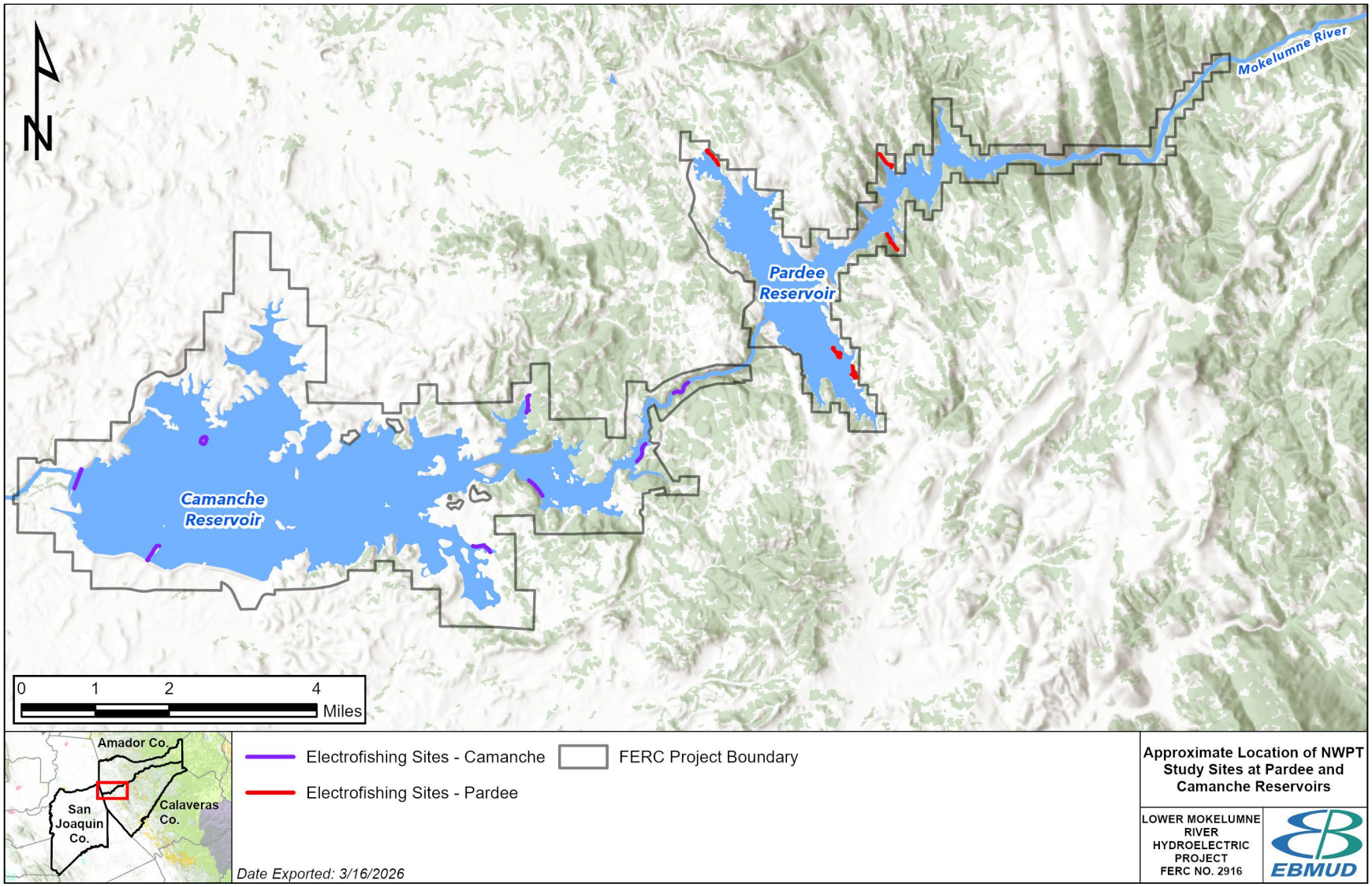


Figure 7-1. Approximate location of NWPT study sites at Pardee and Camanche reservoirs.

Table 7-2. Approximate locations for NWPT study sites in Pardee and Camanche reservoirs.

Site Number	START GPS Coordinates		END GPS Coordinates	
Camanche Reservoir				
CR 1	121° 1' 24.63"W	38° 13' 33.734"N	121° 1' 24.63"W	38° 13' 16.446"N
CR 2	121° 0' 4.818"W	38° 12' 31.919"N	120° 59' 59.415"W	38° 12' 53.104"N
CR 3	120° 59' 26.723"W	38° 14' 2.236"N	120° 59' 25.154"W	38° 14' 1.968"N
CR 4	120° 54' 44.367"W	38° 14' 2.236"N	120° 54' 49.724"W	38° 13' 54.942"N
CR 5	120° 55' 13.272"W	38° 13' 42.251"N	120° 54' 57.437"W	38° 13' 41.2"N
CR 6	120° 53' 7.134"W	38° 13' 40.41"N	120° 52' 55.288"W	38° 13' 55.346"N
CR 7	120° 56' 56.201"W	38° 12' 52.47"N	120° 56' 31.315"W	38° 12' 52.427"N
CR 8	120° 52' 50.805"W	38° 14' 3.559"N	120° 56' 31.315"W	38° 12' 52.427"N
Pardee Reservoir				
PR 1	120° 51' 57.331"W	38° 17' 22.534"N	120° 51' 47.559"W	38° 17' 13.399"N
PR 2	120° 49' 19.93"W	38° 17' 19.637"N	120° 49' 11.364"W	38° 17' 12.658"N
PR 3	120° 49' 6.356"W	38° 16' 14.734"N	120° 49' 17.187"W	38° 16' 27.242"N
PR 4	120° 44' 46.908"W	38° 18' 0.509"N	120° 44' 52.26"W	38° 17' 58.902"N
PR 5	120° 49' 48.269"W	38° 14' 46.659"N	120° 49' 45.401"W	38° 14' 50.014"N

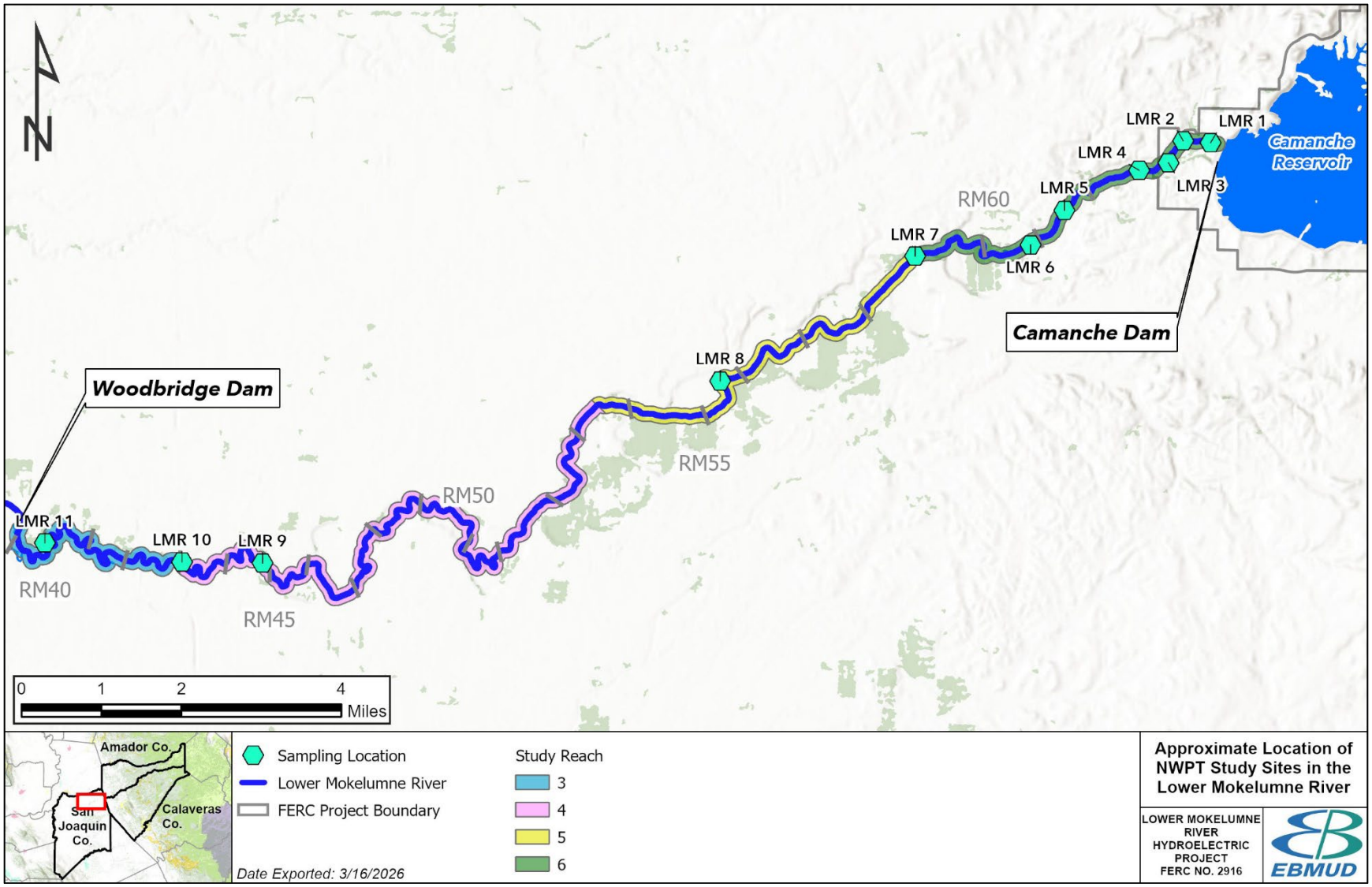


Figure 7-2. Approximate location of NWPT study sites in the Lower Mokelumne River.

Table 7-3. Approximate locations of NWPT study sites in the Lower Mokelumne River (co-located with fish sampling sites).

Site Number	Habitat	Site Name	River Reach	Latitude	Longitude	River Mile
LMR 1	Dam basin	BELCAMDAM	6	38.22627	-121.02512	63.9
LMR 2	Glide	VANASSENE	6	38.22659	-121.03141	63.5
LMR 3	Off-channel contiguous pool	AIB	6	38.22257	-121.03477	63.1
LMR 4	Run	SPANGLER	6	38.22119	-121.0415	62.7
LMR 5	Glide	AFRAMEG	6	38.21384	-121.05863	61.5
LMR 6	Off-channel pool	ABOVE88BW	6	38.20754	-121.06636	60.9
LMR 7	Glide	MACKVILLEG	5	38.20540	-121.09289	59.0
LMR 8	Split-channel glide	BIGBENDG	5	38.18250	-121.13750	55.7
LMR 9	Glide	TRAINBRIDG	4	38.14889	-121.24234	44.9
LMR 10	Glide	HWY99G	4	38.14896	-121.26082	43.0
LMR 11	Lake	LAKELODIE	3	38.15221	-121.29238	40.0

7.1.3. Water Temperature

- Evaluate output from the Water Temperature Study (WR-2) to compare NWPT habitat conditions under the existing Project and alternatives (as appropriate) (Ashton et al. 2015; Snover et al. 2015).
- Correct VES observations for biases in detectability, which occur due to the proportion of time NWPT spend basking and are visible to surveyors based on water temperature (Ruso et al. 2017; inverse relationship between water temperature and detectability).

7.2. Foothill Yellow-legged Frog

7.2.1. Breeding Habitat Characterization

- Identify areas of suitable habitat for breeding, egg deposition, and larval development in the Lower Mokelumne River from Camanche Dam to WIDD and associated tributaries (1,000 meters upstream) based on a desktop analysis of available data and knowledge of the system. Breeding sites are often located near point bars or tail-ends of pools and runs with the following characteristics (Kupferberg 1996; Wheeler and Welsh 2008):
    - Shallow, low-gradient edge habitat with low but consistent flow;

  - Stable substrate for the deposition of eggs (e.g., cobble, boulders); and
  - Areas with limited native and non-native predator or competitor populations (e.g., American bullfrogs, crayfish, garter snakes).

- Following the habitat characterization, develop a map of potential breeding habitat.

7.2.2. Field Surveys

- Conduct VES consistent with the methods described in *Visual Encounter Survey Protocol for Rana boylii in Lotic Environments* (Peek et al. 2017) in suitable FYLF breeding habitat at representative sites in the vicinity of the Fish Population Study (FA-1) electrofishing sites on the Lower Mokelumne River (see Figure 7-2 and Table 7-3). Surveys would be conducted during the breeding and egg deposition/development timeframe (April to June) when observations of adult individuals and egg masses are most likely to be detected.
- In addition to the study sites in the vicinity of the Fish Population Study (FA-1) sample sites, EBMUD proposes to add a second study site within Reach 3, based on site-specific habitat conditions, to ensure that each reach contains a minimum of two sampling sites. EBMUD also proposes to include one additional study site located downstream of Highway 49 within the Project boundary. Final site selection shall consider habitat suitability, site accessibility, and safety considerations.
  - Surveys will consist of three visits at each site (spread temporally from late-April to early June), with systematic visual searches of wetted channel margins, shallow edge habitats, exposed cobble/gravel bars, and other candidate microsites for eggs and tadpoles.
  - All evidence of FYLF presence (adult frogs, tadpoles, or egg mass observations) will be recorded with photographs, global positioning system (GPS) coordinates, and microhabitat characteristics (e.g., water depth, substrate, percent canopy cover, water temperature).
  - Survey details such as total effort (e.g., person-hours), date, time, weather, flow conditions, and locations surveyed will be recorded. Potential predators (e.g., American bullfrog, crayfish, centrarchid fishes) will also be recorded.
  - Potential breeding habitat will be verified at representative locations in the field in conjunction with VES surveys.
- Collect and analyze eDNA samples for FYLF at up to six sampling locations within the study area. Sampling locations shall include one location downstream of

Highway 49, within the FERC Project boundary, and up to five locations within the Lower Mokelumne River between Camanche Dam and WIDD. Final sampling locations shall be selected in coordination with EBMUD and resource agencies. Each sampling location shall be sampled up to three times during the FYLF breeding survey period to coincide with VES.

- Conduct two VES young-of-year FYLF surveys to document the presence or absence of juvenile FYLF following the breeding season and, if present, to provide additional information regarding successful reproduction, relative abundance, and habitat use. VES should be conducted at each FYLF study site that has suitable habitat during mid- to late summer, generally between August 1 and September 15, when recently metamorphosed juvenile frogs are most likely to be present. Surveys shall target suitable juvenile habitat, including stream margins, exposed cobble and gravel bars, bedrock benches, and shallow shoreline habitats.
- Record incidental observations of FYLF observed during other survey/monitoring efforts conducted for the Project.
- Develop an updated map showing potential FYLF breeding habitat and occurrences.

7.3. California Red-legged Frog, California Tiger Salamander, and Western Spadefoot

- Continue to implement annual CTS surveys consistent with the monitoring methods and requirements developed to comply with SHA requirements and approved by USFWS (USFWS and EBMUD 2009).
- Continue to implement CRLF surveys within the three established survey sections (i.e., Camanche North, Camanche South, and Pardee) on a 3-year rotation, consistent with the monitoring methods and requirements developed to comply with SHA requirements and approved by USFWS (USFWS and EBMUD 2009). That is, one section is surveyed each year.
    - To provide recent CRLF survey data for all survey sections, EBMUD will summarize historic CRLF survey data for the previous 3 years.
- As part of the CRLF and CTS survey, also document the presence of WS.

7.4. Giant Garter Snake and Western Spadefoot Habitat

- Map potential aquatic and upland habitat for GGS and WS as part of habitat mapping completed under the Botanical Resources Study (TERR-2) and Wetland, Riparian, and Littoral Habitats Study (TERR-3).

8.0 Schedule, Periodic Reporting, and Consultation

FA-4 is proposed as a single-year study and will include a draft technical study report to be filed with FERC as part of the Initial Study Report for review and comment. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Special Status Amphibians and Aquatic Reptiles Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
April – June 2027	Conduct Study
September 2027	File Initial Study Report
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

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Table 8-2. EBMUD response to comments received on study plans.

Date of Comment	Interested Party	Comment	EBMUD Response
02/18/2026	U.S. Fish and Wildlife Service	The Service does not rely on environmental DNA (eDNA) results alone for the determination of species absence during ESA section 7 consultation. The draft study plan only utilizes focused visual encounter surveys (VES) for foothill yellow-legged frog (FYLF) based on results from eDNA sampling, i.e., VES only occur if eDNA sampling detections occur. While eDNA sampling is a good way to complement VES, VES for FYLF is still essential to address the potential information gap identified in section 6.0 of the draft plan: "Document the location of suitable habitat and presence/absence of FYLF".	Critical habitat for FYLF occurs outside the FERC Project boundary at higher elevations. In addition, EBMUD staff members have not observed FYLF during extensive aquatic surveys conducted throughout the FERC Project boundary. However, VES for FYLF has been added to the RSP along with a breeding habitat assessment. After a second round of consultation, eDNA has been included for both NWPT and FYLF.
02/17/2026	U.S. EPA	The California tiger Salamander is threatened species with critical habitat just north of the Camanche Reservoir. We recommend that FERC work closely with the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife to determine potential impacts of the project on plant and wildlife species, especially species classified rare, threatened, or endangered on either state or federal lists. We also recommend that the Draft EA or EIS: • Identify all petitioned and listed, threatened, and endangered species and critical habitat that might occur within the project area. Identify and quantify which species and/or critical habitat might be affected by each alternative and mitigate impacts to these species. Place emphasis on the protection and recovery of species	Comment noted. EBMUD will coordinate closely with USFW and CDFW during preparation of the Draft License Application and Final License Application for the Project. The Draft License Application and Final License Application will include an evaluation of the effects of continued operation and maintenance of the Project on special-status plant and wildlife species and their habitats, including state- and federally listed species and designated critical habitat. Protection, mitigation, and enhancement measures will also be proposed. In addition, FERC, as the lead federal agency, will evaluate the potential effects of continued Project operation and maintenance on special-status species and their habitats in the National Environmental Policy Act document prepared for

Date of Comment	Interested Party	Comment	EBMUD Response
		due to their status or potential status under the federal ESA and state protections. • Include general locations of rare or special status plants and disclose how these sites would be managed to avoid impacts on the plants. • Discuss the project's consistency with federal or state species' protections. • Summarize, or include as an appendix, the Biological Evaluation and Biological Assessment/Opinion, if applicable. • Discuss mitigation measures to minimize impacts to special status species, describe the effectiveness of such measures to protect wildlife, and indicate how they would be implemented and enforced.	the Project (e.g., Environmental Assessment or Environmental Impact Statement).
01/13/2026	CA State Water Board	Pg. 7 of the PSP FA-4 (Special Status Amphibians and Aquatic Reptile Species Study) reviews the sampling study site selection for northwestern pond turtle and how it will be approximately co-located with the PSP FA-1 (Fish Population Study) within the reservoir. Did EBMUD perform a desktop analysis or reconnaissance to select study sites FA-1 and FA-4 within the proposed study plans?	The study sites identified on Figures 7-1 and 7-2 are historic long-term fish population electrofishing study sites. NWPT study sites will be selected in the field in the vicinity of the electrofishing sites in suitable NWPT habitat (backwater areas, pools, and slow-moving water that have basking sites and terrestrial and aquatic escape cover). The FA-4 study plan has been updated to clarify study site selection.

Date of Comment	Interested Party	Comment	EBMUD Response
01/13/2026	CA State Water Board	Pg. 11 the PSP FA-4 (Special Status Amphibians and Aquatic Reptile Species Study) displays the fisheries sampling sites at which northwestern pond turtle surveys will occur in the Lower Mokelumne River (Figure 7-2). This figure breaks the Lower Mokelumne between Camanche Dam and WIDD into 4 separate reaches. These sampling sites will also be used for the eDNA sampling of northwestern pond turtle and foothill yellow-legged frog. Can EBMUD clarify the reasoning why there are 7 sampling sites in the first reach, but only 4 for the remaining 3 reaches? State Water Board staff recommend EBMUD update the PSP to reflect at least 2 sampling sites in each reach, unless EBMUD has justification for the limited sampling amounts between river mile 59 and river mile 40.	Reaches 4, 5, and 6 all have greater than two sites. Reach 3 has one historic site. An additional study site will be added in Reach 3; the site will be selected in the field based on site-specific conditions. The FA-4 study plan has been updated to reflect this addition.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating feedback from interested parties. The estimated cost for FA-4 ranges from $260,000 to $390,000, assuming $210,000 to $420,000 of work will be captured within existing data collection programs. Existing data collection programs include the lake profile collection, in situ water quality collection, and grab samples.

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CHINOOK SALMON EGG AND JUVENILE SURVIVAL STUDY PLAN (FA-5/FA-6)

Lower Mokelumne River Hydroelectric Project
FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

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Terms and Abbreviations

°	degrees
°F	degrees Fahrenheit
A	
ATU	accumulated thermal unit
C	
Commission	Federal Energy Regulatory Commission
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
M	
MRFH	Mokelumne River Fish Hatchery
P	
PAD	Pre-Application Document
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
R	
RM	River Mile
RST	rotary screw trap
S	
SD1	Scoping Document 1
SD2	Scoping Document 2
State Water Board	California State Water Resources Control Board
T	
TWG	Technical Working Group
U	
USFWS	United States Fish and Wildlife Service

W	
W-V	Whitlock–Vibert
WIDD	Woodbridge Irrigation District Dam

1.0 Introduction

This Chinook Salmon Egg and Juvenile Survival Study (FA-5/FA-6) plan for the Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916, Lower Mokelumne River Project or Project) addresses Chinook salmon (*Oncorhynchus tshawytscha*) egg and juvenile survival to outmigration. The study is designed to estimate egg and juvenile survival in the Lower Mokelumne River reach between Camanche Dam and the Woodbridge Irrigation District Dam (WIDD) and to identify potential factors associated with mortality.

2.0 Project Nexus and Study Rationale

Project operations may influence environmental conditions affecting Chinook salmon survival during incubation, emergence, rearing, and outmigration. Understanding these relationships is necessary to evaluate potential operational effects and inform the development of the Draft License Application.

3.0 Study Goals and Objectives

The primary goal of FA-5/FA-6 is to evaluate factors influencing early life stage survival of Chinook salmon in the Lower Mokelumne River related to flow management. Study objectives include estimating Chinook salmon survival from egg deposition to juvenile outmigration and relating survival with environmental drivers of mortality. This information will be used to inform flow management strategies for the East Bay Municipal Utility District (EBMUD) related to salmon production in the Lower Mokelumne River. Study objectives include evaluating existing information related to variation in egg and juvenile survival in response to environmental data and investigating additional factors related to egg survival. The specific study objectives are as follows:

- **Compile historical data from the Lower Mokelumne River** to evaluate egg and juvenile Chinook salmon survival on the Lower Mokelumne River related to physical, chemical, and biological factors.
- **Develop a mechanistic/empirical model relating egg and juvenile survival** with environmental conditions based on existing data, models, and other pertinent information that can be used to inform flow management strategies.
- **Quantify in-river egg survival rates** by recording survival to emergence of fertilized eggs in artificial redds; monitor potential survival correlates including water temperature, dissolved oxygen, flow, and sediment composition; and evaluate the predictive ability of the model.
- **Identify additional data needs** based on model uncertainty, if present, and develop targeted studies to collect those data.

4.0 Relevant Resource Management Goals

The resource management goals specified in the Joint Settlement Agreement and Water Quality and Resource Monitoring Program that are relevant to this study include:

- Providing, to the extent feasible, habitat quality and availability in the Lower Mokelumne River to maintain fishery, wildlife, and riparian resources in good condition;
- Contributing toward the state and federal fishery restoration goals; and
- Sustaining the long-term viability of the salmon and steelhead fishery.

5.0 Geographic Scope

The study area includes the reach of the Lower Mokelumne River between Camanche Dam and WIDD (Figure 5-1).

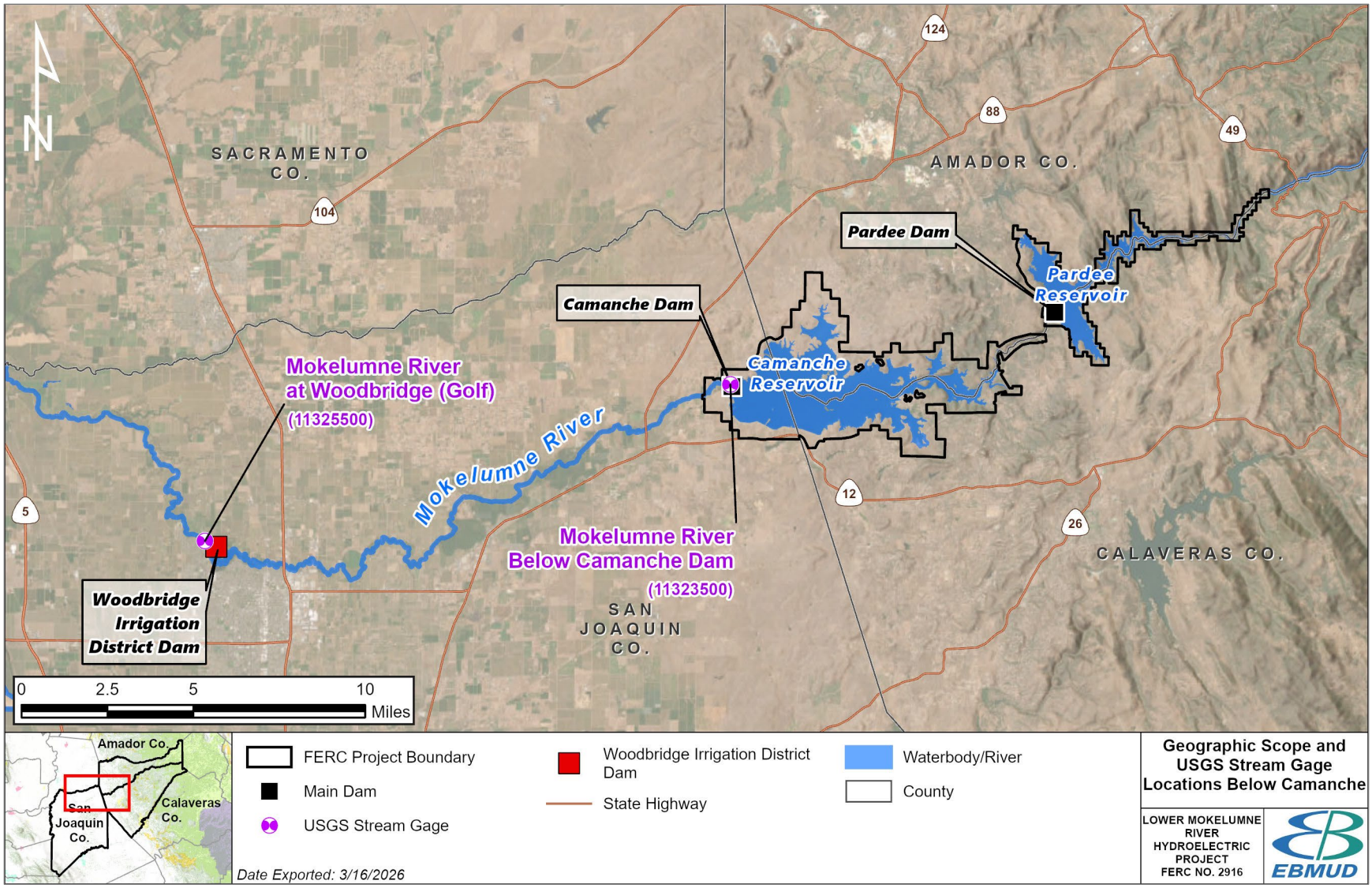


Figure 5-1. Geographic scope and United States Geological Survey stream gage locations below Camanche Dam.

6.0 Existing Information and Need for Additional Information

Existing information related to egg and juvenile survival in the Project area that EBMUD has developed as part of their P-2916 license (FERC 1981) is documented in Section 4.4, Fish and Aquatic Resources, in the Pre-Application Document (PAD). This study leverages available data on egg and juvenile survival for the study area to develop a model with the intention of describing drivers of mortality and identifying data gaps, for which additional studies may be implemented. Based on review of available information, the following potential information gaps were identified related to egg and juvenile Chinook salmon survival:

- Quantitative data on in situ egg survival in the spawning reaches of the Lower Mokelumne River.
- Identification of the factors (physical, chemical, and biological) that influence survival from egg deposition to juvenile outmigration survival within the study area.
- An accurate model to inform management strategies related to juvenile recruitment success in the Lower Mokelumne River.

7.0 Study Methodology

The FA-5/FA-6 study methodology includes compiling historical data and collecting new data as needed on survival from egg deposition to fry emergence and during juvenile outmigration. A model will then be developed in which these data are used to estimate survival of Chinook salmon from egg deposition to juvenile outmigration. Potential data gaps that may affect model uncertainty will be identified, for which additional targeted field studies may be developed to collect data necessary to reduce model uncertainty.

A Fish and Aquatic Resources Technical Working Group (TWG) will convene to collaborate and provide input on the fish and aquatic resources studies (FA-1, FA-2, FA-3, FA-4, and FA-5/FA-6) throughout study implementation.

7.1. Compilation and Analysis of Historical Data

The following include available empirical data relevant to the proposed study that will be compiled:

- Returning adult and redd counts, redd superimposition rates, and number of eggs per redd based on average female size-specific fecundity estimates (e.g., Kauffman et al. 2009) and size distribution of fish returning to the hatchery;
- Thiamine levels in eggs measured at the Mokelumne River Fish Hatchery (MRFH);
- Juvenile catch, survival, and outmigration population data from rotary screw trap (RST) and WIDD bypass trap operations (GOLF Trap: 2001-2025 and VINO Trap: 2009-2025);
- Juvenile outmigration timing and survival from acoustic telemetry monitoring from 2024 to 2026;
- Predator density and location based on fish population monitoring in the Lower Mokelumne River (Fish Population Study FA-1);
- Entrainment risk at known unscreened diversions in the Lower Mokelumne River;
- Habitat assessments of the Lower Mokelumne River;
- Water quality and stage/discharge data collected at multiple monitoring sites in the river (Table 7-1, Figure 7-1).

Table 7-1. Physical/chemical monitoring sites.

Sites	Description	Parameters
BELOW CAMANCHE	Mokelumne River Near McIntire Road Lat: 38.220984° Long: -121.039486° Elev: **85.5** feet	Stage/Discharge Water Temperature
MACKVILLE	"Mackville" Mokelumne River Near Clements Lat: 38.204996° Long: -121.093345° Elev: **67**.3 feet	Stage/Discharge Water Temperature
ELLIOTT	"Elliott" Mokelumne River Near Lockeford Lat: 38.177925° Long: -121.165522° Elev: **47.0** feet	Stage/Discharge Water Temperature
VICTOR	"Victor" Mokelumne River Nr Victor Lat: 38.150636° Long: -121.196607° Elev: **41.0** feet	Stage/Discharge Water Temperature
GOLF	Mokelumne River At Woodbridge Lat: 38.158699 Long: -121.30338 Elev: **16.6** ft	Stage/Discharge Water Temperature
THORNTON	Mokelumne River Near Thornton (Msl G.H. Record) Lat: 38.209843° Long: -121.380717° Elev: **2.0** feet	Stage Water Temperature

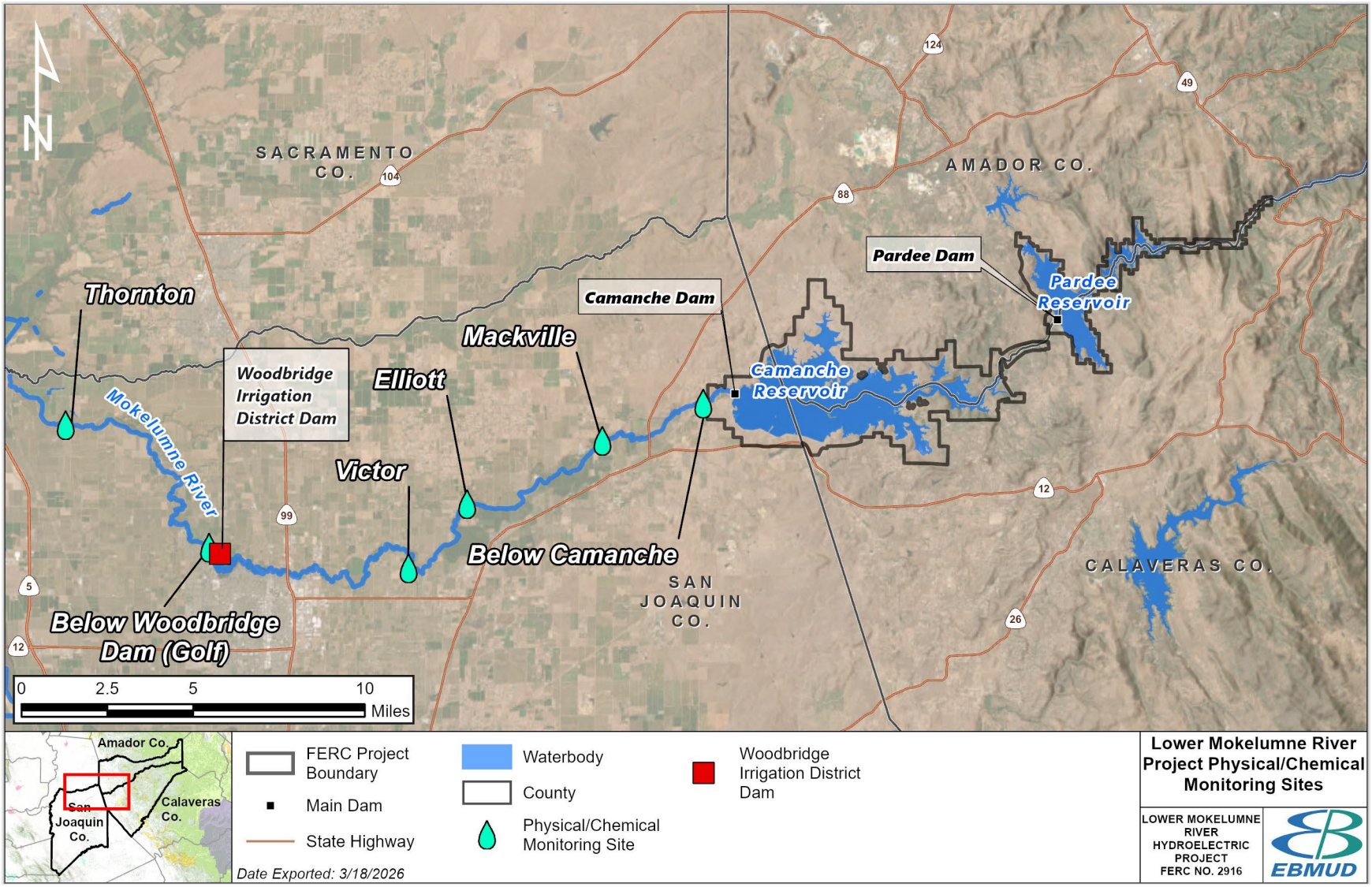


Figure 7-1. Lower Mokelumne River Project physical/chemical monitoring sites.

Relevant data will be compared to published literature on egg survival (e.g., Seymour 1956; Eddy 1972; Heming 1982; Murray and McPhail 1988; Beacham and Murray 1989; Jensen and Groot 1991; Reiser et al. 1998; United States Fish and Wildlife Service [USFWS] 1999; Geist et al. 2006; Johnson et al. 2012) (Figure 7-2) to identify relationships between various correlates and egg survival and required accumulated thermal units (ATUs) to hatch/emergence (Figure 7-3).

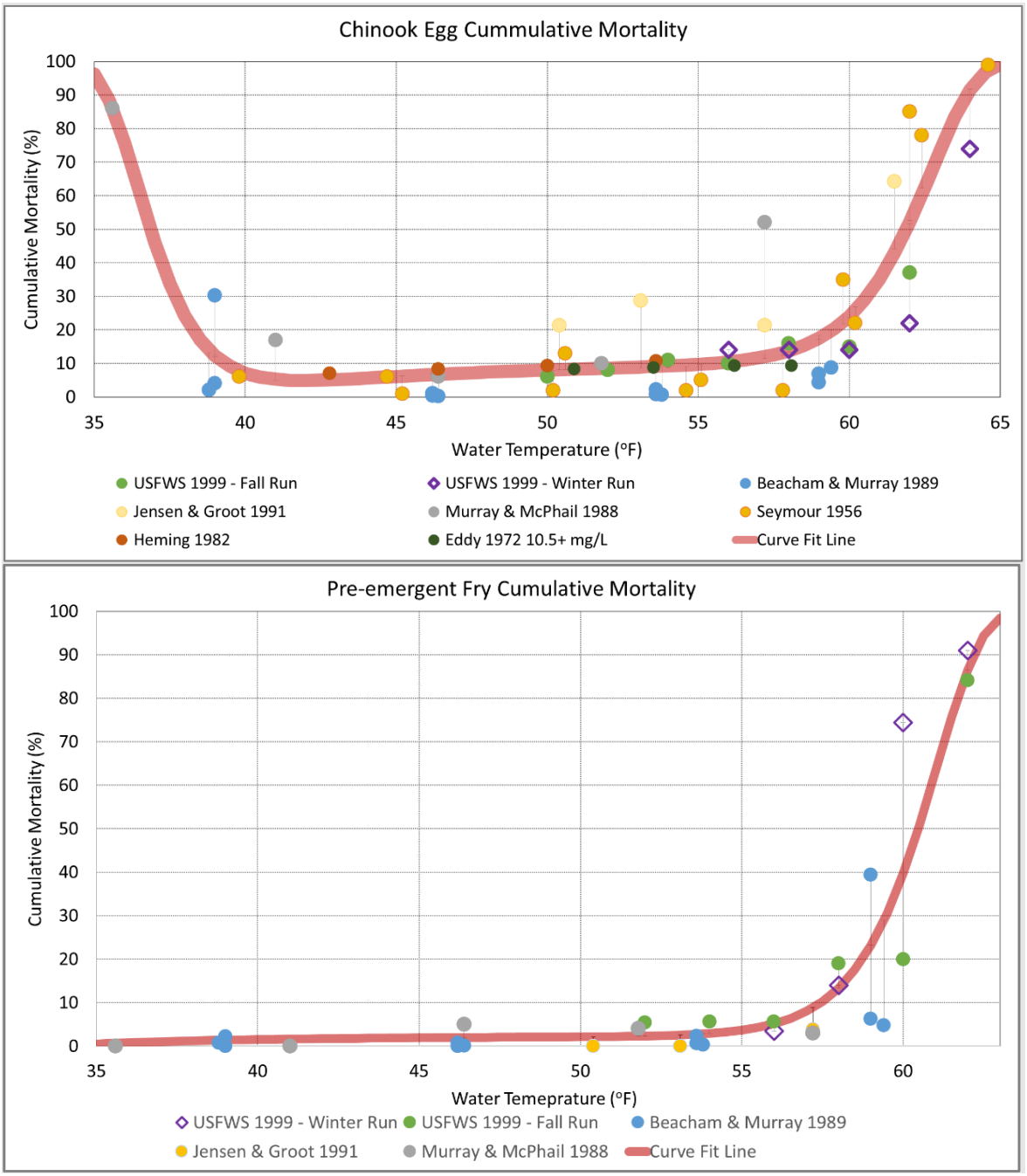


Figure 7-2. Example egg and pre-emergent fry mortality versus water temperature data for Chinook salmon.

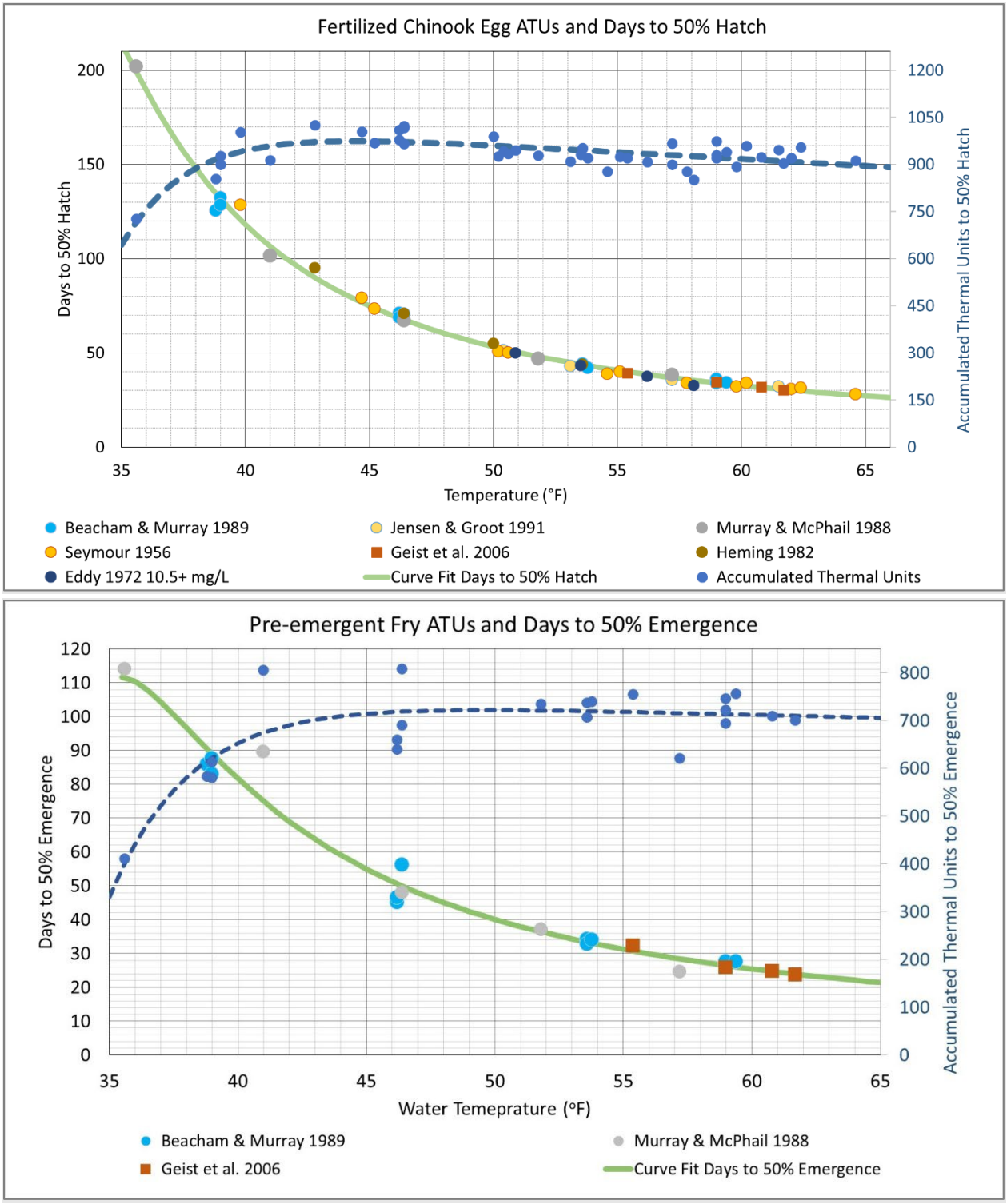


Figure 7-3. ATUs based on degrees Fahrenheit (°F) for Chinook salmon egg 50 percent hatch (top) and 50 percent hatch to 50 percent emergence (bottom) (ATUs degrees Celsius = 5/9 * ATUs °F).

Correlations between historical physical, chemical, and biological survey data and survival estimates will be identified using catch data from existing RSTs, the Woodbridge Irrigation District bypass trap, and redd survey efforts (2009 to 2025) estimating annual fry production, survival from spawning grounds to the first RST, and survival between traps (Table 7-2).

Table 7-2. Annual abundance estimates at trapping sites and survival between sites for outmigrating fall-run Chinook salmon smolts based on catch at the two RSTs and trap efficiency metrics.

Brood Year	Upstream Abundance Estimate	Downstream Abundance Estimate	Survival Between Traps (%)
2009	124,279	67,349	54.19
2010	842,570	281,500	33.41
2011	202,772	51,799	25.55
2012	1,203,754	147,590	12.26
2013	595,070	169,864	28.55
2014	431,677	61,305	14.20
2015	856,127	134,593	15.72
2016	No Estimate	326,455	N/A
2017	456,372	40,117	8.79
2018	4,693,253	2,799,209	59.64
2019	214,226	24,097	11.25
2020	197,004	82,145	41.70
2021	107,931	61,415	56.90
2022	≥ 842,449*	184,242	≤ 21.84
2023	1,781,298	444,117	24.93

*Incomplete abundance estimate (trap pulled on March 16, 2023).

Ongoing monitoring efforts independent from FERC relicensing collect essential data in the Lower Mokelumne River on various Chinook salmon life stages. These data will provide up-to-date information for use as necessary in the proposed model. These efforts include but are not limited to:

- Annual adult escapement, redd count, and redd superimposition surveys;
- Juvenile Chinook salmon outmigration survival and phenology using trapping and acoustic telemetry;
- Lower Mokelumne River water quality monitoring at established sites; and
- Hatchery-related studies (i.e., prevalence of thiamine deficiency complex).

7.2. Development of Integrated Early Life Stage Survival Model

A mechanistic–empirical model will be developed to track survival across sequential life stages (egg incubation, emergence, juvenile rearing, and downstream migration). The modeling framework will be informed by the stage-structured survival modeling approach described by Martin et al. (2016, 2020). This model will be applied to the existing period of record (2009 to present) and alternative scenarios as appropriate. Sensitivity analysis will be used to determine which parameters most strongly influence predicted survival outcomes.

7.3. Field Studies

7.3.1. In-river Egg Survival Rates

7.3.1.1. Study Sites

Artificial redds will be placed in known spawning areas (following approach in Workman and Mesick 2011; Johnson et al. 2012) across three environmentally distinct reaches of the Lower Mokelumne River between Camanche Dam and the Elliot Road Bridge (Figure 7-4):

1. Reservoir Tailwater Reach (River Mile [RM] 62.8–63.9)

   This reach is heavily regulated by reservoir releases, which suppress diurnal temperature swings and create relatively stable thermal conditions. During periods of lake turnover, water temperatures can remain comparatively warm even through peak spawning. The upstream impoundment effect reduces dissolved oxygen levels in this reach, and these conditions generally persist until lake turnover occurs later in the spawning season.

2. Transitional Zone (RM 59.0-62.8)

   This segment represents the shift from reservoir-dominated conditions to a more river-driven thermal regime. Diurnal temperature fluctuations become more pronounced, via solar heating, air exposure, and short-term weather patterns. Although reservoir influence is still detectable, it is substantially reduced. As air temperatures cool through the spawning season, this reach exhibits a clear seasonal decline in water temperature. Dissolved oxygen levels remain somewhat depressed due to residual reservoir influence, but they are higher than in the tailwater reach and continue to improve as the influence of the lake diminishes following turnover.

3. Seasonally Dynamic Reach (RM 53.4-59.0)

   This lower gradient reach, characterized by slower velocities and broader channel morphology, warms through the early part of the seasons and responds more strongly to local environmental conditions. As the season progresses and ambient temperatures drop, water temperatures cool accordingly. Dissolved oxygen levels in this reach are consistently high because the reservoir influence is minimal. Throughout the spawning period, dissolved oxygen conditions remain high and relatively stable.

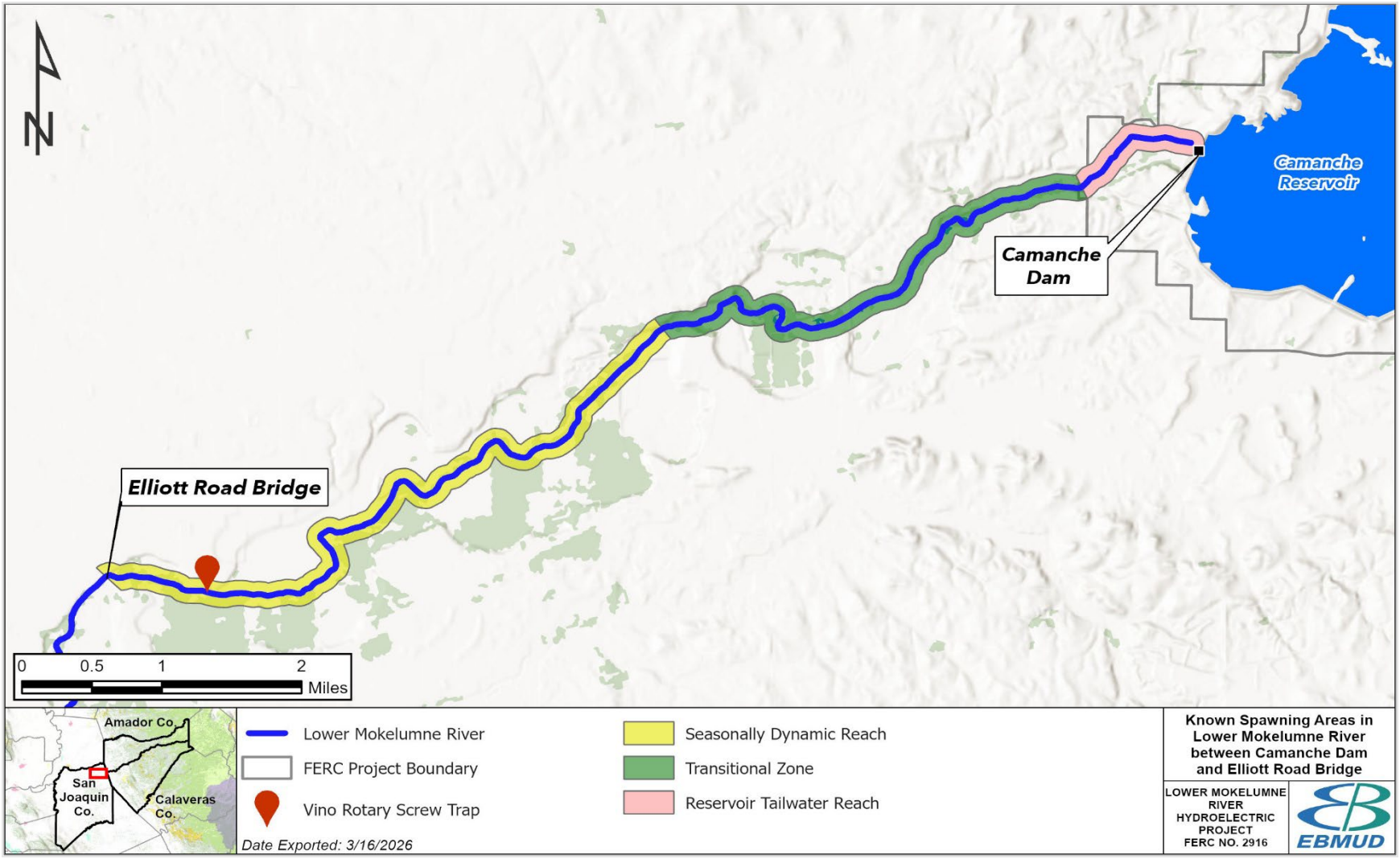


Figure 7-4. Map of the Lower Mokelumne River showing three environmentally distinct Chinook salmon spawning reaches between Camanche Dam and the Elliot Road Bridge: the dam-regulated tailwater reach (RM 62.8-63.9), a mid-river transitional zone where reservoir influence diminishes (RM 59.0-62.8), and a seasonally dynamic lower reach influenced primarily by local environmental conditions (RM 53.4-59.0).

7.3.1.2. Timing

- Artificial redds will be deployed in three separate multi-week intervals: at the beginning, middle, and end of the date range that fall-run Chinook salmon naturally spawn in the Lower Mokelumne River.

7.3.1.3. Artificial Redds

7.3.1.3.1. Redd Number and Parentage

- Artificial redds will be distributed among the three environmentally distinct Chinook salmon spawning reaches. The total number of sampling locations will be determined by the number required to achieve sufficient statistical power to estimate overall survival across the study area and to detect any differences among the three reaches. This sampling design will also provide the data needed to refine key model parameters and to validate model outputs where appropriate.
- Parentage will be controlled to account for individual variability in egg survival. Approximately 10 females and 20 males (1 female:2 males per egg group) will be used as broodstock, with each cross providing equal eggs to each reach. Eggs from individual spawning pairs will be placed in distinct egg boxes.
- A control egg box containing 100 eggs from each parental cross will be incubated in the hatchery in the egg incubation building and held at roughly 12 degrees Celsius (53.6 degrees Fahrenheit; normal hatchery building water temperature due to chiller activation).

7.3.1.3.2. Redd Construction

- Redd construction methods will follow Johnson et al. (2012).
    - Locations for artificial redd construction will be selected near active, naturally constructed redds or where redds were documented in previous years and placed in areas deemed suitable based on appropriate depths (1.0-2.5 feet; 0.30-0.76 meter) and velocities (1-4 feet per second; 0.30-1.22 meters per second).
    - A bottomless 5-gallon bucket will be used to construct the egg pocket of the redd and prevent backfilling during placement of the egg box. A tail spill will then be built over the egg pocket.
    - One hundred eggs placed in modified Whitlock–Vibert (hereafter “W-V”) egg boxes will be buried at a depth of 30 centimeters (11.8 inches) within the redd to mimic natural spawning conditions.

- W-V egg box modifications based on Johnson et al. (2012) include a mesh lining in the egg box to keep emerging fry from leaving and gravel placed within the egg box to emulate natural conditions.

7.3.1.3.3. Fertilization and Egg Placement

- Eggs will be fertilized at the hatchery by hatchery staff. After fertilization at the hatchery, the eggs will be set aside for approximately 1-2 hours to allow water hardening and then transported to the artificial redd sites. At the artificial redd sites, the eggs will be gently poured into the W-V boxes and then transported in buckets out to the artificial redds and buried.

7.3.1.3.4. Hatch and Emergence Survival Estimates

- The W-V egg boxes will be inspected for survival at ATUs consistent with 50 percent emergence based on continuous water temperature data collected at the respective sites (Figure 7-2).

7.3.2. Reach-scale Spawning Habitat Quality

7.3.2.1. Hyporheic Environment

- Standpipes will be driven to 15-centimeter (5.9-inch) and 30-centimeter (11.8-inch) depths into several patches of gravel in each reach that are representative of the artificial redds to measure water temperature, dissolved oxygen, and pH. This sampling will occur biweekly. Intergravel permeability will be measured following the methods adopted from Barnard and McBain (1994).
  - The number of locations will be determined by the observed variability and modeled needs (informing model parameters).
  - Water quality measurements will be taken at the gravel surface, 15 centimeters (5.9 inches) deep, and 30 centimeters (11.8 inches) deep in the substrate.
- Continuously recording water quality sensors (e.g., miniDOTs) will be deployed in a stratified, random subset of artificial redds to collect temperature and dissolved oxygen data throughout the study.
  - Following emergence and retrieval of these sensors, they will be redistributed at current water quality or acoustic telemetry monitoring stations throughout the Lower Mokelumne River from Camanche Dam to WIDD to provide additional temperature and dissolved oxygen data throughout the juvenile rearing and outmigration period.

7.3.2.2. Substrate Quality

- Wolman pebble counts (Wolman 1954) will be used in spawning riffles at a reach level to characterize surface and subsurface grain-size distributions. This will be completed before spawning occurs. The size and number of samples will be determined following preliminary evaluation of sediment sizes to identify appropriate sampling design. For example, areas with larger average sediment sizes require larger samples to ensure representation of all sediment sizes (Church et al. 1987).

7.3.2.3. Environmental Monitoring

- Temperature and flow data collected and modeled under the Water Temperature Study (WR-2) and Hydrology Operations and Modeling Study (WR-3) plans will be leveraged to evaluate correlations between environmental conditions and mortality.
- Continuous water temperature and dissolved oxygen measurements within the river water column will be collected at each site hosting redds to document spatial and temporal trends in water temperature and dissolved oxygen.

7.4. Model Effectiveness and Identification of Data Gaps

Data collected during the proposed field studies will be integrated into the model. Model outputs and levels of uncertainty will be evaluated. If model diagnostics indicate unexplained variance, additional covariates may be incorporated including temperature regimes, dissolved oxygen conditions, gravel composition, predator density, habitat type, and thiamine deficiency indicators. If model uncertainty remains high following analysis of existing data, targeted field studies may be implemented to address key information gaps.

8.0 Schedule, Periodic Reporting, and Consultation

FA-5/FA-6 is proposed as a 2-year study and includes a draft technical study report to be filed with FERC as part of the Initial Study Report for review and comment, and a final technical study report to be filed with FERC as part of the Updated Study Report. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Egg Survival Study schedule.

Date	Activity
August 2026	Complete Compilation and Analysis of Historical Data
September 2026	FERC Study Plan Determination
September 2026 – July 2027	Complete First-Year Study Components and Develop a Draft Technical Study Report on First-Year Results
September 2027	File Initial Study Report
September 2027 – July 2028	Complete Second-Year Study Components and Develop a Draft Technical Study Report on Second-Year Results
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. Table 8-2 lists the interested party comments and EBMUD responses relevant to FA-5/FA-6.

Table 8-2. EBMUD response to comments received on study plans.

Date of Comment	Interested Party	Comment	EBMUD Response
02/17/26	CA State Water Board	5. A study goal for FA-6 (Juvenile Mortality Study), is to monitor physical and chemical environmental conditions (water temperature, dissolved oxygen, etc.). Table 7-2 of FA-6 does not show dissolved oxygen as a parameter to be measured at the monitoring sites. Other factors that are known to potentially negatively impact egg and/or juvenile fish species include turbidity and sedimentation. State Water Board staff recommend that the PSP be updated with dissolved oxygen being included as part of the monitoring efforts described in section 7.0 of the FA-6 study.	Temperature and dissolved oxygen loggers will be deployed for FA-5/FA-6 to collect continuous temperature and dissolved oxygen data through the extent of egg incubation from Camanche Dam to Elliot Road Bridge. When that study ends, as fry are emerging from redds, some of these loggers will be redistributed to cover downstream of Elliot Road Bridge to WIDD, resulting in full coverage from Camanche Dam to WIDD. The PSP has been updated to reflect these additions.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating feedback from interested parties. The estimated cost for FA-5/FA-6 is approximately $650,000. This includes roughly $525,000 for a modeling consultant and $125,000 for the equipment and supplies needed to complete the data collection effort, which is essential for informing the modeling work.

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WILDLIFE RESOURCES STUDY PLAN (TERR-1)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

WILDLIFE RESOURCES STUDY PLAN (TERR-1)

Lower Mokelumne River Hydroelectric Project

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375 11th Street

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Terms and Abbreviations

A	
Agreement	Safe Harbor Agreement
B	
BCC	Birds of Conservation Concern
C	
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CFP	fully protected species (CESA)
CHHP	Camanche Hills Hunting Preserve
CNDDB	California Natural Diversity Database
Commission	Federal Energy Regulatory Commission
CWHR	California Wildlife Habitat Relationships
E	
EBMUD	East Bay Municipal Utility District
ESA	Endangered Species Act
F	
FC	candidate for listing (federal ESA)
FE	engendered (federal ESA)
FERC	Federal Energy Regulatory Commission
FPD	Proposed for delisting (federal ESA)
FPE	proposed endangered (federal ESA)
FPT	proposed threatened (federal ESA)
FT	threatened (federal ESA)
G	
GIS	geographic information system
GPS	global positioning system
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
P	
PAD	Pre-Application Document
Permit	enhancement of survival permit (USFWS)
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan

S	
SD1	Scoping Document 1
SD2	Scoping Document 2
SE	endangered (CESA)
SHA	Safe Harbor Agreement
SSC	California Species of Special Concern
ST	threatened (CESA)
State Water Board	California State Water Resources Control Board
U	
U.S. EPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

1.0 Introduction

East Bay Municipal Utility District's (EBMUD) Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916, Lower Mokelumne River Project or Project) operations and maintenance activities may have the potential to affect special-status wildlife species and their habitat that are known to or have the potential to occur in the Project area. The purpose of this Wildlife Resources Study (TERR-1) plan is to document special-status wildlife species observed and map their habitats in the study area.

Special-status amphibians and aquatic reptiles are covered in the Special Status Amphibians and Aquatic Reptiles Study (FA-4) plan.

2.0 Project Nexus and Study Rationale

Special-status wildlife resources and their habitats are known to or could potentially be present in the FERC Project boundary. Implementation of Project operations and maintenance activities could potentially result in direct loss or disturbance of individuals or their habitat.

3.0 Study Goals and Objectives

The goals and objectives of TERR-1 are as follows:

- Identify special-status wildlife species potentially occurring in California Wildlife Habitat Relationships (CWHR) habitats documented as part of the Botanical Resources Study (TERR-2) plan.
- Map potential habitat for monarch butterfly (*Danaus plexippus*) (i.e., milkweed) in conjunction with special-status plant surveys completed as part of the Botanical Resources Study (TERR-2) plan.
- Document wintering and nesting bald eagle (*Haliaeetus leucocephalus*) in the vicinity of Project reservoirs and the Lower Mokelumne River below Camanche Dam within the FERC Project boundary.
- Document bat roosts present on Project facilities and identify bat species present.
- Document wildlife mortality at Project facilities.
- Map deer migration routes and important areas in relation to Project facilities.

4.0 Relevant Resource Management Goals

Existing management plans will be reviewed and used to develop a baseline understanding of the current management goals and objectives in the Project vicinity. EBMUD has entered into a Safe Harbor Agreement (SHA or Agreement) with the purpose of (1) promoting the enhancement and management of habitat for California red-legged frog (*Rana draytonii*), California tiger salamander (*Ambystoma californiense*), and valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) on EBMUD watershed lands in San Joaquin, Amador, and Calaveras counties; and (2) providing certain regulatory assurances to EBMUD. The SHA serves as the basis for the U.S. Fish and Wildlife Service (USFWS) to issue an enhancement of survival permit (Permit) pursuant to Section 10(a)(1)(A) of the federal Endangered Species Act (ESA). The Permit authorizes the incidental taking of California red-legged frog, California tiger salamander, and valley elderberry longhorn beetle associated with the enhancement and conservation management of these species' habitats, other lawful uses of the property (as described in Section 10 of the SHA), and the potential future return of any eligible land to pre-Agreement conditions (baseline) within the period during which the Permit is in effect.

EBMUD's SHA and relevant management plans include the following:

- Safe Harbor Agreement for East Bay Municipal Utilities District Lands in San Joaquin, Amador, and Calaveras Counties, June 2009 (USFWS and EBMUD 2009).
- California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians (California Department of Fish and Wildlife [CDFW] 2015).
- Draft Revised Recovery Plan for Valley Elderberry Longhorn Beetle (USFWS 2018).
- Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005).

Wildlife resources are a subject of public interest at the local, state, and national level. Public interest statements obtained from relicensing participants are listed below:

- Interest Statement: Direct loss or disturbance of individual wildlife species or their habitat.

5.0 Geographic Scope

As TERR-1 includes multiple study components with different geographic areas, a general geographic scope figure is provided in Figure 5-1, while details on each survey area are described below.

5.1. Special-Status Wildlife Surveys

- For identification of special-status species potentially occurring in CWHR habitats, the study area is the FERC Project boundary and 1 mile outside the boundary.
- For wildlife reconnaissance surveys, the study area is the area where operations and/or maintenance occurs around Project facilities, plus a protective buffer. Refer to Table 5-1 for the survey area by facility type.
- For monarch butterfly habitat surveys, the study area is lands within the FERC Project boundary where operations and/or maintenance activities are conducted, plus a protective buffer (Table 5-1). Milkweed host plants (*Asclepias* spp.) will be documented in conjunction with special-status plant surveys conducted under the Botanical Resources Study (TERR-2) plan.
- For bald eagle wintering and nesting surveys, the study area is Project reservoirs and the Lower Mokelumne River below Camanche Dam within the FERC Project boundary.
- For special-status bat roost surveys, the study area is Project facilities.
- For wildlife mortality, the study area is Project facilities.
- For deer migration routes and important areas, the study area is 1 mile around the FERC Project boundary.

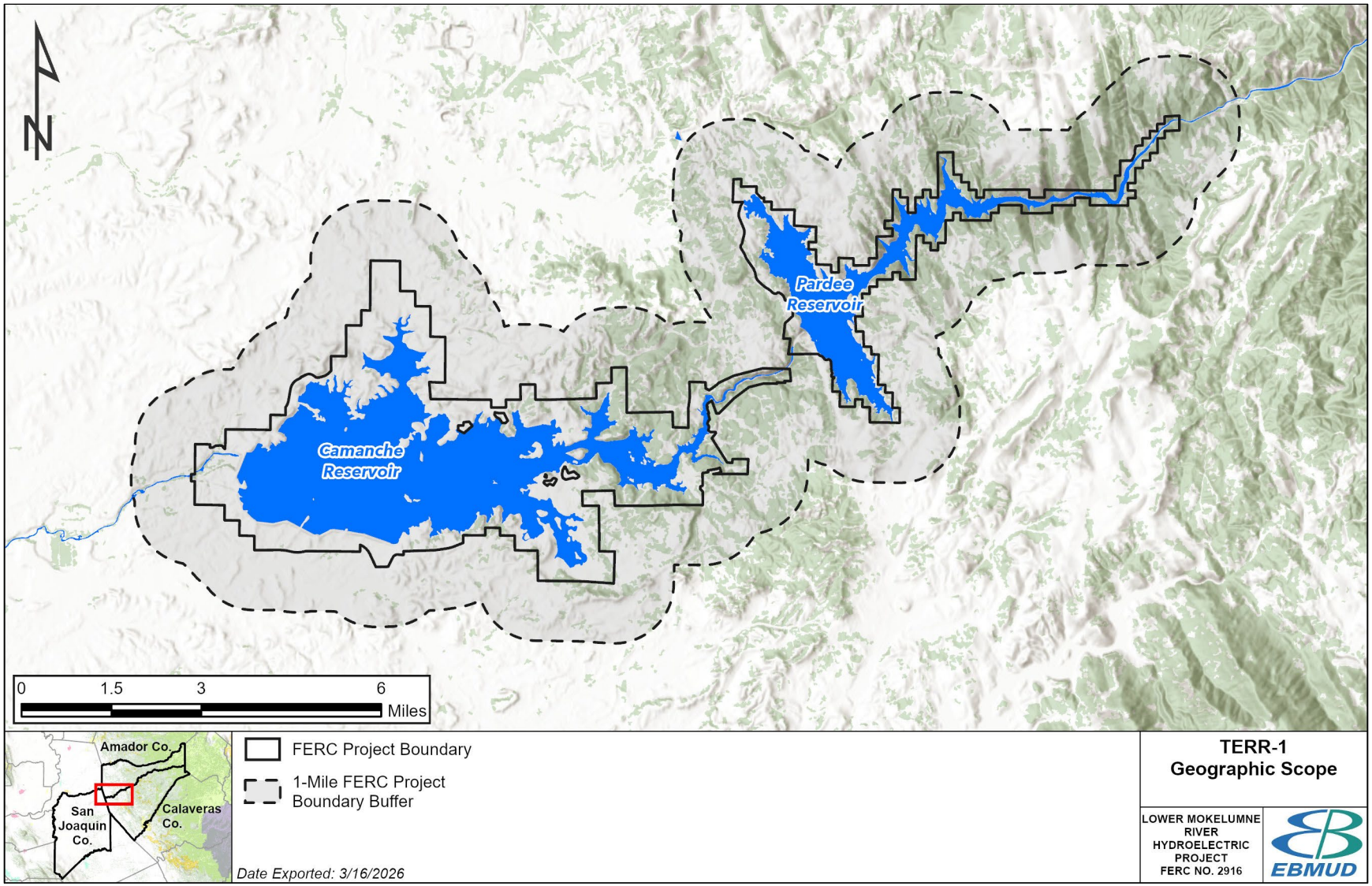


Figure 5-1. TERR-1 geographic scope.

Table 5-1. Special-status Wildlife Survey Area.

Project Facility Type	Survey Area[a]
Dams, Dikes, and Spillways	
Pardee Dam	100 feet
Pardee South Spillway	100 feet
Jackson Creek Dike and Spillway	100 feet
West End Dike	100 feet
Camanche Dam	100 feet
Camanche Spillway	100 feet
Dikes 1 – 6	100 feet
Penstocks	
Pardee Penstock	15 feet on either side
Camanche Penstock	15 feet on either side
Powerhouses and Switchyards	
Pardee Powerhouse and Switchyard	Within and up to 15 feet around the perimeter fence
Camanche Powerhouse and Switchyard	Within and up to 15 feet around the perimeter fence
Ancillary and Support Facilities	
15 feet around the perimeter	
Stream Gages	
10 feet around gages	
Project Access Roads	
20 feet on either side	
Recreation	
Pardee Recreation Area	150 feet around recreation facilities
Camanche North Shore Recreation Area	150 feet around recreation facilities
Camanche South Shore Recreation Area	150 feet around recreation facilities
Camanche Hills Hunting Preserve	150 feet around recreation facilities
Mokelumne River Fish Hatchery	150 feet around hatchery and associated facilities
Mokelumne Day Use Area	150 feet around recreation facilities

[a] This survey area buffer would only apply to the wildlife reconnaissance surveys and monarch butterfly habitat surveys. For special-status bat roost surveys and wildlife mortality surveys, only the Project facilities would be surveyed.

6.0 Existing Information and Need for Additional Information

Extensive data on wildlife resources in the Project area are available and included in EBMUD's Lower Mokelumne River Project Pre-Application Document (PAD) (EBMUD 2025). EBMUD has been conducting ongoing surveys for several special-status wildlife species as part of their Mokelumne Watershed Routine Maintenance Agreement (EPIMS Notification No. SJN-25163-R2) (CDFW 2022), as part of the SHA (USFWS and EBMUD 2009), and on a voluntary basis. Specifically, this includes the following surveys for special-status wildlife:

- Mokelumne Watershed Routine Maintenance Agreement:
  - Annual general nesting bird surveys (raptors and songbirds) during maintenance activities conducted within the nesting season (February 1 to August 31),
  - Annual Swainson's hawk (*Buteo swainsonii*) surveys conducted consistent with the Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys In California's Central Valley (CDFW 2000), and
  - Annual burrowing owl (*Athene cuniculata*) surveys conducted consistent with the *Staff Report on Burrowing Owl Mitigation* (CDFW 2012).
- SHA:
  - Valley elderberry longhorn beetle habitat surveys every 3 years (i.e., elderberry shrub counts).
- Voluntary:
  - Annual bald eagle nest monitoring (every 2 weeks during the nesting season) at Camanche and Pardee reservoirs, and
  - Game species counts by the Camanche Hills Hunting Preserve (CHHP) staff to support the CHHP operations.

Based on review of available information, the following potential information gaps were identified:

- Identify special-status wildlife species potentially occurring in CWHR habitats documented as part of the Botanical Resources Study (TERR-2) plan,
- Identify potential habitat for monarch butterfly (i.e., milkweed),

- Document bat roosts present on Project facilities and identify bat species present,
- Document wildlife mortality at Project facilities, and
- Identify deer migration routes and important areas in relation to Project facilities.

7.0 Study Methodology

7.1. Special-Status Wildlife Surveys

For the purposes of this study, a special-status wildlife species is defined as any animal species that is granted status by a federal or state agency. Federally listed species granted status by USFWS under the ESA include threatened (FT), endangered (FE), proposed threatened or endangered (FPT, FPE), candidates for listing (FC), or proposed for delisting (FPD). Also included are those species listed by USFWS as Birds of Conservation Concern (BCC), which include "species, subspecies, and populations of all migratory nongame birds that, without additional conservation action, are likely to become candidates for listing under the ESA of 1973" (USFWS 2021).

State of California listed wildlife species that are granted status by the CDFW under the California Endangered Species Act (CESA) include threatened (ST), endangered (SE), fully protected species (CFP), and California Species of Special Concern (SSC).

The study approaches for special-status general wildlife surveys, monarch butterfly habitat surveys, bald eagle wintering and nesting surveys, special-status bat roost surveys, wildlife mortality documentation, and deer migration and important area identification are provided below.

7.1.1. General Wildlife Surveys

- Identify and map known occurrences of special-status wildlife species within 0.25 mile of the FERC Project boundary based on agency consultation and a review of existing information. Preliminary information is presented in the Lower Mokelumne River Project (FERC No. 2916) PAD (EBMUD 2025).
- Identify special-status wildlife species potentially occurring within CWHR designations based on *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988). Preliminary information is presented in the Lower Mokelumne River Project (FERC No. 2916) PAD (EBMUD 2025).
    - CWHR wildlife habitats and sensitive natural communities will be documented as part of the Botanical Resources Study (TERR-2) plan.
- Conduct wildlife reconnaissance surveys in conjunction with special-status plant surveys.
    - Species will be recorded as present if they are observed, species-specific vocalizations are heard, or if diagnostic field signs are found (e.g., scat, tracks,

pellets). Special attention will be given to identify and map potential fawning habitat for mule deer.

- Wildlife taxonomy will be based on California's Wildlife, Volumes I, II, and III (Zeiner et al. 1988-1990).
- Survey methods will include both zigzag and linear transects depending on the survey area and terrain. Zigzag transects cover more ground and work well in larger habitat areas (e.g., annual grasslands and woodlands), while linear transects work well in narrow habitats (e.g., riparian).
- For each special-status species observed, a California Natural Diversity Database (CNDDB) field survey form will be completed and submitted to CDFW.
- An electronic database (Microsoft Excel spreadsheet) will be developed of special-status wildlife for distribution to resource agencies and interested relicensing participants.

- Record incidental observations of any special-status species during all field surveys completed in support of the relicensing of the Project.

7.1.2. Monarch Butterfly Habitat Surveys

- Document the location of monarch butterfly habitat (i.e., milkweed) in conjunction with special-status plant surveys (Botanical Resources Study [TERR-2] plan). The study area consists of lands within the FERC Project boundary where operations and/or maintenance activities are conducted, plus a protective buffer (Table 5-1).
  - Digital photographs, global positioning system (GPS) information, an estimate of the number of individuals present, and a description of associated habitats will be collected for each milkweed population observed.
- Develop a geographic information system (GIS) map and table identifying the location of milkweed in the study area and overlay information on Project facilities.

7.1.3. Bald Eagle Wintering and Nesting Surveys

- Identify and map known occurrences of bald eagles, roosts, and nests within the study area, based on agency consultation and a review of existing information. Preliminary information is presented in the Lower Mokelumne River Project (FERC No. 2916) PAD (EBMUD 2025).
- Conduct protocol-level bald eagle wintering and nesting surveys according to the *Protocol for Evaluating Bald Eagle Habitat and Populations in California* (Jackman and Jenkins 2004). A summary of the survey requirements is provided below.

7.1.3.1. Bald Eagle Wintering Surveys

Wintering surveys will consist of two types of surveys—wintering bird surveys and winter roost surveys.

- Wintering Bird Surveys

Single-day surveys will be conducted monthly from December through February (three surveys, at least 2 weeks apart). Unless weather prohibits safe surveys, the January survey will be conducted during the USFWS 2-week nationwide bald eagle winter survey to allow comparisons with statewide population trends. Surveys will be completed by helicopter or boat, depending on weather conditions and accessibility. Data will be recorded on data sheets developed by Zack et al. (1997), as modified by Jackman and Jenkins (2004).

- Winter Night Roost Surveys

Winter night roost surveys will be conducted once a month (December through February) in areas where wintering eagles are observed. To find potential night roost areas, bald eagles will be visually observed as they move from foraging habitat to potential night roosts in the late afternoon. The number of eagles entering the probable night roost will be recorded.

Probable night roost areas will be revisited the following morning for at least 2 hours beginning 0.5 hour before sunrise. Eagles observed returning to foraging habitat will be counted. Once a forest stand is identified as a probable night roost, a daytime survey will be conducted to look for evidence of use by bald eagles (feathers, castings) and to locate via GPS or pinpoint the location used for roosting.

7.1.3.2. Bald Eagle Nesting Surveys

The objective of bald eagle nesting surveys is to monitor the breeding status of existing nests and to locate any new nests. The results of each survey will be reported on the CDFW Bald Eagle Nesting Territory Survey Form.

- Determine New Nests and Occupancy of Existing Nests

A survey in late February through March (as early in the season as possible, but contingent upon weather conditions) will be conducted to determine whether the survey area (suitable breeding habitat) is occupied by bald eagles and, if so, to determine their breeding status. The survey shall include observations of any old nests, as well as identification of any new nests in the area. Presence or apparent absence of adult bald eagles, courtship behavior, and nest construction will be recorded.

- Determine Presence of Eggs/Nestlings

A survey during the mid-nesting season, late April through May, will be conducted to determine the presence of eggs/nestlings in known nests. All nesting sites documented in the initial survey will be evaluated to determine the presence of adults and number of eggs and/or nestlings.

- Determine Nest Success

A survey during the late nesting season, early June through early July, will be conducted to determine nest success.

- Develop a GIS map of bald eagle wintering and nesting sites in relation to Project reservoirs and the Lower Mokelumne River below Camanche Dam within the FERC Project boundary.
    - Prepare and submit California Native Species Field Survey Forms for all bald eagles recorded to the CNDDB.

7.1.4. Special-status Bat Roost Surveys

Special-status bat surveys consist of a facility assessment, visual roost survey, and guano DNA sampling. This approach includes methods that allow confirmation of individual bat species present in a facility. Other methods such as acoustic sampling or mist netting are not included. Acoustic sampling was not included because it would only identify the species present in the vicinity of the facility, without confirming the species roosting in the facility. Mist netting has not been included because this method has a higher risk of transmitting white-nose syndrome fungus.

7.1.4.1. Facility Assessment

- Conduct an initial desktop assessment of Project facilities to determine each facility's potential to support bat roosts. Information to be reviewed includes:
    - Existing photographs of Project facilities, and
    - Descriptions of Project facilities from the PAD (EBMUD 2025).
- Conduct a preliminary visual assessment of Project facilities, during wildlife reconnaissance surveys, to determine the potential to support bat roosts.
- Develop a list of Project facilities potentially supporting bat roosts (by facility type).
- Prepare and submit to agencies a preliminary visual assessment summary that includes the following:

- Survey methods
- List of Project facilities evaluated
- Description of facility features that represent potential roosting habitat
- Description of facility features that do not represent potential roosting habitat
- Photographs
- Description of the surrounding environmental conditions

7.1.4.2. Conduct Roost Survey

- Visual Roost Survey
  - Conduct a visual roost survey at Project facilities identified as potentially supporting roosting bats. The assessment will be conducted (June through July) during the end of the maternal roosting period when colonies may still be present, but after the critical sensitive period (i.e., parturition and early nursing period).
  - Facilities will be closely inspected for bat roost sign (e.g., skeletons, dead young, placentas, guano deposits, urine staining, and culled insect parts) and/or live bats. If live bats are not observed, but bat roost sign is present, spotlights and high-powered flashlights will be used in combination with binoculars for more detailed examination of the potential roost sites.
  - To prevent the introduction of *Pseudogymnoascus destructans*, a fungal pathogen causing the emerging white-nose syndrome responsible for widespread mortality in North American bats, methods described in the most recent National White-nose Syndrome Decontamination Protocol (White-nose Syndrome Response Team 2024) will be implemented to decontaminate clothing and equipment prior to entering potential roosts.
  - If bat roosts are present but the species cannot be determined visually, then species will be determined using guano DNA sampling (if suitable fresh guano is available). Specific methods for guano DNA sampling are provided below.
  - A map and table will be developed documenting the location of bat roosts and species present, if applicable.
- Guano DNA Sampling
  - DNA samples will be collected at roost sites where fresh guano is available and where bat species cannot be determined visually during the roost survey.

- The samples will be stored in a stabilizing solution to prevent DNA degradation and submitted to the Genidaqs SM Molecular Biology and Genetics Lab (Cramer Fish Sciences) for DNA sequencing and species identification.
- DNA sequences will be compared to species-specific genetic markers developed by Walker et al. (2016) and further verified by comparison to samples at the National Center for Biotechnology Information DNA sequence database.
- A map and table will be developed identifying the location of guano DNA sampling and species present, if applicable.

7.1.5. Wildlife Mortality

- Review and summarize existing wildlife mortality reports. This will include, but is not limited to, the annual summary report developed under the SHA.
- Document wildlife mortality observed during implementation of studies conducted to support relicensing of the Project.
- Develop a map and table documenting wildlife mortality in relation to Project facilities.

7.1.6. Deer Migration and Important Areas

- Review California State Geoportal datasets and other available literature to identify mule deer migration corridors and other important areas.
- Develop a map of migration routes and important areas (e.g., winter and summer ranges, migration stopover locations) based on literature review and consultation with CDFW.
- Overlay information on Project facilities.

7.2. Culturally Significant Wildlife Species

Culturally significant wildlife species are those that hold important traditional, spiritual, or historic value to a specific Tribe or people. As part of the TERR-1 study, EBMUD will work with interested Tribes to identify those wildlife species within the FERC Project boundary that may be affected by Project operations.

8.0 Schedule, Periodic Reporting, and Consultation

TERR-1 is proposed as a single-year study and will include a technical study report to be filed with FERC as part of the Initial Study Report for review and comment. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Wildlife Resources Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
October 2026 – February 2027	Conduct Agency Consultation and Desktop Analyses
December 2026	Initiate Bald Eagle Wintering Survey
June 2027 – August 2027	Analyze Data and Prepare Draft Technical Study Report (includes preliminary data)
September 2027	File Initial Study Report
September 2027 – February 2028	Analyze Data and Prepare Updated Draft Technical Study Report
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. Table 8-2 lists the interested party comments and EBMUD responses relevant to TERR-1.

Table 8-2. EBMUD response to comments received on study plans.

Date of Comment	Interested Party	Comment	EBMUD Response
02/18/2026	U.S. Fish and Wildlife Service	The Service requests that the plan include nesting surveys for western and Clark's Grebes on both reservoirs, as both species will nest on larger lakes, and the Project area is within their range. Western and Clark's grebes build floating nests anchored to emergent vegetation and/or rooted submerged vegetation. Fluctuating reservoir water levels during the nesting season can result in nest failure if nests become stranded on shore. Additionally, disturbance from boat-based recreation can also lead to nest abandonment and increased egg predation (Ivey 2004). If such surveys are an implied part of Section 7.1.1 General Wildlife Surveys, it is recommended that they be added to their own section, similar to monarch butterfly and bald eagle, for clarity. The Service recommends the use of acoustic recordings, to accompany avian survey methods in the proposed study plan. Acoustic recordings provide the benefit of being able to be reviewed multiple times by multiple experts, potentially yielding improved estimates of species abundance and community richness.	Project operations would not change from the existing condition under the Proposed Action. The reservoir would continue to be inundated in a pattern consistent with the current operation. EBMUD is proposing to evaluate potential effects to wildlife using a habitat-based approach. Western and Clark's grebes breed in areas containing emergent and submergent vegetation (i.e., wetland habitat). EBMUD biologists have not observed any breeding colonies of Western and Clark's grebes during other resource monitoring studies in the watershed, and nests have never been reported on citizen science platforms such as eBird, despite the popularity of birding activities at Project recreation areas. Wetland habitat will be mapped as part of the Wetland, Riparian, and Littoral Habitats Study Plan, and potential effects to Western and Clark's grebe would be analyzed on a habitat-based approach. Any Western and Clark's grebe that are observed during wildlife reconnaissance surveys would also be reported. Analysis of potential effects to wildlife species will be determined from review of habitats present and Project operations and maintenance activities that could potentially affect habitat. Species abundance and richness is not necessary to determine potential Project effects to avian species.

Date of Comment	Interested Party	Comment	EBMUD Response
			Acoustic sampling was recently completed in 2025, by CDFW. This included deploying four units for 5 days on the southern portion of Camanche Reservoir. During the survey, recordings were obtained for 9 bat species and 51 bird species. Considering the recent acoustic sampling completed and the extensive surveys conducted onsite by EBMUD, acoustic recordings are not proposed at this time.
02/17/2026	U.S. EPA	Identify and quantify other wildlife species that might be directly, indirectly, or cumulatively affected by each alternative and mitigate impacts to these species. Discuss the project's consistency with existing laws and regulations, including the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.	The Draft License Application and Final License Application for the Project will include analysis of effects of continued operation and maintenance of the Project (direct, indirect, and cumulative) to special-status wildlife species, including species protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.
01/13/2025	CA State Water Board	Pg. 10 of the PSP TERR-1, under Wintering Bird Surveys, states that single-day surveys will be conducted monthly from December through February (three surveys, at least 2 weeks apart). Can EBMUD clarify if this is the same monitoring frequency for Bald Eagle Nesting Surveys from late February through March?	As defined in Section 7.1.3.2 of the study plan, a single bald eagle nesting survey will be conducted during each of the following periods: • Nest occupancy (February through March) • Presence of eggs (late April through May) • Nest Success (June through early July) If surveys are conducted by helicopter, they will be completed in a single day; however, if surveys are conducted by boat, it is expected that they will be completed in 2 days.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating feedback from interested parties. The estimated cost for TERR-1 ranges from $225,000 to $425,000, assuming that only the facilities (i.e., buildings, sporting clays, grouse blinds, etc.) that EBMUD maintains and operates in the Camanche Hills Hunting Preserve would be surveyed. The entire 1,500-acre preserve would not be surveyed. Another assumption is that EBMUD completes the necessary modeling to compare hydrology with and without the Project and determine potential effects on riparian recruitment.

10.0 References

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BOTANICAL RESOURCES STUDY PLAN (TERR-2)

Lower Mokelumne River Hydroelectric Project
FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

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Terms and Abbreviations

C	
Cal-IPC	California Invasive Council
CBR	considered but rejected (CNPS CRPR)
CDFW	California Department of Fish and Wildlife
CE	endangered (CESA)
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
Commission	Federal Energy Regulatory Commission
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
CWHR	California Wildlife Habitat Relationships
E	
EBMUD	East Bay Municipal Utility District
ESA	Endangered Species Act
F	
FC	candidate for listing (federal ESA)
FE	engendered (federal ESA)
FERC	Federal Energy Regulatory Commission
FPD	Proposed for delisting (federal ESA)
FPE	proposed endangered (federal ESA)
FPT	proposed threatened (federal ESA)
FT	threatened (federal ESA)
G	
GIS	geographic information system
GPS	global positioning system
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
N	
NNIP	non-native invasive plant
P	
PAD	Pre-Application Document
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan

S	
SD1	Scoping Document 1
SD2	Scoping Document
SE	endangered (CESA)
SR	rare (CESA)
ST	threatened (CESA)
State Water Board	California State Water Resources Control Board
U	
USFWS	U.S. Fish and Wildlife Service

1.0 Introduction

East Bay Municipal Utility District's (EBMUD's) Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916; Lower Mokelumne River Project or Project) operations and maintenance activities may have the potential to affect botanical resources. The purpose of this Botanical Resources Study (TERR-2) plan is to identify and map the location of sensitive natural communities, special-status plant species, and non-native invasive plants (NNIPs) in the study area.

2.0 Project Nexus and Study Rationale

Sensitive natural communities, special-status plant species, and NNIPs are known or could potentially be present in the FERC Project boundary. Implementation of Project operations and maintenance activities may result in loss of sensitive natural communities, loss of special-status plant species, or the spread or introduction of NNIPs. The Project nexus and study rationale are as follows:

- Project operations and maintenance may result in direct loss or degradation of California Wildlife Habitat Relationship (CWHR) habitats and sensitive natural communities, including communities afforded special recognition by state and federal agencies.
- Project maintenance activities may result in removal or disturbance of special-status plants, lichens, and moss populations.
- Project maintenance activities may result in introduction or spread of NNIPs.

3.0 Study Goals and Objectives

The study goals for TERR-2 are as follows:

- Document CWHR habitats and sensitive natural communities adjacent to Project facilities.
- Document special-status plant, lichen, and moss populations at Project facilities.
- Document NNIPs adjacent to Project facilities.

4.0 Relevant Resource Management Goals

Existing management plans will be reviewed and used to develop a baseline understanding of the current management goals and objectives in the Project vicinity.

Relevant management plans include the following:

- California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians (California Department of Fish and Wildlife [CDFW] 2015).
- Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (U.S. Fish and Wildlife Service [USFWS] 2005).

Botanical resources are a subject of public interest at the local, state, and national level. Public interest statements obtained from relicensing participants are listed below:

- Interest Statement: Loss or degradation of habitats or sensitive natural communities.
- Interest Statement: Removal or disturbance of special-status plant, lichen, and moss populations.
- Interest Statement: Potential spread or introduction of NNIPs.

5.0 Geographic Scope

The geographic scope for each study component is described in Sections 5.1 and 5.2 below and is shown generally in Figure 5-1.

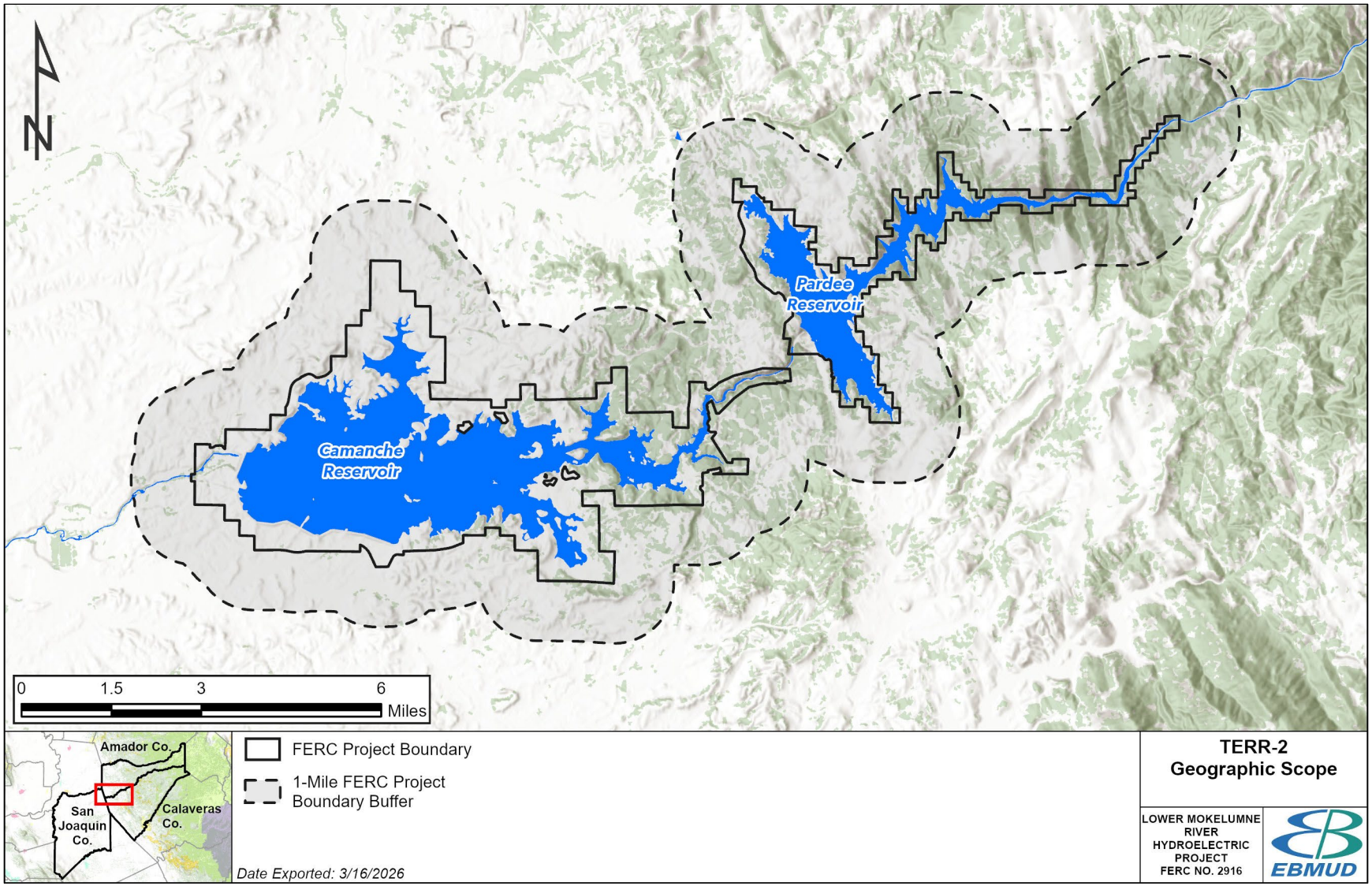


Figure 5-1. TERR-2 geographic scope.

5.1. CWHR Habitats and Sensitive Natural Communities

For CWHR habitats and sensitive natural communities, the study area is the FERC Project boundary and 1 mile outside.

5.2. Special-Status Plants and Non-Native Invasive Plants

For the purposes of the special-status plants and NNIPs studies, the study area includes lands within the FERC Project boundary where operations and/or maintenance activities are conducted, plus a protective buffer. Refer to Table 5-1 for the survey area by facility type.

Table 5-1. Special-status plant and NNIP survey area.

Project Facility Type	Survey Area
Dams, Dikes, and Spillways	
Pardee Dam	100 feet
Pardee South Spillway	100 feet
Jackson Creek Dike and Spillway	100 feet
West End Dike	100 feet
Camanche Dam	100 feet
Camanche Spillway	100 feet
Dikes 1 – 6	100 feet
Penstocks	
Pardee Penstock	15 feet on either side
Camanche Penstock	15 feet on either side
Powerhouses and Switchyards	
Pardee Powerhouse and Switchyard	15 feet around the perimeter fence
Camanche Powerhouse and Switchyard	15 feet around the perimeter fence
Ancillary and Support Facilities	
15 feet around the perimeter	
Stream Gages	
10 feet around gages	
Project Access Roads	
20 feet on either side	

Project Facility Type	Survey Area
Recreation	
Pardee Recreation Area	150 feet around recreation facilities
Camanche North Shore Recreation Area	150 feet around recreation facilities
Camanche South Shore Recreation Area	150 feet around recreation facilities
Camanche Hills Hunting Preserve	150 feet around recreation facilities
Mokelumne River Fish Hatchery	150 feet around hatchery and associated facilities
Mokelumne Day Use Area	150 feet around recreation facilities

6.0 Existing Information and Need for Additional Information

Data on botanical resources in the Project area are available and included in EBMUD's Lower Mokelumne River Project Pre-Application Document (PAD) (EBMUD 2025). Based on review of available information, the following potential information gaps were identified:

- Updated information on CWHR habitats and sensitive natural communities,
- Updated information on special-status plant, lichen, and moss populations, and
- Updated information on NNIPs.

7.0 Study Methodology

7.1. CWHR Habitats and Sensitive Natural Communities

- Develop habitat maps of the study area based on Classification and Assessment with CWHR habitat descriptions (Mayer and Laudenslayer 1988; CDFW 2021).
    - Preliminary information is presented in the Lower Mokelumne River Project (FERC No. 2916) PAD (EBMUD 2025).
- Verify the accuracy of CWHR data and update habitats using recent aerial photographs.
- Conduct ground-truthing of habitats within 0.25 mile of Project facilities, concentrating in areas where concerns about habitat identification or boundaries arise from review of aerial photographs. Inaccessible areas will not be ground-truthed.
    - Within the large CWHR habitats, sensitive natural communities (i.e., ranks S1 – S3) by CDFW (2025) will also be identified and mapped using the *Manual of California Vegetation* classification system (Sawyer et al. 2009) as part of the ground-truthing survey.
    - Wetland, riparian, and littoral habitats will be mapped as part of the Wetland, Riparian, and Littoral Habitats Study (TERR-3) plan (EBMUD 2025).
- Develop a geographic information system (GIS) map of habitats and sensitive natural communities within the study area (i.e., FERC Project boundary and 1 mile outside) and overlay information on Project facilities.

7.2. Special-Status Plants

For the purposes of this study plan, a special-status plant is defined as any plant or moss species that is granted protection by a federal or state agency. Federally listed plant species granted status by the USFWS under the federal Endangered Species Act (ESA) include threatened (FT), endangered (FE), proposed threatened or endangered (FPT, FPE), candidate (FC), or listed species proposed for delisting (FPD).

State of California listed plant species, which are granted status by the CDFW under the California Endangered Species Act (CESA), include state threatened (ST), state endangered (SE), and state rare (SR).

Under the California Environmental Quality Act (CEQA), special-status plants are also defined to include those species identified in the California Native Plant Society (CNPS) California Rare Plant Rank (CRPR) system as rare, threatened, or endangered plants in California. This includes the following CRPR:

- 1A (presumed extirpated in California and either rare or extinct elsewhere);
- 1B (rare, threatened, or endangered in California and elsewhere);
- 2A (presumed extirpated in California, but common elsewhere); and
- 2B (rare, threatened, or endangered in California, but common elsewhere).

The study approach for special-status plants is provided below.

- Identify and map known occurrences of special-status plants within the study area, based on agency consultation and a review of existing information. Preliminary information is presented in the Lower Mokelumne River Project (FERC No. 2916) PAD (EBMUD 2025).
- Develop a list of special-status plant species potentially occurring in the Project area based on literature review and agency consultation. A preliminary list is provided in the Lower Mokelumne River Project (FERC No. 2916) PAD (EBMUD 2025).
- Conduct focused special-status plant surveys in the study area, according to the *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018). As defined in Section 5.0, the study area consists of lands within the FERC Project boundary where operations and/or maintenance activities are conducted, plus a protective buffer (Table 5-1).
    - Field surveys will be conducted at the proper time of year when rare, threatened, or endangered species are both evident and identifiable. Generally, this is when the plants are flowering. Based on the blooming periods for plants known or potentially occurring within the Project vicinity, three surveys would be conducted (March, May, and July) (Table 7-1).
    - Timing of surveys will be verified based on reference population monitoring. Agencies will be notified of survey population monitoring results and proposed survey dates prior to implementation of surveys.
    - Systematic field techniques will be implemented (e.g., zigzag patterns, random meandering, and linear transects) in the study area.

- Areas that cannot be safely accessed will be surveyed using binoculars, to the degree possible.
- If a special-status plant species population is identified on the perimeter of the study area, the study area will be expanded to document the full extent of the population.
- Botanists will also document the location and extent of any population of milkweed (*Asclepias* spp.) (the host plant for the monarch butterfly [*Danaus plexippus*]). Refer to the Wildlife Resources Study (TERR-1) plan (EBMUD 2025) for specific data to be collected.
- Surveys will be floristic in nature, and taxonomy will be based on *The Jepson Manual* (Baldwin et al. 2012). A comprehensive list of species observed during field surveys will be compiled.
- Digital photographs, global positioning system (GPS) information, an estimate of the number of individuals present, and a description of associated habitat will be collected for each special-status plant population observed.
- Moss specimens will be collected and labeled with the date and collection location. Moss specimens will later be identified to species by a qualified bryologist.

- Develop a GIS map of special-status plant populations and overlay information on Project facilities.
- Prepare and submit California Native Species Field Survey Forms for all special-status plant populations recorded to the California Natural Diversity Database (CNDDB).

Table 7-1. Special status plant blooming periods.

Species	Federal Status	State Status	California Rare Plant Rank (CRPR)	Bloom Period											
				Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Ione Manzanita (*Arctostaphylos myrtifolia*)	FT	—	1B.2	■	■	■								■	■
Fleshy Owl's Clover (*Castilleja campestris* var. *succulenta*)	FT	CE	1B.2			■	■	■							
Ione Buckwheat (*Eriogonum apricum* var. *apricum*)	FE	CE	1B.1							■	■	■	■		
Irish Hill Buckwheat (*Eriogonum apricum* var. *prostratum*)	FE	CE	1B.1						■	■					
Boggs Lake hedge-hyssop (*Gratiola heterosepala*)	—	CE	1B.2				■	■	■	■	■				
Sacramento Orcutt grass (*Orcuttia viscida*)	FE	CE	1B.1				■	■	■	■					
Henderson's bent grass (*Agrostis hendersonii*)	—	—	3.2				■	■	■						
Hoover's calycadenia (*Calycadenia hooveri*)	—	—	1B.3							■	■	■			
Tuolumne button-celery (*Eryngium pinnatisectum*)	—	—	1B.2					■	■	■	■				
Big-scale balsamroot (*Balsamorhiza macrolepis*)	—	—	1B.2			■	■	■	■						
Spicate calycadenia (*Calycadenia spicata*)	—	—	1B.3					■	■	■	■	■			
Bisbee Peak rush-rose (*Crocanthemum suffrutescens*)	—	—	3.2				■	■	■	■	■				

Species	Federal Status	State Status	California Rare Plant Rank (CRPR)	Bloom Period											
				Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Mariposa cryptantha (*Cryptantha mariposae*)	–	–	1B.3				■	■	■	■					
Dwarf downingia (*Downingia pusilla*)	–	–	2B.2			■	■	■							
Stanislaus monkeyflower (*Erythranthe marmorata*)	–	–	1B.1			■	■	■							
Parry's horkelia (*Horkelia parryi*)	–	–	1B.2				■	■	■	■	■	■			
Ahart's dwarf rush (*Juncus leiospermus* var. *ahartii*)	–	–	1B.2			■	■	■							
Legenere (*Legenere limosa*)	–	–	1B.2			■	■	■							
Pincushion navarretia (*Navarretia myersii* var. *myersii*)	–	–	1B.1				■	■							
Patterson's navarretia (*Navarretia paradoxiclara*)	–	–	1B.3					■	■	■					
Sanford's arrowhead (*Sagittaria sanfordii*)	–	–	1B.2					■	■	■	■	■	■		

■ Proposed survey period based on the blooming periods for plants known or potentially occurring within the Project vicinity. The timing of surveys will be verified based on reference populations monitoring completed in coordination with resource agencies.

Legend:

Federal Status
FE = Federally Endangered
FT = Federally Threatened

State Status
CE = California Endangered

CNPS Rare Plant Rank (CNPS RPR)
1B = Rare, threatened or endangered in California and elsewhere.
2B = Rare in California but more common elsewhere.
4 = Plants of limited distribution – a watchlist
_.1 = Seriously threatened in California (over 80 percent of occurrences threatened/high degree and immediacy of threat)
_.2 = Moderately threatened in California (20 to 80 percent occurrences threatened)
_.3 = Not very threatened in California (<20 percent of occurrences threatened or no current threats known)
CBR = Considered but rejected

7.3. Non-Native Invasive Plants

The California Invasive Council (Cal-IPC) defines NNIPs as plants that 1) are not native to, yet can spread into wildland ecosystems, and that also 2) displace native species, hybridize with native species, alter biological communities, or alter ecosystem processes (Cal-IPC 2025).

The study approach for NNIPs is provided below.

- Identify and map known occurrences of NNIPs based on agency consultation and a review of existing information. Preliminary information is presented in the Lower Mokelumne River Project (FERC No. 2916) PAD (EBMUD 2025).
- Develop a list of priority NNIPs for focused NNIP surveys. This list will incorporate priority NNIPs identified through consultation with agencies.
- Conduct focused NNIP surveys in conjunction with special-status plant surveys in the study area. As defined in Section 5.0, the study area consists of lands within the FERC Project boundary where operations and/or maintenance activities are conducted, plus a protective buffer (Table 5-1).
- Collect data and report survey results as follows:
    - Data collected will include species, location, and number of acres infested by NNIPs.
    - If an NNIP population is identified on the perimeter of the study area, the study area will be expanded to document the extent of the population.
    - Levels of infestation will be reported as: low (<5 percent cover); moderate (6–25 percent cover), and high (>25 percent cover). Areas that have been surveyed and found to be weed-free will also be identified.
- Develop a GIS map of noxious weeds and invasive non-native plants and overlay information on Project facilities.

7.4. Culturally Significant Botanical Species

Culturally significant botanical species are those that hold important traditional, spiritual, or historic value to a specific Tribe or people. As part of TERR-1, EBMUD will work with interested Tribes to identify those species within the FERC Project boundary that may be affected by Project operations.

8.0 Schedule, Periodic Reporting, and Consultation

TERR-2 is proposed as a single-year study and will include a technical study report to be filed with FERC as part of the Initial Study Report for review and comment. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Botanical Resources Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
February 2027 – March 2027	Conduct Agency Consultation and Reference Populations Visits
June 2027 – August 2027	Analyze Data and Prepare Draft Technical Study Report (includes preliminary data)
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EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. Table 8-2 lists the interested party comments and EBMUD responses relevant to TERR-2.

Table 8-2. EBMUD response to comments received on study plans.

Date of Comment	Interested Party	Comment	EBMUD Response
02/18/2026	U.S. Fish and Wildlife Service	Section 5.2 Geographic Scope only lists project facilities and recreational facilities and appears to exclude the reservoirs. Project operations affect habitat and plant communities around the reservoir. The Service recommends including surveying within 100' upland from the reservoirs' high-water mark.	The perimeter of Project reservoirs is not typically included in botanical survey areas. Outside of the recreation areas (which will be surveyed), no maintenance activities are implemented around the perimeter of Project reservoirs (i.e., within 100 feet), and Project operations would not change from the existing condition under the Proposed Action. The reservoir would continue to be inundated in a pattern consistent with the current operation. Therefore, upland areas adjacent to the Project reservoirs (i.e., within 100 feet) would not experience any changes in habitat conditions from Project operations (i.e., changes in the ordinary high water mark of the reservoir.).
01/13/2026	CA State Water Board	Pg. 11 of the PSP TERR-2 (Botanical Resources Study), Table 7-1, displays the Special status plant blooming periods and how they fall within the proposed survey periods. There are a few plant species bloom periods that are either at the end or beginning of the sampling survey periods. How does EBMUD plan to address sampling for plants at the very end and beginning of their blooming period if they are potentially present and that could potentially be missed (i.e. Ione Manzanita, Ione Buckwheat, Hoover's calycadenia)? State Water Board staff recommend EBMUD discuss how the study accounted for this smaller sampling period of certain species in the study report.	Although Ione manzanita has a peak bloom period from January–February, the Service's 2010 5-year review also states that blooming can occur through early March. Additionally, key diagnostic characteristics (i.e., smooth dark-red bark with gray or bluish patches, bright evergreen leaves with flat edges and pointed tips, glandular hairs, and developing distinct fruit) remain detectable well into late spring/early summer. This survey schedule also aligns with the phenology of Ione buckwheat, which generally flowers from May – October, and Hoover's calycadenia, which typically blooms from July – September. Conducting botanical surveys in March, May, and July provides thorough coverage of early vegetative growth, peak blooming, and fruiting stages across these three species and other California listed and special-status species potentially occurring in the Project area.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating feedback from interested parties. The estimated cost for TERR-2 ranges from $270,000 to $470,000, assuming that only the facilities (i.e., buildings, sporting clays, grouse blinds, etc.) EBMUD maintains and operates in the Camanche Hills Hunting Preserve would be surveyed. The entire 1,500-acre preserve would not be surveyed. Another assumption is that EBMUD completes necessary modeling to compare hydrology with and without the Project and determine potential effects on riparian recruitment.

10.0 References

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(Cal-IPC) California Invasive Plant Council. 2025. California Invasive Plant Inventory. California Invasive Plant Council: Berkeley, CA. Available at: www.cal-ipc.org

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WETLAND, RIPARIAN, AND LITTORAL HABITATS STUDY PLAN (TERR-3)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

WETLAND, RIPARIAN, AND LITTORAL HABITATS STUDY PLAN (TERR-3)

Lower Mokelumne River Hydroelectric Project
FERC Project No. 2916

East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

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Terms and Abbreviations

C	
CDFW	California Department of Fish and Wildlife
Commission	Federal Energy Regulatory Commission
D	
DBH	diameter at breast height
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
G	
GIS	geographic information system
GPS	global positioning system
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
M	
M	medium-aged
N	
NWI	National Wetlands Inventory
O	
O	old/mature
P	
PAD	Pre-Application Document
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
S	
SD1	Scoping Document 1
SD2	Scoping Document 2
State Water Board	California State Water Resources Control Board

U	
USFWS	U.S. Fish and Wildlife Service
Y	
Y	young

1.0 Introduction

East Bay Municipal Utility District's (EBMUD) Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916, Lower Mokelumne River Project or Project) operations and maintenance activities may have the potential to result in direct loss or degradation of Waters of the United States/State (e.g., riverine, freshwater emergent wetland, freshwater forested/shrub wetland, freshwater pond, vernal pool) and riparian habitats. The purpose of this Wetland, Riparian, and Littoral Habitats Study (TERR-3) plan is to document the location of Waters of the U.S./State and riparian habitats in the study area.

2.0 Project Nexus and Study Rationale

Project operations and maintenance activities could result in direct loss or degradation of jurisdictional Waters of the U.S./State or riparian habitats.

3.0 Study Goals and Objectives

The goals and objectives of TERR-3 are as follows:

- Document Waters of the U.S./State and riparian habitats adjacent to Project facilities and reaches affected by the Project.
- Determine the relationship between riparian habitats and flow conditions in Project-affected reaches.

4.0 Relevant Resource Management Goals

Existing management plans will be reviewed and used to develop a baseline understanding of the current management goals and objectives in the Project vicinity. Relevant management plans include the following:

- California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians (California Department of Fish and Wildlife [CDFW] 2015).

Wetland, riparian, and littoral resources are a subject of public interest at the local, state, and national level. Public interest statements obtained from relicensing participants are listed below:

- Lower Mokelumne River Project (FERC Project No. 2916) Joint Settlement Agreement (U.S. Fish and Wildlife [USFWS], CDFW, and EBMUD 1998).
- Interest Statement: Direct loss or degradation of Waters of the U.S./State and riparian habitats.

5.0 Geographic Scope

The geographic scope of TERR-3 is described in Table 5-1 below. Figure 5-1 shows the USFWS National Wetlands Inventory (NWI) wetlands within the FERC Project boundary, which will serve as the basis for initial study plan implementation.

- For documentation of Waters of the U.S./State, the survey area is lands within the FERC Project boundary where operations and/or maintenance activities are conducted, plus a protective buffer. Refer to Table 5-1 for the survey area.
- For documentation of riparian habitats, the survey area is Project-affected reaches and riparian cross-section locations. The geographic scope of this study begins at the Mokelumne River inflow to Pardee Reservoir, through the outflow of Camanche Reservoir downstream to the Woodbridge Irrigation District Dam.
- For the relationship between riparian habitats and flow conditions, the study area is riparian cross-section locations on Project-affected stream reaches.

Table 5-1. Waters of the U.S./State survey area.

Project Facility Type	Survey Area
Dams, Dikes, and Spillways	
Pardee Dam	100 feet
Pardee South Spillway	100 feet
Jackson Creek Dike and Spillway	100 feet
West End Dike	100 feet
Camanche Dam	100 feet
Camanche Spillway	100 feet
Dikes 1 – 6	100 feet
Penstocks	
Pardee Penstock	15 feet on either side
Camanche Penstock	15 feet on either side
Powerhouses and Switchyards	
Pardee Powerhouse and Switchyard	15 feet around the perimeter fence
Camanche Powerhouse and Switchyard	15 feet around the perimeter fence
Ancillary and Support Facilities	
15 feet around the perimeter	
Stream Gages	
10 feet around gages	
Project Access Roads	
20 feet on either side	

Project Facility Type	Survey Area
Recreation	
Pardee Recreation Area	150 feet around recreation facilities
Camanche North Shore Recreation Area	150 feet around recreation facilities
Camanche South Shore Recreation Area	150 feet around recreation facilities
Camanche Hills Hunting Preserve	150 feet around recreation facilities
Mokelumne River Fish Hatchery	150 feet around hatchery and associated facilities
Mokelumne Day Use Area	150 feet around recreation facilities

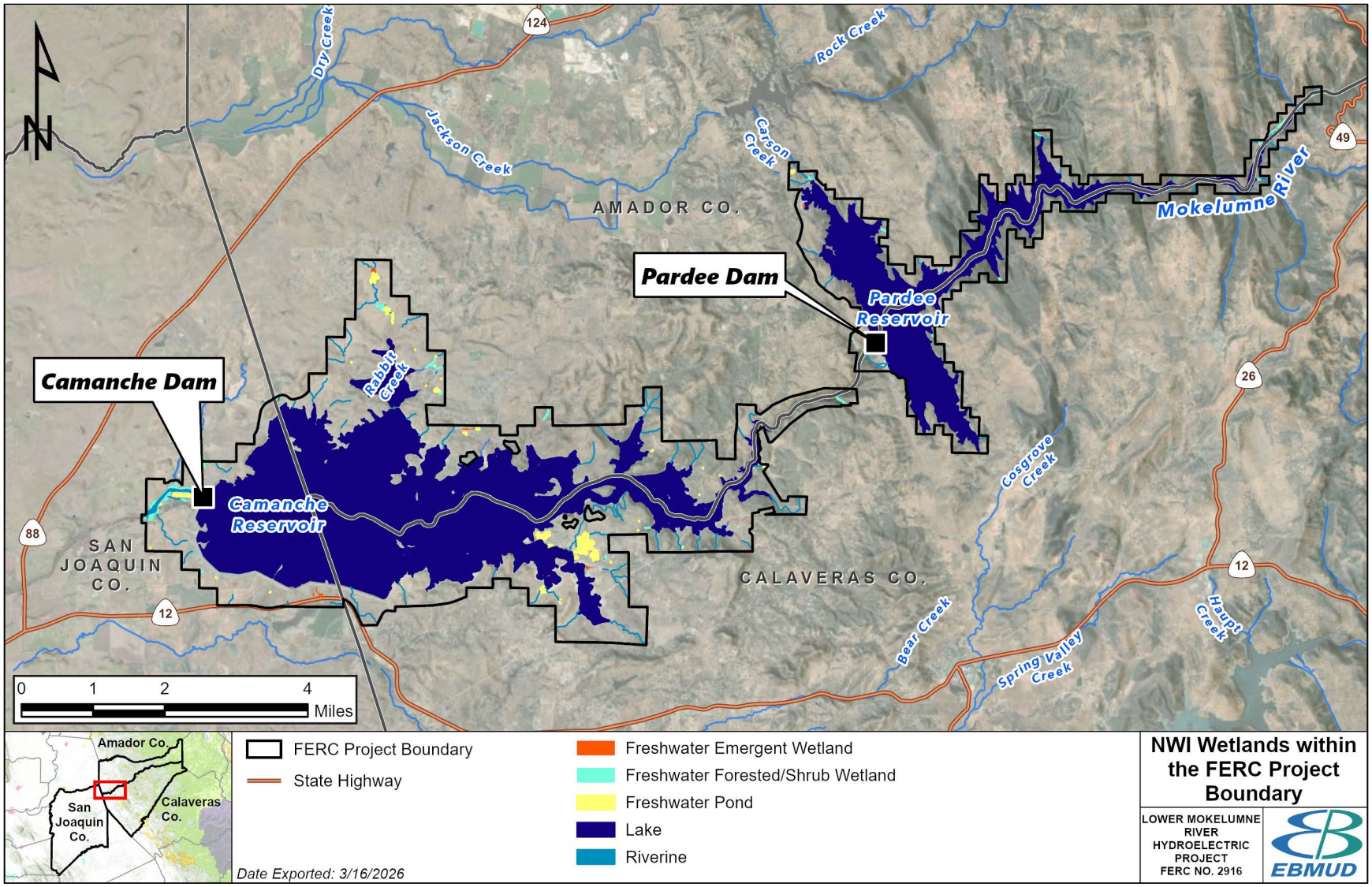


Figure 5-1. NWI wetlands within the FERC Project boundary.

6.0 Existing Information and Need for Additional Information

Data on wetland, riparian, and littoral habitats in the Project area are available and included in EBMUD's Lower Mokelumne River Project Pre-Application Document (PAD) (EBMUD 2025). Based on review of available information, the following potential information gaps were identified:

- Mapping of Waters of the U.S./State and riparian habitats adjacent to Project facilities and reaches affected by the Project, and
- The relationship between riparian habitats and flow conditions in Project-affected reaches.

7.0 Study Methodology

7.1. Preliminary Mapping Jurisdictional Waters of the U.S/State and Riparian Habitats

- Develop preliminary maps of jurisdictional Waters of the U.S./State and riparian habitat based on NWI mapping.
    - Preliminary information is presented in EBMUD's PAD Section 4.06, Wetland, Riparian, and Littoral Habitats (EBMUD 2025).
    - Verify the accuracy of data and update information using recent aerial photographs.

7.2. Ground-truthing Field Verification

7.2.1. Jurisdictional Waters of the U.S/State

- Conduct ground-truthing of jurisdictional Waters of the U.S./State within the survey area, concentrating in areas where questions on classification or boundaries arise from review of aerial photographs. Inaccessible areas will not be ground truthed.
    - Global positioning system (GPS) information will be collected to document location of jurisdictional Waters of the U.S./State.
    - At each aquatic feature, dominant plant species will be recorded within tree, shrub, and herbaceous cover types.
- Develop a geographic information system (GIS) map of jurisdictional Waters of the U.S./State and overlay information on Project facilities.

7.2.2. Riparian Habitats

- Map the extent of riparian habitat along Project-affected reaches using a combination of high-resolution aerial imagery and field observations at riparian cross sections.
    - Riparian communities will be classified based on *A Manual of California Vegetation* (Sawyer et al. 2009).
- Develop a GIS map of riparian habitat along Project-affected reaches.

7.2.3. Characterize Relationship between Riparian Vegetation and Flow Conditions

- Characterize the relationship between the riparian and flow conditions in Project-affected reaches:
    - Establish up to 10 cross sections, as needed, at representative locations along Project-affected reaches.[1]
        - Using riparian habitats as described above in Section 7.2.2., cross-section locations will be selected according to the percentage of riparian vegetation cover by each of the communities observed in the Project-affected reach (e.g., communities with higher cover along the reach would have more cross sections than communities with lower cover).
        - Characterize riparian vegetation and substrate along the length of each cross section. Obtain the following data at the cross sections:
            - GPS coordinates headpin locations,
            - Distribution of riparian vegetation along the cross section, measured from the channel edge to the maximum extent of riparian vegetation on the floodplain,
            - Photographs (across, upstream, and downstream),
            - Woody riparian vegetation (percentage of cover and age class[2] for dominant woody riparian trees/shrubs, by species),
            - Herbaceous riparian/wetland (percentage of cover of riparian/wetland herbaceous and graminoid plants, by species), and
            - Substrate composition (size class/percentage of substrate types).
    - Develop stage-discharge relationships over a range of flows (high to low) in coordination with the Instream Flow Study (FA-2) plan.
- Develop a summary of the relationship between existing inundation characteristics (e.g., timing, frequency, depth, and width of inundation) and the distribution of dominant riparian species within Project-affected reaches.
- Compare and contrast existing Project hydrology to without Project hydrology in relation to riparian recruitment and maintenance in Project-affected reaches.

[1] The Mokelumne River below Camanche Dam extends beyond EBMUD-owned property and overlaps with private land. Therefore, selection of cross sections will be dependent on access permissions.

[2] Age class structure will be determined based on categories of shrub stem densities per individual and tree diameters, as follows: Young (Y): shrubs with less than 10 stems per individual or trees with diameters (diameter at breast height [DBH]) less than 3 inches; Medium-aged (M): shrubs with between 10 and 60 stems per individual or trees with DBHs between 3 and 9 inches; and Old/Mature (O): shrubs with more than 60 stems per individual or trees with DBHs greater than 9 inches.

8.0 Schedule, Periodic Reporting, and Consultation

TERR-3 is proposed as a single-year study and will include a technical study report to be filed with FERC as part of the Initial Study Report for review and comment. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Wetland, Riparian, and Littoral Habitats Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
June 2027 – August 2027	Analyze Data and Prepare Technical Study Report (includes preliminary data)
September 2027	File Initial Study Report
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. Table 8-2 lists the interested party comments and EBMUD responses relevant to TERR-3.

Table 8-2. EBMUD response to comments received on study plans.

Date of Comment	Interested Party	Comment	EBMUD Response
01/13/2026	CA State Water Board	Pg. 9 of the PSP TERR-3 (Wetlands, Riparian, and Littoral Habitat Study) discusses the development of a stage-discharge relationship over a range of flows (high to low). What would be the maximum flow to be analyzed for the stage discharge relationship analysis and reasoning for the chosen maximum flow. State Water Board staff recommend analyzing the highest flow released from Camanche Dam as the maximum flow for the stage-discharge relationship portion of the study.	The maximum flow to be analyzed for the stage-discharge relationship is 5,000 cubic feet per second. This is the maximum flow that can be discharged from Camanche Dam (EBMUD 2025). The TERR-3 study plan is coordinated closely with FA-2 for characterization of the relationship between riparian vegetation and flow conditions. The full range of flows to be analyzed for the stage-discharge relationship would be determined in consultation with resource agencies as specified in the FA-2 Instream Flow Study Plan, Section 7.2. The TERR-3 study plan has been modified to clarify coordination with the FA-2 study plan.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating feedback from interested parties. The estimated cost for TERR-3 ranges from $150,000 to $300,000, assuming only the facilities (i.e., buildings, sporting clays, grouse blinds, etc.) EBMUD maintains and operates in the Camanche Hills Hunting Preserve would be surveyed. The entire 1,500-acre preserve would not be surveyed. Another assumption is that EBMUD completes necessary modeling to compare hydrology with and without the Project and determine potential effects on riparian recruitment.

10.0 References

(CDFW) California Department of Fish and Wildlife. 2015. California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians. Edited by Armand G. Gonzales and Junko Hoshi, PhD. Prepared with assistance from Ascent Environmental, Inc., Sacramento, CA.

(EBMUD) East Bay Municipal Utility District. 2025. Lower Mokelumne River Project Pre-Application Document.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society, Sacramento, CA.

(USFWS) U.S. Fish and Wildlife Service, CDFW, and EBMUD. 1998. Lower Mokelumne River Project (FERC Project No. 2916-004), Joint Settlement Agreement. March 23, 1998.

ENVIRONMENTAL JUSTICE STUDY PLAN (EJ-1)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

ENVIRONMENTAL JUSTICE STUDY PLAN (EJ-1)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916

East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

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Terms and Abbreviations

C	
Commission	Federal Energy Regulatory Commission
E	
EBMUD	East Bay Municipal Utility District
EJ	environmental justice
F	
FERC	Federal Energy Regulatory Commission
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
P	
PAD	Pre-Application Document
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
S	
SD1	Scoping Document 1
SD2	Scoping Document 2

1.0 Introduction

The Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916, Lower Mokelumne River Project or Project) operations have the potential to affect environmental justice (EJ) communities if they exist within or adjacent to the Project boundary. This EJ Study (EJ-1) would identify whether EJ communities are present within the geographic scope of analysis and evaluate potential effects of relicensing and continued operation of the East Bay Municipal Utility District (EBMUD) Lower Mokelumne River Project. The purpose of this EJ-1 study plan is to provide EJ communities with opportunities for meaningful involvement in the relicensing process.

2.0 Project Nexus and Study Rationale

Project operations and maintenance activities could affect EJ communities in the Project boundary. The EJ-1 results will inform development of the Project's Draft License Application.

3.0 Study Goals and Objectives

The goals and objectives of EJ-1 are as follows:

- Identify the presence of EJ communities that may be located within the study area.
- Develop strategies to conduct outreach to identified EJ communities to ensure meaningful involvement in the relicensing process is achieved.

4.0 Relevant Resource Management Goals

EJ is one of the goals and considerations of EBMUD. EJ is a subject of public interest at the local and state level. The public interest consideration is reflected in several local and state plans and guidance documents, including the following:

- EBMUD's (2022) Diversity, Equity, and Inclusion Strategic Plan.

5.0 Geographic Scope

The geographic scope of EJ-1, shown in Figure 5-1, includes all census block groups within and intersecting with a 1-mile radius of the Project boundary.

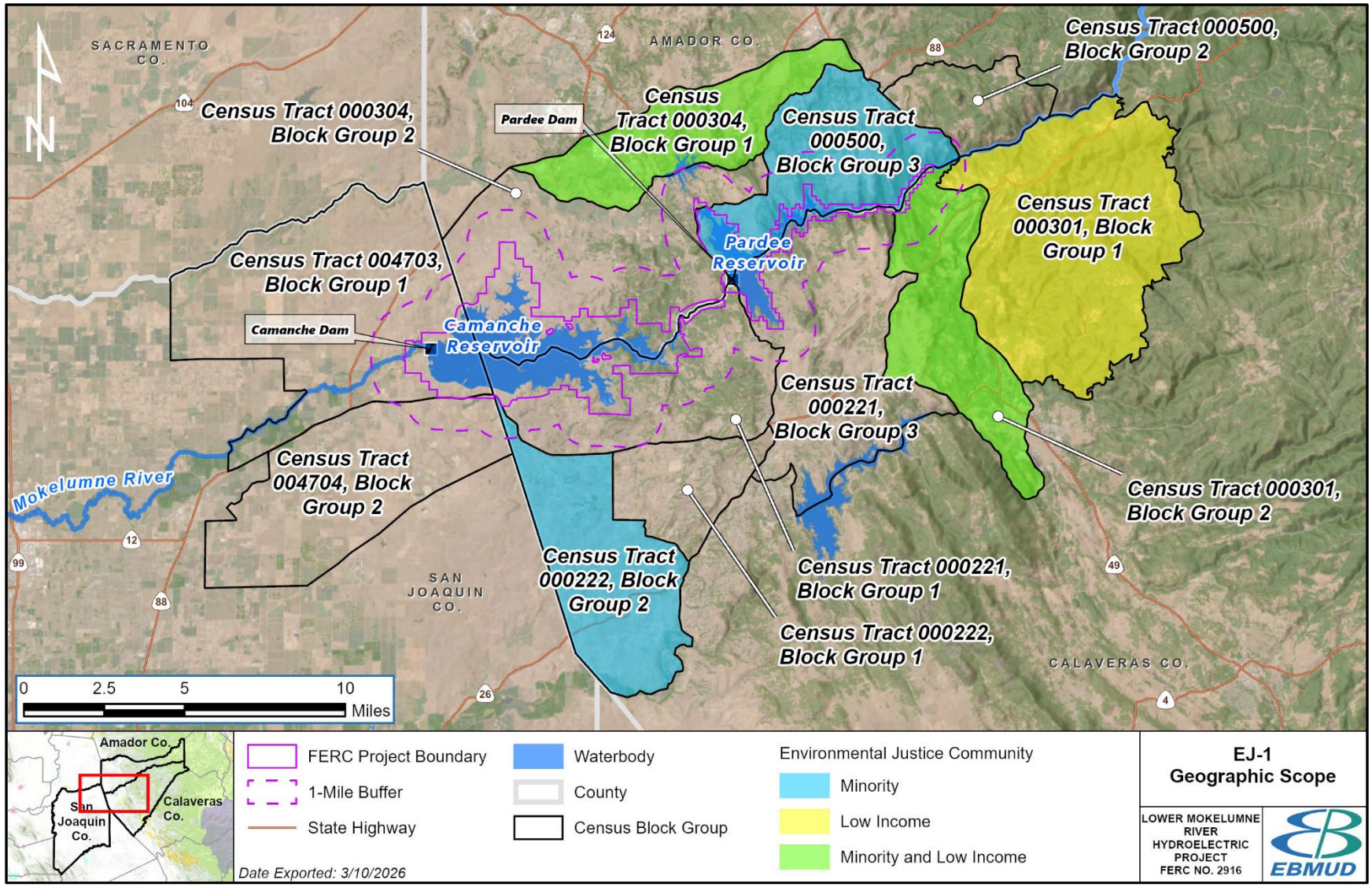


Figure 5-1. EJ-1 geographic scope.

6.0 Existing Information and Need for Additional Information

6.1. Existing Information

Identification of EJ communities was conducted for the Pre-Application Document (PAD).

6.2. Need for Additional Information

Further analysis and outreach efforts may be needed to ensure that EJ communities have meaningful involvement in the Project relicensing.

7.0 Study Methodology

- Desktop Data Gathering and Statistics Tables
  - Available U.S. Census data Census Blocks and/or Census Groups
- Identification of EJ Communities based on U.S. Census Data of Minority Populations
- Identification of EJ Communities based on U.S. Census Data of Low-Income Populations
- Identification of Non-English-Speaking Populations based on U.S. Census Data
- Mapping Efforts
  - ArcGIS
- Outreach Efforts
  - Identify willing community organizations within EJ communities.
  - Develop an outreach strategy with feedback from organizations.
  - Identify opportunities to involve EJ communities in the relicensing process.
  - Develop printed and/or digital materials to distribute (include multilingual materials if non-English-speaking communities are identified).
  - Distribute outreach materials in the most effective ways to reach EJ communities, with the help of organizations.

8.0 Schedule, Periodic Reporting, and Consultation

EJ-1 is proposed as a single-year study and will include a technical study report to be filed with FERC as part of the Initial Study Report for review and comment. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential EJ Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
September 2027	File Initial Study Report
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. There were no comments received relevant to EJ-1.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating feedback from interested parties. The estimated cost for EJ-1 is $50,000.

10.0 References

(EBMUD) East Bay Municipal Utility District. 2022. Diversity, Equity, and Inclusion Strategic Plan https://splashpad.ebmud.com/application/files/2916/4633/5086/Diversity_Equity_and_Inclusion_Strategic_Plan.pdf

RECREATION FACILITIES INVENTORY AND CONDITION ASSESSMENT STUDY PLAN (REC-1)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

RECREATION FACILITIES INVENTORY AND CONDITION ASSESSMENT STUDY PLAN (REC-1)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916

East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

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Appendices

Appendix A Recreation Facilities Condition Assessment Form

Terms and Abbreviations

C	
Commission	Federal Energy Regulatory Commission
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
G	
GPS	global positioning system
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
M	
msl	mean sea level
P	
PAD	Pre-Application Document
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
S	
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SD1	Scoping Document 1
SD2	Scoping Document 2
State Water Board	California State Water Resources Control Board

1.0 Introduction

The Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916, Lower Mokelumne River Project or Project) operations may have the potential to affect Project recreation sites and facilities within the Project boundary. Data collected through this Recreation Facilities Inventory and Condition Assessment Study (REC-1) will be used to assess the effects of continued Project operations on Project recreation sites and facilities and will inform development of the Draft License Application.

2.0 Project Nexus and Study Rationale

Section 10(a) of the Federal Power Act requires FERC to ensure that the Project, as licensed, will be best adapted to a comprehensive plan for improving or developing the Lower Mokelumne River for the use or benefit of multiple public benefits, including recreation. REC-1 will help inform FERC's licensing decisions relative to public recreation within the Project boundary.

3.0 Study Goals and Objectives

The goal and objectives of REC-1 are as follows:

- Inventory FERC-approved recreation sites and the Middle Bar Day Use Area within the Project boundary.
    - Field verify, map, and document recreation facilities and amenities within the Project boundary.
    - Document the general condition of recreation facilities and amenities and describe their maintenance, inspection, and/or management practices.
    - Identify who owns, operates, and maintains each of the FERC-approved recreation sites and the Middle Bar Day Use Area.

4.0 Relevant Resource Management Goals

Existing management plans will be reviewed and used to develop a baseline understanding of the current recreation management goals and objectives in the Lower Mokelumne River Project vicinity. Relevant management plans include the following (FERC 2023):

- California Department of Parks and Recreation. 2021. California's 2021-2025 Statewide Comprehensive Outdoor Recreation Plan (SCORP).
- California Department of Parks and Recreation. 2021. Designing Parks Using Community-Based Planning.
- California Department of Parks and Recreation. 2021. California's Vision for Park Equity.
- Amador County. 2016. Amador County General Plan.
- Calaveras County. 2019. Calaveras County General Plan.
- Calaveras County. 2025. Parks and Recreation Master Plan.
- San Joaquin County. 2016. San Joaquin County General Plan.
- East Bay Municipal Utility District (EBMUD). 2008. Mokelumne Watershed Master Plan.

5.0 Geographic Scope

The geographic scope of REC-1 includes five FERC-approved recreation sites and one non-FERC-approved recreation site located within the Project boundary, as shown on Figure 5-1. FERC-approved sites include Pardee Recreation Area, Camanche South Shore Recreation Area, Camanche North Shore Recreation Area, Mokelumne River Day Use Area, and Camanche Hills Hunting Preserve. Middle Bar Day Use Area is the non-FERC-approved recreation site.

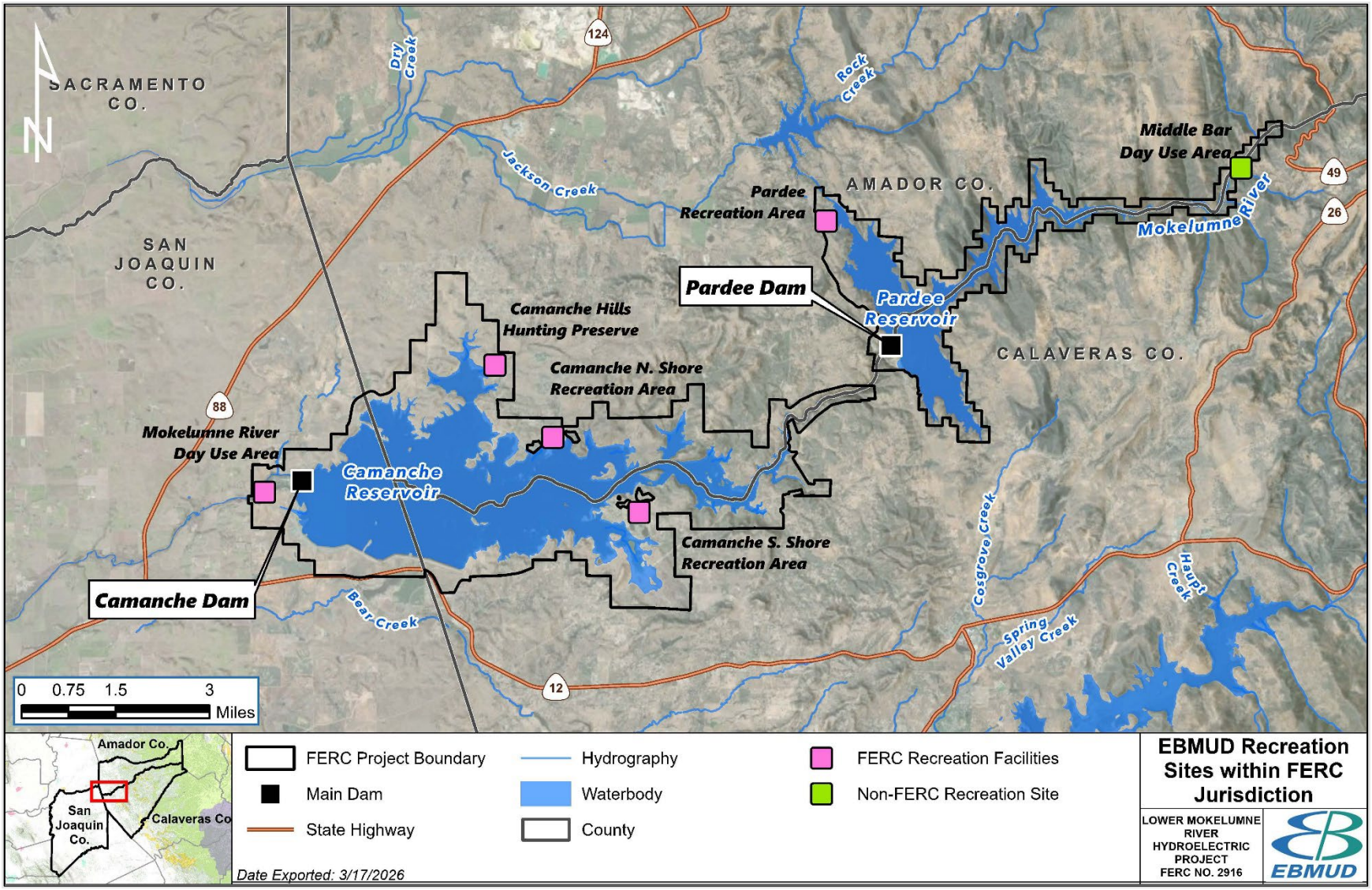


Figure 5-1. Lower Mokelumne River Project recreation sites.

6.0 Existing Information and Need for Additional Information

6.1. Existing Information

The following provide currently available information on Project recreation facilities and their condition:

- EBMUD Recreation Management Plan
- State and Federal Database Reviews
- Recreation Inventory Maps
- EBMUD Data and Publications

6.2. Need for Additional Information

An updated inventory of recreation facilities and amenities (e.g., picnic tables, trash receptables, firepits) is needed to inform relicensing.

7.0 Study Methodology

Field surveys will be conducted at FERC-approved recreation sites and Middle Bar Day Use Area within the Project boundary. Information collected during field surveys will be documented on a Recreation Site Inventory Form. Information to be collected will include the following:

- Global positioning system (GPS) location of the facilities;
- The type and number of recreation amenities provided at each site and facility;
- The condition of the recreation facility/amenities;
- The estimated parking capacity at each site;
- The entities responsible for the operation and maintenance of each recreation facility;
- Hours/seasons of operation;
- Existing safety, security, and informational (signage) measures;
- Observation of site use and accessibility;
- Suitability of facilities to provide opportunities for people with disabilities to participate in recreation opportunities; and
- Site photographs.

Additionally, field investigations at each recreation site will document site areas, if any, that have characteristics of erosion, slumping, or other forms of instability. The Recreation Facilities Condition Assessment Form that will be used is provided in Appendix A. The conditions of the facilities/amenities will be assessed as follows:

- **N** = Needs replacement (Facility/amenity is non-functional or has broken or missing components)
- **R** = Needs report (Facility/amenity has structural damage or is in an obvious state of disrepair)
- **M** = Needs maintenance (Facility/amenity needs maintenance, such as cleaning or painting)
- **G** = Good condition (Facility/amenity is functional and well maintained)

8.0 Schedule, Periodic Reporting, and Consultation

REC-1 is proposed as a single-year study and will include a technical study report to be filed with FERC as part of the Initial Study Report for review and comment. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Recreation Facilities Inventory and Condition Assessment Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
September 2026 – July 2027	Conduct/Complete Study[1]
September 2027	File Initial Study Report
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the Pre-Application Document (PAD) and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day, April 2, 2026. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. Table 8-2 summarizes the interested party comment and EBMUD response relevant to REC-1.

[1] In preparation for its upcoming relicensing, at the end of the 2025 recreation season, EBMUD collected data based on the outlined study methodology. Pending study plan modifications issued by FERC in the Study Plan Determination, EBMUD will present the 2025 data in the technical study report.

Table 8-2. EBMUD response to comments received on study plans.

Date of Comment	Interested Party	Comment	EBMUD Response
02/17/2026	CA State Water Board	Pardee Recreation Area, Section 3.5.1.5 of the PAD, states that a drawdown below an elevation of 547 feet above mean sea level (msl) impacts operation of the Pardee Recreation Area boat launch facilities. Is this elevation level reached under specific circumstances (i.e. dry years or facility maintenance) or is this an annual occurrence? Understanding potential short-term impacts to recreational facilities at Pardee reservoir aids State Water Board staff analysis in understanding potential short-term impacts, if any, to beneficial uses for non-contact. State Water Board staff request this information be included as part of the Proposed Study Plan REC-1 (Recreation Facilities Inventory and Condition Assessment).	Impacts to the Pardee boat launch facilities were incorrectly stated in the PAD. The main boat ramp is in service until 535 feet msl, and the low-water ramp can be utilized between 540 feet msl and 495 feet msl. Additional and corrected information pertaining to the reservoir levels at Pardee Recreation Area boat launch facility will be included in the Draft License Application.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating feedback from interested parties. The estimated cost for REC-1 ranges from $100,000 to $125,000.

10.0 References

(FERC) Federal Energy Regulatory Commission. 2023. Comprehensive Plans. Available online: https://www.ferc.gov/media/comprehensive-plans.

APPENDIX A

RECREATION FACILITIES CONDITION ASSESSMENT FORM

EAST BAY MUNICIPAL UTILITY DISTRICT

LOWER MOKELUMNE
FERC PROJECT NO. 2916
RECREATION SITE INVENTORY FORM

Observed by: Scott Wiemerslage_____Date/Time:_____

Site Name: _____GPS Coordinates (Lat./Long.): _____

Facility Type (Primary Purpose):

Developed Facilities:	o Boat Launch	o Picnic Area	o Angling Access
	o Campground	o Swim Area	o Overlook/Roadside Pull-off
	o Day Use Area	o Trailhead	o Other _____
Undeveloped Facilities:	o Primitive Campsite	o Informal Boat Launch	
	o Informal Angling	o Other _____	

Road Access: Condition Description (N-replace, R-repair, M-maintain, G-good) _____

o Paved access	# entrances _____# lanes _____	o Circular entrance/exit	o Signage
o Unpaved access	# entrances _____# lanes _____	o Circular entrance/exit	o Signage

Parking Lots: Condition Description (N-replace, R-repair, M-maintain, G-good): _____

Type	# Paved	# Estimated Gravel	Space Delineation		
ADA Spaces	_____	_____	o Painted	o Curbs	o Signage
Regular Spaces	_____	_____	o Painted	o Curbs	o Signage
Vehicle & Trailer Spaces	_____	_____	o Painted	o Curbs	o Signage

Operations:
o Staffed o Unstaffed o Seasonal (From _____To_____)
o Fee: (Site $____; Parking $____) o Year Round

Operating Hours _____Owner/Manager_____
Project Facility (Y/N)_____ Within FERC Project boundary (Y/N)?_____

Day Use Site Amenities (total # of all amenities per site; provide additional specifications on next page):

#	Type	Condition (N-replace, R-repair, M-maintain, G-good)	Universal Access
_____	Benches	_____	_____
_____	Boating Launch/Access	_____	_____
_____	Boating Prep Area	_____	_____
_____	Designated Swim Area	_____	_____
_____	Dumping Station	_____	_____
_____	Firepit/ring	_____	_____
_____	Fishing Pier/Platform	_____	_____
_____	Fishing Prep Area	_____	_____
_____	Grills	_____	_____
_____	Hiking/Walking Trail	_____	_____
_____	Information Kiosk	_____	_____
_____	Informational Signage	_____	_____
_____	Overlook	_____	_____
_____	Pedestrian Trail	_____	_____
_____	Picnic Shelter	_____	_____
_____	Picnic Tables	_____	_____
_____	Potable Water	_____	_____
_____	Playground	_____	_____
_____	Restrooms	_____	_____
_____	Safety Signage	_____	_____
_____	Trash Receptacles	_____	_____

Other
(specify)_____
_____

Boat Launch Facilities: Condition Description (N-replace, R-repair, M-maintain, G-good): _____

Craft Type:	o Motorized	o Carry In	o Boat Prep Area
Launch Type:	o Hard surface	o Gravel	o Informal (undeveloped)
	o ADA Access	o Turn-around area	_____ # of Lanes

Fishing Prep Area/Fishing Docks: Condition Description (N-replace, R-repair, M-maintain, G-good): _____

o Prep Area o Fishing Dock Dimensions:_____o ADA Compliant
o Prep Area o Fishing Dock Dimensions:_____o ADA Compliant

Trails (within the recreation area): Condition Description (N-replace, R-repair, M-maintain, G-good): _____

Type:_____ Length (ft):_____ Condition: _____ o ADA Compliant
Type:_____ Length (ft):_____ Condition: _____ o ADA Compliant
Type:_____ Length (ft):_____ Condition: _____ o ADA Compliant

Interpretive/Site Information: Condition Description (N-replace, R-repair, M-maintain, G-good): _____

Display Type: o None o Kisok o Other ____ No. of Displays
Information Type: o Boating Safety o Invasive Species o Fishing Regulations o Fish Type
o Regional Events o Other (specify)_____

Signage: Condition Description (N-replace, R-repair, M-maintain, G-good): _____

o Part 8 o Directional _____ o Informational o Other

Sanitation Facilities: Condition Description (N-replace, R-repair, M-maintain, G-good): _____

	# Flush	(# ADA)	# Portable	(# ADA)	Showers	(#UA)
Unisex	_____	(_____)	_____	(_____)	_____	(_____)
Women	_____	(_____)	_____	(_____)	_____	(_____)
Men	_____	(_____)	_____	(_____)	_____	(_____)

Campground/Campsite: Condition Description (N-replace, R-repair, M-maintain, G-good): _____

	Tent-improved	**Tent-Primitive**	**Group Sites**	**Camps/Cabins**	**RV Sites**
# of sites					
On site parking					
Waterfront					
ADA Access					

Observed Vegetation and Erosion Impacts:
_____ Cut trees for fires
_____ Trampled vegetation
_____ Mowed areas
_____ Trees damaged by people
_____ Trees damaged by environment
_____ Areas of noticeable erosion

Description of Observations/Evidence of Vegetation Impacts:
_____
_____

Description of Observations/Evidence of Erosion:
_____
_____

Evidence of use at site: _____
(C) Compaction, (E) Erosion, (G) Garbage, (GD) Ground disturbance, (HW) Human waste, (UI) Unauthorized improvements, (V) Vandalism, (VR) Vegetation removal, (O) Other (Specify)

Evidence of Overcrowding: _____
(A) Anecdotal information, (FA) facility/amenity @ capacity, (I) improper parking, (S) Signage, (SD) Site degradation, (U) Unauthorized sites, (W) Waiting lines, (O) Other (Specify)

Notes (including general condition, any restrictions/alerts, such as boating use, invasive species, etc.):

_____
_____
_____
_____
_____
_____Photo number from _____ to _____

Sketch of Site and Facilities:

RECREATION USE AND NEEDS STUDY PLAN (REC-2)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

RECREATION USE AND NEEDS STUDY PLAN (REC-2)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916

East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

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Appendices

Appendix A Recreation Use Spot Count Form
Appendix B Recreation Use Visitor Intercept Survey Form and Angler Survey Form

Terms and Abbreviations

C	
Commission	Federal Energy Regulatory Commission
CSPA	California Sport Fishing Alliance
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
L	
Lower Mokelumne River Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
P	
PAD	Pre-Application Document
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
S	
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SD1	Scoping Document 1
SD2	Scoping Document 2
Study Sites	FERC-approved recreation sites and the Middle Bar Day Use Area

1.0 Introduction

The Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916, Lower Mokelumne River Project or Project) may have the potential to affect recreation use and needs. This Recreation Use and Needs Study (REC-2) would evaluate the necessity for potential modifications to the existing Project recreation sites based on use and needs identified.

2.0 Project Nexus and Study Rationale

Section 10(a) of the Federal Power Act requires FERC to ensure that the Project, as licensed, will be best adapted to a comprehensive plan for improving or developing the Lower Mokelumne River for the use or benefit of multiple public benefits, including recreation. REC-2 will help inform FERC's licensing decisions relative to public recreation within the Project boundary.

3.0 Study Goals and Objectives

The goals and objectives of REC-2 are as follows:

Goal 1: Characterize the existing use of FERC-approved recreation sites and the Middle Bar Day Use Area (Study Sites) in the Project boundary.

Goal 1 Objectives:

1. Estimate recreation use at the Study Sites by day type (i.e., weekday, weekend, peak weekend).
2. Evaluate visitor feedback regarding perception and experience at the Study Sites.
3. Estimate the current recreational fishing effort at the Study Sites.

Goal 2: Identify current and future needs related to the Study Sites in the Project boundary.

Goal 2 Objectives:

1. Evaluate whether recreation capacity and existing facilities and amenities at the Study Sites meet or exceed current needs.
2. Estimate future recreation use of the Study Sites.
3. Estimate future needs for potential new recreation sites and facilities.

4.0 Relevant Resource Management Goals

Existing management plans will be reviewed and used to develop a baseline understanding of the current recreation management goals and objectives in the Lower Mokelumne River Project vicinity. Relevant management plans include the following:

- California Department of Parks and Recreation. 2021. California's 2021-2025 Statewide Comprehensive Outdoor Recreation Plan (SCORP).
- California Department of Parks and Recreation. 2021. Designing Parks Using Community-Based Planning.
- California Department of Parks and Recreation. 2021. California's Vision for Park Equity.
- Amador County. 2016. Amador County General Plan.
- Calaveras County. 2019. Calaveras County General Plan.
- Calaveras County. 2025. Parks and Recreation Master Plan.
- San Joaquin County. 2016. San Joaquin County General Plan.
- East Bay Municipal Utility District (EBMUD). 2008. Mokelumne Watershed Master Plan.
- California Department of Fish and Wildlife Stocking and Historical Creel Survey Data.
- Strategic Plan for Trout Management (California Department of Fish and Game 2003).
- Fisheries Techniques*, Third Edition* (Zale et al., 2013).

5.0 Geographic Scope

The geographic scope of REC-2 includes five FERC-approved recreation sites and one non-FERC-approved recreation site located within the Project boundary, as shown on Figure 5-1. FERC-approved sites include Pardee Recreation Area, Camanche South Shore Recreation Area, Camanche North Shore Recreation Area, Mokelumne River Day Use Area, and Camanche Hills Hunting Preserve. Middle Bar Day Use Area is the non-FERC-approved recreation site.

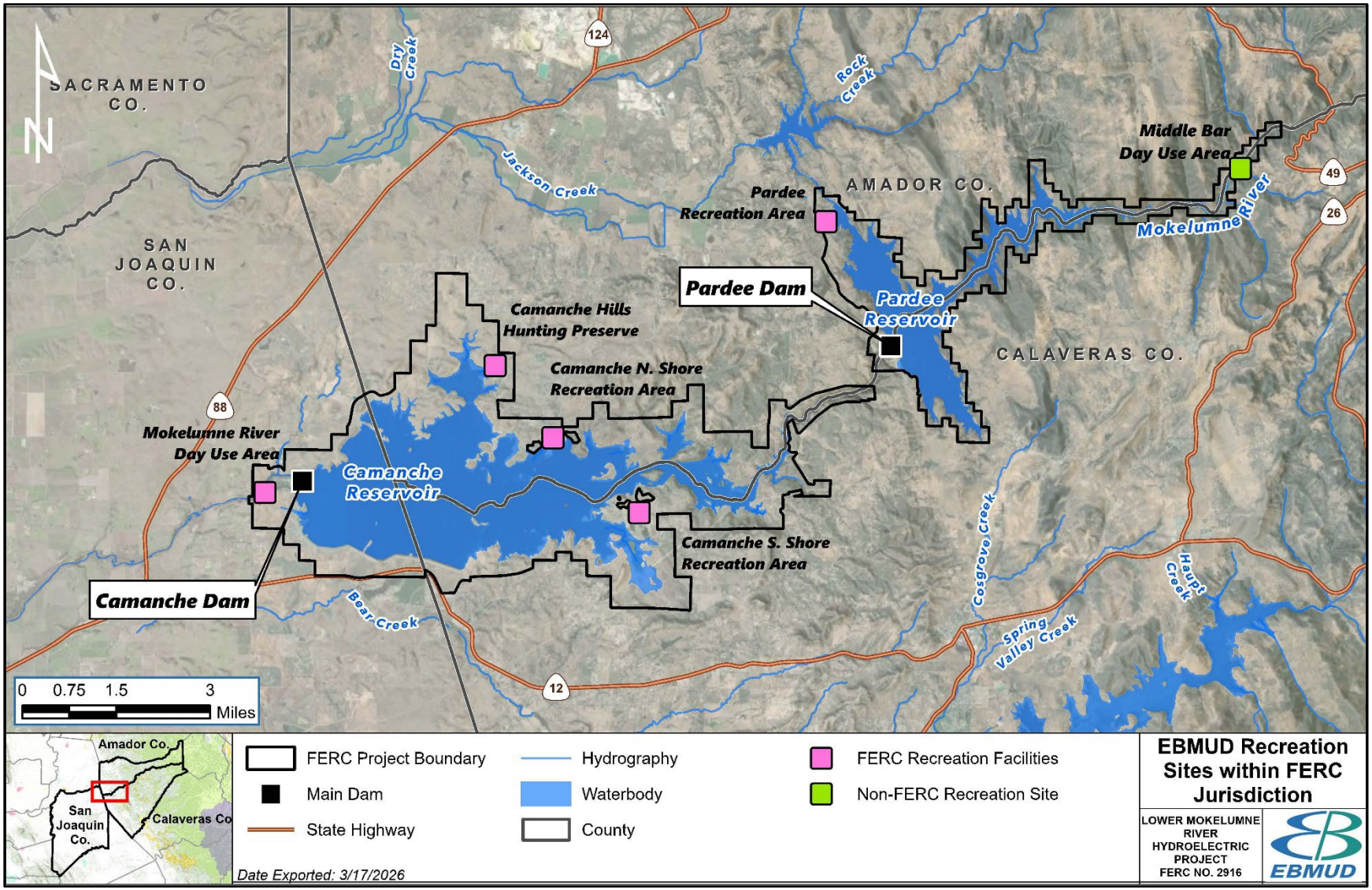


Figure 5-1. Lower Mokelumne River Project recreation sites.

6.0 Existing Information and Need for Additional Information

6.1. Existing Information

The following provide currently available information on Project recreation site use and needs:

- EBMUD Recreation Management Plan
- State and Federal Database Reviews
- Recreation Inventory Maps
- Visitor Attendance
- Fish Stocking Data
- Recreation Card and QR Code User Experience Surveys
- EBMUD Data and Publications
- FERC Form 80

6.2. Need for Additional Information

Additional information regarding the use and visitation of recreation sites within the Project boundary, to be collected during REC-2, is needed to inform relicensing.

7.0 Study Methodology

A variety of data collection techniques will be used to obtain the information necessary to meet the study goals and objectives listed in Section 3.0. Data collection will entail spot counts and recreation use visitor intercept surveys, which will be collected at the Study Sites as shown in Table 7-1. Additionally, for those visitors indicating fishing as a recreation activity in which they participate during the recreation use visitor intercept survey, a set of angler survey questions will be collected.

Table 7-1. Data collection methods at REC-2 Study Sites.

Recreation Site Name	Spot Count	Recreation Use Visitor Intercept Surveys
Pardee Recreation Area	X	X
Camanche South Shore Recreation Area	X	X
Camanche North Shore Recreation Area	X	X
Mokelumne River Day Use Area	X	X
Camanche Hills Hunting Preserve	X	X
Middle Bar Day Use Area	X	X

Existing data will be used to inform current recreation use as well as projected future recreation needs at the Study Sites. Existing data will include U.S. Census Bureau data, SCORP, and other relevant, available data and literature.

Table 7-2 summarizes the study objectives, information needed to meet those objectives, and sources of information. Sections 7.1 and 7.2 provide details on the data collection methods.

Table 7-2. Recreation Use and Needs Study Plan objectives and efforts.

Objectives	Information Needed	Source
Goal 1: Characterize the existing use of FERC-approved recreation sites and the Middle Bar Day Use Area (Study Sites) in the Project boundary.		
Objective 1.1: Estimate recreation uses at the Study Sites by day type (i.e., weekday, weekend, peak weekend).	• Estimate number of vehicles per day • Estimate number of people per vehicle • Estimate length of stay	• Spot count data • Recreation use visitor intercept surveys
Objective 1.2: Evaluate visitor feedback regarding perception and experience at the Study Sites.	• Percentage of visitors perceiving crowded facilities • Percentage of visitors satisfied with recreational facilities • Average quality rating of facilities and amenities • Average value rating of overall recreation site	• Recreation use visitor intercept surveys
Objective 1.3: Estimate the current recreational fishing effort at the Study Sites.	• Estimate catch per unit effort • Average quality rating of fishing at site • Average quality rating of fishing in the area • Summary of target species • Summary of harvest/release by species	• Recreation use visitor intercept surveys • Angler survey
Goal 2: Identify current and future needs related to the Study Sites in the Project boundary.		
Objective 2.1: Evaluate whether recreation capacity and existing facilities and amenities at the Study Sites meet current needs.	• User perceptions of crowding and needed improvements compared to existing data • Parking capacity compared to utilization	• Recreation Facilities Inventory and Condition Assessment (REC-1) • Results of Goal 1 analysis
Objective 2.2: Estimate future recreation use of the Study Sites.	• Current recreational use assessment • Population projections for the Project area • Recreational use trends	• Results of Goal 1 analysis • U.S. Census Bureau data • SCORP or other readily available literature
Objective 2.3: Estimate future needs for potential new recreation sites and facilities.	• Inventory Assessment • Condition Assessment • Parking capacity at recreation sites vs. projected needs density • Future needs identified by additional sources	• Recreation Facilities Inventory and Condition Assessment (REC-1) • Results of Goal 1 analysis

7.1. Spot Count

Spot counts will provide an estimate of the number of recreationists, parked vehicles, and boats/trailers at discrete times at each parking area within each recreation site. Field technicians conducting the spot counts will also record the activities that individuals are participating in, with attention paid to the use of recreation facilities/amenities provided at each site. Results will be documented on the Recreation Use Spot Count Form (Appendix A).

Spot counts at the parking areas of the Study Sites will be conducted based on the schedule provided in Table 7-3. For the purposes of this study, the holidays include the 3 days of the holiday weekend:[1] Memorial Day = May 29 to 31, 2027; Juneteenth = June 18 to 20, 2027; Independence Day =July 3 to 5, 2027; and Labor Day = September 4 to 6, 2027.

[1] For the purposes of this study, the holiday weekend is defined as the Friday, Saturday, Sunday or Saturday, Sunday, Monday closest to the holiday.

Table 7-3. Spot count schedule.

Site Name	Day Type	Month[a]												Total Spot Counts
		Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Pardee Recreation Area	Weekday	0	2	2	2	2	2	2	2	2	2	0	0	40
	Weekend	0	2	2	2	2	2	2	2	2	2	0	0	
	Holiday Weekend	0	0	0	0	1	1	1	0	1	0	0	0	
Camanche South Shore Recreation Area	Weekday	0	0	0	0	2	2	2	2	2	0	0	0	24
	Weekend	0	0	0	0	2	2	2	2	2	0	0	0	
	Holiday Weekend	0	0	0	0	1	1	1	0	1	0	0	0	
Camanche North Shore Recreation Area	Weekday	0	0	0	0	2	2	2	2	2	0	0	0	24
	Weekend	0	0	0	0	2	2	2	2	2	0	0	0	
	Holiday Weekend	0	0	0	0	1	1	1	0	1	0	0	0	
Mokelumne River Day Use Area	Weekday	0	0	0	0	0	2	2	2	0	0	0	0	16
	Weekend	0	0	0	0	0	2	2	2	0	0	0	0	
	Holiday Weekend	0	0	0	0	1	1	1	0	1	0	0	0	
Camanche Hills Hunting Preserve	Weekday	2	2	2	0	0	2	2	2	0	2	2	2	40
	Weekend	2	2	2	0	0	2	2	2	0	2	2	2	
	Holiday Weekend	0	0	0	0	1	1	1	0	1	0	0	0	
Middle Bar Day Use Area	Weekday	0	0	0	0	0	2	2	2	0	0	0	0	16
	Weekend	0	0	0	0	0	2	2	2	0	0	0	0	
	Holiday Weekend	0	0	0	0	1	1	1	0	1	0	0	0	

Note: The Pardee Recreation Area boating season typically runs from the first Friday in February through the last Sunday in October. Camanche boating season is May 1 through October 1, and the Camanche Hills Hunting Preserve hunting season is generally October through March.

Sampling dates and times will be randomly selected for the parking areas at the Study Sites. EBMUD will develop a circuit to allow visits to each parking area associated with Study Sites. On each sampling day, the visits will start at a different location and at a different time of day to support random sampling during each circuit.

7.2. Recreation Use Visitor Intercept Surveys

A Recreation Use Visitor Intercept Survey Form is provided in Appendix B. The full set of questions is designed to collect information on group sizes, recreation activities, length of visit, crowdedness, user satisfaction, and site conditions.

Field technicians will visit each recreation site based on the schedule provided in Table 7-3. For the purposes of this study, the holidays include the 3 days of the holiday weekend: Memorial Day = May 29 to 31, 2027; Juneteenth = June 18 to 20, 2027; Independence Day = July 3 to 5, 2027; and Labor Day = September 4 to 6, 2027. Recreation use visitor intercept survey days will be conducted on the same days as spot counts, previously described in Section 7.1. Field technicians will be at each recreation site for approximately 1 hour conducting recreation use visitor intercept surveys. Two field technicians will be administering surveys on each survey day.

As part of the recreation use visitor intercept surveys, recreationists who indicate fishing as an activity they participated in will be asked a series of angling survey questions (Appendix B). These questions will collect angler characteristics (e.g., origin, gender, age, and group size); determine current angler timing, effort, harvest, composition, and success; and estimate catch-per-unit effort by species.

Survey clerks for recreation use visitor intercept surveys will be trained thoroughly as a means of quality control. Survey clerks will be provided with detailed information on the study schedule, appropriate materials to aid in data collection, and direction on appropriate interviewing techniques and attire.

8.0 Schedule, Periodic Reporting, and Consultation

REC-2 is proposed as a single-year study and will include a technical study report to be filed with FERC as part of the Initial Study Report for review and comment. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Recreation Use and Needs Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
Fall 2026 – Fall 2027	Conduct Study
September 2027	File Initial Study Report
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD initiated the relicensing process by filing the Pre-Application Document (PAD) and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. Table 8-2 lists the interested party comments and EBMUD responses relevant to REC-2.

Table 8-2. EBMUD response to comments received on study plans.

Date of Comment	Interested Party	Comment	EBMUD Response
06/22/2026	Cody Gold, District 2 Commissioner, Amador County Fish and Wildlife Commission	Comments on public hunting access opportunities on EBMUD-owned lands surrounding Pardee Reservoir and Camanche Reservoirs.	EBMUD will evaluate current recreation uses at the Project, including hunting, as part of the recreation use and needs study.
02/18/2026	Foothills Conservancy	Pardee Reservoir Swimming - Currently human body contact is not allowed in Pardee, restricting all swimming recreational activities. While similar restrictions exist on several Northern California Reservoirs built at the same time as Pardee, later reservoirs, including ones used for drinking water, do not. We believe that this restriction dates to the time when polio or other water-borne diseases were a danger. Given modern water treatment facilities, the Conservancy believes it is worth exploring a policy change to allow swimming in Pardee, which will increase its usefulness as a recreation facility and increase its visits and utilization.	By law, recreation in which there is bodily contact with the water is not allowed at reservoirs where water is stored for domestic use. The State Legislature has exempted certain reservoirs from this prohibition, but at Pardee Reservoir, recreation involving bodily contact is not allowed. This is due to drinking water quality standards and the expenses that would be involved in treating the water if this type of recreation was allowed. EBMUD provides and maintains a swimming pool at Pardee Recreation Area for visitors. In addition, there are a significant amount of swimming opportunities elsewhere in the Project boundary, including Camanche Reservoir and the Mokelumne River Day Use Area.

Date of Comment	Interested Party	Comment	EBMUD Response
02/18/2026	Foothills Conservancy	Improved Boat Facilities at Middle Bar - While regulations do allow boats to launch at Middle Bar, conditions are difficult for both boat take-in and take-out. The Conservancy would like to explore improvements that can be made to Middle Bar, such as trail improvements and the construction of a permanent boat ramp and to include this in the Recreational Facilities study.	EBMUD will include the Middle Bar Day Use Area in the REC-1 study and has added it to this REC-2 study.
02/18/2026	Foothills Conservancy	Geographic Origin included in Recreation Study - EBMUD will be conducting a Recreational Inventory and Recreational Use and Needs Study as part of this process. We ask that the geographic origins of visitors using the Project's recreation facilities be included in the survey. Knowing where the recreation facilities draw from - locals in Amador and Calaveras Counties, Central Valley Cities such as Sacramento or Stockton, the Greater Bay Area or beyond would be very helpful in evaluating the utility of the various facilities.	EBMUD will collect demographic data from users as part of the visitor intercept surveys in REC-2.
02/18/2026	Foothills Conservancy	Increase Public Access to Canyon and River Between Pardee and Camanche Reservoir. According to the Buena Vista Rancheria, this stretch of river was important fishing grounds for the local Sierra Miwok Tribe and descendants of the Buena Vista Rancheria as well as other seasonally migrating Miwok tribes. Historically, this stretch of river has been difficult, if not impossible, for the public to access recreational activities. Increased access would likely require cooperation with private landowners along the river to access EBMUD managed watershed areas.	Tribal interests and historic uses of the area will be discussed with Tribes as part of the Cultural Resources Studies. EBMUD does not plan to provide public access to the canyon below Pardee Dam for safety and access reasons.

Date of Comment	Interested Party	Comment	EBMUD Response
02/17/2026	CA Sport Fishing Alliance	CSPA is concerned about the limited public fishing access in reaches of the lower Mokelumne River between Camanche Dam and Woodbridge. This is particularly disappointing considering the relative success of the Mokelumne River Fish Hatchery in producing steelhead and salmon. CSPA requests information related to opportunities for expanded public access downstream of EBMUD's Day Use Area just downstream of the hatchery.	EBMUD is dedicated to ensuring continued success of the programs conducted at the Mokelumne River Fish Hatchery. The FERC Project boundary ends below the Mokelumne River Day Use Area, and EBMUD is not currently planning any actions related to recreation or access downstream as part of the FERC relicensing.
01/28/2026	Members of public during the scoping meeting	Summary of oral comments provided to the court reporter: 1. Maintain the trail as equestrian-only. 2. If bikes must be allowed, implement safety-oriented alternatives: -Separate trails for bicycles and horses -Alternating-use days (e.g., horse days vs. bike days) -Policies to manage speed or behavior of cyclists 3. Recognize equestrian needs as a legitimate recreation user group and protect the few remaining safe riding areas.	EBMUD intends to manage recreation trails for the safety of all users. Additionally, EBMUD's management of the trail segments in the watershed is conducted in accordance with the Mokelumne Watershed Master Plan.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating feedback from interested parties. The estimated cost for REC-2 ranges from $400,000 to $500,000.

10.0 References

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Appendix A

Recreation Use Spot Count Form

Lower Mokelumne Project				Site Name:									
Staff Person:				Weather:									
Date	Time	# of single vehicles	# of vehicles with boat trailers	# of people participating in:									
				Motorized Boating	Non-Motorized Boating	Fishing	Walk/ Hike/ Run	Picnic	Camping	Sightseeing/ birding/ photography	Other (number)	Other Activities Observed (list)	Notes

Appendix B
Recreation Use Visitor Intercept Survey Form and Angler Survey Form

Lower Mokelumne Recreation Use Survey

Clerk: _____ Site:_____ Date:_____ Time: am/pm ____

Weather: ☐ Sunny ☐ Partly Cloudy ☐ Cloudy ☐ Light Rain ☐ Heavy Rain

East Bay Municipal Utility District (EMBUD) welcomes you to the Lower Mokelumne River Hydroelectric Project (Project). If you have participated in any recreational activities at the publicly accessible recreation sites, please take a moment to complete this brief survey. Your input will assist EBMUD in determining if recreation sites, including the facilities and amenities, are meeting current recreational needs.

Section 1: Demographics

1. *Have you participated in this recreation survey before, at this site? If yes, thank you for your time. We are only interviewing each person once, per site, with this survey. If not, please continue with the survey.*

2. *Date survey is being administered: _____*

3. *Which recreation site did you visit today?*

   - ☐ Pardee Recreation Area
   - ☐ Camanche South Shore Recreation Area
   - ☐ Camanche North Shore Recreation Area
   - ☐ Mokelumne River Day Use Area
   - ☐ Camanche Hills Hunting Preserve
   - ☐ Middle Bar Day Use Area

4. *What country, state, and county do you live in? _____*

Section 2: Current Trip Information

5. *Including yourself, how many people are in your party today? _____ people in party*

6. *How did you/your group arrive at the recreation site? (select the one that best applies).*

- ☐ By vehicle
- ☐ By boat
- ☐ By bicycle
- ☐ On foot
- ☐ Other (fill in)

If you arrived by vehicle, how many vehicles did your group use to arrive at this site today?
_____

7. *Approximately how long (hours) was/will your/you visit to this recreation site today?*

_____ *Number of hours*

For campground users surveyed

Approximately how long (days) will you visit this recreation sites?

_____*Number of days*

8. *Please indicate which of the following recreational activities you are participating in on this trip (Mark all that apply):*

❑	*Camping*	❑	*Motorized Boating*	❑	*Day Hiking*	❑	*Photography*
❑	*Scenic Driving*	❑	*Non-motorized Boating*	❑	*Overnight Backpacking*	❑	*Viewing Scenery*
❑	*Picnicking*	❑	*Walking/Running*	❑	*Fishing*	❑	*Viewing Wildlife*
❑	*Relaxing*	❑	*Other:*				

9. *Of the activities listed above, please indicate which is the **primary** activity of this trip (Choose only one):*_____

Section 3: Visitor Perception and Experience

10. *How crowded was this site today?*

1 Extremely Crowded	*2 Moderately Crowded*	*3 Somewhat crowded*	*4 Slightly Crowded*	*5 Not Crowded*

11. *Did crowding impact your visit today? ❑ Yes ❑ No*

If yes, please explain how?

❑ Did not participate in activity

❑ Planned to return at a different time

❑ Changed activity

❑ Other, please specify _____

12. *Overall, please rate your satisfaction with the available recreation facilities and amenities at this site.*

1 Not Satisfied	*2 Slightly Satisfied*	*3 Satisfied*	*4 More than Satisfied*	*5 Excellent*	*Please explain ratings of 1 or 2*

13. *Please provide an overall rating of the **quality and condition** of the facilities and amenities at the recreation site you visited on this trip.*

	Poor		*Fair*		*Excellent*	*NA*	*Please explain ratings of 1 or 2*
Parking	*1*	*2*	*3*	*4*	*5*	*NA*	
Reservoir/River Access	*1*	*2*	*3*	*4*	*5*	*NA*	
Signage	*1*	*2*	*3*	*4*	*5*	*NA*	
Overall Site Condition	*1*	*2*	*3*	*4*	*5*	*NA*	

14. *How would you rate the **value** of this recreation site as a public recreation opportunity on a scale of 1 to 5?*

(Low) 1 2 3 4 5 (High)

15. *Are there any improvements to the **existing** facilities or amenities needed at this recreation site? Y or N*

If yes, please specify:

16. *Are there any additional facilities or amenities needed at this recreation site?*

Y or N

If yes, please specify:

17. *If you have visited other recreation sites, in the past year, within the Project boundary, please indicate which sites below, by season:*

Site	*Spring (Apr 1-May 31)*	*Summer (Jun 1-Aug 31)*	*Fall (Sep 1-Oct 31)*	*Winter (Nov 1-Mar 31)*
Pardee Recreation Area	❑	❑	❑	❑
Camanche South Shore Recreation Area	❑	❑	❑	❑
Camanche North Shore Recreation Area	❑	❑	❑	❑
Mokelumne River Day Use Area	❑	❑	❑	❑
Camanche Hills Hunting Preserve	❑	❑	❑	❑
Middle Bar Day Use Area	❑	❑	❑	❑

Thank you for your time and input.

Angler Survey

FOR ANGLERS ONLY

Number of anglers in party	
What time did you start fishing?	
How much longer will you fish?	
Target Species (primary)	
2nd Target Species (If applicable)	
How often (frequency) do you fish in the area?	*Examples: Just passing through # times per year*
What other nearby locations do you fish?	
How do you define quality of fishing?	Fish Species Size Catch Rate Natural Setting Solitude Park Amenities Water Access Proximity *Any other potential variables*
How does fishing quality compare here to other nearby locations you've fished this trip? (If applicable)	
How does overall fishing quality here compare to past experiences here? (If applicable)	

BIOLOGICAL DATA (Enter total number of harvested (H) and released (R) fish in each size class)

Species	<8 in.	8 in.	9 in.	10 in.	11 in.	12 in.	13 in.	14 in.	15 in.	16 in.	17 in.	18 in.	19+ in.
Rainbow trout													
Brook trout													
Brown trout													
Other													
Notes													

CULTURAL RESOURCES STUDY PLAN (CR-1)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

CULTURAL RESOURCES STUDY PLAN (CR-1)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916

East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

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Terms and Abbreviations

A	
APE	Area of Potential Effect
C	
CFR	U.S. Code of Federal Regulations
Commission	Federal Energy Regulatory Commission
CRMP	Cultural Resources Management Plan
D	
DPR	Department of Parks and Recreation
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
G	
GIS	Geographic Information System
GPS	Global Positioning System
H	
HPMP	Historic Properties Management Plan
N	
National Register	National Register of Historic Places
NHPA	National Historic Preservation Act of 1966
NPS	National Park Service
O	
OHP	California Office of Historic Preservation
P	
PAD	Pre-Application Document
PG&E	Pacific Gas and Electric Company
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
S	
SD1	Scoping Document 1

SD2	Scoping Document 2
T	
TCP	Traditional Cultural Property
TCR	Tribal Cultural Resource
TWG	Technical Working Group

1.0 Introduction

The East Bay Municipal Utility District (EBMUD) has identified the need to conduct cultural resource studies, including inventories of archaeological sites, built-environment resources, Traditional Cultural Properties (TCPs), and Tribal Cultural Resources (TCRs). The Cultural Resources Study (CR-1) will consider archaeological sites and built-environment resources. Native American TCPs and TCRs will be considered within the Tribal Ethnography Resources Study (CR-2).

The relicensing of the Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916, Lower Mokelumne River Project or Project) is a federal undertaking that requires compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA). Therefore, the Project's relicensing requires consideration of the effects on historic properties (i.e., sites, buildings, structures, objects, or districts that are listed or eligible for listing on the National Register of Historic Places [National Register]) within the Project boundary or where the Project may have effects outside of the Project boundary.

Accordingly, as part of the relicensing effort, studies will be required to identify known and potential historic properties, to evaluate their eligibility for listing on the National Register, and to develop measures for avoiding or resolving adverse Project effects.

This CR-1 plan details the objectives, geographic extent, and methods for proposed cultural resources inventories to be completed as part of the relicensing effort. These studies will in turn inform the future development of a Historic Properties Management Plan (HPMP), which will consider the effects of continued Project operations and maintenance on the historic properties of the Project area. Effects may be direct (e.g., result of ground-disturbing activities), indirect (e.g., public access to Project areas), or cumulative (e.g., caused by a Project activity or public access in combination with other past, present, and reasonably foreseeable future projects).

Among the effects to be considered in the Section 106 compliance process are those on elements of cultural and religious significance to Native American Tribes. These effects and their potential resolutions are identified by formal consultation and are described further in Section 5.3 of this study plan.

2.0 Study Goals and Objectives

The goals and objectives of CR-1 are as follows:

- Meet FERC compliance requirements under Section 106 of the NHPA, as amended, by determining if Project-related activities and public access will have an adverse effect on historic properties.
- Identify all archaeological sites and built-environment resources within the Area of Potential Effect (APE).
- Determine historic properties and cultural resources.
- Support development of the HPMP.

3.0 Geographic Scope

Under Title 36 of the U.S. Code of Federal Regulations (CFR) Section 800.16(d), the APE is defined as “the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historical properties, if any such properties exist.” For cultural resources, the Project boundary equates to the APE.

The CR-1 study area also encompasses a 0.25-mile buffer around the Project boundary/APE to provide background on a wider range of archaeological resources (Figure 3-1). This range would include potentially significant resources that may be located just outside the Project boundary that may be affected by Project operations and maintenance.

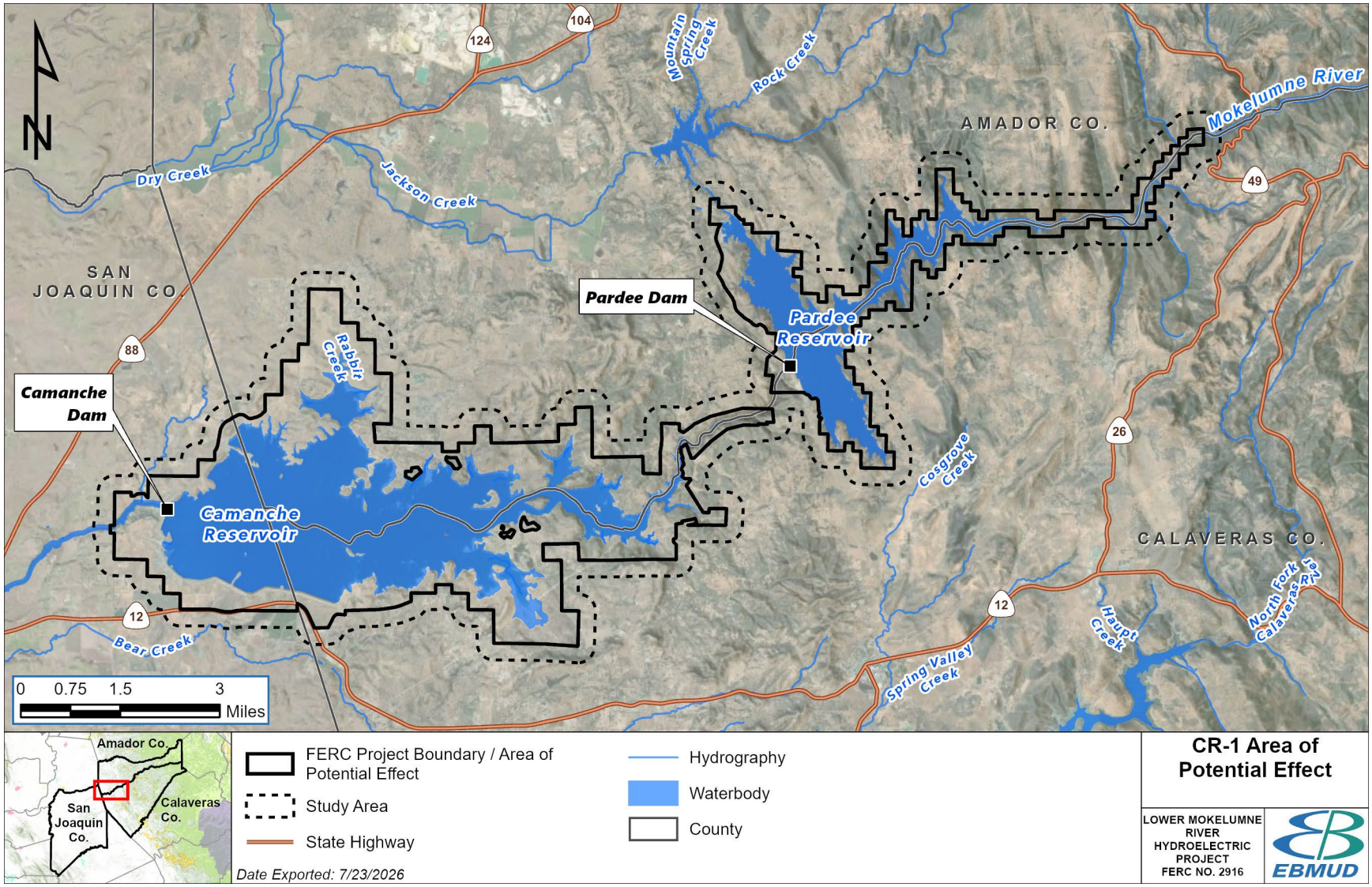


Figure 3-1. CR-1 proposed Area of Potential Effect.

4.0 Existing Information and Need for Additional Information

The primary information sources for this summary are the Camanche and Pardee Reservoirs Cultural Resources Management Plan (CRMP; DeBaker and Siskin 2019) and the recent historic property survey by Demarais et al. (2023). As part of the background research for the 2019 CRMP, cultural resources records searches were conducted at the Northern California Information Center of the California Historical Resources Information System (for portions of the study area within Amador County) and the Central California Information Center (for Calaveras and San Joaquin counties). An updated records search was requested in 2021 as part of the 2023 built-environment survey, though it was not discussed in the main text. This review presents the updated records search data, with some modifications to remove redundant entries.

4.1. Previous Studies

Formal archaeological study of the area began in the 1950s through the early 1960s, with reconnaissance surveys and excavations conducted in advance of the construction of Camanche Reservoir (Payen 1962; Johnson 1967). These studies predated the advent of the NHPA, and there was no expectation of systematic inventory or consultation over effects on cultural resources. These early studies provide the bulk of information about the precontact archaeological resources of the area. Many of the archaeological sites then recorded have since been inundated by the filling of Camanche Reservoir.

Subsequent cultural resources studies began in the early 1980s and continue to the present day. These studies have been driven by compliance with cultural resources law, many on behalf of EBMUD, but also the Bureau of Land Management, Pacific Gas and Electric Company (PG&E), and other agencies. Some 40 archaeological studies have taken place within the study area. Most of these are small surveys, which in aggregate cover only a small fraction of the study area.

Surveys of built-environment resources include the Penn Mine project (Nilsson et al. 1999), and, in advance of the current relicensing effort, a built-environment survey of the FERC boundary was recently conducted (Demarais et al. 2023), as discussed below, providing an essentially complete inventory of these resources.

4.2. Previously Recorded Resources

Cultural resources of the Project area include built-environment resources (historic properties), archaeological sites, and (potentially) Tribal cultural resources.

4.2.1. Built-Environment Resources

The 2023 built-environment inventory formally recorded 54 built-environment resources within the FERC boundary and identified 43 more potential properties that were not formally recorded, mostly because their ages could not be determined. Most of the recorded resources are associated with EBMUD's development of the Pardee and Camanche reservoirs and with recreational development. (Demarais et al. 2023)

There are two National Register-listed historic properties in the APE, including the Middle Bar Bridge at the upstream end of Pardee Reservoir and the Pardee Dam and Reservoir System District, the latter including the main Pardee Dam and Powerhouse, the Jackson Creek Spillway, Pardee South Spillway, and the Pardee Outlet Tower as contributing elements. Demarais et al. (2023) also recommended the portion of the Mokelumne Aqueduct within the FERC boundary as eligible. The Penn Mine Historic District has been determined National Register-eligible, but Demarais et al. recommended re-evaluation due to the time elapsed since that determination.

Demarais et al. (2023) recommended 46 other recorded resources not eligible for the National Register, or not suitable for evaluation because they were not of sufficient age. Some resources, such as the system of dikes on Camanche Reservoir, were recommended individually ineligible, but potentially eligible as contributing elements of a district not yet formally recorded.

4.2.2. Archaeological Sites

There are 175 recorded archaeological sites within the study area, of which 122 are within the FERC boundary. The 175 sites include 114 precontact sites, 25 dating to the historic period, 8 with both precontact and historic-period components, and 28 for which no information was available because the studies were in progress at the time of the records searches.

4.2.3. Religious and Cultural Significance to Tribes

In addition to this study, a separate Tribal Ethnography Resources Study (CR-2) will take place. To date, no TCPs or other places of religious or cultural significance to Native American Tribes have yet been formally recorded in the study area. These must be identified via Tribal consultation, which will take place during the Tribal Ethnography Resources Study (CR-2). NHPA regulations require that consultation provides the Tribe(s) with a reasonable opportunity to identify their concerns about historic properties; advise on the identification and evaluation of historic properties, including those of traditional religious and cultural importance; articulate their views on the undertaking's effects on such properties; and participate in the resolution of adverse effects.

5.0 Study Methodology

Based on the existing data described above, a reasonable and good-faith effort is required to identify historic properties that may be affected by the Project. As described in 36 CFR Section 800.4(b)(1), this may be accomplished through sample field investigations and/or field surveys that are implemented in accordance with the Secretary of the Interior's Standards and Guidelines for Identification (National Park Service [NPS] 1983). FERC is required to consider any other applicable professional standards and Tribal, state, or local laws or procedures to complete the identification of historic properties.

A Cultural and Tribal Resources Technical Working Group (TWG) will be convened as needed through August 2028, when the Updated Study Report is filed, to collaborate and provide input on the cultural and Tribal resources studies (CR-1 and CR-2). EBMUD is available at any time to meet with Tribes outside of the TWG and has strict confidentiality protocols that will be adhered to in the TWG.

5.1. Archaeological Inventory

To assist FERC in meeting its compliance obligations, and to develop appropriate management measures for historic properties within the APE, EBMUD will complete an archaeological inventory.

The general standard for archaeological inventories in the region is pedestrian surface survey, with systematic, complete coverage via controlled transects. While surface survey alone may fail to identify deeply buried sites, most subsurface deposits do have some surface indications, such as cultural materials in rodent burrow back dirt.

5.1.1. Records Search Update and Additional Background Research

As part of the inventory, an up-to-date accounting of all previously recorded archaeological sites within the APE will be required, as all such sites must be accounted for during the field survey. The archaeological records search for the APE was last updated in 2021. This search should be updated to include more recent work as part of this study.

Additional background research should also be conducted as part of a more complete records search effort, primarily to provide context for historic-period sites discovered during survey. This would include searches of land patents; Government Land Office plats; historical maps and aerial photos; census records; newspaper accounts; scholarly research; and any relevant maps or other materials at EBMUD offices.

5.1.2. Field Survey

The field survey will be supervised by one or more qualified professional archaeologists (i.e., individuals who meet the Secretary of the Interior's Professional Qualifications Standards for Archaeology at 36 CFR Part 61) who will participate in all field work. Field surveys must include a Cultural Representative, at the Tribe's option.

During the survey, archaeologists will walk parallel transects spaced at no more than 20 meters (approximately 22 yards), as vegetation and terrain allow within the Project's study area (APE 0.25-mile buffer). If conditions allow, lands typically inundated by Project reservoirs will be examined if they become accessible during the survey season. Areas within the study area that cannot be accessed in a safe manner (e.g., locations with dense vegetation or unsafe slopes) will not be included within the survey or recording of archaeological resources; these areas will be identified in the resulting survey report, and an explanation for variations in survey coverage will be provided.

Locations of previously recorded archaeological sites will be verified, and their site records will be updated when the existing documentation does not meet current standards for recording or if the condition and/or integrity of the property has changed since its previous recording. The archaeologists will determine if sketch maps for previously documented sites require revision to describe current site conditions more accurately.

Newly discovered archaeological resources, including isolated finds, will be documented following the documentation procedures outlined in *Instructions for Recording Historical Resources* (California State Office of Historic Preservation [OHP] 1995), which utilizes California Department of Parks and Recreation (DPR) 523 forms. Sketch maps will be drawn to scale. All site constituents, including artifacts and features, will be described, photographed, and mapped.

Field personnel will use global positioning system (GPS) receivers to document the location of cultural resources, including site boundaries, artifacts (including isolates), and features. These data will be compiled in a Project-wide geographic information system (GIS) and provided to EBMUD at the conclusion of the survey to assist with future management of these resources.

Detailed protocols for field survey, including Tribal involvement, and procedures to follow in the event of discovery of human remains, are laid out in the 2019 CRMP.

Agreements between EBMUD and Tribes interested in participating in the field surveys as Tribal monitors will be established.

5.1.3. National Register Evaluation

National Register evaluations will be completed where applicable and where sufficient information is available. However, archaeological sites often cannot be evaluated at the survey phase, unless they can be found to contain National Register-eligible qualities based on surface features alone (e.g., pictographs) or ineligible due to a clear lack of physical integrity (e.g., redeposited materials). Some sites will therefore remain unevaluated and treated as eligible for the National Register until further formal evaluations can take place. Detailed, site-specific recommendations, as part of relicensing, for formal evaluations will be developed in the HPMP.

Archaeological site locations are considered highly sensitive due to the potential for intentional or accidental damage and looting should these locations become known to the general public. All site records and figures depicting site locations will be contained in confidential appendices in the inventory report and must be treated as confidential throughout the relicensing process.

5.2. Built-Environment Inventory

Inasmuch as a detailed built-environment survey of the APE has recently been completed (Demarais et al. 2023), EBMUD has already met its mandate to make a reasonable and good-faith effort to identify these resources. The 2023 survey made several recommendations that EBMUD will address in this study.

5.3. Coordination with Other Studies

To the extent feasible, archaeological and built-environment resources field studies will be coordinated with each other and with other Project-related studies, in particular the Tribal Ethnography Resources Study (CR-2), and information shared as appropriate. Native American TCPs, while a type of historic property subject to Section 106 of the NHPA, will be documented via consultation, as described in the Tribal Ethnography Resources Study (CR-2). Any non-Native TCPs will be documented as part of the built-environment and/or archaeological inventories.

Cultural field studies should be conducted in a manner that does not affect other sensitive natural resources. Project sponsors and/or their contractors should not violate other federal or state laws or regulations protecting natural resources, including but not limited to the Endangered Species Act and Clean Water Act. Project sponsors should consider that Tribes may use natural resources for subsistence or specific ceremonial uses and should avoid affecting those uses or events while conducting studies.

EBMUD understands that Tribal interests extend beyond the resources identified in this study. For this reason, study implementation will be coordinated with both the TERR-1 and TERR-2 studies to ensure wildlife and botanical species with cultural significance within the study area are identified and included in the final reports.

6.0 Reporting and Historic Properties Management Plan

The non-privileged results of the study will be reported in Exhibit E of the License Application, which will include a summary of the information and findings of the technical studies. Figures and other pertinent data supporting the summary in Exhibit E will be appended to the License Application. The archaeological records and other sensitive information will be included in a confidential appendix withheld from public disclosure, in accordance with Section 304 (16 United States Code 4702-3) of the NHPA.

It is anticipated that FERC will enter into a programmatic agreement with the Advisory Council on Historic Preservation, OHP, and any other agencies or entities FERC elects to include. One of the programmatic agreement stipulations will be the completion and implementation of an HPMP to be included with the License Application.

The HPMP will consider direct and indirect effects of continued Project operations and maintenance on National Register-listed or eligible archaeological and built-environment resources and will require avoidance and protection of specified resources, whenever possible. Processes and procedures will be developed for general and site-specific treatment measures, including minimization and mitigation measures to be taken should license implementation create unavoidable adverse effects to historic properties. The HPMP will include an Evaluation Plan and schedule for evaluating unevaluated resources.

7.0 Schedule, Periodic Reporting, and Consultation

CR-1 is proposed as a 2-year study and includes a draft technical study report to be filed with FERC as part of the Initial Study Report for review and comment, and a final technical study report to be filed with FERC as part of the Updated Study Report. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 7-1 below.

Table 7-1. Potential Cultural Resources Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
September 2026 – August 2028	Conduct Study
September 2027	File Initial Study Report
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

7.1. Consultation Record

EBMUD hosted Early Engagement meetings in September and October 2024 to help inform data gathering and identify interested parties and potential concerns, including a session for Tribes specifically that was held on October 2, 2024. EBMUD also hosted a FERC Relicensing Project "Open House" on October 29, 2024, at Pardee Center and invited community groups, resource agencies, Tribes, and other interested parties. EBMUD hosted a TWG with Tribes on August 25, 2025. EBMUD also held individual meetings with the Buena Vista Rancheria Tribe on February 25, 2026, the California Valley Miwok Tribe on March 23, 2026, and the Ione Band of Miwok Indians on June 11, 2026.

EBMUD initiated the relicensing process by filing the Pre-Application Document (PAD) and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. There were no comments received relevant to CR-1.

8.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating stakeholder feedback. The estimated cost for CR-1 ranges from $1,000,000 to $1,500,000.

9.0 References

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TRIBAL ETHNOGRAPHY RESOURCES STUDY PLAN (CR-2)

Lower Mokelumne River Hydroelectric Project

FERC Project No. 2916



East Bay Municipal Utility District
375 11th Street
Oakland, California 94607

July 2026

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Terms and Abbreviations

A	
ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effect
C	
CFR	U.S. Code of Federal Regulations
Commission	Federal Energy Regulatory Commission
CRMP	Cultural Resources Management Plan
D	
DPR	Department of Parks and Recreation
E	
EBMUD	East Bay Municipal Utility District
F	
FERC	Federal Energy Regulatory Commission
H	
HPMP	Historic Properties Management Plan
L	
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
N	
NAHC	Native American Heritage Commission
National Register	National Register of Historic Places
NHPA	National Historic Preservation Act of 1966
NRB	National Register Bulletin
P	
PAD	Pre-Application Document
Project	Lower Mokelumne River Hydroelectric Project (FERC Project No. 2916)
PSP	Proposed Study Plan
O	
OHP	California Office of Historic Preservation

S	
SD1	Scoping Document 1
SD2	Scoping Document 2
T	
TCP	Traditional Cultural Property
TWG	Technical Working Group

1.0 Introduction

The East Bay Municipal Utility District (EBMUD) has identified the need to conduct a Tribal Resource Ethnographic and Ethnohistoric Research Study (Tribal Ethnography Resources Study ; CR-2) for the relicensing of the Lower Mokelumne River Hydroelectric Project (Federal Energy Regulatory Commission [FERC or Commission] Project No. 2916, Lower Mokelumne River Project or Project). There has been minimal investigation to date of the following: 1) the Native American ethnography of the Project area, 2) the potential for Native American Traditional Cultural Properties (TCPs), or 3) the potential for other Native American resources, some of which may be eligible for listing in the National Register of Historic Places (National Register). CR-2 is intended to address the need to conduct this research. Potential resource areas include TCPs; Tribal economic ventures; resources of traditional, cultural, or religious importance; and environmental considerations of importance to the Native American community.

2.0 Study Goals and Objectives

The principal goal of this CR-2 study plan is for EBMUD to assist FERC, as its non-federal representative, in meeting its compliance requirements under Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, by determining if licensing of the Project will have an adverse effect upon historic properties, in this case Tribal resources. Following Title 18 of the U.S. Code of Federal Regulations (CFR) Sections 5.6 (d)(3)(xii) and 5.9(b)(1), the goals and objectives of the CR-2 plan are to identify Tribal resources that may be affected by operations and maintenance of the Project. Tribal resources will be identified through archival research, oral interviews, and field visits and to ensure that such places are not affected by ongoing operation and maintenance. Initial archival research has indicated that an ethnographic overview of the Project area has not yet been conducted.

3.0 Geographic Scope

Under 36 CFR Section 800.16(d), the Area of Potential Effect (APE) is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historical properties, if any such properties exist." For Tribal resources, the Project boundary is preliminarily assumed to equate to the APE. The overall proposed CR-2 study area, however, encompasses a larger area comprising a 0.25-mile buffer around the APE (Figure 3-1).

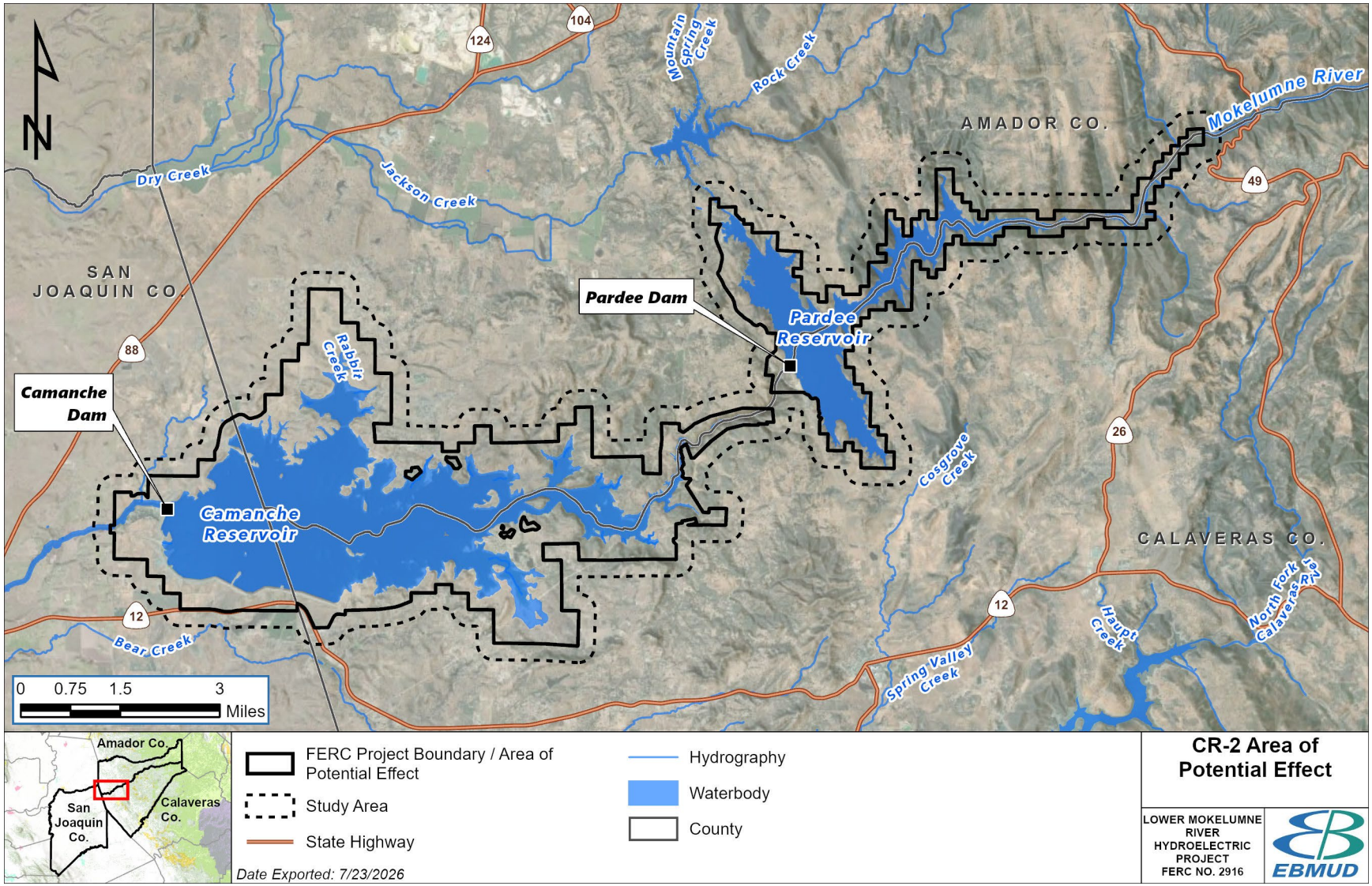


Figure 3-1. CR-2 proposed Area of Potential Effect.

4.0 Existing Information and Need for Additional Information

The primary source of information about Tribal resources and interests, which will be gathered via future consultation, is the interested Tribes themselves. In the interim, this review uses existing ethnographic literature (Merriam 1907; Kroeber 1925; Levy 1978) as summarized in the 2019 Cultural Resources Management Plan (CRMP; DeBaker and Siskin 2019).

The state Native American Heritage Commission (NAHC) maintains a list of potentially interested Tribes that project proponents can request at the outset of consultation. EBMUD obtained a list for the current Project (see Interested Tribes in Section 4.2 below).

4.1. Ethnography

The Camanche and Pardee reservoirs region is located along an indistinct territorial boundary of the Plains Miwok, the Northern Sierra Miwok, and the Northern Valley Yokuts (Merriam 1907). The Sierra Miwok encompassed the western slopes of the Sierra Nevada between the Fresno River to the south and the Cosumnes River to the north and extended into the lower foothills along the eastern edge of the Central Valley. Kroeber (1925) indicated that the sites fall within the territory of the Northern Sierra Miwok and depicted the ethnographically recorded villages of *Upüsüni*, located approximately 4.5 miles north along Jackson Creek, and *Sakayak-ümni*, located approximately 7 miles west along the Mokelumne River downstream of the Camanche Reservoir. A discussion of the traditional lifeways of these groups is presented in Section 4.10, Cultural Resources, in the Pre-Application Document (PAD). Today, these groups are represented politically by a variety of organized Tribes, both federally and state recognized.

4.2. Interested Tribes

EBMUD has identified the following Tribes who may have an interest in the Project area, including both federally recognized and other NAHC-listed Tribes:

- Buena Vista Rancheria of Me-Wuk Indians
- Calaveras Band of Mi-Wuk Indians
- California Valley Miwok Tribe
- Chicken Ranch Rancheria of Me-Wuk Indians
- Colfax-Todds Valley Consolidated Tribe of the Colfax Rancheria

- Ione Band of Miwok Indians
- Jackson Rancheria Band of Miwuk Indians
- Nashville Enterprise Miwok-Maidu-Nishinam Tribe
- North Valley Yokuts Tribe
- Pakan'yani Maidu of Strawberry Valley Rancheria
- Shingle Springs Band of Miwok Indians
- Susanville Indian Rancheria
- Tule River Indian Tribe
- United Auburn Indian Community of the Auburn Rancheria
- Washoe Tribe of Nevada and California
- Wilton Rancheria

4.3. Current Cultural Resource Management

Working in consultation with the Calaveras Band of Mi-Wuk Indians, EBMUD prepared a CRMP for Camanche and Pardee reservoirs in 2019. The CRMP outlines the regulatory requirements related to protecting and preserving archaeological and Native American resources. It identifies the range of anticipated cultural and Tribal resources that might be found in the vicinity of the two reservoirs and describes protocols and management measures for archaeological and Tribal cultural resources. The CRMP also outlined a decision-making process for determining if activities on the watershed require FERC approval and/or State Historic Preservation Office consultation, and it includes protocols, monitoring, and management guidelines in the event that cultural resources are identified. The CRMP contains confidential culturally privileged information and will be updated continuously in consultation with Tribes and will assist EBMUD in the development of a Historic Properties Management Plan (HPMP).

No TCPs or other Tribal resources are currently documented within the study area. However, Tribes have a demonstrated interest in preserving the many precontact and ethnohistoric archaeological sites within the Project area.

5.0 Study Methodology

The study investigation will make a good-faith effort for proper communication with Tribal leaders as laid out in FERC's *Policy Statement on Consultation with Indian Tribes in Commission Proceedings*, issued July 23, 2003 (Docket No. PL03-4-000; Order No. 635). There was also a FERC revision for conducting consultation with Indian Tribes issued on October 17, 2019 (Docket No. PL20-1-000; Order No. 863). The investigation will follow FERC Regulations at 18 CFR Section 2.1c, which added a policy statement on consultation with Tribes in FERC proceedings.

All phases of the study investigation will be conducted in accordance with the Native American community consultation standards outlined by the implementing Regulations of Sections 101 and 106 of the NHPA and discussed in the 2012 Advisory Council on Historic Preservation (ACHP) publication *Consultation with Indian Tribes in the Section 106 Review Process: A Handbook*.

Potential TCP documentation, consultation, and any necessary fieldwork will be implemented in accordance with Section 106 of the NHPA, as amended, and shall take into consideration National Register Bulletin (NRB) No. 38, *Guidelines for Evaluating and Documenting Identification of Traditional Cultural Properties* (Parker and King 1998).

Study documentation will also be implemented in accordance with FERC Regulations and with Section 106 of the NHPA, as amended, if such resources are potential historic properties, and shall take into consideration NRB No. 38 (Parker and King 1998), among other NRBs.

National Register evaluations will be conducted in adherence with NRB No. 15, *How to Apply the National Register Criteria for Evaluation* (National Park Service 1997), and other NRBs as appropriate.

A Cultural and Tribal Resources Technical Working Group (TWG) will convene to collaborate and provide input on the cultural and Tribal resources studies (CR-1 and CR-2) throughout study implementation. EBMUD is available at any time to meet with Tribes outside of the TWG and has strict confidentiality protocols that will be adhered to in the TWG.

5.1. Archival Research

As needed during the implementation of the study, archival research will be conducted at most of the repositories identified in the following text to obtain additional information

specific to the prehistory, ethnography, and history of the Project area. The results of the archival research will 1) provide primary data to create a background Native American ethnohistory of the proposed study area; and 2) inform the Tribal resources historic context against which such resources may be evaluated for the National Register.

The EBMUD ethnographer will conduct background archival research of the study area; the Tribes are also invited to do so. This will involve visits to many repositories, which may include the following:

- California State Archive, Sacramento
- California State Library, California History Room, Sacramento
- Huntington Library, San Marino
- Merriam (C. Hart) and Harrington (J.P.) notes
- National Archives and Records Administration, San Bruno
- University of California Bancroft Library, Berkeley
- University of California, C. Hart Merriam Collection, Davis

5.2. Meetings with Tribal Governments

During the relicensing, EBMUD will conduct meetings with Tribal governments or administrators, and/or attendance at Tribal Council meetings is proposed to provide Project data to Tribal groups, elicit areas of interest, identify appropriate Tribal informants, and establish protocols for conveying information.

All the Tribal groups listed in Section 4.2 above will be contacted via telephone, letter, or email at a minimum to elicit their interest.

5.3. Interviews

Interviews are critical for identification, description of significance, and evaluation of potential effects to Tribal resources. EBMUD proposes conducting interviews with interested and responsive Tribes to better understand their priorities and perspectives. Individuals to interview will be identified in collaboration with each participating Tribe. The methods and nature of the interviews are expected to vary from person to person: some interviews may be held in the field Project area, others held in private homes, and still others held via telephone or teleconference. Interview records are similarly likely to be variable regarding confidentiality protocols and the Tribal expert's willingness to share. Recording methods (e.g., handwritten notes, video, audio tape) will be determined by consulting with the informant.

5.4. Documentation and Evaluation

Three main categories of Tribal resources are anticipated, which include 1) Tribal places; 2) TCPs; and 3) Tribal government matters. Each category will be documented in a different manner. Tribal places may be potential historic properties, places associated with the ancestral past, places related to current gathering and/or hunting practices, or other resource types. Those that qualify as potential historic properties will be documented on California Department of Parks and Recreation (DPR) 523 forms as appropriate and with Tribal permission, while others will be described in the study. TCPs will be documented on DPR 523 forms, with Tribal community permission, and Tribal government resources may be documented in the study or may be larger or different resource types (e.g., documentation of Indian allotments in the study area). All resources will be documented and described according to Tribal values and submitted for review to Tribal representatives. National Register evaluation of Tribal resources suitable for DPR 523 documentation will use site-specific procedures to identify historic context of the resource, boundaries, jurisdiction or land ownership, Tribal significance, integrity from a Tribal perspective, and contributing characteristics. Evaluation of other resource types may occur at the managerial or agency level. After documentation is complete, it will be provided for review and comment to the California State Office of Historic Preservation (OHP) and the Tribes.

5.5. Coordination with Other Studies

Other resource areas may have a connection to Tribal resources. This includes not only cultural resources, but also biological areas, water, trails, and recreation. As needed, the Tribal resource expert will work to assist other resource experts in identifying Tribal resources with connections to their technical study. Assistance to the cultural resource team is anticipated to aid field identification and documentation of historic Native American resources, potential gathering areas, and other places that may have value to Indian Tribes.

EBMUD understands that Tribal interests extend beyond the resources identified in this study. For this reason, study implementation will be coordinated with both the TERR-1 and TERR-2 studies to ensure wildlife and botanical species with cultural significance within the study area are identified and included in the final reports.

6.0 Reporting

The non-privileged results of CR-2 will be reported in Exhibit E of the License Application, which will include a summary of the information and findings of the technical study. Figures and other pertinent data supporting the summary in Exhibit E will be appended to the License Application. Tribal resource documentation and other sensitive information will be included in a confidential appendix withheld from public disclosure, in accordance with Section 304 (16 United States Code 4702-3) of the NHPA. The California Public Records Act similarly exempts site data from disclosure, while Public Resources Code Section 21082.3(c) contains provisions specific to confidentiality related to any information submitted by a Native American Tribe during the environmental review process, including, but not limited to, the location, description, and use of the Tribal cultural resources.

A draft detailed technical report will be prepared and provided for review to the OHP and Tribes to include 1) regulatory, environmental, and cultural contextual statements; 2) discussion of research methods; 3) discussion of Tribal resources that are not also cultural resources; 4) description and evaluation of resources that are assessed as potential historic properties; and 5) conclusions, to include management considerations. Appendices are anticipated to include ethnobiological tables, chronological contact logs, specific historical reference materials, and more. The study will identify all potential and actual Project effects from a Tribal perspective, provide Tribal suggestions for mitigation or modification of impacts, and provide a structural basis for FERC to conduct their National Environmental Policy Act analysis for this technical resource area.

7.0 Historic Properties Management Plan

It is anticipated that FERC will enter into a programmatic agreement with the ACHP, California OHP, and any other agencies or entities FERC elects to include. One of the programmatic agreement stipulations will be the completion and implementation of an HPMP to be included with the license or License Application.

The HPMP will consider direct and indirect effects of continued Project operation and maintenance on National Register-eligible and unevaluated Tribal resources, and it will require avoidance and protection of specified resources, whenever possible. Processes and procedures will be developed for general and resource-specific treatment measures, including mitigation measures to be taken should license implementation create unavoidable adverse effects to historic properties.

8.0 Schedule, Periodic Reporting, and Consultation

CR-2 is proposed as a single-year study and will include a technical report to be filed with FERC as part of the Initial Study Report for review and comment. A draft study schedule based on FERC's Study Plan Determination issuance of September 2026 is provided in Table 8-1 below.

Table 8-1. Potential Tribal Ethnography Resources Study schedule.

Date	Activity
September 2026	FERC Study Plan Determination
September 2026 – August 2027	Conduct Study
September 2027	File Initial Study Report
August 2028	File Updated Study Report
November 2028	File Draft License Application
April 2029	File Final License Application

8.1. Consultation Record

EBMUD hosted Early Engagement meetings in September and October 2024 to inform data gathering and identify interested parties and potential concerns, including a session for Tribes specifically that was held on October 2, 2024. EBMUD also hosted a FERC Relicensing Project "Open House" on October 29, 2024, at Pardee Center and invited community groups, resource agencies, Tribes, and other interested parties. EBMUD hosted a TWG with Tribes on August 25, 2025. EBMUD also held individual meetings with the Buena Vista Rancheria Tribe on February 25, 2026, the California Valley Miwok Tribe on March 23, 2026, and the Ione Band of Miwok Indians on June 11, 2026.

EBMUD initiated the relicensing process by filing the PAD and Notice of Intent on October 20, 2025, which included a preliminary list of potential studies for consideration. FERC subsequently issued Scoping Document 1 (SD1) on December 31, 2025, identifying preliminary issues and alternatives for analysis during the environmental review process. The comment period for both the PAD and SD1 closed on February 17, 2026. FERC then issued Scoping Document 2 (SD2) on April 1, 2026, superseding SD1, and EBMUD filed its Proposed Study Plan (PSP) the following day. An in-person PSP meeting was held on April 29, 2026, and comments on the PSP were accepted through July 3, 2026. There were no comments received relevant to CR-2.

9.0 Level of Effort and Cost

The methods and approach described in this study plan were selected as representing an appropriate balance between cost effectiveness and level of effort while meeting the study objectives. The study schedule and materials have been developed to streamline time and effort by building on existing information, filling data gaps, and incorporating stakeholder feedback. The estimated cost for CR-2 ranges from $500,000 to $1,000,000.

10.0 References

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Attachment B

Proposed Study Plan Comment Letter

Cody Gold, Ione, CA.
Dear Commissioners and EBMUD Relicensing Staff:
I am submitting these comments as the District 2 Representative on the Amador County Fish and Wildlife Commission regarding the East Bay Municipal Utility Districtâ€™s (EBMUD) relicensing of the Lower Mokelumne River Watershed Project.
As part of the relicensing process, I respectfully request that EBMUD evaluate and expand public hunting access opportunities on EBMUD-owned lands surrounding Pardee Reservoir and Camanche Reservoir. EBMUD manages thousands of acres of habitat that support healthy populations of mule deer, wild turkey, and other wildlife species. These lands represent a valuable public resource that could provide meaningful outdoor recreation, wildlife conservation, and youth engagement opportunities for residents of Amador, Calaveras, and neighboring counties.
Under the Federal Power Act, FERCâ€™s licensing process considers not only power generation and environmental protection, but also public recreation, access, and the balanced use of project lands for the benefit of surrounding communities. I believe expanded hunting opportunities on suitable EBMUD lands are consistent with these objectives and should be evaluated as a component of the projectâ€™s recreational resources and public access programs.
Currently, EBMUD provides limited hunting opportunities through the Camanche Hills Hunting Preserve. While this program offers pheasant and waterfowl hunting opportunities, access is largely membership-based and does not provide opportunities for deer or turkey hunting across the broader EBMUD land holdings surrounding the reservoirs. As a result, many local youth hunters and sportsmen have little opportunity to access these publicly managed lands for big game and turkey hunting.
As part of relicensing, I encourage EBMUD to work collaboratively with the California Department of Fish and Wildlife to establish controlled public hunting opportunities utilizing one or more of the following mechanisms:
â€¢ Junior deer hunts administered through a controlled draw system.
â€¢ Junior turkey hunts designed to provide mentored hunting opportunities for youth.
â€¢ Limited-entry late-season buck hunting opportunities.
â€¢ Participation in the California Department of Fish and Wildlifeâ€™s Shared Habitat Alliance for Recreational Enhancement (SHARE) Program.
â€¢ Private land management hunt opportunities administered through existing California Department of Fish and Wildlife drawing systems.
These programs would allow EBMUD to maintain strict control over hunter numbers, timing, and access while providing safe, managed recreational opportunities. Similar programs throughout California have demonstrated that controlled-access hunting can successfully balance wildlife management objectives, habitat protection, public safety, watershed protection, and public recreation.
In addition to providing recreational opportunities, hunting serves as an important wildlife management and conservation tool. Hunters contribute significantly to wildlife conservation through the purchase of hunting licenses, tags, and equipment. Revenue generated through hunting license sales and federal excise taxes collected under the Pittman-Robertson Wildlife Restoration Act provides critical funding for habitat improvement, wildlife research, species management, hunter education, and public access programs throughout California and the nation. Expanding access to hunting opportunities on EBMUD lands would support these conservation efforts while fostering the next generation of responsible outdoor stewards.
Expanding hunting opportunities on EBMUD lands would provide several important public benefits:
1.Increased access for youth hunters and families who often have limited opportunities to hunt quality habitat.
2.Expanded recreational opportunities on lands that are currently inaccessible for deer and turkey hunting.
3.Enhanced wildlife conservation through regulated hunting programs developed in coordination with the California Department of Fish and Wildlife.
4.Greater public appreciation for EBMUDâ€™s stewardship of natural resources and open space lands within the Mokelumne River watershed.
5.Additional recreational benefits that align with FERCâ€™s responsibility to consider the public interest and multiple-use value of project lands during relicensing.
6.Increased participation in conservation funding programs that directly support wildlife and habitat management throughout California.
The lands surrounding Pardee and Camanche Reservoirs contain some of the most productive deer and turkey habitat in the Sierra foothill region. Providing carefully managed public access through controlled drawing systems would create valuable opportunities for future generations of hunters while maintaining EBMUDâ€™s conservation, public safety, and watershed management objectives.
I respectfully request that FERC and EBMUD evaluate expanded public hunting access as part of the recreational resource components of the relicensing process and consider developing a management framework that would allow for

controlled youth deer hunts, youth turkey hunts, and limited-entry big game opportunities on appropriate EBMUD lands.

As public agencies entrusted with the stewardship of significant natural resources, both EBMUD and FERC have an opportunity through this relicensing process to enhance public access, support wildlife conservation, and provide meaningful outdoor recreation opportunities for future generations. Expanding carefully managed hunting access would advance all three objectives while ensuring continued protection of the watershed and its natural resources.

Thank you for your consideration of these comments and for your continued stewardship of the Lower Mokelumne River watershed. I appreciate the opportunity to participate in this important relicensing process and look forward to continued discussion regarding recreational access opportunities that can benefit both wildlife conservation and the public.

Sincerely,

Cody Gold

District 2 Commissioner

Amador County Fish and Wildlife Commission

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