DRAFT

INITIAL STUDY/PROPOSED MITIGATED NEGATIVE DECLARATION

for the

YUBA COUNTY WATER AGENCY

PROPOSED EXTENSION PETITION FOR THE INTERIM INSTREAM FLOW REQUIREMENTS UNDER

STATE WATER RESOURCES CONTROL BOARD

REVISED WATER RIGHT DECISION 1644

Prepared for

Yuba County Water Agency

Prepared by

HDR | SWRI Surface Water Resources, Inc.

October 2006

NOTICE OF AVAILABILITY

DRAFT INITIAL STUDY AND PROPOSED MITIGATED NEGATIVE DECLARATION

PROPOSED EXTENSION PETITION FOR THE INTERIM INSTREAM FLOW REQUIREMENTS UNDER STATE WATER RESOURCES CONTROL BOARD REVISED WATER RIGHT DECISION 1644

AGENCY: **Yuba County Water Agency**

ACTION: **Notice of Availability of the Draft Initial Study and Proposed Mitigated Negative Declaration for the Proposed Extension Petition for the Interim Instream Flow Requirements Under State Water Resources Control Board Revised Water Right Decision 1644**

SUMMARY:

Yuba County Water Agency (YCWA) is submitting a petition to modify the terms of YCWA's water right permits to change the effective date of RD-1644 long-term instream flow requirements from March 1, 2007 to April 1, 2008. Additionally, pursuant to Water Code §1725, YCWA and the California Department of Water Resources (DWR) propose to conduct a one-year water transfer for 2007 (March 2007 through December 2007). The proposed project would enable a one-year water transfer of up to 125,000 acre-feet of water from YCWA to DWR, which would provide YCWA a source of revenue and assist DWR in meeting a substantial portion of the Environmental Water Account Program asset acquisition goal for 2007. The proposed project involves YCWA transferring water from New Bullards Bar Reservoir using Yuba River Development Project (Yuba Project) facilities to DWR via the lower Yuba River, lower Feather River, Sacramento River, and the Delta.

DATES: The Draft Initial Study/Proposed Mitigated Negative Declaration will be available for public review beginning October 6, 2006.

ADDRESSES: Address all comments and/or requests for further information to Ms. Debra Hoek, HDR|Surface Water Resources Inc., 2031 Howe Avenue, Suite 110, Sacramento, CA 95825 (916/563-6360)

FOR FURTHER INFORMATION CONTACT: Mr. Curt Aikens, Yuba County Water Agency, at (530) 741-6278. Or email caikens@ycwa.com

SUPPLEMENTARY INFORMATION: Copies of the Draft Initial Study/Proposed Mitigated Negative Declaration are available for public inspection and review at the following locations:

- Yuba County Library, 303 2nd St., Marysville, CA 95901
- Yuba County Water Agency, 1402 D Street Marysville, CA 95901
- Sacramento Public Library, 828 I Street, Sacramento, CA 95814

Yuba County Water Agency

NOTICE OF INTENT TO ADOPT A MITIGATED NEGATIVE DECLARATION

DATE: **October 6, 2006**

TO: **Interested Parties**

FROM: **Yuba County Water Agency**

Re: **A Mitigated Negative Declaration for the Proposed Extension Petition for the Interim Instream Flow Requirements Under State Water Resources Control Board Revised Water Right Decision 1644 is Available for Public Review Beginning October 6, 2006.**

Project Location and Description: Yuba County Water Agency (YCWA) is submitting a petition to modify the terms of YCWA's water right permits to change the effective date of RD-1644 long-term instream flow requirements from March 1, 2007 to April 1, 2008. Additionally, pursuant to Water Code §1725, YCWA and the California Department of Water Resources (DWR) propose to conduct a one-year water transfer for 2007 (March 2007 through December 2007). The proposed project would enable a one-year water transfer of up to 125,000 acre-feet of water from YCWA to DWR, which would provide YCWA a source of revenue and assist DWR in meeting a substantial portion of the Environmental Water Account Program asset acquisition goal for 2007. The proposed project involves YCWA transferring water from New Bullards Bar Reservoir using Yuba River Development Project (Yuba Project) facilities to DWR via the lower Yuba River, lower Feather River, Sacramento River, and the Delta.

Document Review and Availability: The public comment period will extend from **October 6, 2006 through October 26, 2006**. The Mitigated Negative Declaration is available for public review at the following locations:

- Yuba County Library, 303 2nd St., Marysville, CA 95901
- Yuba County Water Agency, 1402 D Street Marysville, CA 95901
- Sacramento Public Library, 828 I Street, Sacramento, CA 95814

Contact: Questions can be directed to: Curt Aikens, Yuba County Water Agency, 1402 D Street Marysville, CA 95901 (530/741-6278).

Submit Comments To: Debra Hoek
HDR|Surface Water Resources, Inc.
2031 Howe Avenue, Suite 110
Sacramento, CA 95825 (916/563-6360)

The review period will end on October 26, 2006 and all comments must be submitted on or before October 26, 2006. This review period has been shortened pursuant to CEQA Guidelines section 15105. The YCWA Board of Directors will consider adoption of the proposed Mitigated Negative Declaration at a meeting that will be held on November 14, 2006, beginning at 8:30 a.m. at the Yuba County Government Center, 915 8th Street, Supervisors Chambers, Marysville, CA 95901.

PROPOSED MITIGATED NEGATIVE DECLARATION

PROJECT TITLE	**PROPOSED EXTENSION PETITION FOR THE INTERIM INSTREAM FLOW REQUIREMENTS UNDER STATE WATER RESOURCES CONTROL BOARD REVISED WATER RIGHT DECISION 1644**
DATE:	**October 6, 2006**
PROJECT APPLICANT:	**Yuba County Water Agency**
LEAD AGENCY:	**Yuba County Water Agency**
CONTACT PERSON:	**Curt Aikens, General Manager (530/741-6278)**

PROJECT DESCRIPTION

Yuba County Water Agency (YCWA) is submitting a petition to modify the terms of YCWA's water right permits to change the effective date of RD-1644 long-term instream flow requirements from March 1, 2007 to April 1, 2008. Additionally, pursuant to Water Code §1725, YCWA and the California Department of Water Resources (DWR) propose to conduct a one-year water transfer for 2007 (March 2007 through December 2007). The proposed project would enable a one-year water transfer of up to 125,000 acre-feet of water from YCWA to DWR, which would provide YCWA a source of revenue and assist DWR in meeting a substantial portion of the Environmental Water Account Program asset acquisition goal for 2007. The proposed project involves YCWA transferring water from New Bullards Bar Reservoir using Yuba River Development Project (Yuba Project) facilities to DWR via the lower Yuba River, lower Feather River, Sacramento River, and the Delta.

DECLARATION

Yuba County Water Agency has determined that the above project would have no significant impact on the environment and is therefore exempt from the requirement of an environmental impact report. The determination is based on the attached Initial Study and the following findings:

1. The project will not degrade environmental quality, substantially reduce habitat, cause a wildlife population to drop below self-sustaining levels, reduce the number or restrict the range of special-status species, or eliminate important examples of California history or prehistory.
2. The project does not have the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals.
3. The project will not have impacts that are individually limited but cumulatively considerable.
4. The project will not have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly.
5. No substantial evidence exists that the project will have a negative or adverse effect on the environment.

6. The project incorporates all applicable mitigation measures or environmental commitments identified in the Initial Study (attached).
7. This Mitigated Negative Declaration reflects the independent judgment of the lead agency.

The following environmental commitments (mitigation measures) will be implemented by the agency as part of the proposed project. Implementation of these measures would reduce any potential impacts to a less-than-significant level.

- Air Quality - YCWA and Member Units No Net Increase Air Quality Mitigation Plan
- Fisheries Resources - River Management Team/YCWA Coordination and Consultation Regarding 2007 Pilot Program Fisheries Agreement
- Terrestrial Resources – EWA EIS/EIR Mitigation Plan for Reservoir Drawdown
- Cultural - EWA EIS/EIR Mitigation Plan for Reservoir Drawdown
- Groundwater - YCWA Groundwater Monitoring and Reporting Plan

PUBLIC REVIEW

Written comments on the Draft Initial Study and Proposed Mitigated Negative Declaration should be submitted no later than 5:00 p.m. October 26, 2006 to:

Ms. Debra Hoek
HDR | Surface Water Resources, Inc.
2031 Howe Avenue, Suite 110
Sacramento, CA 95825
ATTN: Proposed Yuba Accord 2007 Pilot Program Initial Study

Questions can be directed to: Curt Aikens, General Manager, Yuba County Water Agency, Yuba County Water Agency, 1402 D Street Marysville, CA 95901, (530) 741-6278

Draft

Initial Study/

Proposed Mitigated Negative Declaration

for the

Yuba County Water Agency

Proposed Extension Petition for the Interim Instream Flow Requirements Under

State Water Resources Control Board

Revised Water Right Decision 1644

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List of Acronyms

ASIP	Action Specific Implementation Plan
Basin Plan	Central Valley Regional Water Quality Control Plan
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin Delta Estuary
BVID	Browns Valley Irrigation District
BWD	Brophy Water District
CALFED	CALFED Bay-Delta Program
CCR	California Code of Regulations
CCWD	Contra Costa Water District
CDEC	California Data Exchange Center
CDFG	California Department of Fish and Game
CDPR	California Department of Parks and Recreation
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
cfs	cubic feet per second
CID	Cordua Irrigation District
Corps	U.S. Army Corps of Engineers
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CWUA	composite weighted usable area
D-1644	State Water Resources Control Board Water Right Decision 1644
DCMWC	Dry Creek Mutual Water Company
Delta	Sacramento-San Joaquin Delta
DPS	distinct population segment
Dry Year Program	Dry Year Water Purchase Program
DWR	California Department of Water Resources
EC	electrical conductivity
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
EWA	Environmental Water Account
Extension Petition	Proposed Extension Petition for the Interim Instream Flow Requirements Under State Water Resources Control Board Revised Water Right Decision 1644
FERC	Federal Energy Regulatory Commission
FOR	Friends of the River
ft/s	feet per second
HIC	Hallwood Irrigation Company
HSC	habitat suitability criteria

Interior	U.S. Department of the Interior
mg/L	milligrams per liter
msl	mean sea level
MWD	Metropolitan Water District
NEPA	National Environmental Policy Act
NGOs	non-governmental organizations
NMFS	National Marine Fisheries Service
NYI	North Yuba Index
PEIS/EIR	Programmatic Environmental Impact Statement/Environmental Impact Report
PG&E	Pacific Gas and Electric Company
RD-1644 interim	State Water Resources Control Board Revised Water Right Decision 1644 interim instream flow requirements
RD-1644 long-term	State Water Resources Control Board Revised Water Right Decision 1644 long-term instream flow requirements
Reclamation	Bureau of Reclamation
RM	River Mile
RMF	River Management Fund
RMT	River Management Team
ROD	Record of Decision
RST	rotary screw trap
RWD	Ramirez Water District
RWQCB	Regional Water Quality Control Board
SRA	State Recreation Area
SWP	State Water Project
SWRCB	State Water Resources Control Board
SYRCL	South Yuba River Citizens League
SYWD	South Yuba Water District
Transfer Petition	Transfer Petition filed by Yuba County for a one-year water transfer to the California Department of Water Resources
TBI	The Bay Institute
TU	Trout Unlimited
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
VAKI	VAKI RiverWatcher System

WWD	Wheatland Water District
WUA	weighted useable area
YCWA	Yuba County Water Agency
YOY	young-of-the-year
YRI	Yuba River Index
Yuba Accord	Proposed Lower Yuba River Accord
Yuba Project	Yuba River Development Project

Chapter 1
Introduction

1.1 Project Proponent and Purpose

This Initial Study (IS) has been prepared to comply with the California Environmental Quality Act (CEQA) and addresses the potential environmental impacts associated with modification of the terms of Yuba County Water Agency's (YCWA) water right permits to change the effective date of the State Water Resources Control Board (SWRCB) Revised Water Right Decision 1644 (RD-1644) long-term instream flow requirements from March 1, 2007 to April 1, 2008. A petition (the Extension Petition) has been filed with the SWRCB for this change. Additionally, YCWA has filed a petition (the Transfer Petition) pursuant to Water Code §1725, for a water transfer from March 1, 2007 through December 31, 2007 between YCWA and the California Department of Water Resources (DWR). The proposed project as described in the Transfer and Extension petitions involves YCWA transferring water from New Bullards Bar Reservoir using Yuba River Development Project (Yuba Project) facilities to DWR *via* the lower Yuba River, lower Feather River, Sacramento River, and the Delta. YCWA proposes to release water (including water transferred) according to the instream flow schedules that are specified in the "Fisheries Agreement for the 2007 Lower Yuba River Pilot Program" (2007 Pilot Program Fisheries Agreement). The CEQA Environmental Checklist completed for this project is included in **Appendix 1**. The 2007 Pilot Program Fisheries Agreement and proposed one-year water transfer between YCWA and DWR are collectively referred to as the 2007 Pilot Program.

The 2007 Pilot Program specifies minimum instream flows for the lower Yuba River from March 1, 2007 through March 31, 2008. YCWA's Extension Petition is required to accomplish the proposed temporary water transfer. The requested change in the effective date of RD-1644 long-term instream flow requirements is required for two reasons. First, the proposed water transfer cannot take place unless the regulatory baseline for instream flow requirements from which the temporary transfer would be measured is RD-1644 interim, because some of the RD-1644 long-term instream flow requirements are higher than the instream flow schedules that are specified in the 2007 Pilot Program Fisheries Agreement, and operation of the Yuba Project to comply with both RD-1644 long-term flow requirements as well as the 2007 Pilot Program flow schedules would have the potential to cause severe shortages in subsequent water years, as more fully explained in the Water Code Environmental Analysis (**Appendix 2**). Second, the 2007 Pilot Program is designed to provide an opportunity to test several key elements of the Proposed Yuba Accord (as more fully described in Chapter 2, Project Description), and the extension of RD-1644 interim instream flow requirements for an additional year is necessary to enable YCWA to correctly effect and emulate the North Yuba Index (NYI), lower Yuba River flow schedules, accounting procedures and other elements of the Proposed Yuba Accord. Although no water would be transferred under the 2007 Pilot Program after December 31, 2007, the Extension Petition requests that the effective date of the RD-1644 long-term instream flow requirements be changed to April 1, 2008. This would give YCWA and the SWRCB some additional time to complete the environmental documents and the processing of the petitions for the Proposed Yuba Accord. YCWA anticipates that these documents and this processing will be completed by April 1, 2008.

Under CEQA Guidelines section 15125(a), the physical environmental conditions, as they exist at the time of the environmental analysis is commenced, "will normally constitute the baseline conditions by which a Lead Agency determines whether an impact is significant." (See also CEQA Guidelines §15126.2(a).) However, the instream flow requirements under the 2006 Pilot Program are in effect now and are exactly the same as the instream flow requirements under the 2007 Pilot Program. Thus, if the 2006 Pilot Program instream flow requirements were used as the baseline physical conditions for the present environmental analysis, then the analysis would show no changes between the baseline physical conditions and the proposed project, because they would be the same. For this reason, and because the 2006 Pilot Program is scheduled to end on February 28, 2007, the baseline for the analysis of potential environmental impacts associated with the proposed project (the Extension Petition) assumes that the RD-1644 interim flow requirements are in place. Also, in the interest of providing agency decision-makers with additional information regarding implementation of the proposed 2007 Pilot Program compared to the RD-1644 long-term provisions, the YCWA Transfer Petition Water Code Environmental Analysis is provided as Appendix 2 to this document. Additionally, this IS provides a synthesis of potential environmental impacts that could occur with implementation of the proposed project relative to RD-1644 long-term instream flow requirements (Chapter 4, Environmental Setting, Impacts and Mitigation).

YCWA is the lead agency and project proponent for CEQA compliance. Pursuant to CEQA, where a project is to be carried out or approved by more than one public agency, only one agency, referred to as the lead agency, shall be responsible for preparation of the negative declaration (ND) or environmental impact report (EIR) for the project (Title 14 California Code of Regulations [CCR] §15050). DWR is a CEQA responsible agency as a party to the "*Amendment No. 1 to Agreement for the Temporary Transfer of Water from Yuba County Water Agency to the Department of Water Resources*" (one-year water transfer agreement). The California Department of Fish and Game (CDFG) is a CEQA responsible agency as a signatory to the 2007 Pilot Program Fisheries Agreement. CDFG also is a trustee agency and has responsibility over the conservation, protection, and management of wildlife necessary to maintain biologically sustainable populations. The SWRCB is a CEQA responsible agency for the purposes of approving the Extension Petition. Additionally, the SWRCB is responsible for considering and making water right decisions related to YCWA's Transfer Petition, including change of YCWA's points of diversion/rediversion and place use of water required for implementation of the one-year water transfer between YCWA and DWR.

1.2 Project Objectives

The proposed project includes the requested Extension Petition as well as the Transfer Petition that would enable implementation of the 2007 Pilot Program involving a one-year water transfer of up to 125,000 acre-feet of water from YCWA to DWR and changes in YCWA operations of the Yuba Project to meet the instream flow schedules of the 2007 Pilot Program Fisheries Agreement. The 2007 Pilot Program would provide YCWA revenue, assist DWR in meeting a substantial portion of the Environmental Water Account (EWA) Program asset acquisition goal for 2007, and provide both agencies with a forum to test key elements of the Proposed Yuba Accord.

DWR is a CALFED Project Agency responsible for administering the EWA Program, including banking, borrowing, transferring, selling, and arranging for the conveyance of EWA water supply and EWA assets. DWR and the Bureau of Reclamation (Reclamation) are responsible for seeking to acquire approximately 200,000 acre-feet of water on behalf of the EWA Program annually. DWR also acquires water for its annual Dry Year Water Purchase Program (Dry Year Program) for use in the State Water Project (SWP) and Central Valley Project (CVP) service areas. If a portion of the YCWA transfer water is not needed for the EWA, and if the hydrological conditions are such that the 2007 DWR Dry Year Water Purchase Program seeks to acquire water, then DWR may elect to use the water for the 2007 Dry Year Water Purchase Program.

Implementation of any 2007 water transfer by YCWA to DWR is subject to SWRCB approval of the Extension Petition. Because there is a low probability that the hydrological conditions in late 2006 and early 2007 will be such that any YCWA transfer water can be transferred to the DWR Dry Year Program in 2007, this IS does not analyze such a transfer. If, because of the hydrological conditions that occur in late 2006 and early 2007, YCWA and DWR decide to pursue such a transfer, then YCWA will prepare a supplement to this IS and file a supplemental petition or request the SWRCB for approval of the transfer.

1.3 Regulatory Compliance

1.3.1 California Environmental Quality Act

CEQA requires that state and local government agencies consider the environmental consequences of projects over which they have discretionary authority before taking an action on those projects. YCWA has prepared this IS in accordance with CEQA (Public Resource Code §21000 *et seq*.) and the state CEQA Guidelines (Title 14 CCR §15000 *et seq*.), including completion of an Environmental Checklist (Appendix 1) to determine whether an EIR, a negative declaration (ND), or a mitigated negative declaration (MND) is needed. An EIR would be required if there is substantial evidence that a project may have a significant effect on the environment and those impacts could not be mitigated to a less-than-significant level (CEQA Guidelines §15064(a)). A lead agency may adopt a ND if impacts of a proposed project are considered less than significant, and a MND may be adopted if the project would result in less-than-significant impacts with mitigation incorporated into the project.

1.3.2 Water Code

The Water Code Environmental Analysis (Appendix 2) presents the assessment required by California Water Code §1727 regarding the potential for unreasonable impacts upon fish, wildlife, or other instream beneficial uses and upon any legal user of the water resulting from implementation of the 2007 Pilot Program. However, the CEQA standard for evaluating potential impacts of a project is any "significant effect on the environment, regardless of whether the overall effect of the project is adverse or beneficial" (CEQA Guidelines §15063(b)). Therefore, the analysis presented in this IS will include an evaluation of the potential for any significant impacts due to implementation of the proposed project.

1.3.3 Consistency with Plans and Policies

The proposed project would have no effect upon land use and planning within the local Yuba County region or in other areas of the Central Valley. YCWA and DWR would implement the proposed project elements in accordance with the plans and policies listed below.

1.3.3.1 Coordinated Operations Agreement (DWR/Reclamation)

- 1986 Coordinated Operations Agreement (COA) (as modified by interim operating agreements to reflect changes in regulatory standards, facilities, and operating conditions, including the EWA)

1.3.3.2 Yuba County Water Agency

- California Water Code §1732
- SWRCB Orders
- FERC License Agreements
- PG&E Power Purchase Agreement
- NMFS Biological Opinion for the Narrows II Full Flow Bypass Project

1.3.3.3 California Department of Water Resources/State Water Project

- South Delta Improvements Program
- Kern Water Bank Operating Plan
- California Department of Health Services Drinking Water Standards
- Article 19 Water Quality Objectives for Long-term SWP Contracts
- 2004 NMFS Biological Opinion on the Long-term CVP and SWP Operations and Criteria Plan (OCAP)
- 2005 USFWS Biological Opinion on OCAP
- 2004 USFWS Programmatic Biological Opinion on the Proposed Environmental Water Account
- 1995 Bay-Delta Water Quality Control Plan

1.3.4 Other Permits and Approvals

The following sections provide information related to YCWA's petitions to the SWRCB regarding the temporary changes to YCWA's water right permits necessary for implementation of the proposed project.

1.3.4.1 Change in Effective Date of RD-1644 Long-term Instream Flow Requirements

YCWA's petition to change the effective date of the RD-1644 long-term instream flow requirements from March 1, 2007 to April 1, 2008 (the Extension Petition) is required to accomplish the proposed temporary water transfer. The proposed water transfer cannot take place unless the regulatory baseline from which the temporary transfer will be measured is RD-1644 interim.

1.3.4.2 Other Petitions to State Water Resources Control Board

YCWA has filed a separate petition with the SWRCB under the provisions of Water Code §1725 *et. seq.*, and in conformance with the specific requirements of the California Code of Regulations (CCR) §794 for temporary changes to YCWA's water right permit 15026 (the Transfer Petition). The Transfer Petition seeks to add, during the term of proposed project, the SWP and CVP points diversion/rediversion and place of use that are necessary for water transfers between YCWA and DWR.

Change in Point of Rediversion

YCWA's Transfer Petition includes a request to change the authorized points of rediversion in YCWA's permit to add the Clifton Court Forebay (SWP facility) and the Tracy Pumping Plant (CVP facility).

Change in Place of Use

YCWA's Transfer Petition includes a request to expand the place of use in YCWA's permit from the YCWA service area in Yuba County (YCWA Permit No. 15026) for DWR to include the SWP and CVP service areas in the California Central Valley: SWP (as shown on map 1878-1, 2, 3, and 4 on file with Application No. 5629); and CVP (as shown on map 214-208-12581 on file with Application No. 5626).

Change in Purpose of Use

YCWA's Transfer Petition includes a proposed change in the purpose of use in YCWA's permit to include the additional uses of municipal supply, salinity control, and water quality control to the present authorized uses of irrigation, domestic, industrial, recreational, and fish mitigation and enhancement.

1.4 Organization of the Initial Study

This IS is organized as described below.

Proposed Mitigated Negative Declaration. The proposed MND, which precedes the draft IS, summarizes the environmental conclusions and identifies the mitigation/environmental commitments that would be incorporated into the proposed project. The YCWA Board of Directors would sign the MND and file a notice of determination (NOD), if the project were approved.

Chapter 1 – Introduction, describes the purpose and organization of this document and provides a summary of the environmental analysis findings.

Chapter 2 – Description of the Proposed Project, discusses the operational considerations and conditions that would exist with implementation of the propose project. The proposed project for purposes of this IS involves the "whole of the action" and therefore, although the one-year water transfer to DWR is exempt from CEQA, this document describes and evaluates the potential effects of this action.

Chapter 3 – Analysis Framework, identifies the environmental resource topics evaluated based on the CEQA Environmental Checklist and discusses why certain topics are dismissed from further evaluation in the IS. For resource topics that are evaluated in greater detail in this IS, Chapter 3 provides an overview of the analytical approach utilized to determine the potential for significant impacts. Chapter 3 also explains the use of the earlier environmental review and analysis conducted for the EWA Program, its relationship to the proposed project, whether the earlier impacts were adequately addressed, and how relevant mitigation measures are incorporated into the environmental impact analyses conducted within this document.

Chapter 4 – Environmental Setting, Impacts and Mitigation Measures, describes the environmental setting, the impact analysis methodology and significance criteria, and the analytical results used to identify the potential environmental impacts associated with implementation of the proposed project. The evaluation of potential impacts on environmental resource topics (based on the CEQA Environmental Checklist) is based upon a comparison of potential changes that could occur with implementation of the proposed project relative to RD-1644 interim instream flow requirements (i.e., the regulatory basis of comparison). Additionally, a synthesis of the potential impacts that could occur under RD-1644 long-term instream flow requirements is provided in Chapter 4 to provide a range of possible outcomes associated with implementing the proposed project.

Chapter 5 – Other Impact Considerations (Cumulative and Short-term), identifies and evaluates the incremental effect of the proposed project when added to the effects of past, present, and reasonably foreseeable future projects.

Chapter 6 – List of Preparers, identifies the individuals who prepared this document.

Chapter 7 – References, lists the sources of information used in completing this IS including literature citations and personal communications.

Technical Appendices

Appendix 1 provides the CEQA Environmental Checklist prepared for the proposed project.

The Water Code Environmental Analysis for the Transfer Petition is included as Appendix 2.

The exceedance plots of the average flows at Marysville and Smartville are presented in Appendix 3.

The exceedance plots of the average water temperatures at Marysville, Smartville, and Daguerre Point Dam are presented in Appendix 4.

Appendix 5 presents the methodology for the Analysis of Weighted Usable Areas (WUA) for Spawning Salmonids.

The exceedance plots for annual salmonid spawning habitat availability, as represented by WUA, are presented in Appendix 6.

Appendix 7 presents the list of special-status species known, or with the potential, to occur within the project area.

1.5 Summary of Findings

This section describes the potential impact determinations made by YCWA based on the Environmental Checklist (Appendix 1) and the supporting analysis provided in Chapter 4 of this document.

No Impact

The proposed project would have no impact on the following resource topics:

- Agricultural Resources
- Hazards and Hazardous Materials
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Transportation/Traffic

Less-than-Significant Impacts

Implementation of the proposed project would result in less-than-significant impacts for the resource topics listed below.

- Aesthetics – Visual Resources
- Geology and Soils
- Hydrology and Water Quality - Surface Water Quality
- Hydrology and Water Quality – Flood Control
- Recreation
- Utilities and Services Systems - Water Supply Availability

Less-than-Significant Impacts with Mitigation Incorporated

Mitigation measures or other environmental commitments are identified and would be incorporated into the proposed project to result in less-than-significant impacts on the resources listed below.

- Air Quality
- Biological Resources – Fisheries
- Biological Resources - Terrestrial
- Cultural Resources
- Groundwater Resources

In accordance with state CEQA Guidelines §15070, an MND shall be prepared if the lead agency "*determines there is no substantial evidence in light of the whole record before the public agency that the project, as revised, may have a significant effect on the environment*" after the implementation of mitigation measures. There is no substantial evidence that the proposed project, with the identified mitigation measures (environmental commitments), would have a significant effect on the environment, based on the available project information and the environmental analysis presented in this document. Therefore, a proposed MND has been prepared and is proposed to be adopted in accordance with CEQA and the state CEQA Guidelines.

1.6 Public Participation

The Draft IS/MND is available for a 20-day public review beginning October 6, 2006, and ending October 26, 2006.

Written comments may be submitted by 5 p.m. on October 26, 2006 to:

Ms. Debra Hoek
HDR|Surface Water Resources, Inc.
2031 Howe Avenue, Suite 110
Sacramento, CA 95825
ATTN: Proposed Yuba Accord 2007 Pilot Program Initial Study

Comments submitted on the IS/MND will be taken into consideration by the YCWA Board of Directors when the project is considered for approval.

Chapter 2

Description of the Proposed Project

2.1 Project Area

YCWA will release water from New Bullards Bar Reservoir and through Englebright Reservoir into the lower Yuba River in Yuba County to implement the 2007 Pilot Program Fisheries Agreement instream flow schedules and the 2007 water transfer to DWR. DWR will receive and convey YCWA transfer water in the Sacramento River and Delta and potentially may store a portion of the transfer water in San Luis Reservoir or groundwater banks south of the Delta (**Figure 2-1**).

2.2 Project Background

The SWRCB conducted hearings in 1992 and 2000 that led to the adoption of Water Right Decision 1644 (Decision D-1644 or D-1644) on March 1, 2001. After considering new evidence presented by YCWA, several local water districts in Yuba County, and a coalition of conservation non-governmental organizations (NGOs) in legal challenges to D-1644, the court remanded D-1644 to the SWRCB for reconsideration. Following a two-day hearing, the SWRCB issued RD-1644 on July 16, 2003. RD-1644 contains only minor changes from D-1644.

Since D-1644 was issued, YCWA has been engaged in a set of separate but related negotiations with the parties to the D-1644 litigation, state and federal fisheries agencies, water supply agencies, and other parties to try to resolve flow and other fisheries issues on the lower Yuba River. These collaborative interest-based initiatives led to the development of three interrelated proposed agreements: (1) *"Principles of Agreement for Lower Yuba River Fisheries Agreement"* (Fisheries Agreement); (2) *"Outline of Proposed Principles of Agreements with YCWA Member Units in Connection with Proposed Settlement of SWRCB D-1644"* (Conjunctive Use Agreements); and (3) *"Agreement for the Long-term Purchase of Water from Yuba County Water Agency by the Department of Water Resources and the Bureau of Reclamation"* (Water Purchase Agreement), and related actions. These proposed agreements collectively are known as the Proposed Lower Yuba River Accord (Proposed Yuba Accord).

In January 2006, the parties to the Proposed Yuba Accord signed the 2006 Pilot Program Fisheries Agreement, which contained minimum instream flow requirements for the lower Yuba River for the period of April 1, 2006 through February 28, 2007. On April 5, 2006, the SWRCB issued Order WR 2006-0009, which granted YCWA's petition to extend the effective date of the RD-1644 interim instream flow requirements from April 21, 2006 to March 1, 2007. On April 10, 2006, the SWRCB's Division of Water Rights issued WR-2006-0010-DWR, which approved YCWA's petition for the 2006 Pilot Program water transfer. Due to hydrologic conditions in the Delta (e.g., unbalanced conditions), YCWA was not able to transfer water to DWR for use in the EWA Program in 2006. However, the 2006 Pilot Program Fisheries Agreement flow schedules remain in effect through February 28, 2007.

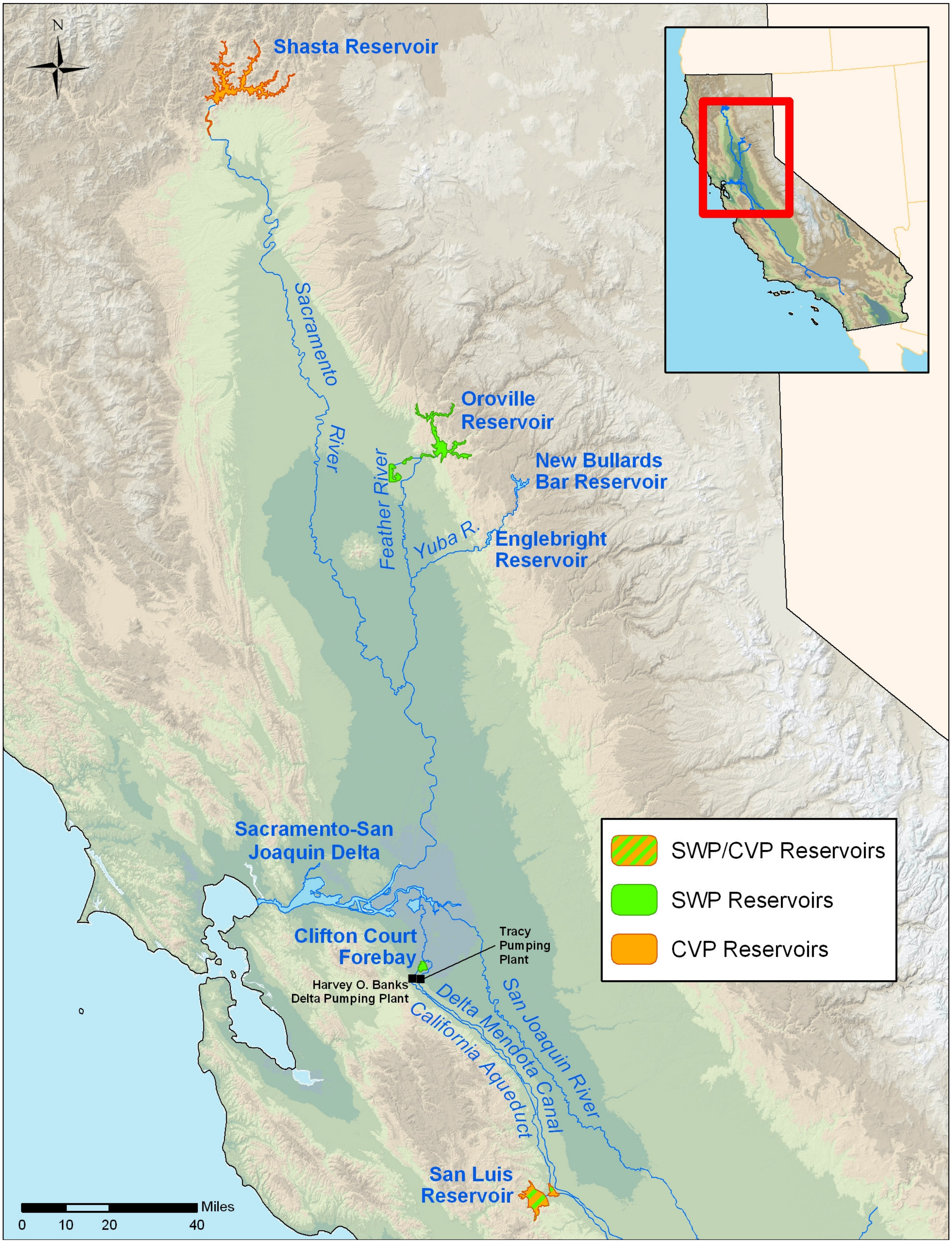

Figure 2-1. Project Area

YCWA anticipates completing the necessary environmental documentation and processing of petitions for the Proposed Yuba Accord prior to April 1, 2008. The parties to the Proposed Yuba Accord have drafted the 2007 Pilot Program Fisheries Agreement, which specifies the instream flow requirements in the lower Yuba River for the period of March 1, 2007 through March 31, 2008.

Additionally, YCWA and DWR are collaborating in the one-year water transfer agreement, which incorporates certain accounting practices that are specific to, and necessary for, calculating the volume of water transferred by implementation of the flows specified in the 2007 Pilot Program Fisheries Agreement. In almost all respects, the transfer of water from YCWA to DWR is a pilot program, which will serve not only the intent of a water transfer between the parties, but also as a test and validation of several key elements of the proposed settlement agreements that are the Proposed Yuba Accord.

Lower Yuba River Instream Flow Requirements

Under CEQA Guidelines section 15125(a), the physical environmental conditions, as they exist at the time of the environmental analysis is commenced, "will normally constitute the baseline physical conditions by which a Lead Agency determines whether an impact is significant." (See also CEQA Guidelines, §5126.2(a).) However, the instream flow requirements under the 2006 Pilot Program are in effect now and are exactly the same as the instream flow requirements under the 2007 Pilot Program. Thus, if the 2006 Pilot Program instream flow requirements were used as the baseline physical conditions for the present environmental analysis, then the analysis would show no changes between the baseline physical conditions and the proposed project, because they would be the same. For this reason, and because the 2006 Pilot Program is scheduled to end on February 28, 2007, the baseline for the analysis of potential environmental impacts associated with the proposed project (the Extension Petition) assumes that the RD-1644 interim flow requirements (**Table 2-1**) are in place. Also, in the interest of providing agency decision-makers with additional information regarding implementation of the proposed 2007 Pilot Program compared to the RD-1644 long-term provisions, the YCWA Transfer Petition Water Code Environmental Analysis is provided as Appendix 2 to this document. Additionally, this IS provides a synthesis of potential environmental impacts that could occur with implementation of the proposed project relative to RD-1644 long-term instream flow requirements (Chapter 4, Environmental Setting, Impacts and Mitigation).

RD-1644 interim instream flow requirements vary by water year type as defined by the Yuba River Index (YRI). The YRI is a water year hydrologic classification index that is based on the unimpaired runoff of the Yuba River for the period of record from 1921 to 1994 and is defined by: (1) the current year's April through July Yuba River unimpaired runoff (50 percent proportional weighting); (2) the current year's October through March Yuba River unimpaired runoff (30 percent proportional weighting); and (3) the previous year's YRI (20 percent proportional weighting).

Yuba River flows are measured at Smartville near Englebright Reservoir at the upper end of the lower Yuba River (Smartville Gage – U.S. Geological Survey (USGS) Station No. 11418000) and at Marysville, about 6 miles upstream of the mouth of the Yuba River (Marysville Gage - USGS Station No. 11421500).

Table 2-1. State Water Resources Control Board Revised Water Right Decision 1644 – Interim Lower Yuba River Instream Flow Requirements at the Smartville and Marysville Gages

Smartville Gage													
Water Year Type (YRI)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Total (AF)**
Wet	700	700	700	700	700	700	800[b]	0	0	0	0	490[b]	329,455
Above Normal	700	700	700	700	700	700	800[b]	0	0	0	0	490[b]	329,455
Below Normal	632[a]	700	700	700	700	700	767[b]	0	0	0	0	410[b]	318,545
Dry	555[a]	600	600	600	600	600	533[b]	0	0	0	0	383[b]	268,364
Critical	510[a]	600	600	600	600	600	490[b]	0	0	0	0	260[b]	255,689
Marysville Gage													
Water Year Type (YRI)	**Oct[c]**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Total (AF)**
Wet	387[a]	500	500	500	500	500	667[a]	1,500	808[a]	265[a]	250	250	400,066
Above Normal	387[a]	500	500	500	500	500	667[a]	1,500	808[a]	265[a]	250	250	400,066
Below Normal	387[a]	500	500	500	500	500	633[a]	1,500	808[a]	265[a]	250	250	398,083
Dry	332[a]	400	400	400	400	400	400[a]	500	400[a]	251[a]	250	250	264,258
Critical	332[a]	400	400	400	400	400	357[a]	270	245[a]	103[a]	100	127[a]	212,652

[a] Indicated flows represent average flow rates for the month. Actual flow requirements vary across the month.

[b] Indicated flows represent average flow rates for the month. Actual flow requirements vary across the month. Where actual flow requirement is zero for part of the month, the flow requirement for modeling purposes is based on the flow requirement at Marysville.

[c] The FERC License 2246 instream flow requirements of 400 cfs applies for the period October 1 to October 14.

2.3 Description of the Proposed Project

2.3.1 Extension Petition

On August 23, 2006, YCWA filed with the SWRCB a petition (the Extension Petition) to modify the terms of YCWA's water right permits to change the effective date of RD-1644 long-term instream flow requirements from March 1, 2007 to April 1, 2008. Also, on August 23, 2006, YCWA filed a separate petition (the Transfer Petition) under §1725 of the Water Code to modify YCWA's water right permits to implement the 2007 Pilot Program.

Under CEQA §15063, the lead agency is required to evaluate the project utilizing the whole record of available information. Therefore, the 2007 Pilot Program, including implementation of the flow schedules as stated in the 2007 Pilot Program Fisheries Agreement and the transfer of water between YCWA and DWR, also must be evaluated in conjunction with the proposed extension of RD-1644 interim flow requirements for CEQA purposes as the "whole of the action."

This IS has been prepared to support YCWA's request for SWRCB authorization of the petition to change the effective date of the RD-1644 long-term instream flow requirements to April 1, 2008. The transfer of water (pursuant to the Transfer Petition and as described in Appendix 2, Water Code Environmental Analysis for the Proposed Yuba County Water Agency One-year Water Transfer to the California Department of Water Resources and 2007 Pilot Program Lower Yuba River Accord Fisheries Agreement [Water Code Environmental Analysis]) also will be evaluated in this IS. This is because although the one-year water transfer between YCWA and DWR is exempt from CEQA requirements (CCR §15282 (v) and Water Code §1729), it is part of the "whole of the action." For the purposes of both documents (i.e., the Water Code Environmental Analysis and this IS), the proposed project is defined as implementation of a water transfer utilizing the 2007 Pilot Program Fisheries Agreement flow schedules and RD-1644 interim flow requirements, whichever is higher on any particular day.

The flow schedules described in the 2007 Pilot Program Fisheries Agreement are based largely on the flow schedules developed as part of the settlement process for the Proposed Yuba Accord. Although the Proposed Yuba Accord flow schedules are designed to supplant the existing instream flow requirements, for the purposes of the 2007 Pilot Program, the RD-1644 interim instream flow requirements still will be in place. During some months under certain water availability conditions (i.e., water year types), the minimum flows specified in the 2007 Pilot Program Fisheries Agreement are less than instream flows required under interim RD-1644. On days when this occurs, flows under the proposed project always will meet, at a minimum, the interim RD-1644 instream flow requirements. On days when the flows under 2007 Pilot Program Fisheries Agreement will be higher, they will govern YCWA's operations of the Yuba Project facilities.

2.3.2 Proposed Yuba Accord Pilot Program

YCWA and DWR propose to conduct a one-year water transfer for 2007 in a manner that would serve as a "pilot program" for the Proposed Yuba Accord. Implementation of the proposed project would result in YCWA's operation of the Yuba Project to meet the 2007 Pilot Program Fisheries Agreement instream flow schedules, resulting in the potential for DWR to acquire a minimum of 62,000 acre-feet and a maximum of 125,000 acre-feet of transfer water. Water released by YCWA would pass from New Bullards Bar Reservoir through Englebright Reservoir and over Daguerre Point Dam. New Bullards Bar Reservoir storage levels during the proposed project would remain within normal operating limits for the Yuba Project. YCWA would not change its historical practices of providing irrigation water to its Member Units. YCWA releases would flow from the lower Yuba River into the Feather River, and the Sacramento River, and downstream to the Delta. DWR would use the transfer water for environmental purposes in the Delta or would convey the water *via* the pumping plants at Clifton Court Forebay into conveyance channels. The acquired transfer water would then either be stored in San Luis Reservoir or transported through the California Aqueduct directly to groundwater storage banks or to state or federal water contractors pursuant to the provisions of the EWA Program.

2.3.2.1 Pilot Program Fisheries Agreement

YCWA has worked with CDFG, NMFS, USFWS, and the NGOs to develop the 2007 Pilot Program Fisheries Agreement, which is included as Appendix A to the Water Code Environmental Analysis (Appendix 2 to this IS). The 2007 Pilot Program Fisheries Agreement specifies the minimum instream flows based on the Proposed Yuba Accord for the lower Yuba River from March 1, 2007 through March 31, 2008. YCWA proposes to implement these instream flow schedules in addition to the RD-1644 interim instream flow requirements.

YCWA and DWR would complete the proposed one-year water transfer by implementing water accounting methods designed to determine the amount of water released under the 2007 Pilot Program Fisheries Agreement flow schedules that also could provide DWR with transfer water. In essence, the one-year water transfer volume is embedded within the fisheries flow schedules. Depending on the hydrologic conditions in the Delta and in the Yuba River watershed in 2007, the amount of water transferred to DWR *via* implementing the 2007 Pilot Program Fisheries Agreement flow schedules could be as much as 125,000 acre-feet.

Lower Yuba River Flow Schedules

RD-1644 interim instream flow requirements are determined by the YRI, whereas instream flows to be met under the proposed project are determined by the NYI. The YRI includes five water year types (wet, above normal, below normal, dry, and critical). The NYI has six water year types, which approximately correspond to the 2007 Pilot Program Fisheries Agreement flow schedules 1 through 6.

Except as otherwise stated in the 2007 Pilot Program Fisheries Agreement, YCWA would comply with the flow schedule requirements in **Table 2-2** during the period of the proposed project. Schedules 1-6 in Table 2-2 specify the minimum instream flow requirements measured at the Marysville Gage, and Schedules A and B specify minimum instream flow requirements at the Smartville Gage. A detailed explanation of the lower Yuba River flow schedules is provided in the Water Code Environmental Analysis (Appendix 2).

River Management Team

During the course of the proposed 2007 transfer, and in accordance with the 2007 Pilot Program Fisheries Agreement, a River Management Team (RMT) will be convened to provide input for lower Yuba River operations. The RMT would consist of a Planning Group and an Operations Group. The Planning Group would include representatives of the parties to the 2007 Pilot Program Fisheries Agreement, which are YCWA, NMFS, USFWS, CDFG, DWR, Reclamation, PG&E, and the NGOs. The Operations Group would include one representative each of: (1) YCWA; (2) PG&E; (3) CDFG, NMFS, and USFWS, where the one representative would rotate between these three agencies; (4) the NGOs; and (5) DWR.

Temporary Alteration of Flow Schedule

The RMT, through a decision by its Planning Group, could decide to temporarily alter instream flow requirements in the 2007 Pilot Program Fisheries Agreement (within specified limits) at any time during the 2007 Pilot Program, so long as the agreed-to instream flows would comply with the applicable requirements of YCWA's FERC license and YCWA's water right permits. Alterations to the 2007 Pilot Program Fisheries Agreement instream flow schedules could occur only during March through October for the proposed project. Any alterations to the 2007 Pilot Program Fisheries Agreement's instream flow schedules approved by the RMT would have to result in flows that were equal to or greater than the minimum flow required by the regulatory requirement. A detailed explanation of the RMT and potential temporary alterations to the flow schedules is provided in the Water Code Environmental Analysis (Appendix 2).

Table 2-2. Lower Yuba River Instream Flow Schedules

Marysville Gage (cfs)														
Schedule	APR		MAY		JUN		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	Total Volume (AF)
	1-15	16-30	1-15	16-31	1-15	16-30	1-31	1-31	1-30	1-31	1-30	1-31	1-31	1-29	
1	1,000	1,000	2,000	2,000	1,500	1,500	700	600	500	500	500	500	500	500	531,178
2	700	800	1,000	1,000	800	500	500	500	500	500	500	500	500	500	385,788
3	700	700	900	900	500	500	500	500	500	500	500	500	500	500	367,738
4	600	900	900	600	400	400	400	400	400	400	500	500	500	500	330,846
5	500	600	600	400	400	400	400	400	400	400	500	500	500	500	303,672
6	350	500	500	400	300	150	150	150	350	350	350	350	350	350	210,349

* Indicated flows represent average volumes for the specified time period. Actual flows may vary from the indicated flows according to established criteria.

* Indicated Schedule 6 flows do not include an additional 30,000 acre-feet available from groundwater substitution to be allocated according to established criteria.

Smartville Gage (cfs)															
A	700	-	-	-	-	-	-	-	700	700	700	700	700	700	-
B	600	-	-	-	-	-	-	-	500	600	600	550	550	550	-

* Schedule A used with Schedules 1, 2, 3 and 4 at Marysville.

* Schedule B used with Schedules 5 and 6 at Marysville.

River Management Fund

The RMF is established as an element of the Proposed Yuba Accord with the purpose of funding studies and research on the lower Yuba River to investigate the impacts and effects of the Proposed Yuba Accord flow schedules. During the term of the proposed project, YCWA would make payments to the RMF in accordance with the terms of the 2007 Pilot Program Fisheries Agreement.

2.3.3 Environmental Commitments

Environmental commitments are measures or practices adopted by a project proponent to reduce or avoid adverse effects that could result from project operations. The following sections describe the environmental commitments, including impact avoidance or mitigation measures that will be implemented by either YCWA or DWR to ensure no significant impacts result from the proposed 2007 Pilot Program, including the Extension Petition.

The identification of environmental commitments below includes those that are included as part of the EWA Program and would apply to the proposed one-year transfer from YCWA to DWR.

2.3.3.1 Air Quality

YCWA and the Member Units would implement a no net increase air quality mitigation plan to ensure no significant or adverse impacts would result during the 2007 Pilot Program associated with 30,000 acre-feet of groundwater substitution pumping that could be implemented during a Schedule 6 year.

2.3.3.2 Fisheries Resources

Impact avoidance, mitigation, and monitoring actions that could be undertaken by the RMT include the following:

- Setting the flow schedule for any surface water operations;
- Altering instream flow requirements as appropriate (within specified limits) to achieve maximum fisheries resource benefits;
- Developing and implementing fisheries monitoring studies on the lower Yuba River; and
- Allocating expenditures from the RMF.

The RMT would adopt a structure for fund allocation based on specific prioritized goals for monitoring, studies, actions and activities. Money from the RMF may be spent for any of the following actions:

- Monitoring and evaluating the effectiveness of the implementation of the 2007 Pilot Program Fisheries Agreement, including flow schedules, and the 2007 water transfer agreement;
- Evaluating the condition of fisheries resources in the lower Yuba River;
- Evaluating the viability of lower Yuba River fall-run Chinook salmon and any subpopulations of the Central Valley steelhead distinct population segment (DPS) and spring-run Chinook salmon Evolutionarily Significant Unit (ESU) that may exist in the lower Yuba River;
- Implementing habitat improvement and non-flow enhancement actions and activities;
- Purchasing water for augmentation of instream flows in the lower Yuba River above the minimum flow requirements specified by the flow schedules;
- Retaining expert advice for specific technical questions;
- Retaining an expert or experts for dispute resolution processes; or
- Paying local shares of grant-funded projects for fish or fish habitat in the lower Yuba River, specifically to facilitate unique grant matching opportunities.

The proposed project would be implemented utilizing the 2007 Pilot Program Fisheries Agreement flow schedules or RD-1644 interim flow requirements, whichever is higher on any particular day. Although the minimum instream flows under the 2007 Pilot Program Fisheries Agreement are generally equivalent to or greater than the instream flows required under RD-1644 interim requirements, the 2007 Pilot Program occasionally would result in lower flows than under RD-1644 interim. As previously discussed, the proposed project will operate, at a minimum, to the RD-1644 interim instream flow requirements.

2.3.3.3 Cultural Resources

The proposed project is not anticipated to result in impacts upon cultural resources. However, as discussed in the Record of Decision (ROD) for the EWA Program, the EWA Agencies incorporated environmental and conservation measures into the EWA Program to avoid environmental effects on several resource categories (Reclamation *et al.* 2004b), including impact avoidance/mitigation measures for cultural resources. The EWA ROD specifies that EWA agencies will only participate in water transfers with water agencies (willing sellers) that comply with the measures identified as part of the EWA Mitigation Monitoring and Reporting Program, which are described in Chapter 6 of the EWA Final EIS/EIR.

To address potential cultural resources impacts, the Mitigation Monitoring and Reporting Program described in the EWA Final EIS/EIR (Reclamation *et al.* 2004b) identifies several mitigation measures related to reservoir drawdown. Thus, as participants in the EWA Program, Reclamation, DWR and YCWA, as a willing seller of water to the EWA Program, are required to comply with the mitigation measures presented in **Table 2-3.**

Table 2-3. Mitigation Measures Identified in the Final EWA EIS/EIR to Reduce or Avoid Potentially Significant Impacts on Cultural Resources (Reclamation *et al.* 2004b)

Action	Potential Effect	Mitigation Measure	Monitoring/ Reporting Action	Responsible Agency	Effectiveness Criteria	Timing
Stored reservoir water, source shifting	Change in water surface elevation exposing cultural resources to increased cycles of inundation, drawdown, and erosion	Consult with the Forest Service and State Historic Preservation Officer on potential effects and appropriate mitigation measures	Programmatic agreement	Reclamation	Concurrence with U.S. Forest Service and SHPO	After transfer
		Inventory and evaluation identifying cultural resources	Determination of eligibility and effect	Willing seller	Concurrence with U.S. Forest Service and SHPO	After transfer
		Historic property treatment	Research historical records, previous cultural resources reports and data, and the detailed recording and/or excavation for data recovery	Reclamation and/or willing seller	Cultural resource preservation	After transfer
		Mitigation for impacts to resources covered under U.S. Forest Service's California Native American policy (if required)	Notify potentially affected Federally recognized Indian tribes and issue follow up letters identifying potential impacts and appropriate mitigation measures	Reclamation	Confirmation by U.S. Forest Service	After transfer
Source: EWA Final EIS/EIR (Reclamation *et al.* 2004) (p. 6-11)						

Based on this information, YCWA's drawdown of water from New Bullards Bar Reservoir for the purposes of providing transfer water to the EWA Program is subject to consideration under §106 of the National Historic Preservation Act, as discussed in the EWA EIS/EIR (Reclamation *et al.* 2003). The proposed project is not anticipated to result in water elevations in New

Bullards Bar Reservoir lower than historic normal operations. Additionally, as applicable, YCWA would comply with the measures presented above in Table 2-3.

2.3.4 Groundwater Resources

YCWA and its Member Units have taken an active role in managing the groundwater resources within the Yuba County groundwater subbasin. The management approach for groundwater substitution transfers in Yuba County consists of three principles, which are stated as follows in the Groundwater Report (Appendix C to Appendix 2 [Water Code Environmental Analysis] of this IS):

(1) Closely monitor conditions to watch for any potential significant impacts and to gain a better understanding of the groundwater resource;

(2) Immediately respond to any significant impacts that occur and mitigate those impacts with appropriate measures; and

(3) Utilize the transfer and associated activities to further the goal of effective management of the water resources of Yuba County through conjunctive use of groundwater and surface water.

In addition to the groundwater management activities listed above, groundwater mitigation measures, as described in the EWA EIS/EIR (Reclamation *et al.* 2004) (Chapter 6) further specify that YCWA would be required to establish monitoring programs for EWA-related water transfers. These programs would monitor groundwater level fluctuations within the local pumping area and if significant effects were to occur, YCWA and/or its Member Units would be responsible for mitigation.

YCWA, in cooperation with DWR, has agreed to continue implementation of a Groundwater Monitoring and Reporting Program (Groundwater Program). The Groundwater Program is described in greater detail in Appendix 2. The Groundwater Program would identify wells within the Yuba groundwater subbasins that could be affected by the proposed groundwater substitution operations. Implementation of monitoring elements of the plan would include recording measurements of groundwater levels both before and after pumping begins. Monitoring of groundwater levels in the groundwater subbasins below the levels that would have occurred in the absence of the transfer would continue on a monthly basis until the groundwater level has returned to its pre-pumping level. Additionally, to ensure that salt intrusion into the groundwater wells is minimized, electrical conductivity (EC) measurements would be taken before and after pumping begins, along with an intermediate measurement at two months into the proposed project. DWR and YCWA would cooperate in obtaining these measurements. In addition to assessment of pumping effects upon the groundwater subbasins, monitoring and reporting would be performed to evaluate and avoid potential effects upon surface waters.

Chapter 3

Analysis Framework

This chapter identifies the resources evaluated and dismissed from further evaluation in this IS. A summary of the analytical approach for resource topics evaluated in Chapter 4, Environmental Setting, Impacts and Mitigation Measures, also is presented below.

3.1 Resources Not Evaluated in Detail

YCWA has completed the CEQA Environmental Checklist (Appendix 1) to support this IS for the proposed 2007 Pilot Program. Based on responses to the checklist, it is evident that the proposed project would not impact several resources because these resources either do not occur within the project area, or are within the project area but no impact was identified that potentially could occur as a result of the proposed project. The proposed project would not result in significant impacts on the following resources:

- Agricultural Resources
- Hazards and Hazardous Materials
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Transportation/Traffic

The following sections provide brief explanations as to why no further analysis of these resources is necessary.

3.1.1 Agricultural Resources

The proposed project does not include any new construction of water facilities, infrastructure, or other type of construction or land disturbance, and would not involve any changes to land use designations or zoning. The proposed project would not directly or indirectly result in the conversion of land areas classified as important farmland, zoned for agricultural use, or under a Williamson Act contract, to non-agricultural use. Under the proposed project, YCWA would continue historic practices of providing surface water supply deliveries to its Member Units. As described in the Groundwater Analysis (Appendix C of Appendix 2 to this IS), the Yuba Groundwater Basin conditions are capable of supporting groundwater substitution operations of up to 85,000 acre-feet in 2007 without significant or unreasonable impacts (page A3-1). Therefore, the proposed project would have no impact on agricultural resources. (Refer to Chapter 4, Section 4.8, Hydrology and Water Quality - Groundwater Resources, for additional discussion of groundwater resources in the project area.)

3.1.2 Hazards and Hazardous Materials

The proposed project does not include any new construction or use of hazardous materials and there would be no transport, use, or disposal of hazardous materials. In addition, the proposed project would not conflict with any state or federal laws related to hazardous material management including regulations for hazardous material cleanup, storage, testing procedures, and quantity reduction. The proposed project, therefore, would have no impact on hazards or hazardous materials.

3.1.3 Land Use and Planning

The proposed project would not affect any established community. The land uses in areas adjacent the waterbodies associated with the proposed project would be the same under the proposed project as under existing conditions. The proposed project would not conflict with any applicable land use plan, policy, or regulation. The proposed project also would not conflict with any habitat conservation plans or natural community conservation plans. Therefore, the proposed project would have no impact on land use or planning.

3.1.4 Mineral Resources

The proposed project does not involve construction or land disturbance and, therefore, would not involve any grading or loss of topsoil, and would not change access to subsurface resources. The proposed project would not result in the loss of availability of a known mineral resource that is valued by the region or residents. The proposed project also would not result in the loss of availability of any locally important mineral recovery site that has been delineated on a local plan. Therefore, no loss of mineral resources would occur as a result of the proposed project and there would be no impact on mineral resources.

3.1.5 Noise

The proposed project does not include any type of construction, land disturbance or noise-generating activities and, therefore, would not increase the ambient noise levels or result in degradation of the existing ambient noise environment. The proposed project also would not conflict with the Yuba County General Plan Noise Element or Yuba County Municipal Code Chapter 8.20 Noise Ordinance. The proposed project would not generate any new or increased noise levels and also would not conflict with general plan or specific plan noise elements or noise ordinances for other counties or cities adjacent to the project area waterbodies. Therefore, the proposed project would have no impact on noise.

3.1.6 Population and Housing

The proposed project does not involve a proposal for residences or businesses or the extension of access to any area. The proposed project also would not displace housing or people. The proposed project would supply water to DWR for use in the 2007 EWA Program. Because this proposed project is limited to one year or less, the water supply would not be of sufficient reliability to result in changes in local economics or accommodate or induce growth. The proposed project, therefore, would have no impact on population and housing.

3.1.7 Public Services

The proposed project does not include any type of construction, and therefore would not result in the provision of new or physically altered government facilities and therefore would not impact the service ratios, response times, or other performance objectives for public services. The proposed project also would not result in the need for any additional fire protection, police protection, schools, parks, or other public facilities. Therefore, the proposed project would have no impact on public services.

3.1.8 Transportation/Traffic

The proposed project would not directly increase the travel demand on any existing roadways or create the need for new roadways, or exceed the level of established roadway service standards. The proposed project also would not affect air traffic. The proposed project does not include any type of construction, and therefore would not contain any design features or uses that would affect traffic hazards, parking capacity, or adopted policies, plans, or programs supporting alternative transportation. Accordingly, the proposed project would have no impact on transportation or traffic.

3.2 Resource Topics Evaluated in the Initial Study

YCWA's implementation of the proposed 2007 Pilot Program would result in flow changes in the Yuba, Feather and Sacramento rivers within the project study area, relative to the basis of comparison. Water surface elevations and storage volumes at New Bullards Bar Reservoir would vary under the proposed project from those that would occur under the basis of comparison. DWR would acquire the proposed project transfer water for use in the EWA Program, potentially affecting water resources of the Delta, San Luis Reservoir, and groundwater banks south of the Delta. Based on the items in the CEQA Environmental Checklist, these project operations have the potential to affect the resources listed here:

- Aesthetics
- Air Quality
- Biological Resources *(Fisheries and Terrestrial)*
- Cultural Resources
- Geology and Soils
- Hydrology and Water Quality
- Recreation
- Utilities and Service Systems

3.2.1 Overview of the Analytical Approach

The evaluation of potential impacts on the resources identified above is based upon a comparison of potential changes in instream flows, water temperatures, and reservoir storage and water surface elevations that could occur with implementation of the proposed project relative to the conditions that could occur with implementation of RD-1644 interim instream flow requirements (i.e., the basis of comparison). Additionally, the analysis considers the potential effects upon the Yuba Groundwater Basin associated with 30,000 acre-feet of groundwater pumping that could be implemented during a Schedule 6 year.

Implementation of the proposed project would result in the following:

- Changes in YCWA's Yuba Project operations on the Yuba River to implement proposed 2007 Pilot Program Fisheries Agreement instream flow schedules for the protection of lower Yuba River fisheries.
- In Schedule 6 years, YCWA Member Units may implement groundwater substitution operations utilizing groundwater supplies for agricultural irrigation purposes instead of diverting or receiving some Yuba River water supplies.
- DWR would acquire transfer water for use in the 2007 EWA Program, potentially affecting water operations in the Feather River, the Sacramento River, and the Delta.

- DWR may convey transfer water and store a portion of the transfer water in San Luis Reservoir or groundwater banks south of the Delta.
- YCWA operations to refill New Bullards Bar Reservoir potentially could affect Oroville Reservoir.

3.2.1.1 Evaluation of Yuba River Development Project and Yuba Groundwater Basin Operations

Yuba River Development Project

YCWA would operate the Yuba Project to implement the proposed 2007 Pilot Program Fisheries Agreement. The transfer water that DWR would acquire for the EWA Program would be embedded within the instream flow schedules. The maximum amount of the transfer would not exceed 125,000 acre-feet. Evaluation of potential changes in the operations of the Yuba Project associated with implementation of the proposed project involved assessment of potential changes in reservoir water surface elevation and storage over an 83-year simulation period, relative to the basis of comparison (RD-1644 interim flow requirements). Changes in these conditions were evaluated using significance criteria or analytical thresholds to determine if the proposed project would result in a significant impact to the environmental resources listed above. In addition, potential changes in river flows and water temperatures were evaluated over an 83-year simulation period, relative to the basis of comparison, to determine if changes in river flows or water temperatures of sufficient magnitude and duration would occur that may result in a significant impact to the resources provided in and around the river. The analyses of potential changes in the Yuba Project operations for the individual resources are provided in Chapter 4.

Yuba Groundwater Basin

The evaluation of potential impacts of the proposed project upon the Yuba Groundwater Basin, including the North Yuba and South Yuba subbasins, is based upon the "*Analysis of the Groundwater Substitution Portion of the Yuba County Water Agency-CALFED Environmental Water Account/Department of Water Resources 2007 Transfer*" included as Appendix C in Appendix 2 to this IS. This study provides a description of the groundwater basin, groundwater occurrence and development, and groundwater storage conditions and presents an evaluation of past groundwater substitution effects upon the basin. The findings of this study are summarized in Chapter 4, Section 4.8, Hydrology and Water Quality – Groundwater Resources.

3.2.1.2 Use of Earlier Analysis – Environmental Water Account EIS/EIR

The CEQA Environmental Checklist identifies the conditions under which a proposed project evaluation may rely upon an earlier analysis of potential impacts. Reliance upon an earlier analysis of a proposed project must indicate that the potential impacts were within the scope of the previous analysis and that the impacts were adequately addressed. Additionally, the project proponent is to indicate whether identified effects were addressed by mitigation measures identified or adopted by the earlier analysis. For resource topics where the impact determination is less than significant with mitigation measures incorporated, the mitigation measures relied upon or refined from the earlier analysis must be described, including the applicability to the current proposal. The Environmental Checklist also suggests that specific page numbers from the previous documentation be provided to substantiate the information.

Reclamation, DWR, USFWS, NMFS and CDFG (Reclamation *et al.* 2003) completed an environmental analysis of the EWA Program, including characterization of probable water transfer volumes from YCWA. The EWA Draft EIS/EIR evaluated potential impacts on the SWP/CVP system facilities based on potential supplies of up to a range of 200,000 to 600,000 acre-feet from water sellers north of the Delta, depending upon water year type. The impact analysis in the EWA Draft EIS/EIR specifically assumed that YCWA would supply up to 100,000 acre-feet of stored reservoir water from New Bullards Bar Reservoir and up to 85,000 acre-feet of water made available through groundwater substitution practices by YCWA Member Units (page 2-35, Table 2-5). Because the 2007 Pilot Program Fisheries Agreement total transfer volume is within this probable maximum water transfer amount (total of up to 185,000 acre-feet evaluated in the EWA EIS/EIR for YCWA), this IS utilizes the earlier environmental analyses conducted by DWR and Reclamation. The impacts identified in the EWA EIS/EIR for the Yuba River, New Bullards Bar Reservoir, Feather River, Oroville Reservoir, Sacramento River, the Delta, San Luis Reservoir and south-of-Delta groundwater banks are summarized in the individual resource sections of Chapter 4, when relevant. The resource sections in Chapter 4 also state whether the mitigation measures or environmental commitments adopted by DWR and Reclamation have been incorporated into the proposed 2007 Pilot Program.

The EWA Draft EIS/EIR, Final EIS/EIR, and ROD are available for viewing at Reclamation's web page: [www.usbr.gov].

Chapter 4

Environmental Setting, Impacts and Mitigation Measures

This chapter of the IS describes the environmental setting and the potential impacts of implementing the proposed project described in Chapter 2. This chapter also describes the impact analysis methodology and significance criteria, and the analytical results used to identify the potential environmental impacts associated with implementation of the proposed project.

For each resource category, the Environmental Setting section characterizes the resource features of the project study area that may be affected by implementation of the proposed project. As discussed in Chapter 3 (Analysis Framework), the proposed transfer of water to the EWA Program has been evaluated by DWR and Reclamation in the Environmental Water Account EIS/EIR (Reclamation *et al.* 2003; Reclamation *et al.* 2004a). Reclamation prepared a Record of Decision (ROD) to document its decision to implement the provisions of the preferred alternative termed the Flexible Purchase Alternative (Reclamation *et al.* 2003; Reclamation *et al.* 2004b) and the California Department of Water Resources (DWR) certified the Final EIS/EIR and issued a Notice of Determination (NOD) (DWR 2004b). The EWA Program will sunset on December 31, 2007, which corresponds to the end of the 2007 Pilot Program water transfer. Although the transfer portion of the 2007 Pilot Program is scheduled to end in concert with the sunset of the EWA Program, the flow schedules defined in the 2007 Pilot Program Fisheries Agreement will be in place through March 31, 2008.

Although the analysis presented in this IS focuses on the potential impacts within the Yuba River watershed and Yuba Groundwater Basin, relevant impact conclusions and mitigation measures from the EWA EIS/EIR also are summarized in this chapter. A supplemental and separate evaluation of the potential impacts due to implementation of the 2007 Pilot Program Fisheries Agreement flow requirements during January 1, 2008 through March 31, 2008 (the period after the sunset of EWA but prior to the conclusion of the 2007 Pilot Program), which was not directly evaluated as part of the EWA Program EIS/EIR (because EWA sunsets on December 31, 2007), is included for the each of the resource categories, as appropriate. Additionally, any changes in flows, water temperatures, or water surface elevations in the Yuba River, New Bullards Bar Reservoir, Feather River, Oroville Reservoir, Sacramento River, and the Delta due to implementation of the proposed project are anticipated to be relatively minor compared to the basis of comparison, and within the range of effects previously evaluated for the entire EWA Program in the EIS/EIR and determined to result in less than significant impacts (see Sections 4.1 though 4.12 for page citations to relevant conclusions in the EWA EIS/EIR).

The evaluation of potential impacts on environmental resources is based upon a comparison of potential changes that could occur with implementation of the proposed project relative to RD-1644 interim instream flow requirements (i.e., the regulatory basis of comparison). Additionally, a synthesis of the potential impacts that could occur under RD-1644 long-term instream flow requirements is provided in this chapter to provide agency decision-makers with a range of possible outcomes associated with implementing the proposed project. The Water Code Environmental Analysis prepared in support of the one-year water transfer petition pursuant to Water Code §1727 (Appendix 2) provides a more detailed discussion of the potential for the proposed project to result in unreasonable impacts on fish, wildlife, or other instream beneficial uses of the water, relative to RD-1644 long-term instream flow requirements.

4.1 Aesthetics – Visual Resources

Both natural and artificial landscape features contribute to perceived visual images and the aesthetic value of a view. The value is determined by contrasts, forms and textures exhibited by geology, hydrology, vegetation, wildlife, and man-made features. Individuals respond differently to changes in the physical environment, depending on prior experiences and expectations and proximity and duration of views. Therefore, aesthetic impact analyses tend to be highly subjective in nature.

The proposed project would not include any construction or modification of landforms and therefore would not result in substantial adverse impacts upon any scenic vista, substantially damage any scenic resource including trees, rock outcroppings or historic buildings within a state scenic highway, or create a new source of substantial light or glare that would adversely affect day or nighttime views in the project study area.

The proposed project would involve changes in YCWA's operation of the Yuba Project and DWR's operation of SWP facilities that would affect river flow levels and reservoir water surface elevations of waterbodies used for recreation or viewed from adjacent roadways or other lands. As described in Chapter 3, Analysis Framework, DWR's operations pursuant to the EWA Program and potential for impacts upon visual resources have been fully evaluated in the EWA EIS/EIR (Reclamation *et al.* 2003; Reclamation *et al.* 2004b). The impact evaluations and impact decisions made in the EWA EIS/EIR are relevant to this proposed project and are summarized within the following sections.

4.1.1 Environmental Setting

The following sections provide discussion of the visual resources setting for the Yuba River, New Bullards Bar Reservoir, Feather River, Oroville Reservoir, Sacramento River, the Delta, San Luis Reservoir, and groundwater bank recharge regions south of the Delta.

4.1.1.1 Yuba River

The North, Middle, and South Yuba rivers originate in the Sierra Nevada. The North Yuba and Middle Yuba rivers join downstream of New Bullards Bar Reservoir, and the South Yuba River joins the mainstem river just upstream of Englebright Reservoir. The lower Yuba River confluence with the Feather River is located near Marysville. The terrain along the North and South Yuba rivers consists of large areas of pine trees intermixed with small pockets of hardwood and barren land. The Middle Yuba River terrain features are similar to the North and South Yuba rivers, with small intermixed pockets of annual grassland. Grassland, agricultural fields, and areas of barren land, align the lower Yuba River. Scattered rural residences and small communities are located near the lower reaches of the river near Marysville and the confluence with the Feather River.

4.1.1.2 New Bullards Bar Reservoir

New Bullards Bar Reservoir is characterized by a varied landscape of vegetative and geologic features including conifers, mixed hardwood trees and cliffs of red, clay-like soils. Viewing opportunities are greatest for individuals utilizing the reservoir for recreation activities on or near the reservoir (marina, trails, campgrounds). Adjacent county roads also provide viewing opportunities of New Bullards Bar Dam and Reservoir.

Typically, during summer months, largely undeveloped areas of the New Bullards Bar Reservoir shoreline become visible as drawdown of the reservoir exposes the fluctuation zones. The visible fluctuation zone or "bathtub ring" represents a negative visual feature that affects the overall visual quality of the area, although it is recognized as part of normal reservoir operations.

4.1.1.3 Feather River

The lower Feather River terrain generally is flat. Riparian vegetation lines the river, with grassland and croplands in the adjacent agricultural areas. Large areas of rice fields and other crops are located along the southern edge of the Feather River near Marysville.

4.1.1.4 Oroville Reservoir

Dams, reservoirs, and related facilities characterize the most visually important elements of the Oroville Reservoir landscape and its vicinity. Although the scenery in the foothill region around the facilities is attractive, it generally is of local and regional importance, not state or national importance.

The Visitor Center on Oroville Reservoir, on the crest of Kelly Ridge, includes a 47-foot high observation tower designed to provide panoramic views of the dam and reservoir. Many of the most immediate views of the reservoir are from marinas, boat launch areas, campgrounds, picnic areas, and other developed recreation sites surrounding the reservoir. During the summer months, largely undeveloped areas of the shoreline become visible as reservoir drawdown exposes the fluctuation zones. As is typical of most water supply reservoirs, the visible fluctuation zone or "bathtub ring" represents a negative visual feature that affects the overall visual quality of the area, although it is recognized as part of normal reservoir operations.

4.1.1.5 Sacramento River

Lands along the lower Sacramento River primarily are lined with agricultural crops. Rice is one of the prominent crops, along with other field crops and orchards, grown in the Sacramento Valley and is visible to travelers along the Interstate 5 corridor where it runs parallel to the river.

4.1.1.6 Delta

The visual resources of the Delta are characterized by agriculture and multiple state recreation areas, including Franks Tract, Brannon Island, and Windy Cove; Stone Lakes National Wildlife Refuge; the Cosumnes-Mokelumne River confluence wildlife preserve; and several private marinas, camping, and fishing sites. Delta waterways, including rivers, creeks, and sloughs, are visible primarily from boats which use the Delta for commerce and recreation. State Route 160 is a state-designated scenic highway from Antioch to Freeport. Additionally, views from the Delta include Mount Diablo in Contra Costa County and the Vaca Range in Napa and Solano counties.

4.1.1.7 San Luis Reservoir

San Luis Reservoir is located in the grassland hills of the western San Joaquin Valley near historic Pacheco Pass. Viewing opportunities of the reservoir occur from recreation areas and facilities, including boat ramps, campgrounds and picnic sites. The Romero Overlook visitor center provides telescopes for viewing the area around the reservoir.

4.1.1.8 South of Delta Groundwater Banks – Recharge Basins

The groundwater bank recharge basins in areas south of the Delta provide habitat and viewing opportunities for waterfowl and water birds.

4.1.2 Impact Analysis

4.1.2.1 Methodology and Significance Criteria

The analysis of the potential impacts on visual resources associated with the proposed project was based on the following significance criteria:

- Would the proposed project cause changes in reservoir water surface elevation or river flow, relative to the basis of comparison, of sufficient magnitude and duration for a given month, to obstruct or permanently reduce visually important, Scenic Class A or B features viewed from visually sensitive areas?
- Would the proposed project cause changes in reservoir water surface elevation or river flow, relative to the basis of comparison, of sufficient magnitude and duration for any given month, to result in long-term (i.e., 5 years or more) adverse visual changes or contrasts to the existing landscape as viewed from areas with high visual sensitivity within 3 miles?
- Would the proposed project cause changes in reservoir water surface elevation or river flow, relative to the basis of comparison, of sufficient magnitude and duration for any given month, to adversely affect landscape character and scenic attractiveness of Class A or B visual features?

The assessment of the scenic value of a landscape is very subjective, therefore visual resources analysis are generally restricted to qualitative significance criteria. In this analysis, the assessment methods are guided by the Scenery Management System (SMS) developed by the United States Department of Agriculture, Forest Service (USDA, FS) in 1995 and outlined in *Landscape Aesthetics: A Handbook for Scenery Management, Agriculture Handbook Number 701*. The SMS allows for integration of aesthetics with other biological, physical, and social/cultural resources in the planning process.

The analysis discusses project components associated with surface water reservoirs, instream flows, and groundwater recharge practices that could affect the quality of visual resources within the project area.

The SMS was applied to the proposed project utilizing the following steps:

- **Identify visually sensitive areas.** Sensitivity is considered highest for views seen by people driving to or from recreational activities, or along routes designated as scenic corridors. Views from relatively moderate to high-use recreation areas also are considered sensitive.
- **Define the landscape character.** Landscape character gives an area its visual and cultural image, and consists of the combination of physical, biological, and cultural attributes that make each landscape identifiable or unique. Landscape character refers to the images of the landscape that can be defined with a list of scenic attributes.
- **Classify Scenic Attractiveness**
    - **Class A - Distinctive**: Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide unusual, unique, or outstanding scenic quality. These landscapes have strong positive attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.
    - **Class B - Typical:** Areas where landform, vegetation pattern, water characteristics, and cultural features combine to provide ordinary or common scenic quality. These landscapes generally have positive, yet common, attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.
    - **Class C – Indistinctive:** Areas where landform, vegetation patterns, water characteristics, and cultural land use have low scenic quality. Often water and rock form of any consequence are missing in Class C landscapes. These landscapes have weak to missing attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

Class A and B resources typically include state or federal park, recreation, or wilderness areas. Rivers and reservoirs typically are considered to have Class A or B scenic attractiveness classifications. Class C areas generally include those of low scenic quality and contain more common landscapes, such as agricultural lands.

4.1.2.2 Environmental Impacts

Yuba River

Under the proposed project, flows in the lower Yuba River are expected to remain within normal operational ranges. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to RD-1644 interim) generally are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, January, and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April and June; and (4) higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during May; (5) higher at low flow levels, lower at intermediate levels, and higher at high flow levels during July; and (6) generally higher over the range of expected flow levels during August, September, and October (**Appendix 3**). Reductions in lower Yuba River flows under the proposed project are not expected to be of sufficient magnitude or duration to result in an adverse affect to the visual character of the Yuba River because they are expected to occur during the winter, when the river already is at a time of high flows under the basis of comparison.

In the EWA EIS/EIR, the visual resources analysis determined that *"Yuba River flows would increase at most by 1,005 cfs in July through September; approximately 60 percent above the Baseline Condition. An increase in flow would contribute to the character of the landscape of the resource; therefore, there would be* [no] *adverse effect"* (Reclamation *et al.* 2003) (p. 18-14). The EWA analysis also determined that, *"flows could decrease by 239 cfs from April to June between YCWA's power facility discharge (just upstream of Englebright Reservoir) and the Member Unit diversion points, typically at Englebright or Daguerre Point Dam). Because flow reductions below Englebright Dam would be minor and temporary, the character of the landscape would not change and the overall scenic attractiveness of the Yuba River would remain intact. The visual character of riparian vegetation along the river corridor would not be affected, and a decrease in flow would cause little affect to Class A or B visual resources. This effect would be less than significant"*(Reclamation *et al.* 2003) (p. 18-14).

Therefore, because the analysis presented above indicates that the range of potential variation in Yuba River flow changes expected to occur under the proposed project would be relatively minor compared to the basis of comparison, and have previously been evaluated for the entire EWA Program, the proposed project would be expected to result in a less-than-significant impact on the aesthetics of the Yuba River.

New Bullards Bar Reservoir

Implementation of the proposed project would alter the hydrologic pattern relative to the basis of comparison; however, reservoir storage and water surface elevations at New Bullards Bar Reservoir would remain within normal operational parameters. During March 2007, average end of month reservoir storage under the proposed project would be 739,234 acre-feet (i.e., water surface elevation = 1,899 feet msl), compared to 744,049 acre-feet (i.e., water surface elevation = 1,900 feet msl) under the basis of comparison. Depending on hydrological conditions, average end of September storage in New Bullards Bar Reservoir under the proposed project would be approximately 594,865 acre-feet (i.e., water surface elevation = 1,868 feet msl), and reservoir storage under the basis of comparison would be approximately 671,063 acre-feet (i.e., water surface elevation = 1,885 feet msl). In March 2008, average end of month reservoir storage under the proposed project would be 725,329 acre-feet (i.e., water surface elevation = 1,896 feet msl), compared to 742,372 acre-feet (i.e., water surface elevation = 1,899 feet msl) under the basis of comparison. Although water surface elevation reductions are anticipated with the proposed project, these decreases would not be substantial enough to change the character of the landscape and would not detract from the scenic attractiveness. The visual impact would cause minimal effects to Class A or B scenic features of New Bullards Bar Reservoir.

In the EWA EIS/EIR, the visual resources analysis determined that, *"EWA acquisition of up to 85,000 acre-feet of water from groundwater substitution would increase water levels in New Bullards Bar Reservoir while the water is held back until the Delta pumps are available. EWA acquisition of 100,000 acre-feet of stored reservoir water from New Bullards Bar Reservoir would decrease water levels, with the release of water starting at the same time that the water from groundwater substitution is released"... "The combination of these releases would reduce lake levels compared to the Baseline Condition. In October, the drawdown zone would be greater than under the Baseline Condition, but not greater than the maximum potential drawdown zone. This visual effect would cause little affect* (sic) *to Class A or B* *scenic features of the Yuba River. Therefore, effects to visual resources would be less than significant"* (Reclamation et al. 2003) (pp. 18-14 – 18-15).

Therefore, because the analysis presented above indicates that the range of potential variation in water surface elevation expected to occur under the proposed project would remain within historic drawdown levels, and has previously been evaluated for the entire EWA Program, the proposed project would be expected to result in a less-than-significant impact on New Bullards Bar Reservoir aesthetics.

Feather River

Flows within the Feather River may be higher under the proposed project during most schedules, but are anticipated to remain within the range of normal instream flows and fluctuations. Specific operations of the Feather River system as a result of the proposed project are presently uncertain. Because the range of flows anticipated under the proposed project in the Feather River would be within normal operating ranges (**Table 4-1**), the character of the landscape would not change and the overall scenic attractiveness of the Feather River would remain intact.

Table 4-1. Average Difference in Simulated Monthly Mean Flows (cfs) for the Lower Yuba River (Marysville) Between the Proposed Project and RD-1644 Interim, Compared to Average Feather River Flows (Gridley) During the March 2007 through March 2008 Period

	Mar 2007	Apr 2007	May 2007	Jun 2007	Jul 2007	Aug 2007	Sep 2007	Oct 2007	Nov 2007	Dec 2007	Jan 2008	Feb 2008	Mar 2008
Average Difference in Monthly Mean Flows[1]	-149*	379	-15*	361	56	275	161	100	-90*	-351*	-372*	-22*	-223*
**Feather River Average Monthly Flow	7,736	4,418	4,068	4,003	5,301	4,293	3,060	2,365	1,978	4,936	5,712	6,931	7,736
Percent of Feather River Flows	1.9	8.6	0.3	9.0	1.1	6.4	5.3	4.2	4.6	7.1	6.5	0.31	2.9

[1]Differences in simulated mean monthly flows between the proposed project and RD-1644 interim include both uncontrolled flow releases during flood control operations during wetter water years, and controlled flow releases during drier water years to meet minimum flow requirements on the lower Yuba River. Therefore, reductions in monthly mean flows presented in the table above represent simulated changes that are expected to occur between the proposed project and RD-1644 interim flows only; these modeled reductions would not result in flow reductions under the proposed project that would cause actual flows to fall below RD-1644 interim minimum instream flow requirements.

*Average monthly flow less than under RD-1644 interim

** Source: CDEC, period of record 1993 through 2005

As described in the EWA EIS/EIR, agricultural lands (Class C) are predominant near the Feather River in its lower reaches, while upper reaches of the three forks have visual resources typical of the Sierra foothills (Class A and B visual resources) (Reclamation *et al.* 2003). Further, if no visual environmental consequences have been associated with an acquisition type, the potentially affected waterbodies (i.e., Feather River) were excluded from the analytical discussion in the EWA visual resources analysis.

Because Class A and B visual resources are generally not present in the Feather River downstream of Oroville Reservoir, a decrease in flow would cause little affect to Class A or B visual resources, and it is not anticipated that the visual character of riparian vegetation along the river corridor would be affected by the proposed project. However, because of the potential for slight changes in flow to occur under the proposed project, relative to the basis of comparison, there would be a less-than-significant impact to the aesthetics of the lower Feather River.

Oroville Reservoir

Oroville Reservoir water surface levels would be affected by the proposed project only if DWR had to release additional flows to meet water quality standards in the Delta as a result of YCWA holding back water to refill New Bullards Bar Reservoir after the completion of the proposed project. The potential drawdown of Oroville Reservoir would be minimal given the much larger size of Oroville Reservoir, and most likely would occur in winter or spring.

In the EWA EIS/EIR, the visual resources analyses for Oroville Reservoir considered the potential impacts of EWA acquisitions of over 200,000 acre-feet, which could become available from crop idling and groundwater substitution in the Feather River Basin. The EWA analysis for Oroville Reservoir determined that, "*Increased releases in July and August would cause the lake level to decline faster compared to the Baseline Condition; however, reduced releases in September would allow the end of month elevation in September to be the same as the Baseline Condition. Under the Baseline Condition, the "bathtub" ring of Lake Oroville is visually noticeable. The EWA would result in the "bathtub" ring becoming larger during July and August, although, by September the ring would be the same size as under the Baseline Condition. Therefore, there would be little visual effect to the "bathtub" ring or shoreline vegetation. Thus, there would be little effect to Class A or B visual resources of Lake Oroville and this effect would be less than significant*" (Reclamation *et al.* 2003) (p. 18-14).

Under the basis of comparison, the "bathtub ring" around Oroville Reservoir is visually noticeable. Compared to the magnitude of change in reservoir water surface elevations identified for the EWA acquisitions in the Feather River Basin, the level of drawdown, if any, under the proposed project would be small and within normal operating conditions for Oroville Reservoir. Because the proportion of EWA asset acquisitions associated with the proposed project (i.e., 62,000 to 125,000 acre-feet) is less than that which was identified for the previously evaluated EWA Program, and because the proposed project also was included in the EWA visual resources analysis, any potential changes in Oroville Reservoir water surface elevation under the proposed project would be expected to be less than those identified for the entire EWA Program. Therefore, there would be minimal impact to the "bathtub ring" or shoreline vegetation. Thus, there would be minimal impact to Class A or B aesthetic values of Oroville Reservoir, and the proposed project, relative to the basis of comparison, would be expected to result in a less-than-significant impact to Oroville Reservoir aesthetics.

Sacramento River

Flows in the Sacramento River are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations and, thus, would not be expected to differ substantially under the proposed project, relative to the basis of comparison. The proposed project would only occur for a period of approximately one-year and would result in relatively minor changes in flow compared to the total volume of flow in the Sacramento River (see **Table 4-2).**

In the EWA EIS/EIR, the analysis of potential impacts to visual resources considered acquisitions of over 275,000 acre-feet from the Sacramento River system. The EWA analysis determined that flow increases could range from 157 cfs to 1,940 cfs, and flow decreases could range from 111 cfs to 1,160 cfs in the Sacramento River. As described (Reclamation *et al.* 2003) (pp. 18-12 – 18-13), flow reductions would be "*insufficient to reduce the riparian vegetation corridor along the river. Therefore, because the minimal percent reduction of flow and the temporary nature of the decrease would not change the character of the landscape or detract from the overall scenic attractiveness of the Sacramento River, this effect would be less than significant.*" Similarly, increases in Sacramento River flow "*could contribute to the character of the landscape; therefore, there would be no adverse effect*."

Table 4-2. Average Difference in Simulated Monthly Mean Flows (cfs) for the Lower Yuba River (Marysville) Between the Proposed Project and RD-1644 Interim, Compared to Average Sacramento River Flows (Freeport) During the March 2007 Through March 2008 Period

	Mar 2007	Apr 2007	May 2007	Jun 2007	Jul 2007	Aug 2007	Sep 2007	Oct 2007	Nov 2007	Dec 2007	Jan 2008	Feb 2008	Mar 2008
Average Difference in Monthly Mean Flows[1]	-149*	379	-14*	361	56	275	161	100	-90*	-351*	-372*	-22*	-223*
Sacramento River** Average Monthly Flow	37,680	28,897	24,686	18,405	15,010	14,387	14,809	12,353	26,089	26,482	35,280	40,619	37,680
Percent of Sacramento River Flows	0.40	1.3	0.1	2.0	0.4	1.9	1.1	0.8	0.3	1.3	1.1	0.1	0.6

[1]Differences in simulated mean monthly flows between the proposed project and RD-1644 interim include both uncontrolled flow releases during flood control operations during wetter water years, and controlled flow releases during drier water years to meet minimum flow requirements on the lower Yuba River. Therefore, reductions in monthly mean flows presented in the table above represent simulated changes that are expected to occur between the proposed project and RD-1644 interim flows only; these modeled reductions would not result in flow reductions under the proposed project that would cause actual flows to fall below RD-1644 interim minimum instream flow requirements.

*Average monthly flow less than RD-1644 interim

** Source: CDEC, period of record 1948 through 2005

The Sacramento River generally is considered a Class B visual resource. The potential decreases in flow expected to occur under the proposed project, relative to the basis of comparison, would be insufficient to reduce the riparian vegetation along the river. Because the proportion of EWA asset acquisitions associated with the proposed project (i.e., 62,000 to 125,000 acre-feet) is less than that which was identified for the previously evaluated EWA Program, and the proposed project also was included in the EWA visual resources analysis, any potential changes in visual aspects of the landscape character under the proposed project would be expected to be less than those identified for the entire EWA Program. Any minimal reductions in flow, and the temporary nature of these decreases, that may result from the proposed project would not change the character of the landscape or detract from the overall scenic attractiveness of the Sacramento River. Therefore, potential flow changes due to the proposed project, relative to the basis of comparison, would be a relatively small proportion of total Sacramento River flows during the March 1, 2007 through March 31, 2008 period and, thus, represent a less-than-significant impact to the aesthetics of the Sacramento River.

Sacramento-San Joaquin Delta

Specific operations of the Delta system as a result of the proposed project are presently uncertain, but would remain within authorized operational constraints. The proposed project would only occur for a period of approximately one-year and would result in relatively minor changes in Sacramento River flows, which contribute to total Delta inflow, compared to the total Delta inflow. Total Delta inflow is calculated as the sum of river flows from the Sacramento River, Yolo Bypass, total from the Eastside stream group (Cosumnes, Calaveras, and Mokelumne), and San Joaquin River inflow (DWR Website 2002).

The percent contributions of Sacramento River flows to Delta inflows for each month of the March 2007 through March 2008 timeframe **Table 4-3** were calculated as the scaled ratios of the averages of Sacramento River monthly mean flows (cfs) at the Freeport Gage, to the averages of monthly Delta inflows (cfs) reported by Reclamation in the tables of Delta Outflow Computations for the years 1998 through 2006 (Reclamation Website 2006).

The data available from CDEC for Sacramento River monthly mean flows at Freeport is for a longer period of record (1948 through 2005) than those reported by Reclamation. Because of the differences in periods of record, the averages of the monthly mean Sacramento River flows at the Freeport Gage available from CDEC are generally lower than those reported by Reclamation. Therefore, to make a comparison between monthly mean average Sacramento River flow data for the 1948 through 2005 period of record from CDEC to the total Delta inflow for the 1998 through 2006 period of record, the percent contributions of the monthly Sacramento River flows to Delta inflows were used to estimate monthly average Delta inflows for the period of 1948 through 2005. These estimates were then related to the average differences in simulated monthly mean flows for the Yuba River between the proposed project and RD-1644 interim during each month to calculate the percent contribution to Delta inflows.

For example, the calculation for January was:

$$January\ Average\ Difference\ Percent\ of\ \ Delta\ Inflow = \frac{-372}{35,280} \times 0.6805 \times 100 = -0.72\%$$

Flows within the Delta may be slightly higher or lower under the proposed project, but would remain within the range of normal flow ranges and fluctuations resulting from SWP and CVP operations, which were previously evaluated in the EWA EIS/EIR (Reclamation *et al.* 2003). The EWA visual resources analysis determined that, "*There would be no decreases in Delta inflows from the Sacramento or San Joaquin Rivers under the Flexible Purchase Alternative; however, Delta exports would increase. EWA acquisition would not result in any effect to Class A or B visual resources in the Delta. The character of the landscape and the level of scenic attractiveness would not change from the Baseline Conditions; therefore, the effect to visual resources would be less than significant*" (Reclamation *et al.* 2003) (pp. 18-16 – 18-17).

The proposed project would not result in any impact to Class A or B scenic attractiveness classifications/visual resources in the Delta. The character of the landscape and the level of scenic attractiveness would not change from the basis of comparison. Therefore, potential changes in Delta inflows from the Sacramento River under the proposed project, relative to the basis of comparison, are expected to result in a less-than-significant impact to the aesthetics of the Delta.

Table 4-3 Average Difference in Delta Inflow (cfs) Relative to Average Difference in Simulated Monthly Mean Flows (cfs) for the Lower Yuba River (Marysville) Between the Proposed Project and RD-1644 Interim During the March 2007 Through March 2008 Period.

	Mar 2007	Apr 2007	May 2007	Jun 2007	Jul 2007	Aug 2007	Sep 2007	Oct 2007	Nov 2007	Dec 2007	Jan 2008	Feb 2008	Mar 2008
1998-2006 Sacramento River Average Monthly Flow [1]	44,138	32,123	28,526	23,459	20,632	18.406	16,347	12,050	13,513	25,697	39,302	44,607	44,138
1998-2006 Delta Inflow Average Monthly Flow [2]	69,588	52,717	40,826	32,466	26,136	21,944	19,178	15,157	16,423	30,476	57,754	78,129	69,588
Sacramento River Flow Percent of Delta Inflow	63.43%	60.93%	69.87%	72.26%	78.94%	83.88%	85.24%	79.50%	82.28%	84.32%	68.05%	57.09%	63.43%
1948-2005 Sacramento River Average Monthly Flow [3]	37,680	28,897	24,686	18.405	15,010	14,387	14,809	12,353	26,089	26,482	35,280	40.619	37,680
Estimated 1948-2005 Delta Inflow Average Monthly Flow	59,406	47,423	35,330	25,472	19,014	17,153	17,373	15,538	31,706	31,407	51,844	71,144	59,406
Average Difference in Monthly Mean Flows [4]	-149	379	-14	361	56	275	161	100	-90	-351	-372	-22	-223
Average Difference Percent of Delta Inflow	-0.25%	0.80%	-0.04%	1.42%	0.29%	1.60%	0.93%	0.64%	-0.28%	-1.12%	-0.72%	-0.03%	-0.38%

[1] Source: (Reclamation Website 2006) (Table of Average Monthly Flows at Freeport)
[2] Source: (Reclamation Website 2006) (Table of Average Monthly Delta Inflows)
[3] Source: CDEC, Period of Record 1948 through 2005
[4] Differences in simulated mean monthly flows between the proposed project and RD-1644 interim include both uncontrolled flow releases during flood control operations during wetter water years, and controlled flow releases during drier water years to meet minimum flow requirements on the lower Yuba River. Therefore, reductions in monthly mean flows presented in the table above represent simulated changes that are expected to occur between the proposed project and RD-1644 interim flows only; these modeled reductions would not result in flow reductions under the proposed project that would cause actual flows to fall below RD-1644 interim minimum instream flow requirements.

San Luis Reservoir

In the EWA EIS/EIR (Reclamation *et al.* 2003) (p. 18-18), the visual resources analysis stated that, "*The EWA assets would be managed to prevent the EWA action from causing or aggravating any low point problems in San Luis Reservoir. A decrease in surface water levels earlier in the year would not result in an adverse change to the existing landscape character or detract from the overall scenic attractiveness because the surface water levels in San Luis Reservoir typically vary during the summer under the Baseline Condition. EWA actions would not result in any change to Class A or B visual resources of San Luis Reservoir; thus, the effect to visual resources as a result of decrease in surface water levels would be less than significant*."

It is anticipated that DWR could store a portion of water available from the proposed project in San Luis Reservoir. It is unknown how DWR may operate San Luis Reservoir during the 2007 through 2008 period, when the proposed project would be in place. However, drawdown of San Luis Reservoir for the purpose of delivering the proposed project transfer water would be expected to occur within normal SWP/CVP operational practices for the reservoir and according to existing regulatory requirements or limitations. The proposed project would not result in any change to Class A or B scenic attractiveness classifications/visual resources of San Luis Reservoir. Therefore, potential changes in San Luis Reservoir water surface elevations under the proposed project, relative to the basis of comparison, are expected to result in a less-than-significant impact to the aesthetics of San Luis Reservoir.

South of Delta Groundwater Banks

DWR's use of groundwater banks and associated recharge basins for the temporary storage of water supplies acquired from the transfer of Yuba River water would occur according to EWA Program practices and protocol. The proposed project would not result in substantial changes to the operations of these facilities and, therefore, potential impacts to visual resources at the recharge basins would be less than significant.

4.1.2.3 Mitigation Measures

Implementation of the proposed project would not result in any significant visual resources impacts, relative to the basis of comparison. Therefore, no mitigation measures are required.

4.2 Air Quality

Groundwater extraction operations generate emissions due to the fuel and energy required for pumping and transporting groundwater. Groundwater pumping operations associated with the proposed project (30,000 acre-feet of groundwater substitution pumping that could occur in a Schedule 6 year) potentially could impact air quality through greater use of diesel-fueled groundwater pump motors by YCWA Member Units, relative to the basis of comparison.

Implementation of the proposed project would not conflict with or obstruct implementation of applicable air quality plans, expose sensitive receptors to substantial pollutant concentrations, or create objectionable odors.

4.2.1 Environmental Setting

This section provides a description of the federal, state, and local regulations applicable to the Yuba County region. Yuba County is located within the Sacramento Valley Air Basin (SVAB) and air emissions are regulated by the Feather River Air Quality Management District (FRAQMD). The EWA EIS/EIR (Reclamation *et al.* 2003) (pp. 8-15 - 8-23) flexible purchase alternative analysis focuses on the potential for air emissions associated with crop idling asset acquisition in the CVP/SWP export service area. The proposed project does not involve use of crop idling to develop water supplies within Yuba County or within the CVP/SWP export service area, therefore, the discussion of potential air quality impacts for the proposed 2007 Pilot Program is limited to the groundwater substitution operations of YCWA Member Units.

4.2.1.1 Regulatory Setting

Air quality in California is regulated by the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB). The FRAQMD administers local, state, and federal air quality management programs within Yuba and Sutter counties.

Federal Clean Air Act

The Federal Clean Air Act (CAA) requires EPA to establish and maintain national ambient air quality standards (NAAQS) used to manage air quality for common air pollutants across the country. California also has adopted ambient air quality standards (CAAQS), and generally, the CAAQS are more stringent than NAAQS. Pollutants for which national and state standards have been established are termed "criteria" pollutants, because the standards are based on criteria that show a relationship between pollutant concentrations and impacts on health and welfare. From this relationship, EPA and the state establish acceptable pollutant concentration levels to serve as ambient air quality standards. **Table 4-4** describes the criteria pollutants of primary concern (ozone, carbon monoxide [CO], nitrogen dioxide [NO_2], sulfur dioxide [SO_2], and particulate matter). **Table 4-5** lists the federal and state ambient air quality standards for these criteria pollutants.

Table 4-4. Description of Criteria Pollutants

Pollutant	Characteristics	Health Effects	Major Sources
Ozone	A highly reactive photochemical pollutant created by the action of sunshine on ozone precursors (reactive organic gasses and oxides of nitrogen).	Eye irritation. Respiratory function impairment.	Combustion sources, such as factories and automobiles, and evaporation of solvents and fuels.
Carbon Monoxide	Odorless, colorless gas that is highly toxic. Formed by the incomplete combustion of fuels.	Impairment of oxygen transport in the bloodstream. Aggravation of cardiovascular disease. Fatigue, headache, dizziness.	Automobile exhaust, combustion of fuels, and combustion of wood in woodstoves and fireplaces.

Table 4-4. Description of Criteria Pollutants (continued)

Pollutant	Characteristics	Health Effects	Major Sources
Nitrogen Dioxide	Reddish-brown gas formed during combustion.	Increased risk of acute and chronic respiratory disease.	Automobile and diesel truck exhaust, industrial processes, fossil-fueled power plants.
Sulfur Dioxide	Colorless gas with a pungent odor.	Increased risk of acute and chronic respiratory disease.	Diesel vehicle exhaust, oil-powered power plants, industrial processes.
PM_{10}	Small particles that measure 10 microns or less are termed PM_{10}. Solid and liquid particles of dust, soot, aerosols, smoke, ash, and pollen and other matter that are small enough to remain suspended in the air for a long period.	Aggravation of chronic disease and heart/lung disease symptoms.	Dust, erosion, incinerators, automobile and aircraft exhaust, and open fires.

Table 4-5. California and Federal Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards	Federal Standards
Ozone	1 Hour	0.09 ppm	0.12 ppm
	8 Hour	0.070 ppm	0.08 ppm
PM_{10}	Annual Arithmetic Mean	20 ug/m^3	50 ug/m^3
	24 Hour	50 ug/m^3	150 ug/m^3
$PM_{2.5}$	Annual Arithmetic Mean	12 ug/m^3	15 ug/m^3
	24 Hour	No Separate State Standard	65 ug/m^3
CO	1 Hour	20 ppm	35 ppm
	8 Hour	9.0 ppm	9 ppm
Nitrogen Dioxide	Annual Arithmetic Mean	--	0.053 ppm
	1 Hour	0.25 ppm	--
Sulfate	24 Hour	25 ug/m^3	No Federal Standard
Sulfur Dioxide	24 Hour	0.04 ppm	0.14 ppm
	Annual Arithmetic Mean	--	0.030 ppm
	1 Hour	0.25 ppm	--
Source: California Air Resources Board			

If pollutant concentration levels of any of the criteria pollutants exceed the state or federal standards established for those pollutants, the area is designated as a "non-attainment" area. For some pollutants, an area can be designated as a basic, moderate, severe, serious, or extreme non-attainment area, depending upon the level of pollutant concentrations. Likewise, if standards for pollutants are met in a particular area, the area is designated as in "attainment" for those pollutants. Where standards may not have been established for certain criteria pollutants, the areas are considered "unclassified" for those pollutants.

State Clean Air Act

The California Air Resources Board (ARB) classifies each district in terms of its attainment of state standards for nine "criteria" pollutants: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter less than 10 microns in diameter (PM_{10}), sulfates, lead, hydrogen sulfide, and visibility-reducing particles. Each air quality management district is responsible for developing plans and implementing programs to meet the air quality standards and maintain pollutant concentrations below the standards for criteria pollutants in its area of jurisdiction.

Senate Bill 700

California air quality management districts and air pollution control districts require any person that uses certain types of equipment that may emit air pollutants to obtain a permit. Prior to the enactment of Senate Bill 700 in 2003, vehicles and certain types of equipment such as agricultural groundwater pumps were exempt from the permit requirement under California law. Senate Bill 700 eliminated that exemption for any equipment used in agricultural operations. The law now requires that a permit to operate agricultural equipment be obtained and renewed every three years.

4.2.1.2 Sacramento Valley Air Basin

During summer in the SVAB, the Pacific high-pressure system can create low-elevation inversion layers where air descending from high pressure overlies shallow, cooler layers of air. This prevents normal mixing of the atmosphere and prevents the vertical dispersion of air above the boundary layer. As a result, air pollutants can become concentrated during summer, decreasing air quality until daytime heating of solid surfaces raises the inversion to the point it breaks and allows full mixing. During winter, when the Pacific high-pressure system moves south, stormy, rainy weather visits the region intermittently and persistent inversions are less common. Prevailing winter winds from the southwest disperse pollutants, often resulting in clear, sunny weather and good air quality over most of this portion of the region. High particulate levels can, however, occur in winter when stable weather occurs and tule fog develops under cold air inversions. In the SVAB, ozone and PM_{10} are pollutants of concern because concentrations of these pollutants have been found to exceed standards. Ozone is a seasonal problem derived from photochemical reactions of hydrocarbons and oxides of nitrogen in the presence of sunlight, occurring predominantly from approximately May through October.

4.2.1.3 Yuba County Air Quality

Yuba County air quality is designated as attainment (or unclassified) for all federal standards. Yuba County air quality is designated as moderate non-attainment for ozone (1-hour) and non-attainment for PM_{10} for California standards, and is either in attainment or unclassified for the remaining state standards. Major sources of PM_{10} are the combustion of wood, diesel, and other fuels; industrial processes; and ground-disturbing activities such as construction and agricultural operations. Ozone is formed by chemical reaction of reactive organic gases (ROG) and oxides of nitrogen (NO_x) in the presence of sunlight; motor vehicles are major sources of ROG and NO_X. **Table 4-6** indicates that Yuba County is within the lower range for annual average tons per day of both nitrogen oxides (NO_x) and PM_{10} among the counties of the SVAB.

Table 4-6. Sacramento Valley Air Basin Historical and Forecast Emissions

	NOx Emissions (tons/day, annual average)									
County	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Sacramento	129	134	140	148	125	103	83	64	48	37
Shasta	36	39	37	42	36	33	29	26	23	21
Placer	23	27	28	31	29	28	24	20	17	15
Yolo	31	32	33	37	34	31	24	18	14	11
Butte	30	34	33	35	31	26	22	18	15	13
Sutter	19	20	18	21	19	17	15	14	11	10
Solano	12	15	14	17	15	13	11	9	7	6
Tehama	14	18	15	15	13	12	10	8	7	7
Colusa	9	10	9	13	13	10	10	8	8	7
Glenn	14	13	12	13	12	10	9	8	7	6
Yuba	11	14	12	12	11	10	8	7	6	5
Air Basin Total	329	356	351	384	337	295	246	200	162	137
	Directly Emitted PM_{10} Emissions (tons/day, annual average)									
	1975	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Sacramento	34	37	40	44	40	42	44	46	48	49
Shasta	30	27	28	31	30	31	32	33	35	36
Yolo	21	22	23	26	26	28	28	29	29	30
Butte	26	29	29	32	28	27	28	29	30	30
Colusa	19	19	19	19	19	20	20	20	21	21
Placer	8	9	11	13	13	15	16	17	18	19
Glenn	14	15	14	15	15	15	15	16	16	17
Sutter	13	14	13	14	14	15	15	15	15	16
Tehama	13	15	15	14	14	14	15	15	15	16
Solano	7	8	8	8	8	9	9	9	9	10
Yuba	10	9	9	8	8	9	9	9	9	9
Air Basin Total	195	203	210	223	216	225	231	239	247	253
Source: The California Almanac of Emissions and Air Quality, 2005. CARB.										

Table 4-7 provides a list of the high emitting facilities in the Sacramento Valley Air Basin; none of these facilities is within Yuba County. Calpine Greenleaf is in Sutter County which is within the FRAQMD.

Table 4-7. High Emitting Facilities in the Sacramento Valley Air Basin

Nitrogen Oxides (NOx)		
Facility Name	**City**	**Tons per Year**
Wheelabrator Shasta	Anderson	592
Lehigh Southwest Cement Co.	Redding	527
PG&E Delevan Compressor Station	Colusa	356
Pacific Gas & Electric	Burney	254
Sierrapine - Rocklin	Rocklin	160
Sierra Pacific	Lincoln	157
Burney Forest Products	Burney	155
Wadham Energy Partnership	Williams	152
Calpine Greenleaf	Yuba City	144
Johns-Manville (Insulation)	Willows	137
Directly Emitted Particulate Matter (PM_{10})		
Facility Name	**City**	**Tons per Year**
Lehigh Southwest Cement Co.	Redding	122
Source: The California Almanac of Emissions and Air Quality, 2005. California Air Resources Board.		

4.2.2 Impact Analysis

4.2.2.1 Methodology and Significance Criteria

The following criteria used to evaluate potential air quality impacts are based on standardized air emission levels. Potential air quality effects were considered significant if the implementation of the proposed project, relative to the basis of comparison, would cause substantial adverse changes to the ambient air quality conditions. The range of such changes includes producing pollutants that would either on their own, or when combined with baseline emissions:

- Would the proposed project cause a lowering of attainment status?
- Would the proposed project conflict with an adopted air quality management plan, policy, or program?
- Would the proposed project violate any air quality standard or contribute to an existing or projected air quality violation?

FRAQMD has not established absolute quantitative significance thresholds for air pollutant emissions. However, the FRAQMD Indirect Source Review Guidelines (FRAQMD 1998) provide recommended thresholds of significance for project-generated emissions, and these thresholds are intended as a guide, rather than strict absolute values. In accordance with these recommended thresholds, a project may be considered to pose a significant air quality impact if project-generated emissions exceed the following:

- 25 pounds per day of ROG
- 25 lbs/day of NO_X
- 80 lbs/day of PM_{10}

4.2.2.2 Environmental Impacts

YCWA and its Member Units have developed and are implementing a mitigation plan with the goal of no net increase in air quality emissions associated with groundwater pumping operations in the Yuba County area (**Figure 4-1**). The air quality mitigation plan is consistent with the EWA Final EIS/EIR Mitigation Monitoring and Reporting Plan (Mitigation Plan) (Reclamation *et al.* 2004) requirement (Page 6-10, Table 6-1), which states: "*Data submitted (to the EWA Project Agencies) must include types of pumps to be used fro transfer, total emissions anticipated from groundwater substitution, and plan for measures to reduce/offset the emissions*." Furthermore, the EWA Mitigation Plan indicates that the "*Willing Seller (is) to provide pump and emissions data, as well as plan for mitigation; Reclamation/DWR to approve*." The basic elements of the YCWA/Member Unit air quality mitigation plan is described in the following sections. For purposes of the 2007 Pilot Program, YCWA and the Member Units would follow the mitigation plan regardless of whether the transfer water would be supplied to the EWA Program.

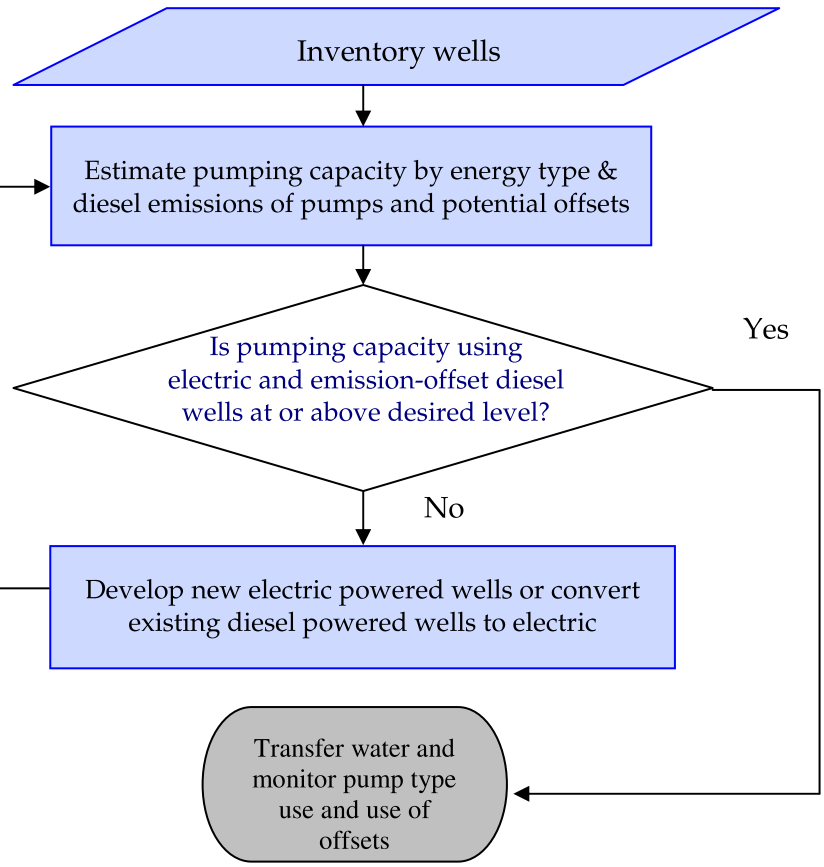

Figure 4-1. Yuba County Water Agency and Member Units - Flow Chart of No Net Impact Air Quality Mitigation Plan

<u>Step 1 – Well Inventory</u>

The well inventory includes an assessment of the pumping capacity of the well, the existing power source (electric or diesel) and enough information about the diesel motors used on the wells to estimate emissions.[1] Additionally, the inventory includes gathering information on diesel engines used to power pumps that would be turned off during a groundwater substitution transfer. The emissions from these diesel-powered pumps could be used as real-time emission offsets. For example, some of the participating Member Units use diesel engines

[1] Pumping capacity is the minimum of the physical capacity of the well to pump water and the crop water demand for the field that the well is irrigating.

to pump surface water out of ditches. These diesel powered ditch pumps would be turned off during a groundwater substitution transfer and therefore the emissions that would have been produced, but for the transfer, are available as offsets to existing diesel pumps used to pump groundwater.

Currently, the well inventory of six of the Member Units is complete. The inventory shows that there are over 240 wells among the participating Member Units. Approximately 80 percent of the wells are currently powered by electricity. Estimates of the volume of water that could be extracted with no net impact to air quality, indicate that up to approximately 88,000 acre-feet (or up to approximately 74,500 acre-feet if Cordua Irrigation District elects to not participate) of water could be made available for groundwater transfers (2005 inventory results). Currently, 170 of the groundwater wells already are DWR-approved. Because the anticipated level of groundwater pumping in 2007 is relatively low (due to high reservoir levels in the system and related reduced need for dry year water supplies), these wells potentially would provide an adequate supply of water for any Schedule 6 water year groundwater substitution operations in 2007.

YCWA also is in the process of working with the participating Member Units to convert some of the remaining existing diesel powered pumps to electric. In 2004, YCWA worked closely with two of the participating Member Units and the FRAQMD to submit applications for Carl Moyer grant funds in order to convert four existing diesel engines. YCWA will continue to work closely with FRAQMD, and the participating Member Units, to submit additional applications for Carl Moyer grant funds, as needed and desired.

Step 2 – Estimate Pump Capacity and Offset Potential

The second step in the air quality mitigation plan is to estimate the volume of water that could be pumped with either/both existing electric wells and/or mitigated diesel powered pumps.

Step 3 – Assess Adequacy of Mitigated Pumping Capacity

YCWA would work closely with participating Member Units to verify that water pumped for the 2007 Pilot Program either would be obtained: (1) from electric-powered motors; or (2) from diesel-powered motors operating according to an emission offset.

Adequate Mitigated Pumping Capacity

If the estimated mitigated pumping capacity volume is sufficient to meet the needs of the proposed project, then Schedule 6 water year groundwater substitution transfers would occur with no impact to air quality.

Insufficient Mitigated Pumping Capacity

YCWA and the Member Units are committed to groundwater pumping operations that result in no net impact to air pollution. Accordingly, if the pumping volume is not sufficient to meet the needs of the proposed project, the following additional mitigation steps would be considered.

- Power new pumps, where feasible, with electricity.
- Electrify existing pumps.

- Repower existing pumps with new, cleaner-burning diesel engines, or engines using an alternative fuel source such as natural gas or propane and use these pumps in combination with offsets generated by turning off existing diesel pumps not used during a groundwater substitution year (e.g., diesel ditch pumps that pump surface water from canals and/or rivers).

YCWA would monitor Member Unit activities through monthly site visits to the participating Member Unit wells during any groundwater substitution operations of the 2007 Pilot Program. During these site visits, YCWA would continue to obtain readings from the groundwater pump flow meters, as in past transfers. Additionally, YCWA would note the type of power used for the groundwater substitution pumping. At the time of the monthly site visit, if a Member Unit is utilizing a diesel-powered motor for the 2007 Pilot Program, then the well-owner would be required to show that a diesel engine, likely a diesel-powered ditch pump, that normally would have been in use, instead is not being used, thereby providing an emission offset.

Implementation of applicable air quality mitigation plan elements would result in avoidance of any air quality standard violation and would ensure the proposed project would not contribute a cumulatively considerable net increase of any criteria pollutant, including those for which the region is in non-attainment under state regulations. Therefore, the proposed project impact on air quality would be less than significant.

4.3 Biological Resources - Fisheries and Aquatic Resources

The evaluation of potential impacts on fisheries and aquatic resources due to the proposed project focuses on the reservoirs where operational changes are anticipated (New Bullards Bar and Oroville), the rivers used for the conveyance of the transfer water (Yuba, Feather, and Sacramento), and the Delta.

4.3.1 Environmental Setting

4.3.1.1 New Bullards Bar Reservoir

New Bullards Bar Reservoir has steeply sloped sides created from the flooding of a deep canyon. New Bullards Bar Reservoir supports both coldwater and warmwater fisheries including rainbow trout, kokanee salmon, brown trout, largemouth bass, smallmouth bass, crappie, sunfish, and bullhead (U.C. Davis Website 2004). Although warmwater fish species are known to occur in New Bullards Bar Reservoir (crappie, largemouth and smallmouth bass, and sunfish), limited recreational fisheries exist for these warmwater fish species. New Bullards Bar Reservoir supports an important salmonid fishery and is reported as having some of the best kokanee salmon fishing throughout the State of California (U.C. Davis Website 2004).

4.3.1.2 Yuba River

Based on general differences in hydraulic conditions, channel morphology, geology, water conditions, and fish species distribution, CDFG (CDFG 1989) divided the lower Yuba River into the following four reaches:

- **Narrows Reach** – extends from Englebright Reservoir to the downstream terminus of the Narrows (River Mile [RM] 23.9 to RM 21.9); topography is characterized by steep canyon walls;

- **Garcia Gravel Pit Reach** – extends from the Narrows downstream to Daguerre Point Dam (RM 21.9 to RM 11.5);
- **Daguerre Point Dam Reach** – extends from Daguerre Point Dam downstream to the upstream area of Feather River back water influence (just east of Marysville) (RM 11.5 to RM 3.5); and
- **Simpson Lane Reach** – begins at the upstream area of Feather River back water influence and extends to the confluence with the Feather River (RM 3.5 to RM 0).

The lower Yuba River consists of the approximately 24-mile section extending from Englebright Dam, the first impassable fish barrier along the river, downstream to the confluence with the Feather River near Marysville. Water temperatures are colder upstream of Daguerre Point Dam than downstream of Daguerre Point Dam during the warmer months of the year. Water diversions occur in the vicinity of Daguerre Point Dam, which result in lower flows downstream, primarily during the summer and fall months. Also, during summer months, Yuba River water temperatures progressively warm from the release point downstream of Englebright Dam to the confluence with the Feather River. Yuba River water temperatures generally are cooler than those in the Feather River around the Yuba-Feather river confluence (YCWA 2003b).

Species of primary management concern evaluated in this analysis include those that are recreationally or commercially important, or are listed under the federal and state ESA, such as Central Valley steelhead (federally listed threatened species), Central Valley fall-run Chinook salmon (federal species of concern), Central Valley spring-run Chinook salmon (state and federally listed threatened species), southern distinct population segment of green sturgeon (federally threatened), American shad, and striped bass. Resident fish in the lower Yuba River include rainbow trout, smallmouth bass, largemouth bass, Sacramento sucker, Sacramento pikeminnow, common carp, stickleback, and sculpin (YCWA 2004).

The differences in habitat characteristics (e.g., substrates, flows, water temperatures) of the 24 miles of the lower Yuba River suggests a gradient of potential use by Chinook salmon and steelhead. The upper reaches represent the best habitat for spawning and rearing.

Species Occurrence, Status, and Life Stage Habitat Requirements

Spring-run Chinook Salmon

Spring-run Chinook salmon cannot reliably be distinguished from fall-run Chinook salmon during spawning, rearing and emigration periods because of overlapping spawning periods, juvenile sizes, and other life history traits (YCWA 2000). Reported information on the life history and habitat requirements of Central Valley spring-run Chinook salmon can be found in the *Report to the Fish and Game Commission: A Status Review of the Spring-Run Chinook Salmon* (CDFG 1998) and *Habitat Restoration Actions to Double Natural Production of Anadromous Fish in the Central Valley of California* (USFWS 1995b).

The Central Valley spring-run Chinook salmon is listed as a threatened ESU under both the federal and state ESAs. Critical habitat for this ESU, which includes the lower Yuba River, was designated on September 2, 2005. Several factors have contributed to the state and federally "threatened' status of Central Valley spring-run Chinook salmon. Major in-basin factors contributing to the decline were migration barriers, hydraulic mining, and water diversions.

Hydraulic mining in the Yuba River watershed from 1850 to 1885 caused extensive habitat destruction. Between 1900 and 1941, debris dams constructed by the California Debris Commission, now owned and operated by the Corps on the lower Yuba River to retain hydraulic mining debris, completely or partially blocked the migration of Chinook salmon and steelhead to historic spawning and rearing habitats (CDFG 1991b; Wooster and Wickwire 1970; Yoshiyama *et al.* 1996). Water diversions also contributed to poor habitat conditions below the dams, especially in dry years. Today, Englebright Dam, completed in 1941 by the California Debris Commission and now owned and operated by the Corps, completely blocks spawning runs of Chinook salmon and steelhead, and is the upstream limit of fish migration.

Since the completion of New Bullards Bar Reservoir in 1970 by YCWA, higher, colder flows in the lower Yuba River have improved conditions for over-summering and spawning of spring-run Chinook salmon in the lower Yuba River. Relatively small numbers of Chinook salmon that exhibit spring-run phenotypic characteristics have been observed (CDFG 1998). Although precise escapement estimates are not available, the USFWS testified at the 1992 SWRCB lower Yuba River hearing that *"…a population of about 1,000 adult spring-run Chinook salmon now exists in the lower Yuba River*" (SWRCB Website 2005). The installation of a VAKI RiverWatcher fish imaging system in the North and South Fish Ladders at Daguerre Point Dam in 2003 has provided an opportunity to count Chinook salmon as they migrate through the lower Yuba River. During 2005, the year in which the VAKI operated continuously during the February through June period, 1,021 Chinook salmon (including grilse) were observed (CDFG, preliminary, unpublished data). Only four Chinook salmon were observed passing Daguerre Point Dam during the month of February; most Chinook salmon passing Daguerre Point Dam during this period were observed during the month of June. Chinook salmon redd surveys have been conducted during late August through September by CDFG since 2000. Historically, September was the peak month of spring-run Chinook salmon spawning, although some temporal overlap with fall-run Chinook salmon occurs (CDFG 2002; Myrick and Cech 2001; Rich 1987; SWRCB Website 2005). The number of Chinook salmon redds observed by CDFG during September has ranged between 66 and 288 during 2000 through 2005, although redd superimposition during some years has precluded accurate redd counts. The recent VAKI and redd observations have not been used to attempt to estimate the total spring-run Chinook salmon escapement in the lower Yuba River. Also, the origins of the early migrating and spawning fish and their genetic relationship with fall-run Chinook salmon are unknown. Hatchery-reared spring-run Chinook salmon were planted in the lower Yuba River during the 1970s and adipose fin-clipped (e.g., hatchery) Chinook salmon have been observed both by the VAKI and during carcass surveys.

Adult Immigration and Holding

Adult spring-run Chinook salmon immigration and holding primarily occurs in the Yuba River from March through October (Vogel and Marine 1991); upstream migration generally peaks in May (SWRI 2002). The adult immigration and holding life stages are evaluated together, because it is difficult to determine the thermal regime that Chinook salmon have been exposed to in the river prior to spawning. Elevated water temperatures and increased adult holding habitat densities can influence the number and virulence of common microparisites affecting immigrating adult salmonids (Spence *et al.* 1996). Water temperatures also can influence the timing of adult spawning and the egg viability of holding females. Adult Chinook salmon prefer to hold in run and pool habitats during their upstream migration to spawning areas.

Preferred holding water depths for these habitats are usually greater than 6.2 feet (Moyle 2002). The acceptable water temperature range for adults immigrating upstream and holding is 57°F to 67°F (NMFS 1997). However, water temperatures above 64°F reportedly could cause the many diseases that commonly affect immigrating and holding Chinook salmon to become virulent (EPA 2001).

Adult Spawning

In the Central Valley, spring-run Chinook salmon spawning has been reported to primarily occur during September through mid-November, with spawning peaking in mid-September (DWR 2004a; DWR 2004c; Moyle 2002; Vogel and Marine 1991). In the Yuba River, spring-run Chinook salmon spawning reportedly occurs in the lower Yuba River from September through November (CDFG 1991a). Approximately 60 percent of the Chinook salmon population in the lower Yuba River spawn above Daguerre Point Dam (SWRCB 2003). In the lower Yuba River, Chinook salmon redds have been observed in the Garcia Gravel Pit Reach (primarily above Parks Bar) by mid-September (CDFG 2000). Characteristics of spawning habitats that are directly related to flow include water depth and velocity. Chinook salmon spawning reportedly occurs in water velocities ranging from 1.2 ft/s to 3.5 ft/s. Chinook salmon redd construction and spawning typically occurs at water depths greater than 0.5 feet.

Embryo Incubation

Spring-run Chinook embryo incubation primarily occurs in the lower Yuba River from September through March (CALFED and YCWA 2005). The intragravel residence times of incubating eggs and alevins (yolk-sac fry) are highly dependent upon water temperatures. Maximum Chinook salmon embryo survival reportedly occurs in water temperatures ranging from 41°F to 56°F (USFWS 1995b).

Juvenile Rearing

Spring-run Chinook salmon juvenile rearing is believed to extend year-round (Moyle 2002). Although some portion of an annual year-class may emigrate as post-emergent fry (individuals less than 45 mm in length), most are believed to rear in the upper Sacramento river and tributaries during the winter and spring and emigrate as juveniles (individuals greater than 45 mm in length, but not having undergone smoltification) or smolts (silvery colored fingerlings having undergone the smoltification process in preparation for ocean entry).

Juvenile salmonid growth, survival, and successful smoltification are influenced by various environmental and physiological factors, including photoperiod and water temperature. During juvenile rearing and smolt emigration, salmonids prefer stream margin habitats with sufficient depths and velocities to provide suitable cover and foraging opportunities. Chinook salmon reportedly utilize river channel depths ranging from 0.9 feet to 2.0 feet (Raleigh *et al.* 1986). Water velocities observed being utilized most frequently by juvenile Chinook salmon range from 0 ft/s to 1.3 ft/s (Raleigh *et al.* 1986). The water temperature reported for maximum growth of juvenile Central Valley Chinook salmon is 66.2°F (Cech and Myrick 1999).

Smolt Emigration

The timing of juvenile emigration from the spawning and rearing grounds varies among the tributaries of origin, and can occur during the period extending from October through April

(Vogel and Marine 1991). Spring-run Chinook salmon smolt emigration generally occurs from November through June in the lower Yuba River (CALFED and YCWA 2005; CDFG 1998; SWRI 2002).

Fall-run Chinook Salmon

In the Central Valley, fall-run Chinook salmon are the most numerous of the four salmon runs, and continue to support commercial and recreational fisheries of significant economic importance. Fall-run Chinook salmon is currently the largest run of Chinook salmon utilizing the Sacramento River and its tributaries. The San Joaquin River tributaries also support runs of fall-run Chinook salmon.

The CDFG began making annual estimates of fall-run Chinook salmon spawning escapement (i.e., the number of salmon that "escape" the commercial and sport fisheries and return to spawn) in the lower Yuba River in 1953. From 1953 to 1971, escapement estimates ranged from 1,000 fish in 1957 to 37,000 fish in 1963, and averaged 12,906 fish. From 1972 to 2001, fall-run Chinook salmon spawning escapement was higher on average than that which occurred during the pre-New Bullards Bar Dam period (1953 to 1971), averaging about 15,000 fish per year (CALFED and YCWA 2005).

Adult Immigration and Holding

Adult fall-run Chinook salmon immigration and holding generally occurs in the lower Yuba River from August through November (CALFED and YCWA 2005). Adult fall-run Chinook salmon generally begin migrating upstream annually in July, with minimal immigration continuing through December in most years (NMFS 2004b; Vogel and Marine 1991). Adult fall-run Chinook salmon immigration generally peaks in November, and typically greater than 90 percent of the run has entered the river by the end of November (CDFG 1992; CDFG 1995). The immigration timing of fall-run Chinook salmon tends to be temporally similar from year-to-year because it is largely dictated by cues (photoperiod, maturation, and other season environmental cues) that exhibit little year-to-year variation.

Adult Spawning

The timing of adult Chinook salmon spawning activity is strongly influenced by water temperatures. When daily average water temperatures decrease to approximately 60°F, female Chinook salmon begin to construct nests (redds) into which their eggs (simultaneously fertilized by males) are eventually released. Fertilized eggs are subsequently buried with streambed gravel. In general, the lower Yuba River fall-run Chinook salmon spawning and embryo incubation period extends from October through December (CALFED and YCWA 2005). It should also be noted that if water temperature conditions are sufficiently low (i.e., ≤ 60°F), spawning activity may begin in September (Moyle 2002).

Embryo Incubation

Fall-run Chinook salmon embryo incubation in the lower Yuba River generally occurs from October through March. The intragravel residence times of incubating eggs and alevins (yolk-sac fry) are highly dependent upon water temperatures.

Juvenile Rearing and Outmigration

Fall-run juvenile rearing and outmigration in the lower Yuba River primarily occurs from December through June (CALFED and YCWA 2005; SWRI 2002). Fall-run Chinook salmon fry emergence generally occurs from late-December through March (Moyle 2002). Water temperatures reported to be optimal for rearing of Chinook salmon fry and juveniles are between 45°F and 65°F (NMFS 2002; Rich 1987; Seymour 1956). Raleigh et al. (Raleigh *et al.* 1986) reviewed the available literature on Chinook salmon thermal requirements and suggested a suitable rearing temperature upper limit of 75°F and a range of approximately 53.6°F to 64.4°F. Zedonis and Newcomb (Zedonis and Newcomb 1997) report that the smoltification process may become compromised at water temperatures above 62.6°F. Fall-run Chinook salmon outmigration generally occurs within several weeks of emergence from gravels. Temperatures required during outmigration are believed to be about the same as those required for successful rearing, as discussed above.

Steelhead

Central Valley steelhead is federally listed as "threatened" under the ESA. Historical information on Central Valley steelhead populations is limited. Steelhead ranged throughout accessible tributaries and headwaters of the Sacramento and San Joaquin rivers before major dam construction, water development, and other watershed disturbances. Historical declines in steelhead abundance have been attributed largely to dams that eliminated access to most of their historic spawning and rearing habitat, and restricted steelhead to less suitable habitat below the dams. Other factors that have contributed to the decline of steelhead and other salmonids include habitat modification, over-fishing, disease and predation, inadequate regulatory mechanisms, climate variation, and artificial propagation (NMFS 1996).

CDFG estimated that only approximately 200 steelhead spawned in the lower Yuba River before New Bullards Bar Reservoir was completed in 1969. From 1970 to 1979, CDFG annually stocked 27,270 to 217,378 fingerlings, yearlings, and sub-catchables from Coleman National Fish Hatchery into the lower Yuba River (McEwan and Nelson 1991; NMFS 1996). Based on angling data, CDFG estimated a run size of 2,000 steelhead in the lower Yuba River in 1975. The current status of this population is unknown, but it appears to be stable and able to support a significant sport fishery (McEwan and Jackson 1996). The Yuba River is currently managed for natural steelhead production.

Adult Immigration and Holding

The immigration of adult steelhead in the lower Yuba River reportedly occurs from August through March, with peak immigration from October through February (CALFED and YCWA 2005; McEwan and Nelson 1991). For this IS, the adult immigration and holding life stages will be evaluated together, because it is difficult to determine the thermal regime that steelhead have been exposed to in the river prior to spawning and, in order be sufficiently protective of pre-spawning fish, water temperatures that provide high adult survival and high egg viability must be available throughout the entire freshwater immigration and holding period. Water temperatures can affect the timing of adult spawning and migrations, and can affect the egg viability of holding females. Few studies have been published that examine the effects of water temperature on either immigration or holding, and none have been recent (Bruin and Waldsdorf 1975; McCullough *et al.* 2001). The available studies suggest that adverse effects could occur to immigrating and holding steelhead at water temperatures that exceed the mid

50°F range, and that immigration could be delayed if water temperatures approach approximately 70°F (Bruin and Waldsdorf 1975; McCullough *et al.* 2001).

Adult Spawning

Steelhead spawning generally occurs from January through April in the lower Yuba River (CALFED and YCWA 2005; CDFG 1991a). Optimal spawning temperatures have been reported to range from 39°F to 52°F (CDFG 1991b). Salmonids typically deposit eggs within a range of depths and velocities that minimize the risk of desiccation as seasonal water levels recede, and that maintain high oxygen levels and remove metabolic wastes from the redd (Spence *et al.* 1996). Water depth range preference for spawning steelhead has been most frequently observed between 0.3 and 4.9 feet (Moyle 2002). The reported preferred water velocity for steelhead spawning is 1.5 feet per second (ft/s) to 2.0 ft/s (USFWS 1995b).

Embryo Incubation

Steelhead embryo incubation generally occurs from January through May in the lower Yuba River (CALFED and YCWA 2005; CDFG 1991a; SWRI 2002). Few studies have been published regarding the effects of water temperature on steelhead spawning and embryo incubation (Redding and Schreck 1979; Rombough 1988). From the available literature, water temperatures in the low 50°F range appear to support high embryo survival, with substantial mortality to eggs reportedly occurring at water temperatures in the high 50°F range and above 60°F (Redding and Schreck 1979; Velsen 1987). Optimal egg incubation temperatures have been reported to range from 48°F to 52°F (CDFG 1991b).

Juvenile Rearing

Juvenile steelhead often rear in the lower Yuba River for one year or more (SWRI 2002). Both seasonal and anthropogenic fluctuations in river flows affect juvenile steelhead habitat quantity and quality. Within freshwater environments, juvenile salmonids select specific microhabitats where water depth and velocity fall within a specific range or where certain hydraulic properties occur. Juvenile steelhead prefer water depths and velocities that provide adequate cover and foraging opportunities. The reported optimal water velocity for juvenile steelhead is 0.9 ft/s (USFWS 1995b). Juvenile steelhead reportedly most often utilize water depths of approximately 15 inches (McEwan 2001).

Like other salmonids, growth, survival, and successful smoltification of juvenile steelhead are affected by water temperature. The duration of steelhead residence in freshwater is long relative to that of fall-run Chinook salmon, making the juvenile life stage of steelhead more susceptible to the influences of water temperature, particularly during the over-summer rearing period. The preferred range of water temperatures for juvenile steelhead is reportedly 62.6°F to 68.0°F (Cech and Myrick 1999).

Smolt Emigration

Juvenile steelhead smolt emigration can occur in the Yuba River from October through May (CALFED and YCWA 2005; SWRI 2002). River flow may be important in facilitating downstream movement of steelhead smolts. Smolt emigration is prompted by factors (e.g., photoperiod, instream flow, and water temperature), that induce the fish to emigrate once a physiological state of readiness has been achieved (Groot and Margolis 1991). The reported optimum water temperature range for successful smoltification of juvenile steelhead is 44.0°F to 52.3°F (Myrick and Cech 2001; Rich 1987). River flows may be an important factor influencing the rate at which steelhead smolts migrate downstream, although factors influencing the actual speed of migration remain poorly understood. Steelhead smolts that emigrate later (e.g., May) during the emigration period may undergo a more rapid parr-smolt transformation as seasonal water temperatures increase (Spence *et al.* 1996).

Southern Distinct Population Segment of Green Sturgeon

The green sturgeon is the most widely distributed member of the sturgeon family *Acipenseridae* (68 FR 4433 (January 29, 2003)). In California, historical spawning populations existed only in the Sacramento, Eel, and Klamath-Trinity river systems. A number of presumed spawning populations (Eel River, South Fork Trinity River, San Joaquin River) have been lost, and the only known spawning in California now occurs in the Sacramento and Klamath river systems (Moyle 2002; NMFS 2002). Green sturgeon are reported to spawn in the Feather River, though this claim is not substantiated (NMFS 2002). Green sturgeon reportedly still regularly occur in the Bear and Yuba rivers (CDFG Website 2002). Daguerre Point Dam restricts the upstream migration of green sturgeon in the lower Yuba River. Although green sturgeon have been known to utilize fish ladders (Peake *et al.* 1997), the fish ladders on Daguerre Point Dam are not adequately designed to allow passage by sturgeon. The Daguerre Point Dam fish ladders are pool and weir type structures that require fish to jump from step to step as they ascend weirs located on each side of the dam (NMFS 2001). This type of swimming behavior would not be expected to commonly occur due to the benthic nature of sturgeon. Therefore, Daguerre Point Dam is considered a barrier to the upstream migration of green sturgeon in the lower Yuba River.

Specific life history requirements have not been developed for green sturgeon populations within tributaries of the Sacramento River; therefore, for the purpose of this environmental assessment, life history requirements for green sturgeon in the Sacramento River are assumed to be the same in the lower Yuba River.

Green sturgeon are anadromous and are the most marine-oriented of the Pacific Coast sturgeon species (68 FR 4433 (January 29, 2003)). Green sturgeon are thought to spawn every three to five years (68 FR 4433 (January 29, 2003)), and may spawn as frequently as every two years (70 FR 17386 (April 6, 2005)). In the Sacramento River, green sturgeon spawning occurs during late spring and early summer above Hamilton City, and perhaps as far upstream as Keswick Dam (CDFG 2000). Adults begin their inland migration in late-February (Moyle *et al.* 1995), and enter the Sacramento River between February and late July (Moyle 2002). The water temperature tolerance of immigrating adult green sturgeon reportedly ranges from 44.4°F to 60.8°F (USFWS 1995b). The spawning period generally extends from March through July, with peak spawning occurring between April and June (Moyle *et al.* 1995). Green sturgeon reportedly tolerate spawning water temperatures ranging from 50°F to 70°F (CDFG 2001). Water temperatures above 68°F are reportedly lethal to green sturgeon embryos (Cech *et al.* 2000). Green sturgeon larvae first feed at about 10 days post-hatch, and metamorphosis to the juvenile life stage is generally complete at 45 days. Juveniles spend one to three years in fresh water before they enter the ocean (68 FR 4433 (January 29, 2003)). Growth of juvenile green sturgeon is reportedly optimal at a water temperature of 59°F and reduced at water temperatures exceeding 66.2°F (Cech *et al.* 2000). Juvenile green sturgeon are taken in traps at the Red Bluff Diversion Dam and the Glenn-Colusa Irrigation District pumping facility in Hamilton City, primarily in the months of May through August. Peak counts occur in the months of June and July (68 FR 4433 (January 29, 2003)). Juvenile emigration may reportedly extend through September (Environmental Protection Information Center *et al.* 2001)

Because the literature does not report on green sturgeon water temperature preferences during juvenile emigration, the water temperature requirement for juvenile rearing are considered to also be applicable to juvenile emigration. Green sturgeon disperse widely in the ocean after their out-migration from freshwater (68 FR 4433 (January 29, 2003)).

American Shad

American shad are native to the Atlantic coast and were introduced into the Sacramento River in the 1800s (Moyle 2002). In the Sacramento River and its tributaries, such as the Yuba River, homing behavior is generally assumed to guide American shad to their natal rivers to spawn, although there is some evidence to suggest that the numbers of shad spawning in major tributaries are proportional to flows of each river at the time the shad arrive. They also are capable of timing their migrations to river outflows (Quinn and Adams 1996). However, spawning fish tagged in one year are most likely to return to the same river in following years if they are repeat spawners (Johnson and Dropkin 1995). Adult American shad typically enter Central Valley rivers from April through early July (CDFG 1986), with the majority of immigration and spawning occurring from mid-May through June (Urquhart 1987). In the lower Yuba River, adult immigration and spawning is believed to primarily occur from April through June. Water temperature is an important factor influencing the timing of American shad spawning, which takes place mostly in the main channels of rivers. Peak spawning reportedly occurs at water temperatures between 51.2°F and 62.6°F (Moyle 2002). Approximately 70 percent of the spawning run is composed of first time spawners (Moyle 2002). When suitable spawning conditions are found, American shad school and broadcast their eggs throughout the water column.

Striped Bass

Adult striped bass are present in Central Valley rivers throughout the year, with peak abundance occurring during the spring months (CDFG 1971; DeHaven 1979; DeHaven 1977). Striped bass spawn in water temperatures ranging from 59°F to 68°F (Moyle 2002). Therefore, spawning may begin in April, but peaks in May and early-June (Moyle 2002).

Sacramento River tributaries seem to be nursery areas for young striped bass (CDFG 1971; CDFG 1986). Juvenile and sub-adult fish have been reported to be abundant in the lower American River and lower Yuba River during the fall (DeHaven 1977). Optimal water temperatures for juvenile striped bass rearing have been reported to range from approximately 61°F to 73°F (USFWS 1988).

Summary of Recent Water Transfer Fisheries Monitoring Studies and Findings

The Yuba River is one of many Central Valley rivers that has been utilized in water transfer projects for a number of years. A summary of YCWA's recent water transfers and related monitoring studies and evaluations performed in 2001, 2002, 2004, and 2005 can be found in Section 4.4.1.2 of Appendix 2. Monitoring studies were not conducted in 2003 because a research permit, authorizing take of federally listed species, as required by Section 10 of the federal ESA, was not issued.

4.3.1.3 Oroville Reservoir

Like many other California foothill reservoirs, Oroville Reservoir is steep-sided, has large water surface elevation fluctuations, and a low surface area-to-volume ratio. It is a warm, monomictic reservoir that thermally stratifies in the spring, destratifies in the fall, and remains destratified throughout the winter. Due to the stratification, Oroville Reservoir has been said to contain a "two-story" fishery, supporting both coldwater and warmwater fisheries that are thermally segregated for most of the year. The coldwater fish use the deeper, cooler, well-oxygenated hypolmnion, whereas the warmwater fish are found in the warmer, shallower, epilimnetic and littoral zones. Once Oroville Reservoir destratifies in the fall, the two fishery components mix in their habitat utilization.

Oroville Reservoir's coldwater fishery primarily is composed of coho salmon and brown trout, although rainbow trout and lake trout are periodically caught. The coldwater fisheries for coho salmon and brown trout are sustained by hatchery stocking because natural recruitment to the Oroville Reservoir coldwater fishery is very low. A "put-and-grow" hatchery program is currently in use, where salmonids are raised at CDFG hatcheries and stocked in the reservoir as juveniles, with the intent that these fish will grow in the reservoir before being caught by anglers (DWR 2001c).

The Oroville Reservoir warmwater fishery is a regionally important self-sustaining fishery. The black bass fishery is the most significant, both in terms of angler effort and economic influence on the area. Spotted bass are the most abundant bass species in Oroville Reservoir, followed by largemouth, redeye, and smallmouth bass, respectively. Catfish are the next most popular warmwater fish at Oroville Reservoir, with both channel and white catfish present in the lake. White and black crappies also are found in Oroville Reservoir, though populations fluctuate widely from year to year. Bluegill and green sunfish are the two primary sunfish species in Oroville Reservoir. Although common carp are considered by many to be a nuisance species, they are abundant in Oroville Reservoir (DWR 2001c). The primary forage fish in Oroville Reservoir are wakasagi and threadfin shad. Threadfin shad intentionally were introduced in 1967 to provide forage for game fish, whereas the wakasagi migrated down from an upstream reservoir in the mid-1970s.

4.3.1.4 Feather River

The lower Feather River begins at the Low Flow Channel, which extends 8 miles from the Fish Barrier Dam (RM 67) to the Thermalito Afterbay Outlet (RM 59). The lower Feather River from the Fish Barrier Dam to Honcut Creek supports a variety of anadromous and resident fish species. The most important fish species in terms of sport fishing is the fall-run Chinook salmon, although striped bass and American shad also are common targets for anglers. Fall-run Chinook salmon may enter the river as early as August and begin spawning in September. Spawning typically continues through December, with October and November constituting the peak spawning months in the lower Feather River.

Several other native and exotic fish species are found in the Feather River including spring-run Chinook salmon, steelhead, and Sacramento splittail. In the Feather River, the basic life history of spring-run Chinook salmon is similar to fall-run Chinook salmon. Spawning may occur a few weeks earlier for spring-run (as compared to fall-run), but there is no clear distinction between the two runs due to the disruption of spatial separation by Oroville Reservoir. Fish exhibiting the typical life history of spring-run Chinook salmon are found holding at the

Thermalito Afterbay Outlet and the Fish Barrier Dam as early as March. At present, the genetic distinctness of Feather River spring-run Chinook salmon is undetermined.

Adult steelhead typically ascend the Feather River from September through January (YCWA *et al.* 2005). The residence time of adult steelhead in the Feather River after spawning, and adult steelhead post-spawning mortality, are currently unknown. It appears that most of the natural steelhead spawning in the Feather River occurs in the Low Flow Channel, particularly in the upper reaches near Hatchery Ditch. It is unknown whether steelhead spawn below the Thermalito Afterbay Outlet (YCWA *et al.* 2005). However, based on the spawning habitat available, it is very likely that at least some steelhead spawn below the Thermalito Afterbay Outlet. Soon after emerging from the gravel, a small percentage appears to emigrate. The remainder of the population rears in the river for at least six months to one year. Recent studies have confirmed that juvenile steelhead rearing (and probably adult steelhead spawning) is most concentrated in small secondary channels within the Low Flow Channel (YCWA *et al.* 2005). The smaller substrate size and greater amount of cover (compared to the main river channel) likely make these side channels more suitable for steelhead spawning.

4.3.1.5 Sacramento River

The upper Sacramento River is often defined as the portion of the river from Princeton (RM 163), the approximate downstream extent of salmonid spawning in the Sacramento River, to Keswick Dam (the upstream extent of anadromous fish migration and spawning). The lower Sacramento River is generally defined as that portion of the river from Princeton to the Delta, at approximately Chipps Island (near Pittsburg). The lower Sacramento River is predominantly channelized, leveed, and bordered by agricultural lands. The Sacramento River serves as an important migration corridor for anadromous fish moving between the Pacific Ocean and/or the Delta and upper river/tributary spawning and rearing habitats.

In excess of 30 fish species are known to use the Sacramento River. Of these, a number of both native and introduced species are anadromous. Anadromous species include Chinook salmon, steelhead, green and white sturgeon, striped bass, and American shad. The upper Sacramento River is of primary importance to native anadromous species, and is presently utilized for spawning and early life stage rearing, to some degree, by all four runs of Chinook salmon (i.e., fall, late-fall, winter, and spring runs) and steelhead. Consequently, various life stages of the four races of Chinook salmon, and steelhead, can be found in the upper Sacramento River throughout the year. Other Sacramento River fish are considered resident species, which complete their lifecycle entirely within freshwater, often in a localized area. Resident species include rainbow and brown trout, largemouth and smallmouth bass, channel catfish, sculpin, Sacramento pikeminnow, Sacramento sucker, hardhead, and common carp (Reclamation 1991).

Many of the fish species utilizing the upper Sacramento River also use the lower river to some degree, even if only as a migratory pathway to and from upstream spawning and rearing grounds. For example, adult Chinook salmon and steelhead primarily use the lower Sacramento River as an immigration route to upstream spawning habitats, and as an emigration route to the Delta. The lower river also is used by other fish species (e.g., Sacramento splittail and striped bass) that make little use of the upper river (i.e., upstream of RM 163). Overall, fish species composition in the lower portion of the Sacramento River is similar to that of the upper Sacramento River and includes resident and anadromous cold- and warmwater species. Many fish species that spawn in the Sacramento River and its tributaries depend on river flows to carry their larval and juvenile life stages to downstream nursery habitats. Native and introduced warmwater fish species primarily use the lower river for spawning and rearing, with juvenile anadromous fish species also using the lower river, to some degree, for rearing.

4.3.1.6 Sacramento-San Joaquin Delta

The Delta provides spawning and nursery habitat for more than 40 resident and anadromous fish species, including delta smelt, Sacramento splittail, American shad, and striped bass. The Delta also is a migratory corridor and seasonal rearing habitat for the various runs of Chinook salmon and steelhead.

Many factors have contributed to the decline of Delta species, including loss of habitat, contaminant input (water quality degradation), entrainment in diversions, and introduction of non-native aquatic species. The Delta is a network of channels through which water, nutrients, and aquatic food resources are moved and mixed by tidal action. Pumps and siphons divert water for Delta irrigation and municipal and industrial use or into CVP and SWP canals. River inflow, Delta Cross Channel operations, and diversions (including agricultural and municipal diversion and export pumping) affect Delta species through changes in habitat conditions (e.g., salinity intrusion) and mortality attributable to entrainment in diversions.

4.3.1.7 San Luis Reservoir

San Luis Reservoir provides habitat for both coldwater and warmwater fisheries. The game fish found in San Luis Reservoir include largemouth bass, crappie, sunfish, striped bass, and bullhead.

4.3.2 Impact Analysis

This IS considers the potential for significant impacts upon fisheries resources in the waterbodies potentially influenced by the proposed project including the lower Yuba River, New Bullards Bar Reservoir, Feather River, Oroville Reservoir, Sacramento River, and the Delta. The impact analysis methodology utilized to conduct this IS is described below.

4.3.2.1 Reservoir Methodology and Significance Criteria

The analysis of potential impacts on reservoir fisheries associated with the proposed project was based on consideration of anticipated seasonal changes in reservoir storage under the proposed project, relative to the basis of comparison. The potential changes in reservoir storage levels in New Bullards Bar Reservoir were based upon information provided in the Hydrologic Analysis (Appendix B to Appendix 2 [Environmental Analysis] of this IS). The analysis of reservoir storage for Oroville Reservoir was performed qualitatively based on anticipated potential changes in operations associated with the proposed project, to the extent that this information was available, and primarily from assessments conducted for recent water transfer years (YCWA 2004; YCWA and SWRCB 2002).

Potential changes in reservoir water surface elevations were considered for the analysis of potential increases in the frequency of warmwater fish nest-dewatering events, and decreases in coldwater pool volume that could occur under the proposed project, relative to the basis of comparison.

San Luis Reservoir

DWR may store a portion of the proposed project transfer water in San Luis Reservoir. To the extent that some of the transfer water (potentially up to 125,000 acre-feet by the end of the transfer period) is stored in San Luis Reservoir, the proposed transfer may have a potentially beneficial effect upon San Luis Reservoir fisheries resources. The storage volume associated with the proposed project transfer potentially would provide increased habitat for reservoir species. Water stored in San Luis Reservoir likely would be held only for a short period prior to delivery to water contractors. Generally, it is expected that operations of San Luis Reservoir would remain within normal operational parameters, and the proposed project water transfer would not result in significant impacts on San Luis Reservoir fisheries. Therefore, San Luis Reservoir is not further discussed in the impact analysis.

Reservoir Coldwater Fisheries

Coldwater fish in the reservoirs reside primarily within the reservoir's metalimnion (middle of the reservoir) and hypolimnion (near the bottom) where water temperatures remain suitable during the period when reservoirs are thermally stratified (i.e., April through November). Reduced reservoir storage during this period could reduce the reservoir's coldwater pool volume, thereby reducing the quantity of habitat available to coldwater fish species during these months. The analysis of potential impacts on reservoir coldwater fisheries associated with the proposed project was based on the following criterion:

- A decrease in reservoir storage during April through November, which would reduce the coldwater pool, relative to the basis of comparison, of sufficient magnitude or duration to adversely affect long-term population levels of coldwater fish.

Reservoir Warmwater Fisheries

Warmwater fish species in reservoirs use the warm upper layer of the reservoir and nearshore littoral habitat throughout most of the year. Seasonal changes in reservoir storage, as it affects reservoir water surface elevation (feet msl) can directly affect the reservoir's warmwater fish resources. Decreases in reservoir water surface elevation during the primary spawning period for nest building warmwater fish (March into June) may result in reduced initial year-class strength through warmwater fish nest "dewatering."

To assess potential elevation-related impacts on warmwater fish in the evaluated reservoirs, the magnitude of change (feet msl) in reservoir water surface elevation occurring each month of the spawning period (i.e., March through June) for nest-building fish under the proposed project relative to the basis of comparison was considered, when available. Review of available literature suggests that, on average, self-sustaining black bass populations in North America experience a nest success (i.e., the nest produces swim-up fry) rate of 60 percent (Friesen 1998; Goff 1986; Hunt and Annett 2002; Hurley 1975; Knotek and Orth 1998; Kramer and Smith 1962; Latta 1956; Lukas and Orth 1995; Neves 1975; Philipp *et al.* 1997; Raffetto *et al.* 1990; Ridgway and Shuter 1994; Steinhart 2004; Turner and MacCrimmon 1970).

A study by CDFG, which examined the relationship between reservoir water surface elevation fluctuation rates and nesting success for black bass, suggests that a reduction rate of approximately 6 feet per month or greater would result in 60 percent nest success for largemouth bass and smallmouth bass (Lee and Jones-Lee 1999). Therefore, a decrease in reservoir water surface elevation of 6 feet or more per month was selected as the threshold beyond which spawning success of nest-building warmwater fish could potentially result in population effects. The analysis of potential effects on warmwater fisheries associated with the proposed water transfer was based on the following criterion:

- A decrease in reservoir water surface elevation of six feet or more per month, relative to the basis of comparison, of sufficient frequency to substantially affect population levels of warmwater fish during the extended spawning period (i.e., March through June).

4.3.2.2 Rivers Methodology and Significance Criteria

Yuba River

Both qualitative and quantitative assessments were utilized to evaluate the potential operational impacts on fisheries resources. Qualitative analyses are conducted based on a combination of literature reviews, reference to previous monitoring studies and reports on the Yuba River fisheries. Hydrologic modeling was performed in order to provide a quantitative basis from which to assess potential impacts of the proposed project on fisheries resources and their associated aquatic habitats within the project area. Specifically, the hydrologic modeling methods used an 83-year simulation period of hydrology in the Yuba River watershed to simulate flows that would be expected under the proposed project and the basis of comparison. The simulation applied a set of rules and reservoir releases for both the proposed project and the basis of comparison in which the starting reservoir level was known, utilizing the hydrologic period of record extending from 1922 through 2004, to produce a set of flow exceedance plots for the March 1, 2007 through March 31, 2008 simulation period. The plots illustrate the distribution of flows under the proposed project and the basis of comparison (Appendix 3). Flow exceedance curves represent the probability, as a percent of time that modeled flows would be met or exceeded at a given location during a certain time period. Therefore, the plots demonstrate the cumulative probability distribution of flows that could occur for each month at a given river location over the simulation period. Flow exceedance curves were developed by ranking the simulated flows for each month from largest to smallest, and the probability of exceedance was then calculated for each flow value based on its rank (i.e., 1.0 to 99.0 percent).

Exceedance curves are particularly useful for examining flow changes that could occur at lower flow levels. Results from past instream flow studies indicate that Chinook salmon spawning habitat is most sensitive to changes in flow during lower flow conditions, during either dry year classes or the driest months of the year (CDFG 1994; USFWS 1985).

The potential impacts of simulated flows on the adult spawning life stage of Chinook salmon in the lower Yuba River were evaluated by examining the spawning habitat available for the months of September through December of the spawning season, as expressed as weighted usable area (WUA). The analysis included summing the WUAs that correspond to average monthly flows during the Chinook salmon spawning season within one reach for spring-run (above Daguerre Point Dam), and two reaches for the fall-run (above and below Daguerre Point Dam). Steelhead spawning habitat availability was examined from January through April for one reach above Daguerre Point Dam (**Appendix 5**).

For analytical purposes, September through November was evaluated for spring-run Chinook salmon spawning habitat availability. In addition, the month of September was emphasized because September was assumed to represent a distinct period of spring-run Chinook salmon spawning. Fall-run Chinook salmon spawning was assumed to occur from October through December, although considerable temporal and spatial overlap in spawning occurs between these two runs. These time periods were used to compare the potential impacts of the proposed project on spring and fall-run Chinook salmon spawning habitat availability, relative to the basis of comparison, using WUA-flow relationships.

CDFG (1991a) described spawning WUA-flow relationships for both fall-run Chinook salmon and steelhead. The steelhead WUA-flow relationships are not as reliable, because they were not based upon depth, velocity and substrate data collected on the lower Yuba River steelhead redds. Instead, steelhead WUA-flow relationships were developed from habitat suitability criteria (HSC) recommended by Bovee (1978). The comparison of Bovee's steelhead HSC curves with HSC curves developed for the species in the lower Feather River, lower American River, and Trinity River suggests that Bovee's criteria may not be representative of steelhead spawning in the Central Valley. Nonetheless, steelhead spawning habitat availability for the months of January through April were evaluated using the CDFG (1991a) relationships, because they represent the best available information.

Yuba River water temperature analyses were conducted for the months of May through October. During these months, solar radiation and ambient air temperature may cause water temperatures in the Yuba River below Englebright Reservoir to increase to levels that can be stressful to anadromous and resident salmonids, and other species of management concern. During November through April, water temperatures in the lower Yuba River are generally cool and, for this IS, are assumed not to cause thermal impacts on salmonids and other fish species in the river.

An evaluation of lower Yuba River water temperatures associated with the proposed project was conducted by assessing water temperature exceedance plots generated using simulated monthly flows from May through October (**Appendix 4**). Simulated monthly water temperatures were used to assess potential impacts of the proposed project relative to the basis of comparison for the following species and life stages which occur, or partially occur, during the period extending from May through October:

- Spring-run Chinook Salmon
    - Adult Immigration and Holding
    - Adult Spawning
    - Embryo Incubation
    - Juvenile Rearing
    - Smolt Emigration
- Fall-run Chinook Salmon
    - Adult Immigration and Holding
    - Adult Spawning
    - Embryo Incubation
    - Juvenile Rearing and Outmigration

- Steelhead
  - Adult Immigration and Holding
  - Juvenile Rearing
  - Embryo Incubation
  - Smolt Emigration
- Green Sturgeon (Southern Distinct Population Segment)
  - Adult Immigration and Holding
  - Adult Spawning
  - Embryo Incubation
  - Juvenile Rearing
  - Juvenile Emigration
- American Shad
  - Adult Immigration and Spawning
- Striped Bass
  - Adult Spawning
  - Initial Rearing

The flow and water temperature exceedance analyses provided are based on modeled monthly mean flows, and linear regression analysis of water temperature parameters such as air temperature and flow volume. Monthly mean flows and water temperatures evaluated here do not describe daily variations that could occur in the river as a result of dynamic flow and climatic conditions. However, this modeling represents the best available information, and monthly modeling results are useful for comparative purposes where, in theory, the inherent limitations of the approach are embedded in both the proposed project and the baseline condition. Modeled water temperature and flow values were utilized to detect the frequency and magnitude of potential changes to flows and water temperatures under the proposed project and the basis of comparison (RD-1644 interim).

Feather and Sacramento Rivers

An evaluation of the potential impacts from the proposed project on fisheries resources and aquatic habitats in the Feather and Sacramento rivers was made by comparing the total contribution of monthly mean flows from New Bullards Bar Reservoir surface water releases under both the proposed project and basis of comparison. To evaluate the potential range of impacts to fisheries resources in the Sacramento and Feather rivers, the difference in simulated average monthly mean flows at the Marysville Gage between the proposed project and the basis of comparison were compared to average monthly mean flows in the Sacramento River at Freeport, and the lower Feather River at Gridley.

Although the specific release pattern associated with the proposed project is unknown at this time and will depend on SWP/CVP operational conditions as they develop, flow releases will be subject to operational constraints, and within normal operational ranges.

Sacramento-San Joaquin Delta

The proposed project would provide water to DWR for use in the EWA Program in 2007. DWR personnel were consulted regarding the anticipated pumping, export, and delivery operations associated with the proposed project. The evaluation of potential impacts upon Delta fisheries resources considers whether DWR's acquisition of the YCWA transfer water would result in changes in SWP operations that could result in the following:

- Conflict with existing regulatory compliance requirements related to Delta export pumping
- Increased pumping at the Delta pumping facilities above levels authorized in existing permits

Regulatory documentation considered in the evaluation includes:

- 1995 SWRCB Delta Water Quality Control Plan
- 2004 NMFS Biological Opinion on OCAP
- 2005 USFWS Biological Opinion on OCAP
- 2005 NMFS Biological Opinion on the Yuba River Development Project License Amendment

Additionally, an evaluation of the potential impacts from the proposed project on fisheries resources and aquatic habitats in the Delta during January 1, 2008 through March 31, 2008 was conducted by comparing the total contribution of monthly mean flows from New Bullards Bar Reservoir surface water releases under both the proposed project and basis of comparison. To evaluate the potential range of impacts to aquatic resources in the Delta, the difference in simulated average monthly mean flows at the Marysville Gage between the proposed project and the basis of comparison were compared to average monthly mean flows in the Sacramento River at Freeport, which contributes to total Delta inflow.

The percent contributions of Sacramento River flows to Delta inflows for each month of the March 2007 through March 2008 time period (Table 4-3) were calculated as the scaled ratios of the averages of Sacramento River monthly mean flows (cfs) at the Freeport Gage, to the averages of monthly Delta inflows (cfs) reported by Reclamation in the tables of Delta Outflow Computations for the years 1998 through 2006 (www.usbr.gov/mp/cvo/pmdoc.html). These percent contributions of Sacramento River flows to total Delta inflows were evaluated to determine the potential impacts from the proposed project on fisheries resources and aquatic habitats in the Delta.

Although the specific release pattern associated with the proposed project is unknown at this time and will depend on SWP/CVP operational conditions as they develop, flow releases will be subject to operational constraints that are within normal operational ranges.

4.3.2.3 Environmental Impacts

New Bullards Bar Reservoir

New Bullards Bar Reservoir Coldwater Fisheries

The proposed project could reduce New Bullards Bar Reservoir storage from 739,234 acre-feet in March 2007 to 594,865 acre-feet by the end of September 2007, depending on hydrological conditions. This reduction corresponds to a change in water surface elevation from approximately 1,899 feet msl to 1,868 feet msl. Under the basis of comparison, the end of September storage in New Bullards Bar Reservoir could be 671,063 acre-feet with a corresponding elevation of 1,885 feet msl.

Anticipated reductions in reservoir storage associated with the proposed project would not be expected to adversely impact the New Bullard Bar Reservoir's coldwater fisheries because New Bullards Bar Reservoir is a deep, steep-sloped reservoir with ample coldwater pool reserves. Throughout the period of operations of New Bullards Bar Reservoir (1969 through present), which encompasses the most extreme critically dry year on record, the coldwater pool in New Bullards Bar Reservoir has not been depleted. In fact, since 1993, coldwater pool availability in New Bullards Bar Reservoir has been sufficient to accommodate year-round utilization of the lower river outlets, at the direction provided by CDFG, in order to provide the coldest water possible to the lower Yuba River. Therefore, potential reductions in coldwater pool storage would not be expected to adversely affect New Bullard Bar Reservoir's coldwater fisheries because: (1) coldwater habitat would remain available in the reservoir during all months of the proposed project; (2) physical habitat availability is not believed to be among the primary factors limiting coldwater reservoir fish populations; and (3) anticipated seasonal reductions in storage would not be expected to adversely affect the primary prey species utilized by coldwater fish. Therefore, impacts to coldwater fisheries resources, relative to the basis of comparison from changes in end-of-month storage at New Bullards Bar Reservoir under the proposed project would be less than significant.

New Bullards Bar Reservoir Warmwater Fisheries

The spawning period for warmwater fish is believed to generally extend from March through June. Decreases in the water surface elevation of New Bullards Bar Reservoir by more than 6 feet per month from March 2007 through June 2007, and March 2008 are 10 percent and one percent, respectively, more likely to occur under the proposed project relative to the basis of comparison. Reductions in end-of-month water surface elevation in New Bullards Bar Reservoir under the proposed project would not be anticipated to result in substantial reductions in warmwater fish spawning success, because the results suggest that these potential decreases in water surface elevation would not be expected to occur during more than two months of any given spawning season. In addition, a 60 percent nest success rate or greater would be achieved during some months of any annual spawning season, which would be expected to provide sufficient recruitment of individuals into the population over the 83-year simulation period. Therefore, impacts upon warmwater fisheries that may be present in New Bullards Bar Reservoir from potential reductions in water surface elevation under the proposed project would be less than significant.

Oroville Reservoir

Oroville Reservoir water levels would be affected by the proposed project only if DWR had to release additional flows to meet water quality standards in the Delta as a result of YCWA holding back water to refill New Bullards Bar Reservoir associated with the proposed project. The potential drawdown of Oroville Reservoir would be minimal given the much larger size of Oroville Reservoir, and most likely would occur in winter or spring. The level of drawdown, if any, would be small and within normal operating conditions for Oroville Reservoir. Consequently, potential impacts to Oroville Reservoir fisheries would be less than significant.

Yuba River

Anadromous Salmonid Utilization of the Lower Yuba River During the Proposed Project

Central Valley steelhead and two runs (i.e., fall-run and spring-run) of Chinook salmon utilize the lower Yuba River. The following life stages of these species/runs are present in the lower Yuba River at various times throughout the year: (1) adult immigration and holding; (2) adult spawning; (3) embryo incubation; (4) juvenile rearing; and (4) juvenile outmigration/smolt emigration. Most fall-run Chinook salmon migrate out of the lower Yuba River as post-emergent fry prior to reaching smolt size; spring-run Chinook salmon and steelhead typically rear in the river for extended periods of time, relative to fall-run Chinook salmon, migrating out as larger, smolt-sized individuals. The following sections describe the anadromous salmonid species and life stages occurring in the lower Yuba River, and the potential changes to instream flows and water temperatures that could occur during the proposed project, relative to the basis of comparison, on a month-to-month basis from March 1, 2007 through March 31, 2008.

Other Species of Primary Management Concern Utilization of the Lower Yuba River During the Proposed Project

USFWS photographic evidence of green sturgeon and captures of juveniles in rotary screw traps in the Feather River downstream of its confluence with the Yuba River (USFWS 1995a) provide evidence that suggests that tributaries to the Sacramento River may provide suitable spawning habitat for green sturgeon. Records of angler catches of green sturgeon in the Feather River coinciding with their spawning season further supports this theory. Based on this information, five life stages could potentially occur in the lower Yuba River at various times throughout the year: (1) adult immigration and holding; (2) adult spawning; (3) embryo incubation; (4) juvenile rearing; and (5) juvenile emigration. The potential utilization of the lower Yuba River by green sturgeon warrants an evaluation of potential impacts to the species associated with potential changes in flow and water temperature under the proposed project, relative to the basis of comparison.

Despite being non-native, American shad are considered an important sport fish in the Central Valley, and are managed accordingly. Therefore, the American shad immigration and spawning life stage in the lower Yuba River will be evaluated for potential impacts associated with changes in flow and water temperature under the proposed project, relative to the basis of comparison. Also non-native, the striped bass lifestages of adult spawning and initial juvenile rearing are evaluated.

4.3.2.4 Results

Operations and Resultant Flows

The analysis of potential impacts to lower Yuba River anadromous salmonids and other species of management concern uses cumulative probability distributions to examine potential differences in flow that could occur under the proposed project and the basis of comparison (RD-1644 interim) from March 1, 2007 through March 31, 2008. Of special concern are flow conditions that could potentially occur during dry and critical water years. These flows roughly correspond to the lowest 30 percent of flows simulated for the lower Yuba River for the 83-year analytical period. Therefore, as an impact indicator of flow conditions, special emphasis is placed on the lowest 30 percent of the cumulative flow distribution.

Results of the simulation period are presented in the following sections utilizing flow exceedance plots for the two control points for minimum instream flows on the lower Yuba River (the Smartville Gage and the Marysville Gage). Each plot compares the proposed project (flow regime based on the flow schedules included in the 2007 Pilot Program Fisheries Agreement) versus the basis of comparison (flow regime based on RD-1644 interim flow requirements).

All of the exceedance plots share certain characteristics. First, as is further described in the hydrological analysis (Appendix 2) for the 2007 Pilot Program, different dispatch, reservoir, and operating rules govern the proposed project and the basis of comparison. In addition to different minimum flow release requirements, the proposed project and the basis of comparison utilize different indices (see Appendix 2, Section 2.3.1.1), and have different reservoir dispatch rules based on those different flow schedules and indices.

Second, because the outlet capacity of the Narrows I and Narrows II powerhouses that release flow to the lower Yuba River totals 4,170 cfs, flows above that level are uncontrolled (spilling over the top of Englebright Dam). Differences in flows between the proposed project and the basis of comparison above that level therefore tend to be a function of river and reservoir operations in response to storm and flood control requirements.

Finally, in wetter year classes, annual Yuba River operations are primarily driven by flood control requirements. In the winter months of wetter year classes, maintenance of appropriate flood pool space may require releases well in excess of required minimums. During the summer months of wetter year classes, releases in excess of required minimum flows and delivery obligations are often required to draw down the reservoir to an appropriate level going into the succeeding fall and winter season. In drier year types, under both the proposed project and the basis of comparison, storm and flood operations cease to be a major influence in operations decisions early in the season, and the Yuba Project is operated to meet minimum flow requirements and consumptive demands. This can be observed in the exceedance plots, where in the driest 30 percent of years the plots of the Marysville Gage flows tend to correspond to the minimum requirements of the proposed project and the basis of comparison.

The following sections describe and discuss flow and water temperature difference between the proposed project and basis of comparison, and potential effects on fisheries and aquatic resources in the lower Yuba River.

<u>**March 2007**</u>

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Fall-run Chinook Salmon (Juvenile Rearing and Outmigration)
- Steelhead (Adult Immigration and Holding; Adult Spawning; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Adult Immigration and Holding; Adult Spawning; Juvenile Rearing)

Simulated Actual Flows

Simulated flows at both the Smartville Gage (Figure A4-1) and Marysville Gage (Figure A4-2) generally reflect flood control operations and/contributory precipitation accretions, and exceed 700 cfs with about a 90 percent probability.

<u>**April 2007**</u>

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Fall-run Chinook Salmon (Juvenile Rearing and Outmigration)
- Steelhead (Adult Spawning; Juvenile Rearing and Smolt Emigration)
- Green Sturgeon (Adult Immigration and Holding; Adult Spawning; Juvenile Rearing)
- American Shad (Adult Immigration and Spawning)
- Striped Bass (Adult Spawning and Initial Rearing)

Simulated Actual Flows

For nearly 90 percent of the flow exceedance distribution, flows at the Smartville Gage simulated under the proposed project are higher (from approximately 100 cfs up to 670 cfs) than those simulated under the basis of comparison. At the highest flow levels (above about 4,200 cfs, which are expected to occur with about a 10 percent probability), flows under the proposed project and the basis of comparison are equivalent (Figure A4-3).

Flows simulated under the proposed project at the Marysville Gage are up to approximately 670 cfs higher than flows under the basis of comparison for 88 percent of the cumulative flow exceedance distribution. Flows at the highest flow levels (above about 4,200 cfs which are expected to occur with about a 12 percent probability), under the proposed project and basis of comparison are equivalent (Figure A4-4).

May 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Fall-run Chinook Salmon (Juvenile Rearing and Outmigration)
- Steelhead (Embryo Incubation; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation; Juvenile Rearing; Juvenile Emigration)
- American Shad (Adult Immigration and Spawning)
- Striped Bass (Adult Spawning and Initial Rearing)

Simulated Actual Flows

Flows simulated under the basis of comparison at the Smartville Gage are generally higher than the proposed project (up to 620 cfs) when flows exceed 3,000 cfs, which occurs with about a 50 percent probability. At flows less than or equal to 3,000 cfs, which occur with about a 50 percent probability, the proposed project generally provides substantially higher (up to 590 cfs) flows relative to the basis of comparison (Figure A4-5).

Flows simulated under the basis of comparison at the Marysville Gage are higher than the proposed project (up to 620 cfs) when flows exceed 2,000 cfs, which occurs with about a 50 percent probability. At flows less than or equal to 2,000 cfs, which occur with about a 50 percent probability, the proposed project generally provides substantially higher (up to 630 cfs) flows relative to the basis of comparison (Figure A4-6).

Water Temperature

During May, average water temperatures simulated at Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 54.4°F to 55.2°F (Figure A5-1).

During May, average water temperatures simulated at Marysville under the proposed project and under the basis of comparison are similar (within 0.2°F of each other) for most of the water temperature exceedance distribution (75 percent), and range from approximately 54.0°F to 56.1°F. However, average water temperatures simulated under the proposed project during the warmest 25 percent of the distribution are approximately 1.1°F to 3.4°F lower than under the basis of comparison (Figure A5-2).

June 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Fall-run Chinook Salmon (Juvenile Rearing and Outmigration)
- Steelhead (Juvenile Rearing)

- Green Sturgeon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation; Juvenile Rearing; Juvenile Emigration)
- American Shad (Adult Immigration and Spawning)
- Striped Bass (Adult Spawning and Initial Rearing)

Simulated Actual Flows

Flows simulated under the proposed project at the Smartville Gage are equivalent to the basis of comparison when flows exceed about 4,200 cfs, which occurs with about a 15 percent probability. At flows less than or equal to 4,200 cfs, which occur with about a 85 percent probability, the proposed project generally provides equivalent or substantially higher (up to about 800 cfs) flows relative to the basis of comparison (Figure A4-7).

Flows simulated under the proposed project at the Marysville Gage are equivalent to the basis of comparison when flows exceed about 3,000 cfs, which occurs with about a 20 percent probability. At flows less than or equal to 3,000 cfs, which occur with about a 80 percent probability, the proposed project generally provides substantially higher (up to 700 cfs) flows relative to the basis of comparison (Figure A4-8).

Water Temperature

During June, water temperatures simulated at Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 57.2°F to 57.9°F **(**Figure A5-3).

Water temperatures simulated at Marysville during June are expected to range from 57.2°F to 62.6°F under the proposed project, and from 57.2°F to 63.3°F under the basis of comparison. During the warmest 25 percent of the water temperature exceedance distribution for June, water temperatures simulated at Marysville under the proposed project are expected to be 0.7°F to 1.5°F lower than those under the basis of comparison. For the remainder of the distribution, water temperatures under the proposed project are similar to or lower (up to approximately 1°F) than those under the basis of comparison **(**Figure A5-4).

<u>July 2007</u>

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing)
- Steelhead (Juvenile Rearing)
- Green Sturgeon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation; Juvenile Rearing; Juvenile Emigration)

Simulated Actual Flows

Simulated flows under the proposed project at the Smartville Gage are expected to be higher than the basis of comparison during the highest flow conditions (above approximately 2,700 cfs) which are expected to occur with about a 20 percent exceedance probability, and lower during the intermediate flow range (about 1,700 to 2,700 cfs), which is expected to occur with about a 20 to 50 percent probability. During the lowest flow conditions which are expected to occur with nearly a 50 percent probability, flows under the proposed project remain between approximately 1,100 and 1,700 cfs, and are higher than the basis of comparison (Figure A4-9).

Simulated flows under the proposed project at the Marysville Gage are expected to be higher than the basis of comparison during the highest flow conditions (above approximately 1,700 cfs) which are expected to occur with about a 20 percent exceedance probability, and lower during the intermediate flow range (about 700 to 1,700 cfs) which is expected to occur with about a 20 to 55 percent probability. In addition, flows under the proposed project are expected to be higher (generally from about 200 up to 400 cfs) than under the basis of comparison during drier conditions, which are expected to occur with up to about a 45 percent probability (Figure A4-7).

Water Temperature

During July, water temperatures simulated at Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 58.0°F to 58.2°F (Figure A5-5).

During July, water temperatures simulated at Marysville range from 59.1°F to 65.1°F under the basis of comparison, and from 59.1°F to 63.6°F under the proposed project. During about the warmest 45 percent of the water temperature exceedance distribution for July, water temperatures simulated at Marysville under the proposed project are lower (up to 2.3°F) than those under the basis of comparison. For the remaining central portion of the cumulative probability distribution (about 50 to 75 percent), simulated average water temperatures under the proposed project are less than 62°F, but are up to approximately 2.1°F higher than those under the basis of comparison (Figure A5-6).

August 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing)
- Fall-run Chinook Salmon (Adult Immigration and Holding)
- Steelhead (Adult Immigration and Holding; Juvenile Rearing)
- Green Sturgeon (Juvenile Rearing and Juvenile Emigration)

Simulated Actual Flows

During the lowest flow conditions, which are expected to occur with a 35 percent probability, flows under the proposed project at the Smartville Gage are expected to remain between about 1,000 cfs and 1,500 cfs, whereas simulated flows under the basis of comparison are not expected to exceed 1,200 cfs. At flows higher than about 1,700 cfs, which are expected to occur with about a 50 percent probability, flows under the proposed project are generally 200 to 400 cfs higher relative to the basis of comparison (Figure A4-11).

During the lowest flow conditions, which are expected to occur with a 35 percent probability, flows under the proposed project at the Marysville Gage are expected to remain between 350 cfs and 500 cfs, whereas simulated flows under the basis of comparison are not expected to exceed 250 cfs. At flows higher than about 800 cfs, which are expected to occur with about a 50 percent probability, flows under the proposed project are generally 200 to 400 cfs higher relative to the basis of comparison (Figure A4-12).

Water Temperature

During August, water temperatures simulated at Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 57.2°F to 57.4°F (Figure A5-7).

During August, water temperatures simulated at Marysville range from 58.3 °F to 62.6°F under the proposed project, and from 58.4°F to 64.1°F under the basis of comparison.

During the warmest water temperature conditions during August, which are expected to occur with about a 35 percent probability, water temperatures simulated at Marysville under the proposed project are lower (up to 2.3°F) than those under the basis of comparison. For the remainder of the water temperature exceedance distribution, average water temperatures under the proposed project and under the basis of comparison are within 1.0°F (Figure A5-8).

September 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation; Juvenile Rearing)
- Fall-run Chinook Salmon (Adult Immigration and Holding)
- Steelhead (Adult Immigration and Holding; Juvenile Rearing)
- Green Sturgeon (Juvenile Rearing and Juvenile Emigration)

Simulated Actual Flows

Flows under the proposed project at the Smartville Gage are expected to be higher (up to 100 to 200 cfs) than the basis of comparison with about a 90 percent probability. Flows equal to or higher than 700 cfs are expected to occur under the proposed project with about a 98 percent probability, whereas flows under the basis of comparison are expected to exceed 700 cfs with about a 70 percent probability (Figure A4-13).

Flows under the proposed project at the Marysville Gage are expected to be higher (from about 100 to 250 cfs) than the basis of comparison with about a 90 percent probability. Flows equal to or higher than 500 cfs are expected to occur under the proposed project with about a 90 percent probability, whereas flows under the basis of comparison are expected to exceed 500 cfs with less than a 70 percent probability (Figure A4-14).

Water Temperature

During September, water temperatures simulated at Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 58.2°F to 58.3°F (Figure A5-9).

During September, water temperatures simulated at Marysville generally range from about 59.2°F to 62.6°F under the proposed project, and from 59.3°F to 63.9°F under the basis of comparison. During the warmest 30 percent of the water temperature exceedance distribution for September, water temperatures simulated at Marysville under the proposed project are expected to be lower (up to 2.1°F) than those under the basis of comparison. For the remainder of the water temperature exceedance distribution, average water temperatures under the proposed project and the basis of comparison are within 1.0°F (Figure A5-10).

October 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation; Juvenile Rearing)
- Fall-run Chinook Salmon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation)
- Steelhead (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Juvenile Rearing)

Simulated Actual Flows

Flows at both the Smartville Gage (Figure A4-15) and the Marysville Gage (Figure A4-16) under the proposed project are expected to be higher than the basis of comparison with more than a 95 percent probability. At the Marysville Gage, under the proposed project 500 cfs is expected to be equaled or exceeded with about a 95 percent probability, but only with about a 5 percent probability under the basis of comparison.

Water Temperature

During October, water temperatures simulated at Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 55.4°F to 55.7°F (Figure A5-11).

For nearly the entire water temperature exceedance distribution during the month of October at the Marysville Gage, simulated average water temperatures under the proposed project are expected to be lower (up to approximately 1.0°F) than those under the basis of comparison (Figure A5-12).

November 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Spawning; Juvenile Rearing; Smolt Emigration)
- Fall-run Chinook Salmon (Adult Immigration and Holding; Adult Spawning)
- Steelhead (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Juvenile Rearing)

Simulated Actual Flows

Flows at both the Smartville Gage (Figure A4-17) and the Marysville Gage (Figure A4-18) under the proposed project are expected to be higher than flows under the basis of comparison during lower flow conditions (about 700 cfs or less), which occur with nearly a 70 percent probability. At both gages, flows are expected to be lower under the proposed project at intermediate flow levels (about 700 to 2,500 cfs) which are expected to occur with a 10 to 20 percent probability.

December 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Juvenile Rearing and Smolt Emigration)
- Fall-run Chinook Salmon (Adult Spawning; Juvenile Rearing and Outmigration)
- Steelhead (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Juvenile Rearing)

Simulated Actual Flows

Flows at the Smartville Gage (Figure A4-19) and the Marysville Gage (Figure A4-20) during 60 percent of the cumulative flow distribution generally reflect flood control operations and/or contributory precipitation accretions. During lower flow conditions (700 cfs or less), which are expected to occur with about a 35 percent probability, flows are expected to be slightly higher under the proposed project than flows under the basis of comparison. At both gages, flows are expected to be lower under the proposed project at intermediate flow levels (about 700 to 4,100 cfs), which are expected to occur with a 10 to 60 percent probability.

January 2008

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Juvenile Rearing and Smolt Emigration)
- Fall-run Chinook Salmon (Juvenile Rearing and Outmigration)
- Steelhead (Adult Immigration and Holding; Adult Spawning; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Juvenile Rearing)

Simulated Actual Flows

Flows at both the Smartville Gage (Figure A4-21) and Marysville Gage (Figure A4-22) generally reflect flood control operations and/or contributory precipitation accretions, and exceed 1,000 cfs during about 65 percent of the cumulative flow distribution. Flows under the proposed project that are expected to occur during the lowest flow conditions, which are expected to occur with about 10 percent probability, are equivalent to or slightly higher than flows expected to occur under the basis of comparison. At both gages, flows are expected to be lower under the proposed project at intermediate flow levels (about 700 to 4,100 cfs), which are expected to occur with about a 50 percent probability.

February 2008

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Juvenile Rearing and Smolt Emigration)
- Fall-run Chinook Salmon (Juvenile Rearing and Outmigration)
- Steelhead (Adult Immigration and Holding; Adult Spawning; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Adult Immigration and Holding; Juvenile Rearing)

Simulated Actual Flows

Simulated flows at both the Smartville Gage (Figure A4-23) and Marysville Gage (Figure A4-24) during February are commonly (70 percent or higher probability) expected to be influenced by flood control operations and/or runoff. During low flow conditions, expected to occur with about a 30 percent probability, flows under the proposed project are expected to be equivalent to or higher than flows expected under the basis of comparison. At both gages, flows are generally expected to be slightly higher under the proposed project at intermediate flow levels (about 700 to 4,100 cfs), which are expected to occur with about a 25 percent probability.

March 2008

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Fall-run Chinook Salmon (Juvenile Rearing and Outmigration)
- Steelhead (Adult Immigration and Holding; Adult Spawning; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Adult Immigration and Holding; Adult Spawning; Juvenile Rearing)

Simulated Actual Flows

Simulated flows at both the Smartville Gage (Figure A4-25) and Marysville Gage (Figure A4-26) generally reflect flood control operations and/or contributory precipitation accretions, and exceed 700 cfs with about 90 percent probability. Under the proposed project, flows are generally equivalent at low flow levels, slightly lower at intermediate levels (about 700 to 4,100 cfs), and similar at high flow levels.

Spawning Habitat Availability

Spring-run Chinook Salmon

Spring-run Chinook salmon reportedly spawn from September through November (CDFG 1991a) in the Garcia Gravel Pit Reach, downstream to Daguerre Point Dam (SWRCB 2003). Thus, the spring-run Chinook salmon spawning habitat analysis focused on the annual spawning habitat availability for the Yuba River reach upstream of Daguerre Point Dam during the spawning months of September, October and November (Figure A6-1). During these months, the annual spawning habitat availability under the proposed project was slightly higher than under the basis of comparison (i.e., RD-1644 interim). The proposed project provided an average of 91 percent of maximum WUA, while under the basis of comparison the annual spawning habitat availability averaged 90 percent of maximum WUA. Over the simulation period, annual spawning habitat availability indexes of at least 80 percent of the maximum WUA were achieved 89 percent of the time under the proposed project, and 83 percent of the time under RD-1644 interim.

The spring-run Chinook salmon spawning habitat analysis also emphasized the month of September, because this is the only month during the spring-run Chinook salmon spawning period that is assumed to not temporally overlap with fall-run Chinook salmon spawning (CDFG 2000). For September, Chinook salmon spawning habitat availability, expressed as percent maximum WUA, under the proposed project was lower (up to about 10 percent) than under the basis of comparison for approximately 57 percent of the cumulative WUA distribution, and was higher (up to approximately 5 percent) than under the basis of comparison for the remainder of the distribution (Figure A6-2). Overall, over the entire simulation period, the proposed project provided an average of about 87 percent of maximum WUA, and the basis of comparison provided about 89 percent of maximum WUA. Under the proposed project, approximately 99 to 100 percent of the maximum WUA was provided for 42 percent of the cumulative WUA distribution, whereas the basis of comparison did not provide spawning habitat over about 96 percent of maximum WUA.

Fall-run Chinook Salmon

The fall-run Chinook salmon spawning habitat analysis focused on the months of October through December. WUA estimates were utilized to estimate the annual spawning habitat availability upstream and downstream of Daguerre Point Dam. Over the entire simulation period, Chinook salmon spawning habitat availability under the proposed project was generally higher than under the basis of comparison (Figure A6-3). Over the entire simulation period, the proposed project achieved an average annual probability of 86 percent of maximum WUA, whereas the basis of comparison (RD-1644 interim) achieved an average annual 81 percent of maximum WUA. Under the proposed project, over 90 percent of the maximum WUA was achieved about 62 percent of the cumulative WUA distribution, while under the basis of comparison 90 percent of maximum WUA was achieved for only approximately 48 percent of the cumulative WUA distribution. The percentage of maximum WUA was generally higher (up to approximately 20 percent) under the proposed project than under the basis of comparison for about 50 percent of the cumulative WUA distribution.

Steelhead

The steelhead spawning period generally extends from January through April (CALFED and YCWA 2005). Most steelhead spawning activity in the lower Yuba River is believed to take place upstream of Daguerre Point Dam (CALFED and YCWA 2005). Consequently, the steelhead spawning habitat analysis was focused upstream of Daguerre Point Dam during January through April. Because the duration of the proposed project includes portions of two water years (i.e., water year 2007 from March 2007 through September 2007, and water year 2008 from October 2007 through March 2008), and neither of these portions includes the whole steelhead spawning period, two cumulative distributions of the annual scaled composite WUA were generated for steelhead spawning in the lower Yuba River. One cumulative WUA distribution describes steelhead spawning habitat availability during March and April 2007; the other describes spawning habitat availability from January through March 2008.

The March through April 2007 steelhead spawning habitat availability under the proposed project was lower than under the basis of comparison (RD-1644 interim) for approximately 60 percent of the cumulative WUA distribution (Figure A6-4). Overall, the average proposed project WUA was 38 percent of maximum WUA, whereas the basis of comparison average was 42 percent of maximum WUA. Over 90 percent of the maximum WUA occurred for about 10 percent of the cumulative WUA distribution under the proposed project, and about 18 percent of the cumulative WUA distribution under the basis of comparison.

Over the entire period of simulation, the January through March 2008 steelhead spawning habitat availability under the proposed project was higher than under the basis of comparison for approximately 60 percent of the cumulative WUA distribution, and essentially the same for the remainder of the distribution (Figure A6-5). Overall, the average proposed project WUA was 43 percent of maximum WUA, whereas the basis of comparison average was 37 percent of maximum WUA. The proposed project WUA was over 90 percent of the maximum WUA for about 17 percent of the cumulative WUA distribution, while the basis of comparison WUA was over 90 percent of the maximum WUA for only about 5 percent of the distribution.

Fisheries Issues Related to Recent Water Transfers

The discussion of potential fisheries resources impacts for the lower Yuba River also focuses on issues raised related to recent water transfers and a subsequent synthesis of species-specific potential impacts. Specifically, the topics addressed in this evaluation include:

- Potential Effects on Juvenile Salmonid Movement in the Yuba River
    - Inducement of Juvenile Salmonid Downstream Movement
    - Downstream Extension of Cold Water Habitat
- Potential Effects on Attraction of Non-native Adult Chinook Salmon in the Yuba River
- Cold Water Reserves for Fall Releases from New Bullards Bar Reservoir
- Potential Redd Dewatering and Juvenile Stranding

Juvenile Salmonid Downstream Movement

Water transfers characterized by substantial increases in flows at the onset of the transfer, particularly when initiated in summer months when flows are at the instream minimum levels, have the potential to result in adverse impacts to aquatic resources. CDFG indicates that a significant increase in the magnitude of flow is a primary factor that induces steelhead and Chinook salmon to outmigrate (CDFG 2004).

In 2004, the total ramp-up for the water transfer was 122 cfs over the course of two days; a 67 cfs increase in flows from June 30 to July 1, 2004 and a 55 cfs increase in flows from July 1 to July 2, 2004 (at the Smartville Gage). The 2004 water transfer monitoring and evaluation studies did not observe or report any consistent trend between juvenile steelhead counts (at the rotary screw traps) and Yuba River streamflow prior to, during, or immediately following initiation of the 2004 water transfer. Under the proposed project, a pronounced ramp-up is not anticipated because the flow schedules under the 2007 Pilot Program Fisheries Agreement were designed to minimize such occurrences, and because flow increases during spring 2007 are not expected to exceed those which occurred during 2004. Therefore, the proposed project would not be expected to result in the inducement of juvenile salmonid downstream movement from above Daguerre Point Dam to below Daguerre Point Dam in the lower Yuba River, or from the Yuba River to the Feather River.

Downstream Extension of Coldwater Habitat

Resource agency representatives also have expressed concern regarding the creation or extension of coldwater habitat in the lower Yuba River associated with water transfer operations. As discussed previously (Summary of Recent Water Transfer Fisheries Monitoring Studies and Findings), it appears that water transfers may be associated with the extension of cooler water temperatures farther downstream in the lower reaches of the Yuba River (i.e., below Daguerre Point Dam). Generally, such extension of coldwater habitat further downstream can be beneficial to fisheries resources by providing a larger area of suitable habitat. However, once the transfer terminates, if the extended cool water habitat is not maintained, areas of suitable cool water habitat may shift upstream, and fish in the lower downstream reaches that do not also shift upstream may be subjected to stressful water temperatures.

In the Yuba River, habitat in the lower river below Daguerre Point Dam and, in particular, below Hallwood Boulevard generally is considered poor over-summering habitat for juvenile salmonids, relative to reaches upstream of Daguerre Point Dam (see Yuba River Environmental Setting). CDFG has identified concerns regarding the decreased survival of fish remaining in the lower reaches of the river following the end of the water transfer due to elevated water temperatures and increased predation (CDFG 2004).

Water temperatures in the lower Yuba River below Daguerre Point Dam during the period of the year (May through October) included in the water temperature analysis are consistently lower much of the time under the proposed project, relative to the basis of comparison. Simulated water temperatures in the lower reaches of the lower Yuba River (i.e., represented by the Marysville Gage) are anticipated to be more suitable for juvenile steelhead from the period extending from May through October 2007 under the proposed project, relative to the basis of comparison. However, it is recognized that water temperature conditions are variable and are influenced by climatic conditions, and should continue to be monitored during the proposed project.

Potential Effects on Attraction of Non-native Adult Chinook Salmon in the Lower Yuba River

Chinook salmon straying is fairly common in Central Valley streams throughout the Chinook salmon distribution. However, introducing non-native Chinook salmon (especially of hatchery origin) at high rates may be detrimental to the overall well-being of self-sustaining natural Chinook salmon populations, such as those in the Yuba River. Although some straying of non-indigenous Chinook salmon into the lower Yuba River occurs every year, resource agencies have expressed concern regarding the potential for the lower Yuba River water transfers via decreased water temperatures and increased proportions of flow, relative to the Feather River, to encourage non-natal Feather River hatchery Chinook salmon to stray into the lower Yuba River.

As described in the Water Code Environmental Analysis (Appendix 2) discussions under *Summary of Recent Water Transfer Fisheries Monitoring Studies and Findings*, some straying of anadromous salmonids into the lower Yuba River is a natural phenomenon, and also occurs every year under various prevailing water conditions. It should be recognized that increases in lower Yuba River flows, whether from water transfers, increased minimum instream flow requirements ordered by the SWRCB, or flood flow releases potentially may attract salmonids into the lower Yuba River. Additionally, straying of non-Yuba River origin adult Chinook salmon can be influenced by Feather River flows, hatchery release location and timing, and other factors.

Overall, based on the findings of monitoring studies conducted for recent YCWA water transfers, the flow and water temperature differences between the proposed project and the basis of comparison are not expected to increase straying of non-indigenous adult salmonids in the lower Yuba River.

Coldwater Reserves for Fall Releases from New Bullards Bar Reservoir

During previous water transfers involving YCWA, concern has been expressed about the loss of coldwater reserves for fall releases from New Bullards Bar Reservoir. Monitoring conducted for the SWRCB following YCWA's 1997 water transfer to Reclamation indicates that a reduction of 75,000 acre-feet did not significantly reduce available coldwater storage. In addition, water temperature profiles in the reservoir indicate that the thermocline (the depth zone of a lake or reservoir in which there is a rapid decrease in temperature with water depth) extends to depths of 50 to 60 feet in late summer and early fall. Below a depth of about 120 feet, water temperatures are relatively low and stable (40°F to 45°F) ((YCWA 2004); Appendix 2). The low-level penstock outlet draws water at reservoir elevations from 1,623 to 1,675 feet. It is expected that the proposed project would result in less-than-significant impacts to the coldwater pool.

Potential Redd Dewatering and Juvenile Stranding

Revised flow reduction and fluctuation criteria for the lower Yuba River were established in the 2005 NMFS Biological Opinion for the Yuba River Development Project License Amendment (FERC No. 2246). The revised flow reduction and fluctuation criteria were developed to be more protective than previous requirements of juvenile salmonids from stranding and of salmonid redds from dewatering. The following conditions stipulated in the Biological Opinion were developed to protect salmonid redds from dewatering (NMFS 2005):

- Once the daily project release or bypass level is achieved, fluctuations in the streamflow level downstream of Englebright Dam due to changes in project operations shall not vary up or down by more than 15 percent of the average daily flow.
- During the period from September 15 to October 31, YCWA shall not reduce the flow downstream of Englebright Dam to less than 55 percent of the maximum five-day average release or bypass level that has occurred during that September 15 to October 31 period or the minimum streamflow requirement that would otherwise apply, whichever is greater.
- During the period from November 1 to March 31, YCWA shall not reduce the flow downstream of Englebright Dam to less than the minimum streamflow release or bypass established under (4) above; or 65 percent of the maximum five-day average flow release

or bypass that has occurred during that November 1 to March 31 period; or the minimum streamflow requirement that would otherwise apply, whichever is greater.

Additional detail is provided in the NMFS Biological Opinion (NMFS 2005).

Substantial decreases in instream flows at the conclusion or “ramp-down” phase of water transfers are of concern because of the potential that fish stranding could result when flows in the river decrease. As juvenile salmonids grow, they move from the shallower back water/side channel habitats to faster water associated with the main channel. However, stranding or isolation of juvenile salmonids can occur in side pools or channels with an increasing gradient towards the main channel if these areas become isolated from the main river channel due to flow reductions. It is recognized that there are side channels along the lower Yuba River that could become isolated from the main river channel if flow reductions at the end of the transfer period are not managed carefully. In addition to complying with the flow reductions and fluctuation criteria in the NMFS 2005 BO, during the proposed project YCWA would implement a maximum ramp-down rate of 200 cfs per day, in four increments of about 50 cfs each, as was done for the 2004 water transfer (YCWA 2004). These proposed rates are more restrictive than the ramp-down rates in the current SWRCB RD-1644 interim regulatory baseline.

YCWA also is obligated to complete a fry stranding and redd dewatering study that was developed collaboratively with NMFS, USFWS, and CDFG. The NMFS 2005 BO states that the results of this study will be used as the basis for developing a flow reduction and fluctuation management plan (FRFMP) for the lower Yuba River. This FRFMP is expected to be designed and implemented in a way that will further minimize potential take of listed species resulting from flow reductions and fluctuations downstream of Englebright Dam.

4.3.2.5 Summary of Evaluation Considerations and Conclusions

Yuba River

Spring-run Chinook Salmon

The adult immigration and holding life stage primarily extends from March through October, with most Chinook salmon that exhibit spring-run phenotypic immigration timing moving past Daguerre Point Dam during June. Flows in the lower Yuba River throughout the upstream migration period generally remain within ranges sufficient to allow adequate passage of adult spring-run Chinook salmon through the Daguerre Point Dam fish ladders (Daguerre Point Dam fish ladders are not effectively operational at flows above 10,000 cfs). During June, when most early immigrating (i.e., spring-run) Chinook salmon are observed, the proposed project provides equivalent, or substantially higher flows than the basis of comparison over 80 to 85 percent of the exceedance distribution, at both the Smartville and Marysville gages. After passing Daguerre Point Dam, the fish reportedly continue their upstream migration to spend the summer in deep pools in the Narrows Reach below Englebright Dam where they hold until spawning commences in September (SWRCB 2003).

The presence of adult spring-run Chinook salmon below Daguerre Point Dam, during their immigration until holding in the Narrows Reach, is transitory. Water temperatures below Daguerre Point Dam under both the proposed project and the basis of comparison are not expected to substantially affect the upstream migration of spring-run Chinook salmon. Flows and water temperatures under both the proposed project and the basis of comparison are expected to provide essentially equivalent holding habitat conditions in the Narrows Reach from March through October.

Spring-run Chinook salmon spawning reportedly occurs above Daguerre Point Dam from September through November. During September, the proposed project is expected to provide higher flows (generally up to about 200 cfs) than the basis of comparison, which results in an overall average less amount of spawning habitat (87 versus 89 percent of maximum WUA) due to the nature of the spawning habitat–discharge relationship. However, the proposed project provides more spawning habitat during "drier" conditions (i.e., the lowest 40 percent of the cumulative flow distribution). Moreover, higher amounts of spring-run Chinook salmon spawning habitat are expected to be provided by the proposed project than by the basis of comparison (overall average of 91 percent versus 90 percent of maximum WUA) from September through November. Water temperatures above Daguerre Point Dam are cool and nearly identical during September and October under the proposed project and the basis of comparison.

The juvenile rearing life stage of spring-run Chinook salmon is believed to extend year-round. Specific habitat-discharge relationships for juvenile rearing salmonids have not been developed for the lower Yuba River. Available information indicates that physical habitat for this life stage is not limiting under the flow regimes anticipated for either operational scenario. Elevated water temperatures from spring through fall are considered to be the primary stressor to juvenile rearing spring-run Chinook salmon in the lower Yuba River.

Under the proposed project, water temperatures in the lower Yuba River during the juvenile spring-run Chinook salmon over-summer rearing period are anticipated to be substantially lower, and therefore more suitable, than those under the basis of comparison. During the simulated warmest 30 percent of conditions that could occur during late summer and fall, water temperatures at Marysville under the proposed project would be up to 2°F lower than those under the basis of comparison below Daguerre Point Dam.

The smolt emigration life stage of spring-run Chinook salmon extends from November through June in the lower Yuba River. Under the proposed project (relative to the basis of comparison), flows are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, January, and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April and June; and (4) higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during May.

During the month of June portion of the smolt emigration life stage, water temperatures at Marysville under the proposed project are expected to be about 0.7 to 1.5°F lower than the basis of comparison for the warmest 25 percent of the distribution, when water temperatures exceed 60°F under both alternatives.

Based on the findings of YCWA's recent monitoring studies, and the flow and water temperature analyses conducted for this impact analysis, it is concluded that, relative to the basis of comparison, the proposed project is expected to provide:

- Similar rates of non-indigenous adult Chinook salmon straying;
- Similar adult upstream migration and holding conditions;

- Higher spawning habitat availability during drier flow conditions, and lower spawning habitat availability during wetter conditions in September; higher spawning habitat availability from September through November; and nearly identical spawning water temperatures;
- Substantially lower (up to 2°F) and therefore more suitable water temperatures during the juvenile spring-run Chinook salmon over-summer rearing period below Daguerre Point Dam;
- Similar protection against juvenile non-volitional downstream movement; and
- Generally equivalent or enhanced smolt outmigration conditions.

In conclusion, the proposed project is expected to result in less-than-significant impacts to the lower Yuba River spring-run Chinook salmon population, and is expected to provide an equivalent or higher level of protection, relative to the basis of comparison (RD-1644 interim).

Fall-run Chinook Salmon

The adult immigration and holding life stage generally extends from August through November, which encompasses the time fall-run Chinook salmon enter the lower Yuba River to the time spawning site selection begins. The majority of fall-run Chinook salmon reportedly enter the lower Yuba River during October and November. Based upon simulated flow analysis, the proposed project flows at the Marysville Gage during August, September, October, and November would be higher most of the time, relative to the basis of comparison. Increased flows would increase the mean width and depth of the river channel, thus potentially increasing the total area of holding habitats, which could decrease the overall holding fish density. Potential increases in flows, under the proposed project, could also be beneficial in facilitating the migration of adult fall-run Chinook salmon to holding habitats in upstream areas. Associated decreases in water temperature (up to 2°F) below Daguerre Point Dam could decrease the potential spread of infectious parasitic diseases and, thus, increase the general fitness level of adult fall-run Chinook salmon present in the lower Yuba River during late summer and early fall.

Fall-run Chinook salmon spawning generally extends from October through December. The proposed project is expected to provide higher flows under drier flow conditions than the basis of comparison. Consequently, the proposed project provides more (generally 10 to 20 percent) spawning habitat when spawning habitat is least available, which occurs with about a 60 percent probability. Water temperatures below Daguerre Point Dam during the early part of the spawning and embryo incubation season (i.e., October) could be up to 1°F cooler than under the basis of comparison, and therefore more suitable for spawning and embryo incubation.

The juvenile rearing and outmigration life stage of fall-run Chinook salmon generally extends from December through June in the lower Yuba River. Under the proposed project (relative to the basis of comparison), flows are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during December, January, and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April and June; and (4) higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during May.

During the month of June portion of the juvenile rearing and outmigration life stage, water temperatures at Marysville under the proposed project are expected to be about 0.7 to 1.5°F lower than the basis of comparison for the warmest 25 percent of the distribution, when water temperatures exceed 60°F under both alternatives.

Based on the findings of YCWA's recent monitoring studies, and the flow and water temperature analyses conducted for this impact analysis, it is concluded that relative to the basis of comparison, the proposed project is expected to provide:

- Substantially higher flows (up to 250 cfs) and lower water temperatures (up to 2°F) below Daguerre Point Dam during the late-summer and fall period of the adult immigration and holding life stage;
- Similar rates of non-indigenous salmonid straying;
- More spawning habitat overall, and more spawning habitat (generally 10 to 20 percent) when spawning habitat is least available, which occurs with about a 60 percent probability;
- Lower (up to 1°F) and therefore more suitable water temperature during the early part (i.e., October) of the spawning and embryo incubation season;
- Similar protection against juvenile non-volitional downstream movement; and
- Generally equivalent or enhanced juvenile rearing and outmigration conditions.

In conclusion, the proposed project is expected to result in less-than-significant impacts to the lower Yuba River fall-run Chinook salmon population, and is expected to provide an equivalent or higher level of protection relative to the basis of comparison (RD-1644 interim).

Steelhead

The analytical period for the steelhead adult immigration and holding life stage in the lower Yuba River extends from August through March. Based on the simulated flow analysis, there is about a 90 percent or higher probability that flows under the proposed project would be higher than they would be under the basis of comparison from August through October, and about a 70 percent probability of higher flows in November. Potential increases in flow under the proposed project could increase the quantity of usable adult steelhead holding habitat due to increases in water depth, and increases in the longitudinal cross sectional area of the river channel that would occur from increases in river stage elevations. Also, lower water temperatures at Marysville would increase the suitability of migratory corridor and adult holding habitat. Under the proposed project (relative to the basis of comparison), flows are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during December, January, and March; and (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February.

The steelhead spawning period generally extends from January through April, upstream of Daguerre Point Dam. The March through April 2007 steelhead spawning habitat availability under the proposed project was lower than under the basis of comparison (RD-1644 interim) for approximately 60 percent of the cumulative WUA distribution. The average proposed project WUA was 38 percent of maximum WUA, whereas the basis of comparison average was 42 percent of maximum WUA. Over 90 percent of the maximum WUA occurred for about 10 percent of the cumulative WUA distribution under the proposed project, and about 18 percent of the cumulative WUA distribution under the basis of comparison.

The January through March 2008 steelhead spawning habitat availability under the proposed project was higher than under the basis of comparison for approximately 60 percent of the cumulative WUA distribution, and essentially the same for the remainder of the distribution. The average proposed project WUA was 43 percent of maximum WUA, whereas the basis of comparison average was 37 percent of maximum WUA. The proposed project WUA was over 90 percent of the maximum WUA for about 17 percent of the cumulative WUA distribution, while the basis of comparison WUA was over 90 percent of the maximum WUA for only about 5 percent of the distribution.

Water temperatures above Daguerre Point Dam during the May portion of the embryo incubation period (January through May) are cool (< 56°F) and similar under both the proposed project and the basis of comparison.

The juvenile rearing life stage of steelhead occurs year-round in the lower Yuba River. Specific habitat-discharge relationships for juvenile rearing salmonids have not been developed for the lower Yuba River. Available information indicates that physical habitat for this life stage is not limiting under the flow regimes anticipated for either operational scenario. By contrast, water temperatures from spring through fall are considered to be the primary stressor to juvenile rearing steelhead in the lower Yuba River.

Water temperatures in the lower Yuba River below Daguerre Point Dam during the juvenile steelhead over-summer rearing period are anticipated to be substantially lower and, therefore, more suitable, than those with the basis of comparison. During the simulated warmest 30 percent of conditions that could occur during late summer and fall, water temperatures under the proposed project are expected to be up to 2°F lower than those under the basis of comparison.

Steelhead young-of-the-year (YOY) downstream movement is believed to occur from May through September, and yearling or older individuals (smolts) are believed to emigrate from October through May. For the steelhead YOY downstream movement period (May through September), under the proposed project(relative to the basis of comparison) flows are expected to be: (1) higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during May; (2) higher at low and intermediate flow levels, and equivalent at high flow levels during June; (3) higher at low flow levels, lower at intermediate levels, and higher at high flow levels during July; and (4) generally higher over the range of expected flow levels during August and September.

It is unclear whether the flow patterns from May through September would influence the downstream movement of YOY steelhead under the proposed project, relative to the basis of comparison. The downstream movement of juvenile anadromous salmonids is stimulated by both physiological and environmental cues. Physical cues, such as rapid increases in flows, may be more closely associated with the downstream movement of juvenile salmonids, rather than sustained flow conditions (see Appendix 2, for a discussion of Recent Water Transfer Fisheries Monitoring Studies and Findings). Nonetheless, for those YOY steelhead that do move downstream, water temperatures below Daguerre Point Dam during summer and early fall are expected to be substantially lower, and therefore more suitable, under the proposed project relative to the basis of comparison.

For the smolt emigration period (October through May) under the proposed project (relative to the basis of comparison) flows are expected to be: (1) generally higher over the range of expected flow levels during October; (2) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, January and March; (3) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (4) higher at low and intermediate flow levels, and equivalent at high flow levels during April; and (5) higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during May.

During the October and May months of the smolt emigration life stage, water temperatures at Marysville under the proposed project are expected to be lower, and therefore more suitable, for the smolt emigration life stage.

Based on the findings of YCWA's recent monitoring studies, and the flow and water temperature analyses conducted for this IS, it is concluded that relative to the basis of comparison, the proposed project is expected to provide:

- Substantially lower (up to 2°F) and therefore more suitable water temperatures below Daguerre Point Dam during the late summer and early fall portion of the adult immigration and holding period;
- Equivalent or better flow and water temperature conditions during the spawning and embryo incubation life stage;
- Substantially lower (up to 2°F) and therefore more suitable water temperatures below Daguerre Point Dam during the juvenile steelhead over-summer rearing period;
- Substantially lower (up to 2°F) and therefore more suitable water temperatures below Daguerre Point Dam during the late summer and early fall portion of the juvenile downstream movement life stage; generally equivalent or better flow and water temperature conditions during the smolt emigration life stage; and
- Similar protection against juvenile non-volitional downstream movement.

In conclusion, the proposed project is expected to result in less-than-significant impacts to the lower Yuba River steelhead population, and is expected to provide an equivalent or higher level of protection relative to the basis of comparison (RD-1644 interim).

Green Sturgeon

Flows during green sturgeon immigration and holding (February through July) and adult spawning and embryo incubation (March through July) are expected to allow adequate upstream migration and spawning habitat availability, under the proposed project, relative to the basis of comparison. During the lowest 30 percent of the cumulative flow distribution, flows under the proposed project are expected to be higher during the spring and early summer, relative to the basis of comparison. These higher flows could potentially increase the amount of green sturgeon adult holding, and spawning habitat availability.

Water temperatures under the proposed project during May through July below Daguerre Point Dam could range from 54°F to 63.5°F. These water temperatures are within the range of water temperatures reported to be suitable for green sturgeon immigration and holding, and spawning and embryo incubation.

Green sturgeon juvenile rearing is reported to occur year-round in their natal stream habitats. Average monthly flows under the proposed project are expected to be generally higher during most months of the year during low flow conditions, and therefore would not be expected to be a limiting factor impacting green sturgeon juvenile habitat availability, relative to the basis of comparison.

Average monthly water temperature in the lower Yuba River under the proposed project would not be expected to exceed the water temperatures reported to be optimal for juvenile green sturgeon growth.

Green sturgeon begin their emigration to the Delta from May through September. Flows during this period are expected to allow juvenile emigration under the proposed project and the basis of comparison. During the lowest 30 percent of the cumulative flow distribution, higher flows during the summer and fall months under the proposed project could potentially be more beneficial to green sturgeon juvenile emigration, relative to the basis of comparison.

Thermal requirements for the green sturgeon juvenile emigration life stage have not been reported; therefore, it is assumed for the purpose of this analysis, that water temperature suitabilities reported for the juvenile rearing life stage also are appropriate for juvenile emigration. Water temperatures under the proposed project would be within the range reported to be suitable for juvenile green sturgeon.

Based on the flow and temperature analyses conducted for this impact analysis, it is concluded that relative to the basis of comparison, the proposed project is expected to provide:

- Similar or better flows and water temperatures during the adult immigration and holding and spawning and embryo incubation life stages;
- Substantially lower water temperatures during over-summer juvenile rearing periods; and
- Similar flows and substantially lower water temperatures during juvenile emigration.

In conclusion, the proposed project is expected to result in less-than-significant impacts to green sturgeon in the lower Yuba River, and is expected to provide an equivalent or higher level of protection, relative to the basis of comparison (RD-1644 interim).

American Shad

The proportion of lower Yuba River outflow to the lower Feather River flow would be 9 percent higher under the proposed project during the month of April, no different during May, and 9 percent higher during the month of June, relative to the basis of comparison (**Table 4-8).** American shad adult immigration and spawning would not be expected to be significantly affected by changes in flows under the proposed project. Flows under the proposed project during April, May, and June are expected to provide flows of sufficient magnitude to attract American shad into the lower Yuba River to spawn. Therefore, the proposed project would be expected to result in less-than-significant impacts to American shad immigration and spawning in the lower Yuba River, relative to the basis of comparison.

Table 4-8. Difference in Proportional Simulated Mean Monthly Flows for the Lower Yuba River (Marysville), Relative to the Lower Feather River (Gridley), Between the Proposed Project and RD-1644 Interim During April through June 2007

	Apr	May	Jun
Feather River Mean Monthly Flow (cfs)[1]	4,418	4,069	4,003
Yuba River Mean Monthly Flow (cfs) with Proposed Project[2]	2,582	2,883	2,329
Yuba River Mean Monthly Flow (cfs) with RD-1644 Interim[2]	2,202	2,898	1,967
Difference in Proportional Flow (%)	9	0	9

[1]Source: CDEC, period of record 1993 through 2005
[2]Simulated at Marysville

Striped Bass

Striped bass spawning and initial rearing in the lower Yuba River extends from April through June. Flows under the proposed project during April, May and June simulated at Marysville are expected to provide flows of sufficient magnitude to attract striped bass into the lower Yuba River to spawn (see American shad discussion, above). Water temperatures lower than the range reported for spawning (59°F to 68°F) are expected to occur with about a 15 percent higher probability under the proposed project, relative to the basis of comparison. Water temperatures reported to be suitable for rearing (61°F to 73°F) are expected to occur with the same probability under the proposed project, relative to the basis of comparison. The proposed project would be expected to result in less-than-significant impacts to striped bass spawning and initial rearing in the lower Yuba River, relative to the basis of comparison.

Feather River

Overall, flows in the Feather River would not be expected to differ substantially under the proposed project, relative to the basis of comparison. The difference in average simulated monthly mean flows (Marysville Gage) and the percentage of these flows to Feather River (Gridley Gage) flows under the proposed project relative to the basis of comparison for the 83-year simulation period are represented in Table 4-1.

These potential monthly changes in flow would not be of sufficient magnitude to significantly affect Feather River fisheries resources. Neither physical habitat availability for fish residing in the Feather River nor immigration of adult or emigration of juvenile anadromous fish would be expected to be substantially affected by the anticipated differences in flows that could occur under the proposed project, relative to the basis of comparison. These relatively small differences in flow between the proposed project and the basis of comparison are not expected to result in substantial differences in water temperatures, would not persist downstream and, therefore, would result in less-than-significant impacts to fish resources in the lower Feather River.

Sacramento River

Although the specific release pattern is uncertain at this time and will depend on SWP/CVP operational conditions as they develop over the summer, the release, when it occurs, will be subject to operational constraints, and within normal operational parameters.

The proposed project would not compromise compliance with environmental regulations that specify minimum flow requirements for winter-run and spring-run Chinook salmon, and Central Valley steelhead. Required releases from New Bullards Bar Reservoir, Englebright Reservoir, and Oroville Reservoir for the protection of fisheries resources would continue to be made by YCWA and DWR.

Overall, flows in the Sacramento River would not be expected to differ substantially under the proposed project, relative to the basis of comparison. The difference in average simulated monthly mean flows at the Marysville Gage for the 83-year simulation period between the proposed project and the basis of comparison and the percentage of these flows to Sacramento River (Freeport) flows are represented in Table 4-2.

These potential changes in flow would not be of sufficient magnitude to result in significant impacts to Sacramento River fisheries resources. Neither physical habitat availability for fish residing in the Sacramento River nor immigration of adult or emigration of juvenile anadromous fish would be significantly affected by the anticipated differences in flows that could occur under the proposed project, relative to the basis of comparison. These relatively small differences in flow between the proposed project and the basis of comparison are not expected to result in substantial differences in water temperatures, would not result in water temperature differences in the Sacramento River and, therefore, would not significantly impact fish resources in the Sacramento River.

Sacramento-San Joaquin Delta

The current regulatory requirements for managing Delta exports include:

- 1995 SWRCB Delta Water Quality Control Plan
- 2004 NMFS Biological Opinion on OCAP
- 2005 USFWS Biological Opinion on OCAP

Compliance with the environmental agreements and requirements specified in these regulations would preclude the occurrence of significant impacts on fish as a result of the pumping from the Delta of the water made available by the proposed project. DWR would provide YCWA water transfer water only to SWP or CVP water contractors within the service area (or place of use) as authorized in DWR's water right permits. Provision of the YCWA transfer water through the EWA Program would be within permitted and authorized operational and regulatory requirements (or constraints). Consequently, the proposed project water would become part of the overall SWP or CVP water supply with attendant environmental limitations for exporting water from the Delta. The impacts on the Delta from SWP/CVP making full use (within prescribed constraints) of its pumping capacities and any necessary mitigation have been documented (Reclamation 2004).

Potential Delta impacts associated with EWA asset acquisitions were addressed through separate environmental compliance processes (i.e., NEPA, CEQA, ESA), which included preparation of an EIS/EIR and corresponding Action Specific Implementation Plan (ASIP). Based on the analyses, conclusions and mitigation measures presented in the EWA EIS/EIR and ASIP, a Record of Decision (Reclamation *et al.* 2004b) was issued by Reclamation and the EIR was certified by DWR (DWR 2004b). Thus, the necessary regulatory compliance requirements of NEPA and CEQA have been satisfied for the EWA Program. Similarly, federal and state ESA compliance requirements have been satisfied through the ASIP process. In particular, the USFWS concurred in its Programmatic Biological Opinion on the EWA Program that the EWA was not likely to adversely affect delta smelt or its critical habitat (USFWS 2004). Similarly, NMFS found that the EWA was not likely to adversely affect Sacramento River winter-run Chinook salmon and its critical habitat, Central Valley spring-run Chinook salmon, and Central Valley steelhead (NMFS 2004a).

Completed in 2004, the EWA Final EIS/EIR analyzed EWA Program actions through 2007. As described in the EWA Draft EIS/EIR (2003), the Flexible Purchase Alternative included potential asset acquisitions from the Yuba River Basin in the amount of: (1) 100,000 acre-feet of stored reservoir water; and (2) 85,000 acre-feet of groundwater, both of which could be provided to the EWA Program by YCWA (Reclamation *et al.* 2003).

The expected amount of water entering the Delta as a result of the transfer element of the proposed project is within the levels evaluated in the EWA Final EIS/EIR (Reclamation *et al.* 2004b). The proposed project would result in the potential for DWR to acquire a minimum of 62,000 acre-feet and a maximum of 125,000 acre-feet of transfer water. Therefore, the total quantity of YCWA water (i.e., up to 125,000 acre-feet) proposed for transfer in 2007 is less than the maximum asset acquisition (185,000 acre-feet) identified for the Yuba River Basin as part of the EWA Program.

Although Delta diversions generally can result in fishery impacts, findings supporting the conclusion that habitat conditions resulting from implementation of the EWA Program (i.e., Flexible Purchase Alternative) would result in beneficial effects on fisheries resources in the Delta, as described in the EWA Draft EIS/EIR (2003), are as follows.

- The ratio between exports and Delta inflow (E/I ratio) has been identified as an indicator of the vulnerability of fish and macroinvertebrates to direct and indirect impacts resulting from SWP and CVP operations (Reclamation *et al.* 2003). The E/I ratio limits are identified in the 1995 Water Quality Control Plan, with the greatest reductions in exports, relative to inflows, occurring during the biologically sensitive February through June period. As part of the EWA Program, export pumping would be curtailed in July if the density data shows that fish species of primary management concern are present at the SWP and CVP pumping facilities. The occurrence and density of fish species of primary management concern would be determined from routine salvage monitoring. This practice would be effective in preventing potential salvage-related adverse effects at the SWP and CVP pumping facilities.

- The average annual Chinook salmon and steelhead salvage estimates would decrease in all 15 years simulated, and delta smelt and splittail salvage estimates would decrease in 14 out of the 15 years simulated. Although there would be increases in salvage in individual months and in some years, annual salvage estimates for delta smelt, Chinook salmon, steelhead, splittail and striped bass would decrease, relative to the Baseline Condition.

- The EWA water transfers would provide a benefit by decreasing the frequency of reverse flows and reducing the magnitude when reverse flows would still occur. Overall, such changes would be considered a benefit to juvenile salmonid emigration and the transport of planktonic eggs and larvae (Reclamation *et al.* 2003).

The EWA Draft EIS/EIR (2003) generally concluded that implementation of the Flexible Purchase Alternative would result in beneficial or less-than-significant impacts on fisheries and aquatic resources within the Sacramento-San Joaquin Delta Region (p. ES-21). Because the 2007 YCWA transfer water is within the quantity of the asset acquisitions evaluated in the EWA EIS/EIR, potential impacts associated with the conveyance of EWA assets that could occur as a result of changes in the magnitude, timing and duration of Delta conditions have been previously addressed by the analyses conducted for the full 185,000 acre-feet Yuba River Basin asset acquisition presented in the EWA EIS/EIR (2003). Thus, potential changes in Delta conditions and resultant impacts on Delta fisheries resources associated with the YCWA transfer water (i.e., 125,000 acre-feet) in 2007 are anticipated to be within the range of that which was previously evaluated for the EWA Program and no further analyses are required.

Additionally, to evaluate the potential impacts associated with implementation of the 2007 Pilot Program Fisheries Agreement flow schedules through March 31, 2008, an assessment of the changes in Delta inflow was conducted as described in Section 4.1 above. Changes in Delta inflow during January, February, and March 2008 would be less than one percent lower under the proposed project, relative to the basis of comparison, and would range from approximately 0.03 percent to 0.72 percent (Table 4-3). The relatively small difference in total Delta inflow during these months is not anticipated to result in any substantial changes to Delta aquatic habitats or fisheries resources. Therefore, implementation of the proposed project would result in a less-than-significant impact on fisheries and aquatic resources within the Sacramento-San Joaquin Delta Region.

Water transfers such as the proposed project have been identified as an effective means of minimizing overall environmental effects and increasing SWP/CVP operational flexibility (SWRCB 1995). Consequently, potential impacts on Delta fisheries resources resulting from the proposed project would be less than significant given the on-going compliance with existing environmental requirements, the presence of EWA assets that could be used to offset any potential impacts, and the ability to enhance EWA assets through the transfer to DWR. In addition, the EWA Project Agencies also will coordinate EWA water acquisition and transfer actions with federal (USFWS and NMFS), state (DWR and CDFG), other CALFED agencies, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, the Senate Bill [SB] 1086 program, the Corps' Sacramento and San Joaquin Basin Comprehensive Study, the Riparian Habitat Joint Venture, the Central Valley Project Improvement Act (CVPIA), the Central Valley Habitat Joint Venture, and the Grassland Bird Conservation Plan) that could affect management of evaluated species. Coordination will avoid conflicts among management objectives.

4.4 Biological Resources - Terrestrial Resources (Wildlife and Vegetation)

CDFG's Wildlife Habitat Relationship Program identifies 249 species of wildlife that use the valley and foothill habitats of the California Central Valley. These include 151 species of birds, 65 species of mammals, and 33 species of reptiles and amphibians. Riparian zones in the Central Valley, representing terrestrial habitat that potentially could be affected by the proposed project, provide migratory corridors, food, and cover for wildlife species typical of riverine and upland areas. Numerous special-status and sensitive wildlife and plant species are found in the Central Valley including wildlife species that utilize riparian habitats, such as Swainson's hawk, bald eagle, western yellow-billed cuckoo, willow flycatcher, western pond turtle, and valley elderberry longhorn beetle. **Appendix 7** provides a listing of special-status species that are known to, or potentially could, occur in the project area.

4.4.1 Environmental Setting

4.4.1.1 Yuba River

The Yuba River Basin is located on the eastern edge of the Sacramento Valley. It is bounded by the Feather River to the west, the Bear River to the south, Honcut Creek to the north and the Sierra foothills to the east. The primary land use is agriculture, with rice, pasture, and fruit and nut trees accounting for most of the crops. Rice fields are flooded in fall for rice straw decomposition and the creation of wintertime waterfowl habitat. Agricultural drains and canals support wetland vegetation in some areas and provide habitat for wetland-associated species. In addition to agricultural land, the valley floor supports non-native grassland. Approximately two-thirds of the Yuba River Basin is in the Sierra Nevada foothills. Vegetation communities and their associated wildlife species in this portion of the basin include blue oak woodland, and valley oak woodland. In addition to the wildlife species identified below for the Sacramento River Basin, the foothill yellow-legged frog and the California red-legged frog are identified as terrestrial species of management concern in the Yuba River Basin.

Foothill Yellow-Legged Frog

One occurrence (1997) of foothill yellow-legged frog in the Yuba River area is recorded in CDFG's California Natural Diversity Database (CNDDB). This record is from Grizzly Gulch, which runs into Oregon Creek about 2 miles from upper New Bullards Bar Reservoir and is 4 to 5 miles from the location where flows would be released to the Yuba River. There are no records of foothill yellow-legged frog occurrences along the lower Yuba River below Englebright Reservoir. Historically, foothill yellow-legged frogs were found in the Coast Ranges from the Santiam River drainage in Oregon (Mehama and Marion counties) to the San Gabriel River Drainage in California (Los Angeles County), and along the west slopes of the Sierra Nevada/Cascade Crest in most of central and northern California. The elevation range of the foothill yellow-legged frog extends from near sea level to about 6,000 feet in the Sierra Nevada. Foothill yellow-legged frogs have disappeared from about 45 percent of their historic range in California and 66 percent of their historic range in the Sierra Nevada Mountains. Based on the results of recent surveys conducted on the Pit, North Fork Feather, North Fork Mokelumne, and Middle Fork Stanislaus rivers, breeding populations of foothill yellow-legged frogs documented on these regulated rivers have all been below 3,000 feet in elevation, with the majority of the frogs occurring at elevations at or below 2,600 feet (Ibis Environmental, Inc. 2004).

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-60) analysis recognized that, "*Another consequence of altered hydrological conditions is the presence of amphibian species in river mainstems where they were previously confined to tributaries. Dams, particularly those created for power generation* *have often reduced flows to such a degree that newly created slow moving water habitats attract frogs such as the foothill yellow-legged frog (FYLF). These frogs lay eggs March through May, and the tadpoles metamorphose three to four months later. Frogs at this stage are highly vulnerable to non-volitional movements because of increased flows. However, a search of the CNDDB and current literature did not reveal any occurrences of species such as the FYLF in the mainstems of the rivers being affected by EWA actions*." Because the closest reported occurrence of the foothill yellow-legged frog is approximately 4 or more miles from where releases into the lower Yuba River would occur, and this species has been previously evaluated for the entire EWA Program in the EWA EIS/EIR, the proposed project is not expected to affect the foothill yellow-legged frog. Therefore, this species has been eliminated from further consideration.

California Red-legged Frog

The California red-legged frog was federally listed as threatened on June 24, 1996 (67 FR 57830-57831). On November 3, 2005, USFWS proposed new critical habitat for the California red-legged frog that includes 51 units in 23 counties, including Yuba County. Yuba County contains one (YUB-1, Little Oregon Creek) of the 51 proposed critical habitat units, and this unit consists of: (1) approximately 6,322 acres of land surrounding Little Oregon Creek, which flows southwesterly into New Bullards Bar Reservoir; and (2) land surrounding the Little Oregon Creek finger of New Bullards Bar Reservoir. YUB-1 is considered an area that is essential for the conservation of California red-legged frog because it contains all the primary constituent elements for the species including aquatic breeding habitat, non-breeding aquatic habitat, upland habitat and dispersal habitat, and is occupied by the species. California red-legged frogs are relatively prolific breeders, usually laying egg masses during or shortly following large rainfall events in late winter or early spring. The breeding period for the California red-legged frog typically extends from November through early April (Storer 1925 *in* USFWS 2000). Adult frogs often utilize dense, shrubby or emergent vegetation closely associated with deep-water pools with fringes of cattails and dense stands of overhanging vegetation such as willows. Frogs living in coastal drainages are rarely inactive, whereas those found in interior sites where temperatures are lower may become inactive for long periods (Jennings *et al*. 1992 *in litt. in* USFWS 2002). Additionally, adult frogs that have access to permanent water will generally remain active throughout the summer. If water is not available, upland habitat areas provide important dispersal, estivation and summer habitat for the species (USFWS 2002).

4.4.1.2 New Bullards Bar Reservoir

Vegetative communities adjacent to New Bullards Bar Reservoir predominantly are oak woodland types with some chaparral, and mixed conifer and montane hardwood communities occurring at higher elevations. The oak woodland communities include live oak (*Quercus wizlizenii*), blue oak (*Quercus douglasii*), and foothill pine (*Pinus sabiniana)*, with several species of understory shrubs and forbs including poison oak (*Toxicodendron diversilobum*), manzanita (*Arctostaphylos* sp.), California wild rose (*Prunus,* sp.), and lupine (*Lupinus)*. The reservoir shoreline is mostly devoid of vegetation as a result of clearings and frequent fluctuations in surface water elevations. Wildlife consists of species that typically use oak woodlands and chaparral habitats in the Central Valley.

New Bullards Bar Reservoir supports a pair of nesting southern bald eagles, a species listed as endangered under the California Endangered Species Act (CESA) and listed as threatened under the federal ESA. Bald eagle production may be adversely affected by extreme drawdown of reservoirs during the period when eagle chicks are in the nest.

Bald Eagle

Throughout most of California, the bald eagle breeding season extends from approximately January through August (CDFG Website 2004). Females generally lay between one and three eggs. The most common clutch size, however, reportedly is two eggs (Stalmaster 1987). Females and males incubate the eggs with incubation generally lasting approximately 35 days. Both parents bring prey feed the eaglets prior to fledging, which generally occurs 11 to 12 weeks after hatching. Fledglings disperse from the nest area as early as several weeks after fledging.

Bald eagles currently nest throughout the western United States, including California. Historically, bald eagles nested throughout California near seacoasts, major rivers, and lakes. As of 1999, 188 known nesting territories existed in 58 California counties (up from 28 in 1978) (CDFG Website 2004). Hundreds of additional bald eagles migrate into California during winter months from nesting territories throughout Washington, Oregon, Alaska, and Canada.

Bald eagle habitat generally can be described in terms of nesting and wintering requirements, but foraging habitat also has some specific attributes that vary geographically and seasonally. Bald eagles usually nest in the same territories year after year but may use alternate nest sites (as many as five may occur) within the territory. Nesting habitat in California is described as multistoried forests with old-growth trees and snags that are near water (Anthony *et al.* 1982); Zeiner et al. 1990). Foraging habitat for bald eagles includes lakes, rivers, oceans, shorelines, and occasionally, deserts, grasslands, and alpine (Stalmaster 1987). In northern California, most bald eagles nesting near reservoirs forage on fish (PG&E 2002).

4.4.1.3 Feather River

Although levees restrict the extent of riparian and wetland vegetation along the Feather River, this system still supports a diversity of riparian and wetland vegetation and wildlife communities. Willow scrub riparian habitat occupies frequently flooded areas closest to the river. Cottonwoods are more prominent in less frequently flooded areas, but still require and tolerate regular inundation. Valley oaks occupy the least flooded portion of the river. Back water areas support freshwater emergent wetlands, which contribute to increasing the overall habitat diversity of the river. Wildlife consists of species typically found in riparian habitats of the Central Valley.

4.4.1.4 Oroville Reservoir

Habitats adjacent to Oroville Reservoir are predominantly oak woodland with some chaparral. The oak woodland habitat includes live oak, blue oak, and foothill pine, with several species of understory shrubs and forbs including poison oak, manzanita, California wild rose, and lupine. The reservoir rim is mostly devoid of vegetation as a result of regular and frequent fluctuations in water elevations. Wildlife consists of species that are typically associated with oak woodlands and chaparral habitats in the Central Valley. In addition, large numbers of waterfowl and gulls overwinter in the Thermalito Afterbay, although few use Oroville Reservoir.

4.4.1.5 Sacramento River

Much of the Sacramento River is confined by levees that reduce the natural diversity of riparian vegetation. Agricultural land (rice, dry grains, pastures, orchards, vineyards, and row and truck crops) is common along the lower reaches of the Sacramento River, but is less common in the upper portions. Along most of the Sacramento River, remnants of riparian communities are all that remain of once very productive and extensive riparian areas (Reclamation *et al.* 2003). The riparian communities consist of Valley oak, cottonwood, wild grape, box elder, elderberry, and willow. Although riparian vegetation occurs along the Sacramento River, these areas are confined to narrow bands between the river and the river side of the levee.

The wildlife species inhabiting the riparian habitats along the lower Sacramento River include, but are not limited to, wood duck, great blue heron, great egret, green heron, black phoebe, ash-throated flycatcher, sora, great horned owl, Swainson's hawk, California ground squirrel, and coyote. The freshwater/emergent wetlands represent habitat for many wildlife species, including reptiles and amphibians such as the western pond turtle, bullfrog, and Pacific Chorus Frog. Agricultural areas adjacent to the river also represent foraging habitat for many raptor species.

4.4.1.6 Sacramento–San Joaquin Delta

Most of the vegetation in the Delta consists of irrigated agricultural fields and associated ruderal (disturbed), non-native vegetation fringes that border cultivated fields. Throughout much of the Delta, these areas border the levees of various sloughs, channels, and other waterways within the historic floodplain. Native habitats include remnant riparian vegetation that persists in some areas, with brackish and freshwater marshes also being present. Saline wetlands consist of pickleweed, cord grass, glasswort, saltgrass, sea lavender, arrow grass, and shoregrass. These wetlands are very sensitive to fluctuations in water salinity, which are determined by water flows into the Delta (SFEP 1993).

There are pockets of water resulting from old channels that have been cut off from mainstem rivers entering the Delta as a result of channel meandering over time, or where dredge-mining activities have left deep depressions. These back water areas typically contain large fringes of emergent and isolated vernal pools bordered by emergent marsh plants such as cattails and rushes. The calm waters provide excellent habitat for ducks such as cinnamon teal, American wigeon, and mallard.

The wetlands of the Delta represent habitat for a number of shorebirds and waterfowl species including killdeer, California black rail, western sandpiper, long-billed curlew, greater yellow-legs, American coot, American wigeon, gadwall, mallard, canvasback, and common moorhen. These areas also support a number of mammals such as coyote, gray fox, muskrat, river otter, and beaver. Several species of reptiles and amphibians also are present in this region.

The complex interface between land and water in the Delta has led to a rich and varied plant life that provides habitat for a diversity of wildlife species, especially birds. Wildlife habitats include agricultural land, riparian forest, riparian scrub-shrub, emergent freshwater marsh, heavily shaded riverine aquatic, and grassland/rangeland. Many species that either are listed or are candidates for listing as rare, threatened, and endangered inhabit the Delta, but none are endemic to that area.

4.4.1.7 San Luis Reservoir

Habitat types found at San Luis Reservoir include lacustrine, riparian, and scattered blue oak woodlands. Riparian habitat is limited to scattered patches of mule fat and occasional willows. Blue oak woodlands are present on the western shore of the reservoir.

4.4.1.8 South-of-Delta Groundwater Banks

Groundwater recharge basins associated with groundwater banks provide habitat for waterfowl, wading birds, and shorebirds.

4.4.2 Impact Analysis

4.4.2.1 Methodology and Significance Criteria

The analysis of potential impacts on wildlife and vegetation associated with the proposed project within the affected waterbodies was based on the following criteria:

- Would the proposed project cause any changes in river flow, relative to the basis of comparison, of sufficient magnitude and duration for any given month to result in significant impacts on river corridor riparian habitat or other sensitive natural communities and associated species?
- Would the proposed project cause any changes in reservoir water surface elevation, relative to the basis of comparison, of sufficient magnitude and duration, to result in significant impacts on reservoir near-shore habitat and associated species?

Potential changes in reservoir water surface elevation and river flows were evaluated to determine if changes in reservoir water surface elevations of sufficient magnitude and duration would occur that may result in a significant impact on reservoir near-shore, riparian, and river corridor riparian habitats, or other sensitive natural communities and associated special-status wildlife species.

4.4.2.2 Environmental Impacts

Yuba River

Under the proposed project, flows in the lower Yuba River are expected to remain within normal operational ranges. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to RD-1644 interim) generally are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, January, and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April and June; and (4) higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during May; (5) higher at low flow levels, lower at intermediate levels, and higher at high flow levels during July; and (6) generally higher over the range of expected flow levels during August, September; and October.

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-61 and 10-62) analysis determined that, "*Flows would increase at most by 1,005 cfs in July through September, approximately 60 percent above the Baseline Condition. While this increase would be a noticeable change, releases would be operated to* *maintain relatively constant flows during this time period in accordance with existing Yuba County WA operations to protect fish and the environment. This increase in flow would have the potential to increase non-volitional movement of aquatic wildlife that cannot find quieter water to remain in during periods of increase. However, species such as the California red-legged frog and foothill yellow-legged frog are not known to inhabit this reach of the Yuba River. These effects cannot be quantified, but may be considered significant adverse effects if the EWA-related water releases are maintained at significantly higher flows for long periods of time. EWA agencies would monitor the releases to ensure that adverse effects do not occur, and institute changes to quantities of water released through adaptive management processes to avoid or minimize any adverse effect*." Conversely, the EWA analysis also concluded that, "*Yuba River flows would decrease at most by 239 cfs in late spring as farmers use groundwater for irrigation instead of surface water from New Bullards Bar Reservoir. (A total of 12 to 19 percent reduction in April through June compared to the median flow under the Baseline Condition.) EWA agencies would monitor the releases to ensure that adverse effects do not occur, and institute changes to quantities of water released through adaptive management processes to avoid or minimize any adverse effect* (Reclamation *et al.* 2003) (p. 10-61)."

Based on the model output (see Appendix 3), average increases in monthly mean Yuba River flow under the proposed project, relative to the basis of comparison, would be expected to be less than those identified in the EWA EIS/EIR. Flows under the proposed project would not decrease below the basis of comparison (i.e., RD-1644 interim) during any month of the March 2007 through March 2008 period. Because the proportion of EWA acquisitions associated with the proposed project (i.e., 62,000 acre-feet to 125,000 acre-feet) is less than that which was previously evaluated by the EWA Program, and the proposed project would be implemented for a period of less than one year, potential effects on river corridor riparian habitat or other sensitive natural communities and associated species would be expected to be less than those identified for the entire EWA Program. Therefore, flow changes expected under the proposed project, relative to the basis of comparison, represent a less-than-significant impact on river corridor riparian habitat or other sensitive natural communities and associated species.

New Bullards Bar Reservoir

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-66) analysis determined that, "*By the end of June, the surface water elevation in the reservoir would be, at most, 5 feet higher than under the Baseline Condition… An increase in the surface water elevation would only inundate the existing drawdown zone and would not affect vegetation and wildlife*." Shoreline vegetation would not be impacted by reductions in reservoir water surface elevations because this vegetation is not dependent upon reservoir levels for water (the shoreline vegetation is not riparian, it is associated with upland scrub that is not dependent on saturated soil for water). In addition, the EWA EIS/EIR analysis determined that, "*New Bullards Bar Reservoir water levels fluctuate seasonally and annually; therefore, the drawdown zone is vegetated primarily with non-native herbaceous plants and scattered willow shrubs that do not form contiguous riparian communities and would not be affected by decreases in water levels caused by EWA actions (CALFED 1998). Therefore, the EWA agency acquisition of Yuba County Water Agency water would have less-than-significant effects on the lacustrine habitat of New Bullards Bar Reservoir used by special-status species or other wildlife, particularly as wildlife movement corridors or nurseries along the shoreline*" (Reclamation *et al.* 2003) (p. 10-66).

Changes in New Bullards Bar Reservoir levels associated with the proposed project, relative to the basis of comparison, are not expected to substantially impact aquatic and littoral habitat near New Bullards Bar Reservoir that may be used by the California red-legged frog. In April

2007, which is the reported end of the breeding period, average end-of-month water surface elevation would be approximately 5 feet lower under the proposed project, relative to the basis of comparison. In September 2007, average end-of-month water surface elevation would be approximately 17 feet lower under the proposed project, relative to the basis of comparison. Although the California red-legged frog is rarely found far from water during dry periods, the USFWS Draft Recovery Plan (2002) reports that the species will disperse to upland areas in response to receding water, which often occurs during the driest time of the year (e.g., September). However, because adult frog movements of up to 3 miles have been reported (USFWS 2002), a water surface elevation change of 17 feet would not be of a magnitude that would result in a significant impact to the species' ability to access or utilize aquatic habitat in New Bullards Bar Reservoir. Therefore, potential changes in reservoir levels associated with the proposed project, relative to the basis of comparison, would result in a less-than-significant impact to the California red-legged frog.

Although New Bullards Bar Reservoir supports a pair of nesting southern bald eagles, the proposed project is not expected to have a substantial impact on bald eagles. The reservoir drawdown associated with the proposed project is expected to generally be similar to the drawdown under the basis of comparison, and is expected to be within historical and recent operation levels. Reservoir level reductions resulting from the proposed project are not anticipated to be large enough to either substantially affect prey fish populations or substantially increase the distance from the nest to the reservoir surface. Therefore, potential changes in reservoir levels associated with the proposed project, relative to the basis of comparison, would result in a less-than-significant impact on the foraging success of bald eagles inhabiting areas adjacent to New Bullards Bar Reservoir.

Additionally, although water surface elevation reductions are anticipated with the proposed project, these decreases are not expected to adversely impact the vegetation and wildlife at New Bullards Bar Reservoir. The anticipated lower water surface elevations at New Bullards Bar Reservoir are expected to be within historical operational limits, and are not expected to go below the minimum drawdown zone. Therefore, the proposed project, relative to the basis of comparison, would result in a less-than-significant impact on any moderate to high value vegetation or wildlife habitat.

Feather River

Flows within the Feather River may be higher under the proposed project during most schedules (Table 4-1), but are anticipated to remain within the range of normal instream flows and fluctuations resulting from Oroville Reservoir operations. Specific operations of the Feather River system as a result of the proposed project presently are uncertain. However, because of the potential for slight changes in flow to occur under the proposed project, relative to the basis of comparison, there would be a less-than-significant impact to the vegetation and wildlife communities along the lower Feather River.

Oroville Reservoir

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-65) analysis determined that, "*Increased releases in July and August as the stored EWA water is released for cross-Delta transfer would cause the lake level to decline faster compared to Baseline Conditions; however, reduced releases in September would allow end of month elevation in September to be the same as Baseline Conditions. The increase* *water surface elevation would result in increased flooding of shoreline habitat. The increased level would come slowly (less than an inch per day) so that wildlife would not be affected and riparian vegetation are accustomed to flooding and will not be adversely affected. Therefore, the change in Lake Oroville water surface elevation would have less-than-significant effects on the lacustrine habitat used by special-status species or other wildlife, particularly as wildlife movement corridors or nurseries along the shoreline*."

Oroville Reservoir water levels would not be substantially affected by the proposed project, relative to the basis of comparison, because operation of Oroville Reservoir would remain within normal operational parameters. Oroville Reservoir water levels would be affected by the proposed project only if DWR had to release additional flows to meet water quality standards in the Delta as a result of YCWA holding back water to refill New Bullards Bar Reservoir after potentially associated with the proposed project. The potential drawdown of Oroville Reservoir would be minimal given the much larger size of Oroville Reservoir, and most likely would occur in winter or spring. Therefore, the proposed project, relative to the basis of comparison, would be expected to result in a less-than-significant impact on the vegetation or wildlife communities around Oroville Reservoir.

Sacramento River

Flows within the lower Sacramento River under the proposed project change slightly relative to the basis of comparison (Table 4-2) but are anticipated to remain within the normal flow ranges and fluctuations resulting from SWP and CVP operations. The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-60) analysis determined that although EWA acquisitions could reduce Sacramento River flows by 1,160 cfs during June and could increase flows between 1 to 11 percent during other months, these changes were not considered significant to cause adverse effects.

Specific operations of the Sacramento River system as a result of the proposed project are uncertain at this time. However, potential changes in flow under the proposed project, relative to the basis of comparison, are expected to result in a less-than-significant impact on the vegetation and wildlife communities along the lower Sacramento River.

Sacramento-San Joaquin Delta

Inflow to the Delta under the proposed project may slightly change than under the basis of comparison, but are anticipated to remain within the range of normal flow ranges and fluctuations resulting from SWP and CVP operations. The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-85) analysis determined that EWA acquisitions "*would result in changes in the Delta, but these changes would remain within the same general range of flows that the Delta experiences. The vegetation in the region has adapted to these flow ranges; therefore, these changes would likely not substantially affect the growth, maintenance, or reproductive capacity of this community.*"

Specific operations of the Delta system as a result of the proposed project are presently uncertain, but would remain within authorized operational constraints. Additionally, implementation of the 2007 Pilot Program Fisheries Agreement flow schedules during January, February, and March of 2008 would change Delta inflow by less than 1 percent (Table 4-3). Therefore, the potential changes to Delta inflows under the proposed project, relative to the basis of comparison, are expected to result in a less-than-significant impact on the vegetation and wildlife communities within the Delta.

The EWA Project agencies coordinate EWA water acquisition and transfer actions with federal (Reclamation, USFWS and NMFS), state (DWR and CDFG), other CALFED agencies, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, the Senate Bill [SB] 1086 program, the Corps' Sacramento and San Joaquin Basin Comprehensive Study, the Riparian Habitat Joint Venture, the CVPIA, the Central Valley Habitat Joint Venture, and the Grassland Bird Conservation Plan) that could affect management of evaluated species. Coordination would avoid conflicts among management objectives.

San Luis Reservoir

DWR may store a portion of water transferred under the proposed project in San Luis Reservoir. The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-88) analysis determined that, "*EWA actions would be managed to prevent contributing to or aggravating the low point problem… Therefore, the effect of borrowing project water on lacustrine habitat would be less than significant*." It is unknown how DWR may operate San Luis Reservoir, however, if water from the proposed project is stored in the reservoir, there is potential for a slight beneficial effect upon near-shore habitat areas through increased water surface elevations.

Drawdown of San Luis Reservoir for the purpose of delivering water from the proposed project would be expected to occur within normal SWP and CVP operational practices for the reservoir, and according to existing regulatory requirements or limitations. Therefore, potential changes in San Luis Reservoir water surface elevations under the proposed project, relative to the basis of comparison, are expected to result in a less-than-significant impact on the vegetation and wildlife communities surrounding San Luis Reservoir.

South-of-Delta Groundwater Banks – Groundwater Recharge Basins

DWR may store proposed project transfer water in groundwater banks south of the Delta. This operation includes spreading water in basins for recharge and storage into the groundwater banks. This practice temporarily could increase habitat for waterfowl, wading birds, and shorebirds, relative to the basis of comparison.

No additional areas would be flooded or inundated as a result of the proposed project. The proposed project also would not develop or cultivate any native untilled land. Overall, the proposed project, relative to the basis of comparison, would be expected to result in a less-than-significant impact to state or federal special-status animal or plant species, as well as other wildlife or vegetation in the areas potentially affected by the proposed project.

4.5 Cultural Resources

The proposed project would not involve any construction or other land-disturbing activities and therefore would not be expected to result in a substantial adverse change to historical, archaeological, or paleontological resources or sites, including any unique geologic features. Additionally, it would not be expected that the proposed project would result in the disturbance of any human remains. Further, the proposed project would not result in impacts upon Indian Trust Assets (ITAs) and would not include any actions or activities that would affect Indian Trust lands and federally reserved hunting, fishing, gathering, water, or other rights.

The proposed project operations could result in changes to river flows and reservoir water surface elevations that potentially could result in increased exposure of cultural resources due to changes in cycles of inundation and drawdown.

4.5.1 Environmental Setting

The area of potential effect (APE) within the project study area for cultural resources includes all river banks and reservoir shorelines of waterbodies within the proposed project study area. Cultural resources may be impacted by project operations that cause reservoir and river surface water level fluctuations, which could increase exposure of cultural resources to increased cycles of inundation and drawdown, potentially eroding the value and character of the historical resource. Such fluctuations potentially can expose previously unexposed sensitive cultural lands, or contribute to a more rapid degradation of sensitive cultural lands along the perimeter of watercourses.

The following section provides a discussion of the cultural resources setting for the Yuba River, New Bullards Bar Reservoir, Feather River, Oroville Reservoir, Sacramento River, and the Delta.

4.5.1.1 Yuba River

Native Americans indigenous to Yuba County are the Maidu. Nisenan villages were generally located along the watercourses in the County with a major Nisenan site near the mouth of the Yuba River.

4.5.1.2 New Bullards Bar Reservoir

Investigation of the area around New Bullards Bar Reservoir revealed prehistoric evidence of the Northwestern Maidu settlements and earlier distinct Mesilla and Martis cultural complexes. The east side of New Bullards Bar Reservoir, which experienced a recent fire, was subject to an intense pedestrian survey of cultural resources; inventories of the reservoir’s west side are few. The reservoir contains 12 recorded prehistoric sites, two of which also are historic sites. Ten of the sites are inundated. Numerous studies comprise the body of literature pertaining to the area within reservoir boundaries (Baldrica 2000; Deal 1980; Humphreys 2005; Meals 1978; O'Halloran 1992; Riddell and Olsen 1966; Stevens 1982).

4.5.1.3 Feather River and Oroville Reservoir

The Maidu occupied areas near the Feather River headwaters, and the Nisenan lived in the downstream areas south of the Middle Fork Feather River. Traditional cultural practices of the Maidu and Nisenan include weaving baskets and tule mats. Maidu and Nisenan would coil peeled willow and peeled and unpeeled redbud in a clockwise manner to form baskets. Baskets were made to hold water by overlaying hazel shoots, pine roots, and maidenhair fern shoots and covering with pitch (Swartz, Jr. 1958). Maidu also wove tule mats that they used for seats, beds, camp roofing, and doors (Kroeber 1925).

Historical landmarks are sites, buildings, features, or events of statewide significance that have anthropological, cultural, military, political, architectural, economic, scientific, or technical, religious, experimental, or other value. Historic landmarks in the Feather River watershed include gold mining sites of Dogtown, Nugget and Oregon City, along with the original propagation site of the Thompson seedless grape. Oroville Reservoir now covers Bidwell's Bar, the second county seat of Butte County.

4.5.1.4 Sacramento River

The northernmost indigenous California people in the regional study area were the Achowami, Atsugewi, Ajumawi, Wintun, Pit River, and Yana. Descendants of these tribes live on the Big Bend, Burney Tract, Montgomery Creek, Redding, and Roaring Creek rancherias in Shasta County. Shasta County also has 15 individual allotments. Maidu and Wintun people inhabited the downstream Colusa Basin section of the Sacramento River. The Wintun Tribe comprises three divisions: Patwin, Nomlaki, and Wintu. Present-day descendants of the Wintun live on the Colusa (Cachil Dehe) and Cortina rancherias in Colusa County and Rumsey Rancheria in Yolo County. Wintun-Wailaki descendants in Glenn County live on the Grindstone Creek Rancheria. The Paskenta Band of Nomlaki Indians has a large tract of trust land in Tehama County, just northwest of Orland, near I-5. Colusa County has one individual allotment; there are no individual allotments in Glenn and Yolo counties.

4.5.1.5 Sacramento-San Joaquin Delta

The Delta is one of the most intensely investigated areas of California because of its high prehistoric population density and proximity to population centers. Although the bulk of cultural sites were recorded prior to 1960, there has been little systematic inventory for cultural resources. Most of the early archeological work in the region focuses on prominent prehistoric mounds. Documentation of historic sites has largely occurred within the last 20 to 30 years (Reclamation *et al.* 2003).

Although there are many cultural resources in the Delta region, the EWA EIS/EIR (Reclamation *et al.* 2003) (p. 17-3) states that, "*EWA actions will not make operational changes in the Delta that would affect cultural resources in the Delta region and, thus, the Delta is not an area of concern for cultural resources*." Because the proposed project will provide water to the EWA Program, it is assumed that Reclamation and DWR will adhere to previously identified EWA operating provisions and continue to operate the CVP and SWP systems such that operational changes in the Delta do not occur outside of normal operating parameters. Therefore, no further description of cultural resources or historic properties in the Delta is included here.

4.5.2 Impact Analysis

4.5.2.1 Methodology and Significance Criteria

Applicable laws, ordinances, regulations, and standards and CEQA Guidelines were consulted to develop significance criteria for cultural resources. The analysis of potential impacts on cultural resources associated with the proposed project, within potentially affected waterbodies, was based on the following criteria:

- Would the proposed project cause any substantial elevation or lowering water level fluctuation zone, relative to the basis of comparison, which would result in increased inundation of previously exposed areas or exposure of previously inundated lands with sufficient frequency to adversely affect sensitive cultural resources?

- Would the proposed project cause any substantial increase in maximum monthly mean river flows or decrease in minimum monthly mean river flow, relative to the basis of comparison, which would result in increased inundation of previously exposed areas or exposure of previously inundated lands with sufficient frequency to adversely affect sensitive cultural resources?

CEQA requires that *important* cultural resources be protected. The CEQA Guidelines define an important resource as one listed on, or eligible for listing on, the California Register of Historical Resources (PRC Section 5024).

4.5.2.2 Environmental Impacts

Yuba River

The proposed project would result in a change in the hydrologic pattern of the Yuba River below New Bullards Bar Reservoir, although flows within the lower Yuba River would remain within normal operational ranges. In the EWA EIS/EIR (Reclamation *et al.* 2003) (p. 17-20), the cultural resources analysis determined that *"…Release flows would remain within historic channels and flow ranges and would not affect availability of or accessibility to Native American cultural resources on U.S. Forest Service lands surrounding the New Bullards Bar Reservoir and the Yuba River downstream. There are no significant effects associated with changes in flow patterns on the Yuba River*."

Under the proposed project, flows in the lower Yuba River are expected to remain within normal operational ranges during March 1, 2007 through March 31, 2008. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to RD-1644 interim) generally are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, January, and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April and June; and (4) higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during May; (5) higher at low flow levels, lower at intermediate levels, and higher at high flow levels during July; and (6) generally higher over the range of expected flow levels during August, September, and October.

In addition, potential cultural resource impacts due to exposure of formerly unexposed resources beneath the water would be avoided under the proposed project because flows would not be reduced below flows identified for RD-1644 interim instream flow requirements. The proposed project would only occur for a period of approximately one-year and potential changes in Yuba River flows are expected to be within a range that is similar to those identified for the EWA Program. Because the proportion of EWA asset acquisitions associated with the proposed project (i.e., 62,000 to 125,000 acre-feet) is less than that which was identified for the previously evaluated EWA Program, and because the proposed project was included in the EWA EIS/EIR cultural resources analysis, potential changes in Yuba River flows under the proposed project, relative to the basis of comparison, would be expected to result in a less-than-significant impact on cultural resources along the Yuba River.

New Bullards Bar Reservoir

Drawdown of water from New Bullards Bar Reservoir under the proposed project is subject to consideration under Section 106 of the National Historic Preservation Act, as discussed in the EWA EIS/EIR (Reclamation *et al.* 2003). The EWA cultural resources analysis states that acquisition of stored reservoir water from New Bullards Bar Reservoir that results in drawdown beyond baseline (historic) water surface elevations exposing areas that have been unsurveyed for cultural resources would require further inventory and evaluation (Reclamation *et al.* 2003). The historic lower bounds of water surface elevations in New Bullards Bar Reservoir, which should not be exceeded for EWA purchase of stored reservoir water, was identified as 1,711 feet msl (Reclamation *et al.* 2003).

During the April through September period, which represents the months when New Bullards Bar Reservoir storage and water surface elevations would be anticipated to be the lowest, monthly mean water surface elevations in New Bullards Bar Reservoir would not fall below 1,868 feet msl under the proposed project. Thus, the proposed project is not anticipated to result in water surface elevations in New Bullards Bar Reservoir that would be lower than historic normal operations and, therefore, would not result in creation of a new drawdown zone. Because potential impacts upon cultural resources due to potential exposure of formerly unexposed resources beneath the water would be avoided during implementation of the proposed project, relative to the basis of comparison, potential changes in reservoir levels associated with the proposed project would be expected to result in a less-than-significant impact on cultural resources at New Bullards Bar Reservoir.

Feather River

Because the proposed project would not be expected to result in Feather River flows outside of normal operational parameters, instream flows would not be expected to differ substantially under the proposed project, relative to the basis of comparison. Average differences in simulated monthly mean Yuba River flows at Marysville and the percentage of these flows to Feather River flows at Gridley under the proposed project, relative to the basis of comparison, over the 83-year simulation period are presented in Table 4-1.

In the EWA EIS/EIR (Reclamation *et al.* 2003) (p. 17-19), the cultural resources analysis for the Feather River determined that, "*Flow releases would remain within historic channels and would not change the availability of or accessibility to resources pertinent to Native American cultural practices on U.S. Forest Service lands surrounding the Oroville-Wyandotte ID reservoirs and downstream reaches of the rivers. There are no significant effects associated with changes in flow patterns on the Feather River*."

Therefore, because flow changes in the Feather River would be relatively minor under the proposed project, relative to the basis of comparison, and also were previously evaluated as part of the entire EWA Program, any potential flow increases or decreases associated with the proposed project would be expected to result in a less-than-significant impact on cultural resources along the Feather River.

Oroville Reservoir

The proposed project is not anticipated to result in water surface elevations in Oroville Reservoir lower than historic normal operations and, therefore, would not result in creation of a new drawdown zone.

In the EWA EIS/EIR (Reclamation *et al.* 2003), the cultural resources analysis determined that groundwater substitution and crop idling would increase reservoir levels from the EWA Baseline Condition, because higher amounts of water remain in the reservoir. As a result, water surface elevations in Oroville Reservoir would be higher than the EWA Baseline Condition. Conversely, the release of the water to EWA would decrease water surface elevations to low operating levels earlier in the year than under the EWA Baseline Condition. However, because EWA releases would not exceed normal operating levels in Oroville Reservoir, groundwater substitution and crop idling releases would not expose previously submerged artifacts and would not affect cultural resources in Oroville Reservoir (Reclamation *et al.* 2003).

Because the proportion of EWA asset acquisitions associated with the proposed project is less than that which was identified for the previously evaluated EWA Program, it is also anticipated that Oroville Reservoir water surface elevation changes resulting from the proposed project would be less than that which was identified for the EWA Program. Therefore, potential impacts from changes in Oroville Reservoir water levels under the proposed project, relative to the basis of comparison, would be expected to result in a less-than-significant impact on cultural resources at Oroville Reservoir.

Sacramento River

Flows in the Sacramento River are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations and, thus, would not be expected to differ substantially under the proposed project, relative to the basis of comparison.

In the EWA EIS/EIR (Reclamation *et al.* 2003), the cultural resources analysis focused on cultural resources in regions affected by the EWA. The level of analytical detail that was presented was proportional to the expected effect of EWA water transfers, particularly areas potentially affected by acquisition of stored reservoir water. EWA acknowledged that the pattern of water releases from reservoirs upstream of the Delta would change, which would change the flows in the rivers downstream. The river flows, however, would not decrease below minimum flows, and would stay within historic channels (Reclamation *et al.* 2003). Because there would be no acquisition of stored reservoir water from reservoirs on the Sacramento River, this river was not included in the detailed cultural resources analysis of the EWA EIS/EIR.

The proposed project would only occur for a period of approximately one-year and would result in relatively minor changes in flow compared to the total volume of flow in the Sacramento River (see Table 4-2). Because the proposed project could alter monthly mean Sacramento River flows between 0.1 percent (February and May) and 2.0 percent (June), relative to the basis of comparison, these types of flow changes are not expected to be of sufficient magnitude or duration to result in an adverse impact on cultural resources. Therefore, consistent with the findings presented in the EWA EIS/EIR, potential flow changes due to the proposed project, relative to the basis of comparison, would be expected to result in a less-than-significant impact on the cultural resources along the Sacramento River.

4.6 Geology and Soils

The proposed project would not involve the construction or modification of structures that could be adversely affected by seismic events; therefore, seismicity is not discussed.

Additionally, because implementation of the proposed project does not involve construction activities, the proposed project would not expose people or structures to geologic hazards such as ground failure or liquefaction and would not result in increased potential for substantial soil erosion or loss of topsoil. Further, the potential for landslides in Yuba County is limited to locations where unconsolidated Cenozoic or Mesozoic bedrock units are encountered and on hillsides exceeding 60 percent slopes. Because the YCWA Member Unit groundwater pumping operations do not occur in the foothill regions of the county, there would be no increased potential for landslides associated with the proposed project, relative to the basis of comparison. In addition, lower Yuba County is considered to have a low to moderate landslide potential (YCWA 2003c).

The focus of the geology and soils discussion is on the potential for proposed project groundwater substitution operations in Schedule 6 years to result in an increased potential for land subsidence in areas overlying the Yuba Groundwater Basin, relative to the basis of comparison.

4.6.1 Environmental Setting

The proposed project would involve 30,000 acre-feet of groundwater pumping during Schedule 6 water years only within the YCWA Member Unit service areas. Therefore, the environmental setting describes geology and soils resources only within Yuba County.

4.6.1.1 Yuba County Geology

The Yuba Groundwater Basin is bounded on the east by the impermeable rocks of the Sierra Nevada. All alluvial deposits and adjacent non-water-bearing rocks beneath the groundwater basin are subdivided into geologic units or formations ranging in age from the very old Paleozoic Sierran bedrock to the overlying alluvial materials that continue to be deposited. Between these formations are the non-water-bearing Eocene and Cretaceous Age rocks and the two principal water-bearing formations, the Laguna Formation and the Older Alluvium Formation, that together comprise over 95 percent of the groundwater basin water storage volume (YCWA 2005b). The remaining groundwater basin water storage volume includes the superficial stream channel and floodplain deposits. The freshwater-bearing formation structure is thickest along the Feather River and thinnest along the Sierra Nevada boundary.

4.6.1.2 Yuba County Soils

The upper portion of Yuba County, which encompasses the area around New Bullards Bar Reservoir, is dominated by a combination of loam, sandy loam, and coarse sandy loam soil surface texture. The lower portion of Yuba County, from Merle Collins Reservoir south, is dominated by a silt loam and gravelly loam soil surface texture. The soils within southern Yuba County are moderately deep and shallow, well-drained soils formed in material from metavolcanic rock and are considered to have low to moderate shrink-swell potential and moderate erosion potential.

4.6.2 Impact Analysis

4.6.2.1 Methodology and Significance Criteria

There are no formal, specific regulations for evaluating the impacts of geology and soils. The significance criteria developed for this analysis, therefore, are based on the CEQA Guidelines Environmental Checklist Form (CELSOC 2005) and the Guidelines for Geologic/Seismic Considerations in Environmental Impact Reports (Department of Mines and Geology [DMG] Note 46 1986) including:

- Would the proposed project result in an increase in the exposure of people or property to subsidence or ground collapse, relative to the basis of comparison, that could affect human safety or structures?

4.6.2.2 Environmental Impacts

Groundwater substitution operations under the proposed project would involve use of wells located in YCWA Member Unit service areas within the southern region of Yuba County (**Figure 4-2**). Groundwater pumping operations have the potential to result in unstable soil conditions within the well during groundwater pumping activities, including subsidence due to collapse.

During a typical pumping season, changes in land surface elevation can be observed as a result of both elastic[2] and inelastic[3] subsidence in the underlying basin. Historically, land surface subsidence within Yuba County has been minimal, with no known significant impacts to existing infrastructure. Therefore, although implementation of the proposed project has the potential to result in slightly higher levels of groundwater pumping (i.e., up to 30,000 acre-feet in Schedule 6 years), relative to the basis of comparison, given the historical trends, the potential for land surface subsidence from groundwater extraction in the North Yuba or South Yuba groundwater subbasins is small.

Additionally, YCWA's Groundwater Management Plan includes actions that require coordination between YCWA and DWR to conduct monitoring for potential land surface subsidence (YCWA 2005b).

In the event that inelastic subsidence is observed and documented in conjunction with declining groundwater elevations, YCWA would further investigate and identify appropriate actions to avoid adverse impacts. Therefore, due to the minimal potential for occurrence of subsidence within the groundwater wells during operation of the proposed project and the implementation of the Groundwater Management Plan, the proposed project would be expected to have a less-than-significant impact on geology and soils.

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[2] Elastic subsidence results from the reduction of pore fluid pressures in the aquifer and typically rebounds when pumping ceases or when groundwater is otherwise recharged resulting in increased pore fluid pressure.

[3] Inelastic subsidence occurs when pore fluid pressures decline to the point that aquitard (a clay bed of an aquifer system) sediments collapse resulting in permanent compaction and reduced ability to store water in that portion of the aquifer.

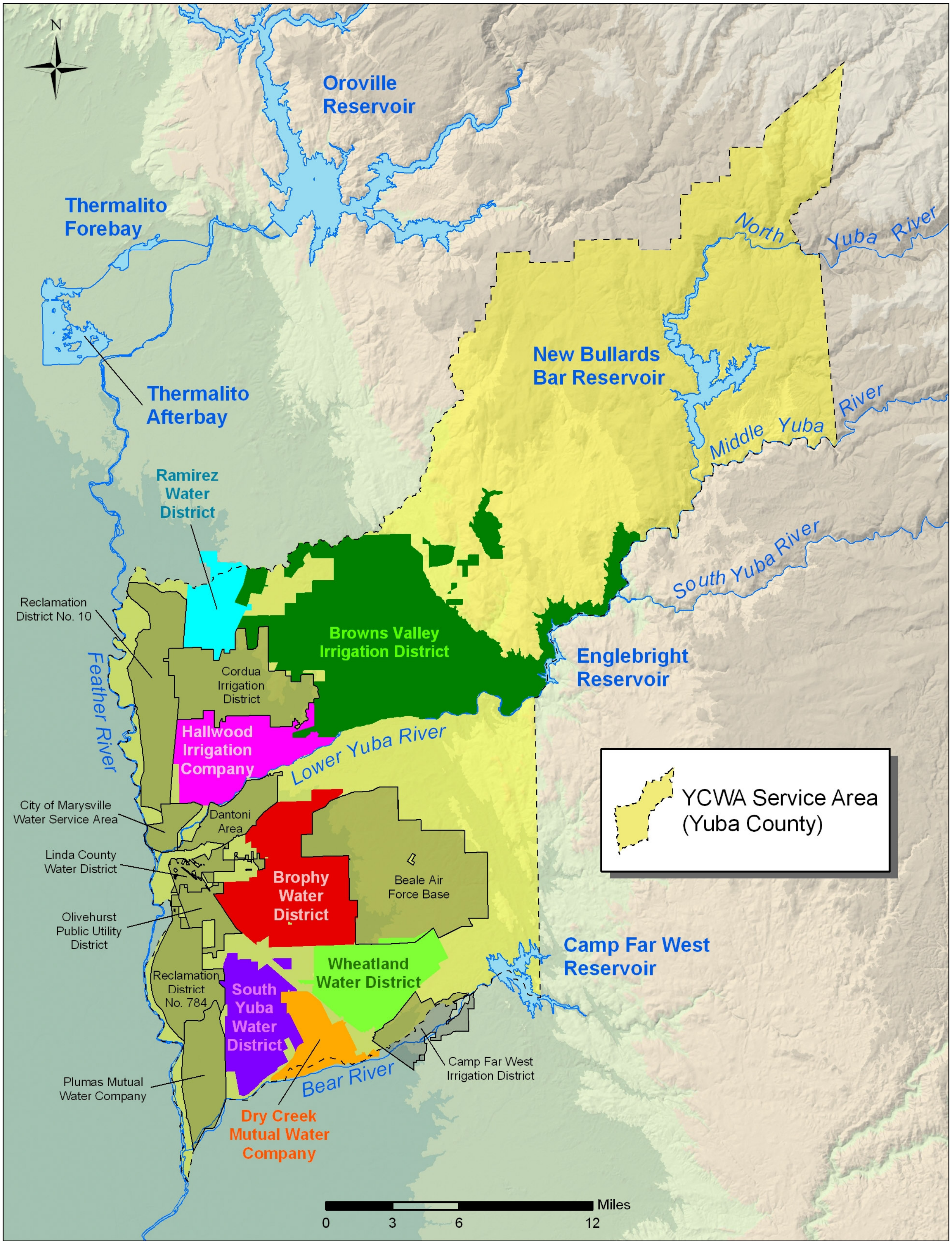

Figure 4-2. YCWA and Member Unit Service Areas

4.7 Hydrology and Water Quality – Surface Water Quality

4.7.1 Environmental Setting

The following section provides a discussion of the surface water quality setting for the Yuba River, New Bullards Bar Reservoir, Feather River, Oroville Reservoir, Sacramento River, the Delta, and San Luis Reservoir.

4.7.1.1 Yuba River and New Bullards Bar Reservoir

The Yuba River is the largest tributary to the Feather River. Forestland is the primary land use and land cover for the Yuba River Basin, comprising about 85 percent of the land cover (USGS 2002 *as cited in* Reclamation *et al.* 2003). The forestland in the Yuba River Basin is located in the foothills of the Sierra Nevada, which experienced a substantial amount of gold mining, including placer and hard rock mines. Mercury was used in the basin to recover gold from both placer deposits and ore-bearing minerals. Residual mercury from those operations has been detected in invertebrate and fish communities nearby and downstream from the gold mining operations (May *et al.* 2000; Slotton *et al.* 1997).

The general water quality of the lower Yuba River is considered good and has improved in recent decades due to control of hydraulic and dredge mining operations, and the establishment of minimum instream flows (CDFG 1989). Dissolved oxygen concentrations, total dissolved solids, pH, hardness, alkalinity, and turbidity are well within acceptable or preferred ranges for salmonids and other key freshwater biota (Reclamation *et al.* 2003).

YCWA currently supplies raw water exclusively for agricultural purposes in YCWA's service area. YCWA is proposing to sell and deliver water to DWR, which has contracting agencies that have water treatment plants that would make YCWA water available for municipal supply.

4.7.1.2 Feather River

The Feather River is a large tributary to the Sacramento River. Flows in the lower Feather River are controlled mainly by releases from Oroville Reservoir, the second largest reservoir within the Sacramento River Basin, and by flow from the Yuba River, a major tributary. Forestland is the major (about 78 percent of total) land use or land cover for the Feather River Basin. Gold mining also was an important land use in the Sierra Nevada foothills that are part of the Feather River Basin. The Yuba and the Bear rivers both flow into the lower Feather River. Both the Yuba River and the Bear River basins have been affected by past gold mining and contribute mercury to the lower Feather and Sacramento rivers (May *et al.* 2000). Constituents of concern for the Feather River, according to the Clean Water Act Section 303(d) list, include diazinon, Group A pesticides, mercury and unknown toxicity. Potential sources of these constituents include agriculture, urban runoff, storm sewers, resource extraction and other unknown sources (Reclamation *et al.* 2003).

4.7.1.3 Oroville Reservoir

Oroville Reservoir primarily is used for water supply, power generation, flood control, fish and wildlife enhancement, and recreational purposes (DWR 2001b *as cited in* Reclamation *et al.* 2003). Water quality in Oroville Reservoir is influenced by tributary streams, of which the Middle Fork

Feather River, North Fork Feather River, and South Fork Feather River contribute the bulk of the inflow to the reservoir. Water quality in Oroville Reservoir generally is more influenced by recreation activities and other historical land-based activities (i.e., mining) than by SWP operations. Overall, based on preliminary ongoing investigations conducted under the Oroville Facilities FERC Relicensing studies (DWR Website 2005c), Oroville Reservoir water quality typically meets Central Valley Regional Water Quality Control Plan (Basin Plan) objectives for intended beneficial uses. Preliminary information indicates infrequent and minor exceedances for some constituents (DO, pH and nutrients) and more frequent exceedances of some metals (arsenic, aluminum and iron). Elevated metals concentrations potentially are related to wind disturbances and movement of bottom sediments, as well as from storm runoff events.

4.7.1.4 Sacramento River

The lower Sacramento River receives urban runoff, either directly or indirectly (through tributary inflow), from the cities of Sacramento, Roseville, Folsom, and their surrounding communities. The Natomas East Main Drainage Canal discharges to the Sacramento River immediately upstream of the confluence with the American River. This canal transfers both agricultural discharges and urban runoff into the Sacramento River.

Sacramento River water quality monitoring studies indicate that the river's water is generally of high quality (Brown and Caldwell *et al.* 1995; Larry Walker Associates 1996; Larry Walker Associates 1991). Concentrations of some trace elements (particularly copper and zinc) frequently approach limits established by regulatory agencies while other metals such as lead, cadmium, mercury, and silver also may approach these limits. Much of the trace element loadings in the Sacramento River are from non-permitted sources. Acid mine drainage contributes cadmium, copper, and zinc, while agricultural return flows typically contribute chromium and nickel. Discharges of urban runoff and seasonal agricultural runoff are the principal sources of water quality problems in the Sacramento River near its confluence with the American River (Corps 1991). Water quality of the Sacramento River near its confluence with the American River ranges from medium to good for numerous beneficial uses (SWRCB 1994).

4.7.1.5 Sacramento-San Joaquin Delta

Water quality in the Delta is influenced by a combination of environmental and institutional variables, including upstream pollutant loading, water export and diversions within and upstream of the Delta, and agricultural activities in the Delta. The tidal currents carry large volumes of seawater back and forth through the Bay-Delta Estuary with each tide cycle. The mixing zone of saltwater and freshwater can shift two to six miles depending on the tides, and may reach far into the Delta during periods of low inflow. Thus, the inflow of the tributaries into the Delta is essential in maintaining Delta water quality.

Metals, pesticides, and petroleum hydrocarbons enter the Delta through several means, including agricultural runoff, municipal and industrial wastewater discharge, urban runoff, recreational uses, river inflow, and atmospheric deposition (SFEP 1992). The concentrations of these pollutants in the Delta vary geographically and seasonally. The toxic effects of pollutants on aquatic life can vary with flow levels.

In January 2005, DWR biologists identified and reported an unexpected decline of pelagic (i.e., open-water) organisms in the Delta. A draft white paper titled, *Interagency Ecological Program*

2005 Workplan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary, discussed the findings and was distributed among Interagency Ecological Program (IEP) agencies. Subsequently, a study plan was developed to begin intensive data analysis and technical studies into the causes of the decline. The IEP agencies provided approximately $2 million to support the initial studies, and a study plan was designed to continue to explore historical data and to clarify the nature of the decline and preliminarily screen possible explanations for the decline from among three broad categories: (1) ecological effects of non-indigenous species introductions; (2) unexpected effects of recent changes in water project operations; and (3) toxic effects of agricultural chemicals and blue-green algae. The correct explanation may involve one or more of these factors.

The IEP currently is in the process of finalizing its 2006/2007 work plan, which is being developed to expand on the efforts conducted as part of the initial 2005 studies focusing on pelagic organism decline. Because this work has yet to be conducted, it is not possible to include a more detailed discussion of potential water quality impacts associated with these pelagic organism issues, as they relate to the proposed project, at this time. Due to the short-term nature (i.e., one year) of the proposed project, it is unlikely that new information will become available prior to completion of the proposed project. However, the proposed project would be operated such that it will be consistent with the way that DWR and Reclamation operate the SWP/CVP system in compliance with OCAP, which represent the best available science and management direction to date.

4.7.1.6 San Luis Reservoir

In general, the natural inflow from the San Luis Reservoir watershed is insignificant relative to the reservoir's capacity (DWR 2001c). Most of the reservoir's water is pumped from the California Aqueduct and the Delta-Mendota Canal via the O'Neill Forebay through the Gianelli Pumping-Generating Plant during the winter and spring (DWR 2001c). Water enters and exits San Luis Reservoir from a common inlet/outlet tower (DWR 2001c). Reclamation pumps water out of San Luis Reservoir in a westerly direction to San Felipe Division Water contractors through the Pacheco Pumping Plant and the Santa Clara Tunnel (DWR 2001c). San Luis Reservoir water is delivered to the San Joaquin Valley, the Santa Clara Valley, and Southern California when water supply in the California Aqueduct and the Delta Mendota Canal is insufficient (DWR 2001c).

In San Luis Reservoir, the low-point problem and associated algal growth represent the primary water quality concern. The low point in San Luis Reservoir refers to a range of minimum reservoir levels that occur in late summer and fall. The low-point problem is produced by a combination of warm-season algae growth and decreasing summer water levels (Reclamation *et al.* 2003). High algae content reduces the effectiveness of water treatment and can affect the quality and taste of treated water. As the reservoir is progressively drawn down below 300,000 acre-feet, increasing amounts of algae may enter the intake, and water quality problems can arise. Typically, taste and odor concerns associated with algal growth in the reservoir are more serious water quality concerns during drought years (DWR 2001c). In the fall, especially during drought years, a greater demand by SWP contractors creates lower water levels in the reservoir (DWR 2001c). Because of the improved light penetration and greater likelihood of establishment of a thermocline in the reservoir, algal blooms, consisting primarily of the blue-green algae *Aphanizomenon flosaquae*, are more likely to occur (DWR 2001c). During fall months, winds blow accumulated blue-green algae toward the intake, and taste and odor concerns may result (DWR 2001c). The EWA EIS/EIR (Reclamation *et al.* 2003) presents a detailed description of the San Luis Reservoir low-point topic.

4.7.2 Impact Analysis

4.7.2.1 Methodology and Significance Criteria

The analysis of potential impacts on surface water quality associated with the proposed project, within potentially affected waterbodies, was based on the following criteria:

- Would the proposed project cause a decrease in reservoir storage, of sufficient magnitude or duration relative to the basis of comparison, to result in an increase in the concentration of contaminants?
- Would the proposed project cause a decrease in river flow, of sufficient magnitude or duration relative to the basis of comparison, to result in an increase in the concentration of contaminants?

Increases in reservoir storage or river flows under the proposed project, relative to the basis of comparison, were considered to have a slightly beneficial, or no effect, upon surface water quality due to the potential for increased dilution of contaminants.

Consultation with the Central Valley Regional Water Quality Control Board (RWQCB) related to the proposed YCWA water transfer to DWR in 2005 led to the identification of potential concerns regarding the possibility of a shift in hardness levels of the waterbodies receiving the proposed project water inflow. Therefore, a discussion of this topic is provided following the waterbody specific analyses presented in this section. Determination of the potential for a significant impact is based on the following criterion:

- Would the proposed project cause an increased potential for a substantial shift in hardness levels of the waterbodies receiving the proposed project source water, relative to the basis of comparison, of sufficient magnitude that the potential for increased bioavailability of metals would occur (e.g., substantially lower hardness level in the source water than in the receiving water)?

4.7.2.2 Environmental Impacts

Yuba River

Under the proposed project, flows in the lower Yuba River are expected to remain within normal operational ranges during the March 1, 2007 through March 31, 2008 period (see Appendix 3, Flow Exceedance Plots). Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to RD-1644 interim) generally are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, January, and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April and June; and (4) higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during May; (5) higher at low flow levels, lower at intermediate levels, and higher at high flow levels during July; and (6) generally higher over the range of expected flow levels during August, September, and October.

Additionally, reductions in lower Yuba River flows under the proposed project, relative to the basis of comparison, are not expected to be of sufficient magnitude or duration to result in an increase in the concentration of contaminants.

The EWA EIS/EIR water quality analysis identified past YCWA water transfers to the EWA Program as ranging between approximately 162,000 acre-feet (2002) and 172,000 acre-feet (2001), although a maximum of up to 185,000 acre-feet was evaluated for impact analysis purposes (Reclamation *et al.* 2003). Based on data from previous transfers, flows in the lower Yuba River flow would be greater than the flows under the EWA Baseline Condition (Reclamation *et al.* 2003). The EWA (2003) (p. 5-82) analysis concluded that, "*Increases in lower Yuba River flow would allow dilution of water quality constituents, including pesticides and fertilizers present in agricultural run-off. As a result, increases in flow would not be of sufficient frequency and magnitude to affect water quality in such as way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality. Therefore, potential flow-related changes to water quality under the Flexible Purchase Alternative would be less than significant*."

Similar to the EWA water quality analysis, flow increases expected to occur in the Yuba River under the proposed project, relative to the basis of comparison, may provide a beneficial effect to surface water quality by increasing the dilution of contaminants. Because the proportion of EWA asset acquisitions associated with the proposed project is less than that which was identified for the previously evaluated EWA Program, it also is anticipated that Yuba River water temperature changes resulting from the proposed project would be less than that which was identified for the EWA Program. Therefore, the proposed project, relative to the basis of comparison, would result in a less-than-significant impact to Yuba River surface water quality.

New Bullards Bar Reservoir

Implementation of the proposed project would alter the hydrologic pattern relative to the basis of comparison; however, reservoir storage and water surface elevations at New Bullards Bar Reservoir would remain within normal operational parameters. During March 2007, average end of month reservoir storage under the proposed project would 739,234 acre-feet, compared to 744,049 acre-feet under the basis of comparison. Depending on hydrological conditions, end of September 2007 storage in New Bullards Bar Reservoir under the proposed project would be approximately 594,865 acre-feet, and reservoir storage under the basis of comparison would be approximately 671,063 acre-feet. In March 2008, average end of month reservoir storage under the proposed project would be 725,329 acre-feet, compared to 742,372 acre-feet under the basis of comparison.

The EWA EIS/EIR water quality analysis for New Bullards Bar Reservoir determined that, "*…differences in median water surface elevation and reservoir storage would not be of sufficient magnitude and frequency to affect long-term water quality in such as way that would result in adverse effects to designated beneficial uses, exceedance of existing regulatory standards or substantial degradation of water quality. Consequently, potential effects to water quality would be less than significant* (Reclamation *et al.* 2003) (p. 5-71)."

Under the proposed project, monthly decreases in reservoir storage under the proposed project, relative to the basis of comparison, would not be of sufficient magnitude or frequency to increase concentrations of contaminants. Therefore, because changes in New Bullards Bar Reservoir would be relatively minor under the proposed project, relative to the basis of comparison, and have been previously evaluated for the entire EWA Program in the EWA EIS/EIR, the potential changes associated with the proposed project would result in a less-than-significant impact on surface water quality.

Feather River

The proposed project could result in increased or decreased instream flows in the Feather River, relative to the basis of comparison. Average differences in simulated monthly mean Yuba River flows at Marysville and the percentage of these flows to Feather River flows at Gridley under the proposed project, relative the RD-1644 interim, over the 83-year simulation period are presented in Table 4-1**.**

As presented in Table 4-1, the proposed project could alter monthly mean Feather River flows between 0.3 percent (May 2007 and February 2008) and 9.0 percent (June 2007), relative to the basis of comparison. Because these values represent the total change in flow on a month-to-month basis, individual flow reductions that could occur in the Feather River under the proposed project, relative to the basis of comparison, are not expected to be of sufficient magnitude or duration to result in an increase in the concentration of contaminants.

The EWA EIS/EIR Feather River water quality analysis determined that, "…*any differences in flow would not be of sufficient frequency and magnitude to affect water quality in a way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality. Therefore, potential flow- related changes to water quality under the Flexible Purchase Alternative would be less than significant (*Reclamation *et al.* 2003) (pp. 5-79 – 5-80)." The EWA analyses also concluded that water temperature at the mouth of the Feather River "*would infrequently be increased by up to 0.7°F and would otherwise be essentially equivalent to or less than water temperatures relative to the Baseline Condition*", and these water temperature differences "*would not be of sufficient frequency and magnitude to affect water quality in a way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality. Consequently, potential water temperature-related changes to water quality would be less than significant* (Reclamation *et al.* 2003) (p. 5-81)."

Similar to the EWA water quality analysis, flow increases expected to occur in the Feather River under the proposed project, relative to the basis of comparison, may provide a beneficial effect to surface water quality by increasing the dilution of contaminants. Because the proportion of EWA asset acquisitions associated with the proposed project is less than that which was identified for the previously evaluated EWA Program, it may be anticipated that Feather River water temperature changes resulting from the proposed project would be less than that which was identified for the EWA Program. Therefore, the proposed project, relative to the basis of comparison, would result in a less-than-significant impact to Feather River surface water quality.

Oroville Reservoir

In the EWA EIS/EIR (Reclamation *et al.* 2003), total transfers made in the Upstream from the Delta Region would range from 50,000 to 600,000 acre-feet, limited by hydrologic year and conveyance capacity through the Delta. The EWA water quality analysis determined that, "…*implementation of the Flexible Purchase Alternative would not adversely affect concentrations of water quality constituents or water temperatures in Lake Oroville. As a result, any differences in water* *surface elevation and reservoir storage would not be of sufficient magnitude and frequency to affect water quality in such as way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards or substantial degradation of water quality. Consequently, potential effects to water quality would be less than significant (*Reclamation *et al.* 2003) (p. 5-65)."

Because the proportion of EWA asset acquisitions associated with the proposed project (i.e., 62,000 to 125,000 acre-feet) is less than that which was identified for the previously evaluated EWA Program, and the proposed project also was included in the EWA water quality analysis, any potential changes in Oroville Reservoir water surface elevation under the proposed project would be expected to be less than those identified for the entire EWA Program. Therefore, the proposed project, relative to the basis of comparison, would result in a less-than-significant impact on Oroville Reservoir water quality.

Sacramento River

Flows in the Sacramento River are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations and, thus, would not be expected to differ substantially under the proposed project, relative to the basis of comparison. Average differences in simulated monthly mean Yuba River flows at Marysville and the percentage of these flows compared to Sacramento River flows at Freeport expected to occur under the proposed project, relative to RD-1644 interim, over the 83-year simulation period are presented in Table 4-2.

As presented in Table 4-2, the proposed project could alter monthly mean Sacramento River flows between 0.1 percent (May 2007 and February 2008) and 2.0 percent (June 2007), relative to the basis of comparison. Because these values represent the total change in flow on a month-to-month basis, individual flow reductions that could occur in the Sacramento River under the proposed project, relative to the basis of comparison, are not expected to be of sufficient magnitude or duration to result in an increase in the concentration of contaminants.

In the EWA EIS/EIR water quality analysis, it was determined that, "…*increases in Sacramento River flow at Freeport during the summer months would allow dilution of water quality constituents, including pesticides and fertilizers present in agricultural run-off. As a result, any differences in flow under the Flexible Purchase Alternative would not be of sufficient frequency and magnitude to affect water quality in a way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality. Therefore, potential flow-related changes to water quality under the Flexible Purchase Alternative would be less than significant* (Reclamation *et al.* 2003) (pp. 5-76 – 5-77)." In addition, potential water temperature-related changes to water quality would be less than significant (Reclamation *et al.* 2003).

Similar to the EWA water quality analysis conducted for the Sacramento River, flow increases expected to occur under the proposed project, relative to the basis of comparison, may provide a beneficial effect to the water quality in the Sacramento River by increasing the dilution of contaminants. Therefore, the proposed project, relative to the basis of comparison, would result in a less-than-significant impact to Sacramento River surface water quality.

Sacramento-San Joaquin Delta

DWR is responsible for mitigating its water quality impacts as required under the 1995 Delta Water Quality Control Plan (SWRCB 1995). Some operational changes may have to be made to meet these standards, but DWR's ability to meet these standards will not be compromised under the proposed project, relative to the basis of comparison.

As presented in Table 4-3, the proposed project could alter monthly mean Delta inflow between 0.03 percent (February 2008) and 1.6 percent (August 2007), relative to the basis of comparison. Because these values represent the total change in flow on a month-to-month basis, individual flow reductions that could occur in the Delta due to changes in Sacramento River flow (as one component of total Delta inflow) under the proposed project, relative to the basis of comparison, are not expected to be of sufficient magnitude or duration to result in an increase in the concentration of contaminants.

The Central Valley Regional Water Quality Control Board has presented recommendations for establishing a Total Maximum Daily Load (TMDL) for methylmercury in the Sacramento-San Joaquin Delta Estuary (RWQCB 2006). The report contains an analysis of the mercury impairment, a review of the primary sources, a linkage between methylmercury sources and impairments, and recommended mercury reductions to eliminate impairments. The Sacramento Basin (Sacramento River + Yolo Bypass) contributes approximately 80 percent or more of the total mercury fluxing through the Delta. While Cache Creek and the upper Sacramento River (above Colusa) watersheds contribute the most mercury, the report identifies the Feather River watershed, which contains the Yuba River, as a relatively large mercury loading source with high mercury concentrations in suspended sediments. As a result, RWQCB staff recommends total mercury load reductions from the Feather River watershed, as well as numerous other watersheds within the Sacramento Basin. Because sediment in the lower Yuba River is not anticipated to be disturbed by flow fluctuations (i.e., pulses) or flow ranges outside of historic ranges, the proposed project would result in a less-than-significant impact with regard to mercury loading to the Delta.

If implemented in 2007, provision of the transfer water would occur through the EWA Program. Under EWA, carriage water is used as a mechanism to maintain Delta water quality standards (Reclamation *et al.* 2003) by increasing Delta outflows to protect Delta water quality by either maintaining or preventing increases in chloride and bromide concentrations within the Delta during periods of increased pumping. Because bromide is primarily present as a result of seawater intrusion, the use of carriage water to increase Delta outflow and hold ocean salts at the same point they were before pumping was increased would result in no increase in bromide concentrations. Water quality, including salinity, bromide, and the potential for THM and bromate formation, would not be altered in a way that would result in adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality (Reclamation *et al.* 2003). Therefore, the proposed project, relative to the basis of comparison, would result in a less-than-significant impact to Delta water quality.

Additionally, DWR monitors SWP water quality to ensure that SWP water supplies meet the Department of Health Services drinking water standards and Article 19 Water Quality Objectives for long-term SWP contracts. The objective of the SWP water quality monitoring program is to maintain project water at a quality acceptable for recreation, agriculture, and public water supply for the present and future under a policy of multiple uses of SWP facilities. These uses include fishing, boating, and water contact sports. DWR analyzes the water for physical parameters such as water temperature, specific conductance, and turbidity and more than 60 different chemical constituents, including inorganic chemicals, pesticides, and organic carbon potential. The monitoring program has stations throughout the SWP, including the O'Neill Forebay in San Luis Reservoir, the California Aqueduct, and terminal reservoirs such as Silverwood Lake, Lake Perris, Pyramid Lake, and Castaic Lake.

San Luis Reservoir

To the extent that water from the proposed project could be stored in San Luis Reservoir during summer and fall months when potential concerns related to the low point occur, the transfer of this water potentially could provide a beneficial effect. Although the SWP operations related to the proposed project are unknown, it is expected that DWR would operate according to prevailing regulatory water quality and environmental protection requirements, and that San Luis Reservoir storage and water surface elevations would remain within normal operating ranges. Therefore, the proposed project, relative to the basis of comparison, would result in a less-than-significant impact to San Luis Reservoir water quality.

Discussion of Potential Water Quality Concerns Related to Hardness Levels

The RWQCB requested that the 2005 Water Code Environmental Analysis provide information regarding hardness levels of the waterbodies potentially affected by the proposed 2005 water transfer. The RWQCB had determined that water transfers have the potential to impact water quality when the waterbodies are of substantially different hardness levels. In particular, if the transfer source water has a lower water hardness level than the receiving water, there is the potential for the transfer to cause a shift (reduction) in hardness levels in the receiving water, thereby causing metals in the water to become more bioavailable than they were previously (pers. comm., McHenry 2005a; pers. comm., McHenry 2005b). The potential for water quality impacts depends upon the dilution potential and on the concentrations of metals in the affected waterbodies. The following provides a discussion of hardness levels in the affected water systems, as provided by the RWQCB (pers. comm., McHenry 2005a; pers. comm., Niiya 2005) and an assessment of the potential impacts of the proposed project.

The RWQCB indicated that the hardness levels for the Yuba and Feather rivers are generally in the range of 40 milligrams per liter (mg/L) $CaCO_3$. Data for the Feather River for the period of March through November 2002 indicated a low value of 37 mg/L $CaCO_3$ and a high of 40 mg/L $CaCO_3$ (pers. comm., R. McHenry, RWQCB 2005). Sacramento River (near Freeport) hardness levels were reported to range from a low of 26 mg/L $CaCO_3$ to a high of 160 mg/L $CaCO_3$ for the period of January 1998 through November 2002 (pers. comm., Niiya 2005). Hardness levels for the Delta are reported to be in the range of 90 to 100 mg/L $CaCO_3$ (CCWD web page accessed March 3, 2005). Based on the information provided by the RWQCB and other sources, the range of hardness levels that would occur in the potentially affected waterbodies under the proposed project, relative to the basis of comparison, represent a less-than-significant impact on water quality.

Additionally, because the Feather River and Sacramento River flows are substantially higher than the Yuba River flows under the proposed project, there is adequate dilution potential (of Yuba River water) to reduce the possibility of a shift in hardness levels that would result in a water quality concern in any of the receiving waterbodies.

4.8 Hydrology and Water Quality - Groundwater Resources

Groundwater resources are described and evaluated in detail in the Groundwater Analysis (MWH 2005), the EWA EIS/EIR (Reclamation *et al.* 2003), and the "*Analysis of the Groundwater Substitution Portion of the Yuba County Water Agency-CALFED Environmental Water Account/Department of Water Resources 2007 Transfer*" included as Appendix C in Appendix 2 (Environmental Analysis) to this IS. Information presented below is based upon these documents.

4.8.1 Environmental Setting

4.8.1.1 Yuba Groundwater Basin

The 2007 YCWA groundwater substitution component (i.e., up to 30,000 acre-feet in a Schedule 6 year) of the proposed project would utilize the Yuba County groundwater subbasin. The groundwater subbasin is described below in association with the environmental impacts analysis.

4.8.1.2 South-of-the-Delta Groundwater Banks

DWR potentially would store a portion of the proposed project transfer water in groundwater banks south of the Delta within the San Joaquin Groundwater Basin. The specific groundwater banking operations associated with the proposed project are not known at this time. The EWA EIS/EIR (Reclamation *et al.* 2003) provides detailed information regarding South-of-Delta Groundwater Banks, including participating agencies in Kern County that could be utilized as part of the EWA. Groundwater in the South San Joaquin Groundwater Basin historically has been heavily used, and excessive groundwater withdrawals have caused substantial declines in groundwater levels. However, as reported in the EWA EIS/EIR (Reclamation *et al.* 2003), groundwater levels have substantially increased relative to pre-project groundwater levels in several groundwater banks.

4.8.2 Impact Analysis

4.8.2.1 Methodology and Significance Criteria

As part of the Pilot Program, YCWA potentially could transfer up to a total of 125,000 acre-feet of water into the Yuba River between March 1, 2007 and March 31, 2008. Under the proposed project, water will be supplied from surface water storage in New Bullards Bar Reservoir and a portion may be from substitution of groundwater for surface water deliveries by several Member Units. The maximum amount of water that could be derived from groundwater substitution is 30,000 acre-feet, which only would occur during a Schedule 6 water year.

The evaluation of potential impacts of the proposed project upon the Yuba Groundwater Basin, including the North Yuba and South Yuba subbasins, is based upon the "*Analysis of the Groundwater Substitution Portion of the Yuba County Water Agency-CALFED Environmental Water Account/Department of Water Resources 2007 Transfer*" (Appendix 2). Additionally, the evaluation of potential groundwater resources impacts due to the proposed project is relies upon the assessments provided in the Groundwater Analysis (MWH 2005) and the analyses in the EWA EIS/EIR (Reclamation *et al.* 2003). In these assessments, the groundwater recharge rate of the

Yuba County groundwater subbasin first was determined. Then, historic groundwater level data were critically reviewed to evaluate the rate of aquifer recovery associated with historic water transfers (i.e., transfers that utilized groundwater substitution operations). To evaluate the potential impacts on non-Member Unit groundwater well users, available documentation of mitigation measures performed in support of the historic transfers also were reviewed.

4.8.2.2 Environmental Impacts

Groundwater substitution was used by YCWA and its Member Units to support water transfers in 1991, 2001 and 2002 (MWH 2005). Based on the experience gained from these water transfers, extracted quantities will be well within the aquifer’s ability to recharge in a reasonable amount of time (Appendix 2). Further, although groundwater substitution may result in temporary localized declines in groundwater levels, programmatic monitoring and mitigation measures exist to address this potential effect (Appendix 2).

For the proposed project, the maximum amount of water that would be derived from groundwater substitution is 30,000 acre-feet. Based on the information presented in the Groundwater Analysis (Appendix 2), the extraction of this amount of water will result in conditions that are within an acceptable range for the groundwater basin. Operation of the 2007 groundwater substitution program and the projected post-transfer basin conditions would result in a less-than-significant impact to the environment. Additionally, these expected conditions along with the basin management procedures implemented by YCWA and Member Units would result in no significant unmitigated third-party impacts to other groundwater users within the basin. The water transferred as part of the proposed project would not strain the water supply or overall conditions of the North Yuba or South Yuba subbasins, and would not contribute to, or result in, conditions of overdraft.

Yuba Groundwater Basin

Currently, groundwater is the primary source of drinking water and surface water is the primary source of irrigation water in the Yuba River Basin. Historically, however, groundwater also was a primary source of irrigation water, and signs of overdraft were apparent by the 1980’s. As a result of these overdraft trends, actions were taken to replace groundwater with surface water for irrigation purposes. Subsequent to the development of the Yuba River Operating Program, deliveries of surface water began with the completion of the initial phase of the South Yuba Canal in 1983. Extension of the canal continues to this day with increasing areas of the South Yuba subbasin receiving surface water with a concomitant reduction in groundwater use. Groundwater storage has recovered to the extent that current groundwater storage in the South Yuba subbasin is nearing the levels of the pre-development era.

Groundwater Recharge Rates

Since construction of the South Yuba Canal, the estimated increase in groundwater storage for the South Yuba Basin has ranged from 15,100 acre-feet to 21,200 acre-feet per year, depending on hydrologic conditions (Appendix 2). Recharge is faster adjacent to the river, because all of the stream channels and floodplain deposits along the Yuba River act as a large water intake area for recharge of the subbasin (Appendix 2).

Groundwater Levels

Increased groundwater pumping in support of water transfers could cause localized declines of groundwater levels, or the development of cones of depression near pumping wells. For example, the 2001 transfer operations affected wells in the Las Quintas area (through lower groundwater levels). Because of the lower levels, either reduced well pumping capacity or loss of pumping capacity occurred. In response, the Cordua Irrigation District (the member district for this area) lowered the pumps and/or deepened the wells for five residences. Ultimately, no significant long-term or unmitigated impacts to the residents of this area occurred.

The EWA EIS/EIR recognized that changes in groundwater levels could cause multiple secondary effects. Declining groundwater levels could result in: (1) increased groundwater pumping cost due to increased pumping depth, (2) decreased yield from groundwater wells due to reduction in the saturated thickness of the aquifer, (3) reduced groundwater in storage, and (4) decrease of the groundwater table to a level below the vegetative root zone, which could result in environmental effects (Reclamation *et al.* 2003).

The EWA groundwater analysis for the North Yuba and South Yuba groundwater subbasins determined that groundwater substitution could result in temporary drawdown that exceeds historical seasonal fluctuations (Reclamation *et al.* 2003). In addition, estimates of an upper bound for regional water level declines associated with an EWA groundwater transfer are up to 19 feet for both the North Yuba and South Yuba subbasins. However, the actual water level declines would generally be less than this amount.[4] The EWA analysis also concluded that groundwater substitution transfers could result in groundwater declines in excess of seasonal variation and these effects on groundwater levels potentially could be significant. To reduce these effects, in addition to the monitoring activities discussed above, the groundwater mitigation measures further specify that YCWA would be required to establish monitoring programs for EWA-related transfers. These programs would monitor groundwater level fluctuations within the local pumping area and if significant effects were to occur, then YCWA and/or its Member Units would be responsible for mitigation. These mitigation measures would reduce effects to less than significant levels (Reclamation *et al.* 2003).

As previously discussed in the EWA EIS/EIR (2003), to address these potential local declines in future transfers involving groundwater substitution, DWR, YCWA and the Member Units have implemented a cooperative monitoring program that will ensure immediate remedial action would be taken to mitigate any identified impacts from a groundwater substitution (see Groundwater Management, below.)

Interaction with Surface Water

All of the stream channels and floodplain deposits along the Yuba River act as a large water intake area for recharge of the groundwater subbasin (Appendix 2). Because groundwater substitution could be used to support higher river flows during Schedule 6 years, effects to riparian and aquatic habitats along the Feather and Yuba Rivers would be unlikely during the one-year that the proposed project would occur. Any loss from the river that would occurs in response to transfer pumping is accounted for by the required instream flow rate. Large flows

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[4] Grinnell (2002) indicated regional groundwater declines associated with a 65,000 acre-foot transfer from the North Yuba subbasin were on the order of 10 feet.

would be maintained in these rivers that would continue to support aquatic and riparian resources at levels that would exist in the absence of the proposed project.

In the EWA EIS/EIR (2003), the analysis for the North Yuba and South Yuba groundwater subbasins has previously determined that, "*river flows could be reduced through pumping close to the Bear River to the south, or the Yuba River that flows through the subbasins. The Feather River borders the area on the west but pumping in support of water transfers does not occur near the river. Pumping could adversely affect the riparian and aquatic habitats and downstream water users. However, effects to riparian and aquatic habitats along the Feather and Yuba Rivers would be unlikely. Large flows would be maintained in these rivers that would continue to support aquatic and riparian resources at levels that would exist in the absence of a transfer to EWA.*"

The portion of the Bear River that most likely could be affected by the proposed project has only limited connection with adjacent groundwater that would be pumped. Wetlands, primarily irrigated rice cultures, exist in the area and pumping activities could reduce groundwater availability as a source of the wetlands' water supply. However, the amount of water applied for irrigation and the resulting return flows would be largely unchanged under the proposed project, relative to the basis of comparison, and would continue to support wetlands (Reclamation *et al.* 2003).

In addition to the Groundwater Management tasks YCWA employs to protect groundwater resources (see below) as part of the EWA, DWR implements a Well Review process to reduce potential impacts on surface waters. As described in the EWA EIS/EIR, groundwater pumping for EWA groundwater substitution transfers could reduce flows in nearby surface water bodies and these effects could be potentially significant (Reclamation *et al.* 2003). To reduce these effects, the EWA groundwater mitigation measures require assessment of measures to avoid and minimize any significant potential effects of an EWA transfer. (Reclamation *et al.* 2003) states, "*Through the Well Review process of the groundwater mitigation measures, the purchasing agency would review the location and screened interval of the proposed production wells. If data were insufficient to show that pumping would not result in adverse effects, production wells within 2 miles of a surface water body could be required to meet well depth criteria. Furthermore, the Well Review may determine that pumping activities should be limited to a specified depth in some areas, in order to avoid hydraulic interaction between pumping and overlying surface water systems. In addition to the well review, the groundwater mitigation measures provide guidance for the establishment of a local monitoring and mitigation program designed to identify and mitigate local impacts. These mitigation measures would reduce effects to less than significant levels.*"

Therefore, if necessary, the Well Review may determine that pumping activities associated with the proposed project should be limited to certain wells, or to a specified depth in some areas, in order to avoid hydraulic interaction between pumping and overlying surface water systems.

Groundwater Quality

Potential groundwater quality impacts associated with increased groundwater withdrawals in the North Yuba and South Yuba subbasins that may occur as part of the proposed project include the migration of reduced quality water. Groundwater underlying Beale Air Force Base on the eastern boundary of the South Yuba subbasin is contaminated and being remediated (Grinnell 2002 *as cited in* Reclamation *et al.* 2003). In addition, high nitrate levels are present in the boundaries of Dry Creek Mutual Water Company (Reclamation *et al.* 2003), and the upward migration of saline water from the deeper aquifers is of concern near Wheatland in the southeastern portion of the South Yuba subbasin. Although plans to supply surface water to this area are in the preliminary planning phase, this area currently relies on groundwater, which may cause the upward migration of saline water (Grinnell 2002 and Aikens 2003 *as cited in* Reclamation *et al.* 2003).

With the exception of these areas, groundwater is of good quality with a median total dissolved solids (TDS) concentration of 277 mg/L and 224 mg/L for the North and South Yuba subbasins, respectively. Because groundwater extraction associated with past water transfers was a sufficient distance from these potential problem areas, it is anticipated that the proposed project also would avoid these areas and, thus, result in a less-than-significant impact to groundwater quality.

Groundwater Management

YCWA has a number of water transfer policies that help guide agency operations. These policies specify that groundwater transfers should not result in unmitigated third party impacts, or cause overdraft (Grinnell 2002 *as cited in* Reclamation *et al.* 2003). BVID also has a set of principles and policies addressing groundwater substitution transfers (Reclamation *et al.* 2003).

Through previous transfers, YCWA has learned that conjunctive use operations can cause isolated and site-specific effects. If immediate response is provided, significant short-term or long-term impacts could be avoided completely.

Over the past decade, YCWA and its Member Units have taken an active and progressive role in managing the groundwater resources of the subbasin. YCWA also works with DWR in monitoring the basin and has been instrumental in extending the monitoring network of wells in the basin. Several of the districts in Yuba County have adopted groundwater management plans and YCWA adopted a groundwater management plan (compliant with AB 3030 SB 1938) during February 2005. YCWA and the districts participating in water transfers meet regularly to discuss the management of the basins. As part of basin management, YCWA, DWR, and the Member Units have instituted a monitoring plan to record in detail the water levels and water quality of the basins. The monitoring plan will be included in the water transfer contract with DWR.

The groundwater management approach for groundwater substitution transfers in Yuba County is embodied in three principles, as follows:

- Closely monitor conditions to watch for any potential significant impacts and to gain a better understanding of the groundwater resource;
- Immediately respond to any significant impacts that occur and mitigate those impacts with appropriate measures; and
- Utilize the transfer and associated activities to further the goal of effective management of the water resources of Yuba County through conjunctive use of groundwater and surface water.

YCWA and DWR coordinated implementation of the Groundwater Program for the Yuba Basin will protect Yuba County's groundwater resources. Overall, implementation of the proposed project in concert with the groundwater management actions described above, is expected to result in a less-than-significant impact to local groundwater resources in Yuba County.

South-of-the-Delta Groundwater Banks

DWR may store a portion of water associated with the proposed project in groundwater banks located in the San Joaquin Groundwater Basin, south of the Delta. Storing excess transfer water in groundwater banks would make storage space available in San Luis Reservoir available for 2008.

As discussed in the EWA EIS/EIR (Reclamation *et al.* 2003), groundwater in the South San Joaquin Groundwater Basin has historically been used heavily, and excessive groundwater withdrawals have caused substantial declines in groundwater levels. Thus, groundwater resources in the San Joaquin Groundwater Basin have experienced overdraft conditions in past years. Although groundwater levels have increased since the beginning of banking operations, a large amount of storage capacity is available in the underlying aquifer. The purchase of storage space for EWA water (used to recharge the underlying aquifer) would increase the EWA agencies' operational flexibility because EWA assets could be stored if they were available at times that they could not be used immediately. The banked EWA water would also benefit south of Delta water contractors by increasing groundwater levels in their underlying basins.

The EWA EIS/EIR states that, "*EWA groundwater purchase and direct extraction from these banking facilities could result in declines of groundwater levels; however, the levels would generally remain higher than they would have been absent the banks. In contrast to the affected subbasins discussed previously, no estimated groundwater declines exist for this region. Groundwater banking agencies have policies that do not allow greater extraction of groundwater than the project has banked. Banking participants have signed MOUs and Agreements to monitor and regulate these declines. The MOUs, Agreements, and monitoring programs developed by these banks provide assurances that participating banking agencies have a sufficient level of monitoring and management to address effects if they occur* (Reclamation *et al.* 2003)." The EWA EIS/EIR further states that, "*migration of reduced quality groundwater and distribution of reduced quality water into the aqueduct system are two types of potential water quality effects associated with increased groundwater withdrawals for EWA asset acquisition. The banking projects' MOUs, agreements, and monitoring activities address many of these groundwater quality concerns*."

In addition to the monitoring activities and the water quality control measures incorporated into south of Delta water contractor's operations, the *Interim DWR Water Quality Criteria for Acceptance of Non-Project Water into the SWP* (DWR 2001b) protects the quality of the water transported within SWP aqueducts (Reclamation *et al.* 2003). All groundwater that is directly pumped from the banking projects and conveyed into the California aqueduct must comply with criteria requiring that all non-Project water entering the SWP aqueducts remain within or exceed historical water quality levels. Prior to the transfer, an established facilitation group must review the request for input and the DWR must give final approval (DWR 2001b).

Further, groundwater transfers to the EWA Project Agencies must not only meet the approval of Kern County Water Agency, but also must gain the approval of the banking participants and meet the operation criteria set forth by the MOUs and agreements. These MOUs and agreements specify operational parameters and priorities for participating entities, monitoring requirements, and mitigation strategies. Consequently, all potential impacts associated with the groundwater purchase and direct recovery operations conducted in accordance with local groundwater management requirements for the EWA Program would be less than significant (Reclamation *et al.* 2003)."

If groundwater basins south of the Delta were used to store water from the proposed project, the amount of water that would be extracted from them would be equivalent to the amount that is deposited. Storage of the proposed project transfer water potentially could result in beneficial impacts upon the groundwater basin by increasing groundwater levels, if only temporarily. Eventual extraction of the water potentially could result in groundwater declines, subsidence, or groundwater quality degradation. However, transfer water utilized in the EWA Program is subject to certain mitigation provisions. Groundwater banking participants have signed MOUs or other agreements that ensure mitigation of potential adverse impacts through monitoring and regulation of groundwater declines, subsidence and water quality conditions. Therefore, the proposed project, relative to the basis of comparison, would result in less-than-significant impacts to South-of-Delta groundwater banks.

4.9 Hydrology and Water Quality - Flood Control

Floods can be very damaging and costly. In order to lessen the effects, numerous practices aim to reduce flood damages, including the construction of levees, dams, and reservoirs. Levees confine the water flows within a channel. The integrity of a levee, and its maximum design flow capacity, dictate the extent of a levee's effectiveness. Dams and reservoirs can be operated to reduce flows downstream by storing inflows and controlling releases (Reclamation *et al.* 2003).

Many agencies, such as Reclamation, Corps, DWR, and the State Reclamation Board, have a role in designing, constructing, and operating flood control facilities. The Federal Emergency Management Agency (FEMA) oversees the National Flood Insurance Program, which helps ensure protection from flood-related damages through the implementation of three main components: (1) flood insurance program; (2) floodplain management; and (3) flood hazard mapping (Reclamation *et al.* 2003).

The proposed project would not involve the construction or modification of infrastructure that would alter existing drainage patterns, substantially increase surface runoff conditions on land areas within the study region; result in surface runoff conditions that would exceed existing or planned drainage systems, contribute substantial levels of polluted runoff to the system; or place housing or other structures within the 100-year flood hazard area. The proposed project also does not have the potential to result in inundation of the project area by seiche, tsunami or mudflow.

The focus of the discussion in this section relates to potential changes in project operations under the proposed project, relative to the basis of comparison, to result in potential increased risk of flooding and associated hazards, resulting from exposing people or structures to a significant risk of loss, injury or death, including, flooding resulting from failure of a levee or dam.

4.9.1 Environmental Setting

The environmental setting for evaluating potential flood control impacts is defined as those waterways and associated flood control infrastructure (e.g., levees, pumps, diversion weirs, and bypass channels), potentially influenced by implementation of the proposed project. The following sections provide discussion of the flood control setting for the Yuba River, New

Bullards Bar Reservoir, Feather River, Oroville Reservoir, Sacramento River, the Delta, San Luis Reservoir, and groundwater bank recharge regions south of the Delta.

4.9.1.1 Yuba River and New Bullards Bar Reservoir

New Bullards Bar Reservoir is the major storage facility for the Yuba Project. The reservoir has a total storage of 966,000 acre-feet with a minimum operating level of 234,000 acre-feet (FERC Project License minimum pool), leaving 732,000 acre-feet of regulating capacity. A portion of this regulating capacity, 170,000 acre-feet, is held in seasonal reserve from October through May for flood control. The amount of available flood control storage in New Bullards Bar Reservoir varies from mid-September through October (depending on early season rainfall) and from the end of March through May (depending on the amount of snowfall in the watershed). This flood storage aids in attempting to keep Yuba River flows within the designed levee capacity of 135,000 cfs.

4.9.1.2 Feather River and Oroville Reservoir

Oroville Reservoir holds winter and spring runoff for release into the Feather River, and aids in reducing downstream flooding during wet years. As required by the Corps, up to 750,000 acre-feet of the 3.5 million acre-feet of storage capacity is maintained to capture inflows. From October through March, between 2.8 and 3.2 million acre-feet of storage is the maximum allowable in order to reserve space for flood flows. From April through June, the storage limit increases, reflecting less need for flood storage space. The maximum allowed storage limit decreases again in September in preparation for the upcoming flood season. Flood control releases are made based on a release schedule, and in consultation with the Corps. During times when flood control space is not required to accomplish flood control objectives, reservoir space can be used for storing water (Reclamation *et al.* 2003).

The Feather River is leveed from its confluence with the Sacramento River to Hamilton Bend near the City of Oroville on the east bank, and from the confluence to Honcut Creek on the west bank. Oroville Dam is the lower-most dam on the Feather River, and regulates downstream flows in the Feather River (Reclamation *et al.* 2003).

4.9.1.3 Sacramento River

Flood control on the Sacramento River relies heavily on levees constructed along the banks of the river, extending from Old Ferry to the southern tip of Sherman Island in the Delta. Many of the levees originally were built by the Corps, and have been turned over to the State of California for maintenance as part of the Sacramento River Flood Control Project (SRFCP), which provides flood protection for the lower reach of the Sacramento River and into the Delta.

Flood control on the Sacramento River also is managed by a system of weirs and bypasses constructed by the Corps. The bypasses are large tracts of low density or undeveloped lands, including Butte Basin, Sutter Bypass, Yolo Bypass, Tisdale Bypass, and Sacramento Bypass. Water released to the bypass lands flows south into the Delta, in effect providing a short-term storage system for floodwaters. Water released to the bypass system also infiltrates into the ground, recharging groundwater supplies, although this volume is small compared to the total volume of a flood. When flooding occurs, the weir and bypass system diverts water to protect the levee system and free flood storage capacity in the upstream reservoirs.

4.9.1.4 Sacramento-San Joaquin Delta

Unlike the system of reservoirs and weirs that control the magnitude of flooding on the rivers upstream from the Delta, the flood control system in the Delta (with the exception of the Delta Cross Channel control gates) operates passively. Since the construction of the SWP/CVP, and more importantly, the Yolo Bypass system, flood flows in the Delta have been more controlled. Flooding still occurs, but has been confined to the individual islands or tracts and is due mostly to levee instability or overtopping. The major factors influencing Delta water levels include high flows, high tide, and wind. The highest water stages occur December through February when these factors are compounded (Reclamation *et al.* 2003).

4.9.2 Impact Analysis

4.9.2.1 Methodology and Significance Criteria

Assessment methods are separated into two sections in this discussion: (1) flood management operations; and (2) levee systems. The analysis of flood management operations focuses on the flood control system's ability to handle flood flows under the proposed project from a storage perspective. The analysis of the levee system focuses on the system's ability to handle the flood flows from a geotechnical perspective. Flood control storage, reservoir operations, and channel capacity are compared to movement of water under the proposed project during the October through May period.

The analysis of the potential impacts on flood control associated with the proposed project was based on the following significance criteria:

Potential impacts on flood management operations are considered significant if:

- Would the proposed project cause any increases in reservoir storage levels, relative to the basis of comparison, are of sufficient magnitude and duration for a given month to conflict with flood control operation?
- Would the proposed project cause any increases in river flows, relative to the basis of comparison, are of sufficient magnitude and duration for a given month to substantially decrease channel capacity?

Potential impacts on the levee system are considered potentially significant if:

- Would the proposed project cause any increases in river flows, relative to the basis of comparison, are of sufficient magnitude and duration for a given month to substantially decrease levee stability through increased flood stages, excessive seepage and scour, or increased deposition?

4.9.2.2 Environmental Impacts

Yuba River

Over the 83-year simulation period, the highest flow of the cumulative flow distribution for the proposed project at Marysville during any month is 21,342 cfs. The designed levee capacity is 135,000 cfs, much higher than the expected proposed project flows, and therefore, river flows are expected to be maintained well below the river channel carrying capacity during the proposed project. The proposed project also would not affect levee stability because a substantial flow increase, relative to the basis of comparison, is not expected. For most months of the flood control season, flows in the highest 20 percent of the cumulative flow distribution under the proposed project are similar to or slightly lower than flows in this part of the distribution under the basis of comparison; during October, November, and April flows in the highest 20 percent of the cumulative flow distribution are slightly higher under the proposed project than under the basis of comparison. Because the additional flows under the proposed project are only slightly higher than the flows under the basis of comparison, and the flows expected in the Yuba River are well below the river channel capacity, the proposed project is anticipated to result in a less-than-significant impact on flood control in the Yuba River.

New Bullards Bar Reservoir

Entering the flood season, New Bullards Bar Reservoir storage under the proposed project is anticipated to be lower than under the basis of comparison. During each month of the flood control season, New Bullards Bar Reservoir storage levels under the proposed project are expected to be less than storage levels under the basis of comparison. A New Bullards Bar Reservoir storage reduction could lessen the number of flood releases or the amount of water needed to be released. The additional space made available in New Bullards Bar Reservoir because of the proposed project, relative to the basis of comparison, is expected to have a beneficial impact on flood control operations.

Feather River

The EWA EIS/EIR (Reclamation *et al.* 2003) (pp. 15-12 - 15-13) Feather River analysis determined that, "*River flows would be maintained well below the river channel carrying capacity during transfers… The channel capacity below Lake Oroville is 210,000 cfs, much higher than the expected flows with the EWA. Because the average Baseline Condition flows are substantially below the channel capacity, the additional flows with the EWA are only slightly greater than the Baseline Condition, and the increase in flows occurs during the irrigation season rather than the flood season, there would not be an effect on flood control*." The EWA EIS/EIR analysis also concluded that, "*The EWA would not affect levees because it would not substantially increase flows. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. The EWA would have no effect on flood control from increased river flows*."

Under the proposed project, Feather River flows may increase below the confluence of the Yuba River, but are anticipated to remain within the normal range of flow releases and fluctuations that result from SWP operations. Additionally, potential increases in flow associated with the proposed project during the October through May flood season generally would be expected to be relatively minor, compared to the total volume of flow in the Feather River. As presented in Table 4-1, the proposed project could alter monthly mean Feather River flows by approximately 0.3 percent (May 2007 and February 2008) to 8.6 percent (April 2007) during the October through May flood season, relative to the basis of comparison. Because flows under the proposed project would not substantially increase, relative to the basis of comparison, and are considerably less than that which was previously evaluated for the entire EWA Program, the proposed project would not be anticipated to exceed Feather River channel capacity (i.e., 210,000 cfs) or impact Feather River levee stability. Therefore, the proposed project, relative to the basis of comparison, would be expected to have a less-than-significant impact on flood control operations in the Feather River.

Oroville Reservoir

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 15-12) Oroville Reservoir analysis determined that, "*surface water elevation would be higher from November until the transfer the following summer compared to the Baseline Condition… As long as the water levels in Lake Oroville were maintained below the dedicated flood control space, the addition of EWA water to Lake Oroville would not conflict with reservoir operations*." The EWA analysis further concluded that, "*Under certain hydrologic conditions, high inflows to Lake Oroville could cause water levels to encroach on flood control space... The presence of the EWA water in the reservoir could cause required flood control releases to occur sooner than under the Baseline Condition. The addition of EWA water to Lake Oroville would not cause the operational guidelines of the lake regarding releases to be changed. Thus, the effects on flood control due to the acquisition of stored reservoir water…would be less than significant*."

As described in Section 4.1.2.2, Oroville Reservoir water levels would be affected by the proposed project only if DWR had to release additional flows to meet water quality standards in the Delta as a result of YCWA holding back water to refill New Bullards Bar Reservoir after the completion of the proposed project. However, it is unlikely that Delta water quality would be impaired during flood events and, thus, releases would be expected to occur within the required parameters of current Oroville Reservoir flood control operations rather than in response to Delta water quality standards. Likewise, YCWA would manage operations at New Bullards Bar Reservoir for flood control purposes, and would not hold back water for refill purposes until after the peak of the October through May flood season. Therefore, implementation of the proposed project would not be expected to conflict with Oroville Reservoir operations because storage and water surface elevations would be maintained below the dedicated flood control space. Overall, the proposed project, relative to the basis of comparison, would have a less-than-significant impact on flood control operations in Oroville Reservoir.

Sacramento River

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 15-11) analysis determined that, "*The Feather, Yuba, and American Rivers contribute flows to the Sacramento River. EWA actions would not cause substantial increases in flow on these rivers compared to the Baseline Condition; therefore, EWA actions would not affect flood control on the lower Sacramento River*." The EWA EIS/EIR analysis further determined that, "*The EWA would not affect levees because it would not substantially increase flows. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. There would be no effect on flood control from increased river flows*."

Under the proposed project, Sacramento River flows may increase below the confluence of the Feather River, but are anticipated to remain within the normal range of flow releases and fluctuations that result from SWP and CVP operations. Additionally, potential increases in flow associated with the proposed project during the flood season generally would be expected to be relatively minor, relative to total volume of flow in the Sacramento River. As presented in Table 4-2, the proposed project could alter monthly mean Sacramento River flows between 0.1 percent (May 2007 and February 2008) and 1.3 percent (April 2007 and December 2007) during the October through May flood control period, relative to the basis of comparison. Because flows would not substantially be increased, the proposed project also would not be anticipated to impact Sacramento River levee stability. Therefore, the proposed project, relative to the basis of comparison, would be expected to have a less-than-significant impact on flood control operations in the Sacramento River.

Sacramento-San Joaquin Delta

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 15-17) analysis determined that, "*Because the Delta annually receives higher inflows than would occur with the EWA, and the increases in inflow would not occur during the Delta's highest water stages, December through February, the effect on the Delta would be less than significant*." Similarly, the proposed project would only occur for a period of approximately one-year and would result in relatively minor changes to Delta inflows, compared to the total volume of Delta inflow from the Sacramento River. As presented in Table 4-3, the proposed project could alter monthly mean Delta inflows between 0.03 percent (February 2008) and 1.1 percent (December 2007) during the October through May flood control period, relative to the basis of comparison. Because the proportion of EWA acquisitions associated with the proposed project is less than that which was identified for the previously evaluated EWA Program, the proposed project would not be expected to decrease levee stability or significantly impact flood control operations in the Delta.

Therefore, potential changes in Delta conditions under the proposed project, relative to the basis of comparison, would be a relatively minor and are expected to result in a less-than-significant impact on Delta flood control operations.

4.10 Recreation

The proposed project would not result in increased use of existing neighborhood or regional parks or other recreational facilities resulting in physical deterioration of such facilities. The proposed project also would not construct or expand recreational facilities causing adverse physical effects on the environment.

Recreational activities at reservoirs or rivers within the study area could be affected by changes in water operations associated with the proposed project, relative to the basis of comparison. Changes in reservoir storage or water surface elevation levels at New Bullards Bar Reservoir, Oroville Reservoir, or San Luis Reservoir could affect swimming, boating, water-skiing, or other water-based activities. Surface water storage at these reservoirs normally varies throughout the year due to water releases made for agricultural, urban, and environmental needs and the necessity to have a designated volume available to store runoff during winter and spring (flood control). Recreational activities along or within the Yuba, Feather, and Sacramento river corridors and the Delta that could be affected by the proposed project include swimming, boating, fishing, camping, and picnicking.

4.10.1 Environmental Setting

4.10.1.1 Yuba River

Numerous rivers, creeks, tributaries, and reservoirs along the Yuba River offer recreational opportunities. Where access to the river is available, fishing, picnicking, rafting, kayaking, tubing, and swimming are the dominant recreational uses. The Yuba River offers excellent American shad, Chinook salmon, and steelhead fishing (Reclamation *et al.* 2003).

4.10.1.2 New Bullards Bar Reservoir

New Bullards Bar Reservoir recreation facilities are managed by the U.S. Forest Service (USFS). Popular recreation activities include boating, fishing, and camping. Over 20 miles of hiking and mountain biking trails exist in the area, including Bullards Bar Trail, which runs along the perimeter of the lake. Several campgrounds, including Schoolhouse and Dark Day, are in the vicinity. Some campgrounds around the reservoir, such as Madrone Cove and Garden Point, are accessible only by boat. Emerald Cove Resort and Marina is a floating marina that is operable at all water surface elevations. The marina offers a variety of services to recreationists including, a general store, fuel pumping station, boat launch, boat rentals, moorage, and annual slips. Boat access to the reservoir is provided by the Cottage Creek boat ramp (at Emerald Cove Marina) and Dark Day boat ramp. Cottage Creek boat ramp is unusable when water surface elevations are below 1,822 feet-msl, and Dark Day boat ramp becomes inoperable when water surface elevation are below 1,798 feet-msl (Onken 2003 *as cited in (Reclamation et al. 2003)*). Low reservoir levels affect day swimming areas and boat-in campgrounds before boat ramps are affected. Some boat launchings occur year-round; however, the typical boating season extends from about early May through mid-October. The heaviest use of the ramps occurs on weekends and holidays from Memorial Day to Labor Day (USDA Forest Service 1999 *as cited in* Reclamation *et al.* 2003*)*. Fishing is also a popular recreational activity; some species found in the reservoir include rainbow trout, brown trout, Kokanee salmon, smallmouth bass, largemouth bass, bluegill, crappie, and bullhead catfish.

4.10.1.3 Feather River

Feather River recreational activities include swimming, fishing, camping, bird-watching, picnicking, and bicycling. Rafting on the North and Middle forks of the Feather River runs from January to April or May, depending on flow. Summer rafting and kayaking occurs on the North Fork depending on upstream PG&E reservoir operations. Recreational activities along the Low Flow Channel reach of the Feather River include fishing, sightseeing, hiking, bicycling, and wildlife and bird watching. The Oroville Wildlife Area, downstream of the Thermalito Afterbay Outlet, provides opportunities for bird-watching, in-season hunting, fishing, swimming, and camping.

4.10.1.4 Oroville Reservoir

The California Department of Parks and Recreation (CDPR) manages the recreation facilities of the Oroville Reservoir complex. Oroville Reservoir has a surface area of approximately 15,800 acres and a shoreline of 167 miles when full (SWRCB 1997). The peak recreation season is from late-spring through summer.

Oroville Reservoir has two full-service marinas, nine parks provide facilities for baseball, tennis, swimming, and picnicking within the vicinity of the lake. There are major boat launch ramps at Bidwell Canyon, Loafer Creek, and Lime Saddle (DWR 2001a). The spillway has an 8-lane and 12-lane boat ramp in two stages. Construction of extensions on boat ramps at Bidwell Canyon, the Spillway, and Lime Saddle allow the ramps to remain open when lake elevations remain at or greater than 700 feet above msl (Reclamation *et al.* 2003). Average water surface elevation in Oroville Reservoir historically has been between 817 and 787 feet above msl between July and September, respectively. Although boat ramps remain usable, lower lake elevations can adversely affect swimming beaches and boat-in campgrounds (Sherman 2003 *as cited in*

Reclamation *et al.* 2003. The Oroville Reservoir State Recreation Area (SRA) provides camping, picnicking, boating, fishing, hunting, horseback riding, hiking, bicycling, sightseeing, and a variety of other activities. Major facilities in the SRA include Loafer Creek, Bidwell Canyon, Spillway, Lime Saddle, Oroville Reservoir Visitor Center, and North and South Thermalito Forebay. The Oroville Reservoir SRA also provides several less-developed car-top launching areas, boat-in campsites, and floating campsites on Oroville Reservoir. DWR maintains three launch ramps and a day-use area at the Oroville Wildlife Area, which includes Thermalito Afterbay.

4.10.1.5 Sacramento River

On the upper Sacramento River, water-dependent activities (e.g., swimming, boating, and fishing) account for approximately 52 percent of the recreation uses (Reclamation and Sacramento County Water Agency 1997). Fishing, rafting, canoeing, kayaking, swimming, and power boating are available along most of the upper Sacramento River. While fishing is a year-round activity, boating, rafting, and swimming use take place primarily in summer months when air temperatures are high. Between Colusa and Sacramento, major recreation facilities are located at Colusa-Sacramento River Recreation Area, Colusa Weir access, Tisdale Weir access, River Bend Boating Facility, Knights Landing, Sacramento Bypass, and Elkhorn Boating Facility.

Recreational use of the lower Sacramento River, between the American River confluence and the Delta, is closely associated with recreational use of Delta waterways. This section of the river, influenced by tidal action similar to the Delta, is an important boating and fishing area with several private marinas located on the river.

4.10.1.6 Sacramento-San Joaquin Delta

As a complex of waterways affected by both freshwater inflows and tidal action, the Delta is a very important recreation resource that provides a variety of water-dependent and water-enhanced recreation opportunities. Boating is the most popular activity in the Delta region, accounting for approximately 17 percent of visitation, with other popular uses including fishing, relaxing, sightseeing, and camping (DWR and Reclamation 1996). Boating and related facilities are located throughout the Delta and include launch ramps, marinas, boat rentals, swimming areas, camping sites, dining and lodging facilities, and marine supply stores. Most recreation facilities are privately owned and operated commercially.

Located near several metropolitan areas, the Delta supports about 12 million user days of recreation a year (DWR 1993). Parks along the mainstem of the Sacramento River and Delta sloughs provide access for water-oriented recreation as well as picnic sites and camping areas. Brannan Island State Park and Delta Meadows River Park are major water-oriented recreational areas. Use of these parks typically peaks in July.

4.10.1.7 San Luis Reservoir

The San Luis SRA is open year-round. Recreational activities include boating, water-skiing, fishing, camping, and picnicking. Boat access is available via one boat ramp at the Basalt area at the southeastern portion of the reservoir and at Dinosaur Point on at the northwestern portion of the reservoir. The boat ramp at Basalt becomes difficult to use because of low reservoir levels at elevation 340 feet above msl; the boat ramp at Dinosaur Point is difficult to access at elevation

360 feet above msl (San Joaquin River Group 1999 *as cited in* Reclamation *et al.* 2003). There are no designated swimming areas or beaches at San Luis Reservoir.

4.10.2 Impact Analysis

4.10.2.1 Methodology and Significance Criteria

The potential for impacts to recreation opportunities at reservoirs was analyzed based on a comparison of the percent probability that a dewatering event would occur during the recreation use season (i.e., May through September) such that the reservoir water surface elevations would drop below the level to sustain boat ramp use under the basis of comparison and the proposed project. The potential impact to recreation along the river was analyzed based on a comparison of changes in river flows and water temperatures during the recreation use season under the proposed project and basis of comparison.

The analysis of the potential impacts on recreational opportunities associated with the proposed project was based on the following criteria:

- Would the proposed project cause a reduction in river flows, relative to the basis of comparison, of sufficient magnitude during the recreation season, such that boating opportunities are decreased?
- Would the proposed project cause any changes of river water temperature, relative to the basis of comparison, of sufficient magnitude and duration during the recreation season, to significantly impact recreational swimming, tubing, canoeing, kayaking, and rafting?
- Would the proposed project cause any reduction in reservoir water levels, relative to the basis of comparison, of sufficient magnitude during the recreation season, such that boat ramps become unusable?
- Would the proposed project cause any changes in reservoir water levels or river flows, relative to the basis of comparison, of sufficient magnitude and duration for a given month of the recreation use season to significantly impact (substantially reduce) recreational opportunities?

4.10.3 Environmental Impacts

4.10.3.1 Yuba River

Under the proposed project, flows in the lower Yuba River are expected to remain within normal operational ranges. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to RD-1644 interim) generally are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, January, and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April and June; and (4) higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during May; (5) higher at low flow levels, lower at intermediate levels, and higher at high flow levels during July; and (6) generally higher over the range of expected flow levels during August, September, and October.

Flow decreases that occur under the proposed project during the recreation use season at the Marysville Gage would not result in flows dropping below the optimum flow range, and flows at the Smartville Gage under the proposed project would be equal to or higher than flows under the basis of comparison. Any impacts on river recreation activities would be minimal, or beneficial. The increased flows could benefit rafting and other boating opportunities. The greater water volumes under the proposed project could enhance angling opportunities on the Yuba River. In addition, the slight increase in flows would not significantly impact water temperatures in the Yuba River. During the recreation use season, the water temperatures simulated at Daguerre Point Dam under the proposed project and the basis of comparison are similar (always within 0.1°F of each other), and water temperatures simulated at Marysville did not increase or decrease by more than 2.5°F under the proposed project, relative to the basis of comparison.

Because of limited river access, recreation is not common along the Yuba River, although angling occurs year-round (Reclamation *et al.* 2003). Thus, the EWA EIS/EIR focused on two primary recreational activities, which were fishing and swimming, to a limited extent. The analysis of recreation resources in the EWA EIS/EIR determined that flow reductions of up to 239 cfs (the maximum identified in the analysis) "*would not affect fish population or decrease the quality of fishing*" (Reclamation *et al.* 2003) (p. 14-23). Under the proposed project, it is unlikely that reductions from controlled releases would be as extreme as those identified for the entire EWA Program because flows would not decrease below the levels established by RD-1644 interim. Further, the decrease in flows under the EWA Program "*would not create a substantial loss of recreational opportunity; therefore, the effect would be less than significant*" (Reclamation *et al.* 2003) (p. 14-23). Comparatively, the change in flow as a result of EWA actions "*would not increase flows beyond fishable levels. In fact, increased flow is beneficial to fish, which could lead to more favorable fishing conditions* (Reclamation *et al.* 2003) (p. 14-23)." The EWA analysis also concluded that although water temperatures would be substantially colder, recreational opportunities would not be substantially affected because while water temperatures may not be as desirable as without the EWA, recreational users could partake in water dependent activities at lower river water temperatures, as demonstrated by use of the American and Sacramento rivers.

Potential flow- and water temperature-related changes in the Yuba River under the proposed project are within the range of potential impacts previously evaluated in the EWA EIS/EIR, and would not be of sufficient magnitude to reduce the recreational opportunities on the Yuba River. Additionally, the ramping rates identified as part of the Yuba Project operations for Yuba River have been developed with consideration for the overall safety of anglers and other recreationists. Because the proposed project would only occur for a period of approximately one-year and potential impacts are less than those identified for the EWA Program, potential changes in Yuba River flows under the proposed project, relative to the basis of comparison, would result in a less-than-significant impact to recreational opportunities, including angling, on the Yuba River.

4.10.3.2 New Bullards Bar Reservoir

Cottage Creek boat ramp is unusable when the lake level is below 1,822 feet above msl, and Dark Day boat ramp is unusable when the lake level is below 1,798 feet above msl. Emerald Cove Marina is operable at all lake levels. During the recreation use season there would be an additional 0.24 percent probability under the proposed project that water surface elevations would decrease below the 1,798 feet msl threshold over the 83-year simulation period (Appendix 3). During the recreation use season there would be an additional 1.7 percent probability under the proposed project that water surface elevations would decrease below the 1,822 feet msl threshold over the 83-year simulation period (Appendix 3). These minor increases in probability of exceeding a threshold are most likely to occur at the end of the recreation season and during dry or critical water year types. Therefore, based on the low probability of occurrence and the timing of the occurrence, the proposed project would not result in unreasonable impacts to boat ramp use at New Bullards Bar Reservoir. Lower reservoir levels would generally affect boat ramps prior to affecting other recreational activities (e.g., swimming or fishing). If boat ramps remain usable, it is assumed that there are sufficient water levels in the reservoir to sustain other recreational activities.

The EWA EIS/EIR (Reclamation *et al.* 2003) analysis of recreation resources determined that although water surface elevation in New Bullards Bar Reservoir would decline below the Dark Day boat ramp, this would occur late in the recreational season (i.e., mid-October) (Reclamation *et al.* 2003). Additionally, the number of boaters would be fewer than during the peak recreational season (Memorial Day through Labor Day) (Reclamation *et al.* 2003). The EWA EIS/EIR (2003) (p. 14-25) also includes provisions that, "*The EWA agencies and YCWA could agree to transfer water under a multi-year contract. If full refill occurred, which it has for 85 percent of the past transfers, effects on recreation for subsequent years would be the same as described above. If full refill did not occur, Yuba County WA would consider selling less water the following year. The EWA agencies would not purchase water if the transfer would cause a significant effect on recreation.*" Because the proposed project is designed to provide water to the EWA Program, it is assumed that the refill provisions also would be met as part of the 2007 Pilot Program.

Therefore, because the analysis presented above indicates that the range of potential variation in New Bullards Bar Reservoir water surface elevations under the proposed project, relative to the basis of comparison, would be relatively minor, and have previously been evaluated for the entire EWA Program, the proposed project would result in a less-than-significant impact on recreational opportunities at New Bullards Bar Reservoir.

4.10.3.3 Feather River

Flows in the lower Feather River potentially would be higher under the proposed project, relative to the basis of comparison. Increased flows potentially would improve recreational opportunities during most months and flow schedules. Overall, the range of Feather River flows anticipated under the proposed project would be within normal operating ranges, and would not be expected to be of a sufficient magnitude or frequency to impact recreational opportunities on the Feather River. Because the volume of flow under the proposed project generally would result in only a slight increase, relative to the total volume of flow in the Feather River (Table 4-1), it also would not significantly impact water temperatures in the Feather River.

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 14-18) analysis of recreation resources determined that, "*In July through September, the Feather River would increase below the point of diversion by 2,105 cfs, 850 cfs, and 149 cfs in July, August, and September, respectively. This is an increase above the median monthly flow under the Baseline Condition of 36 percent, 19 percent, and 9 percent in July through September. The increase in flow because of increased releases is not associated with any reduction in recreational opportunities. The increases would not preclude any recreational* *activity (e.g., fishing, boating, or swimming) that occurred under the Baseline Condition. The flow increase would therefore have a less-than-significant effect on recreation along the Feather River*."

Changes in Feather River flows under the proposed project, relative to the basis of comparison, are expected to be less than those identified for the entire EWA Program and, thus, would result in a less-than-significant impact to recreational opportunities on the Feather River.

4.10.3.4 Oroville Reservoir

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 14-22) analysis of Oroville Reservoir recreation resources determined that, "*The small change in elevation would not affect the boat ramps, which are usable until the lake level falls below 700 msl… The changes in surface water elevation would not affect fishing, swimming, and boating opportunities; therefore, the effects would be less than significant*." Under the proposed project, water levels in Oroville Reservoir during the primary recreation season (May through September) would remain within normal operational parameters, relative to the basis of comparison. Therefore, because any potential changes in Oroville Reservoir water surface elevation under the proposed project are expected to be less than those identified for the entire EWA Program, the proposed project would result in a less-than-significant impact on recreation activities at Oroville Reservoir.

4.10.3.5 Sacramento River

Flows in the lower Sacramento River under the proposed project may be higher or lower than flows under the basis of comparison, but are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations, which were previously evaluated in the EWA EIS/EIR (Reclamation *et al.* 2003). Although specific operation of the Sacramento River system as a result of the proposed project are uncertain, the potential changes in flow are not expected to significantly impact recreation, and may be slightly beneficial, relative to the basis of comparison. Because the volume of flow under the proposed project generally would result in only a slight increase, relative to the total volume of flow in the Sacramento River (Table 4-2), it also would not be anticipated to significantly impact water temperatures in the Sacramento River. Therefore, the proposed project, relative to the basis of comparison, would result in a less-than-significant impact to recreational opportunities on the Sacramento River.

4.10.3.6 Sacramento-San Joaquin Delta

Flows within the Delta could be slightly higher or lower during the proposed project (Table 4-3), but are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations, which were previously evaluated in the EWA EIS/EIR. The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 14-31) analysis of recreation resources determined that, "*There would be no decreases in Delta inflows from the Sacramento or San Joaquin Rivers under the Flexible Purchase Alternative. Because river water temperatures are not significantly affected in the Upstream from the Delta Region, there would be no adverse effect on recreation from changes in water temperature in the Delta. Therefore, no effects on recreation in the Delta would be anticipated*."

Although specific operations of the Delta system are uncertain as a result of the proposed project, relative to the basis of comparison, the slight increases in flow that may occur during certain months would result in a less-than-significant impact on recreational opportunities in the Delta.

4.10.3.7 San Luis Reservoir

DWR potentially would store some portion of water from the proposed project in San Luis Reservoir. The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 14-32) analysis of recreation resources determined that, "*there would be no significant change to recreational opportunities, including water-enhanced and water-based activities*" in San Luis Reservoir.

The proposed project would not be anticipated to lower reservoir water surface elevations and, thus, would not be expected to affect boat ramp accessibility. Because DWR could use a portion of the proposed project to store water in San Luis Reservoir, storage levels could increase during the primary recreational months (May through September), and may provide a beneficial effect upon recreational opportunities at the reservoir. Therefore, the proposed project, relative to the basis of comparison, would result in a less-than-significant impact on recreational opportunities at San Luis Reservoir.

4.10.3.8 South-of-Delta Groundwater Recharge Basins

The groundwater recharge basins located south of the Delta provide habitat for waterfowl and water birds and provide recreational opportunities for bird watching. The potential increase in water stored in south-of-Delta groundwater banks possibly could increase habitat for waterfowl and water birds at the recharge basins. Therefore, the proposed project, relative to the basis of comparison, would be expected to result in a less-than-significant impact to bird watching opportunities at the groundwater recharge basins.

4.11 Utilities and Service Systems – Water Supply Availability

4.11.1 Environmental Setting

The surface waterbodies potentially affected by the proposed project include New Bullards Bar Reservoir, the lower Yuba River, Oroville Reservoir and the lower Feather River, the Sacramento River, the Delta, and San Luis Reservoir.

4.11.2 Impact Analysis

4.11.2.1 Methodology and Significance Criteria

There are no formal, specific regulations the indicate criteria or thresholds associated with impact significance related to changes in water supply. Therefore, a significance criterion has been developed specifically to address the potential regional and local area effects of implementing the proposed project. Analysis of the potential for a significant impact on surface water supply availability associated with the proposed project within the affected waterbodies, listed above, was based on the following criterion:

- Would the proposed project cause reductions in reservoir storage or river flows, relative to RD-1644 interim instream flow requirements, of sufficient frequency and duration, to result in a significant impact on the water supply availability to customers and/or contractors?

Increases in reservoir water surface elevation or river flows were considered to have no significant impact upon water supply availability.

Yuba River

Under the proposed project, flows in the lower Yuba River are expected to remain within normal operational ranges during the March 1, 2007 through March 31, 2008 period. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to RD-1644 interim) generally are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, January, and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April and June; and (4) higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during May; (5) higher at low flow levels, lower at intermediate levels, and higher at high flow levels during July; and (6) generally higher over the range of expected flow levels during August, September, and October.

Overall, the annual supply of water would not decrease to a level that would impair water supply availability. Additionally, YCWA would continue historic practices of providing surface water supply deliveries to its Member Units and/or implementation of groundwater substitution practices, thereby avoiding potentially significant impacts on agricultural water supplies within the YCWA service area.

Therefore, hydrologic changes in the lower Yuba River under the proposed project, relative to the basis of comparison, would result in a less-than-significant impact to surface water supply availability for water agencies and their customers or contractors that utilize the Yuba River.

New Bullards Bar Reservoir

Implementation of the proposed project would alter the hydrologic pattern relative to the basis of comparison; however, reservoir storage and water surface elevations at New Bullards Bar Reservoir would remain within normal operational parameters. During most months, simulated end of month reservoir storage under the proposed project would be less than the basis of comparison over approximately 80 percent to 100 percent of the cumulative distribution. Depending on hydrological conditions, average end of September 2007 storage in New Bullards Bar Reservoir under the proposed project would be approximately 594,865 acre-feet, and average end of September storage under the basis of comparison would be approximately 671,063 acre-feet.

Downstream flow impacts can result when water has been released from reservoir storage for transfer purposes and the storage volume subsequently must be refilled with incoming water that otherwise would be spilled or bypassed. The reduction in spills or bypass flows could reduce flows downstream of the reservoir by as much as the quantity of the transferred amount of water.

Any analysis of storage refill (carryover storage) effects is highly speculative because these potential impacts are directly related to future water conditions that cannot be accurately predicted. Water management decisions in California are based on daily conditions occurring in a variety of water year types, and specific management decisions for future years are difficult to forecast; therefore, the following discussion is considered speculative and based on hypothetical situations.

The proposed project would result in a minimum reduction in storage of 62,000 acre-feet in New Bullards Bar Reservoir during March 2007 through March 2008, and could affect the probability, or at least the timing and duration, of spilling in the following year (or subsequent years). Spills would not occur as early, or may be smaller, under the proposed project compared to the basis of comparison. During a subsequent dry or critically dry year, after March 2008, it is possible that no spilling would take place regardless of whether the proposed project occurs; thus, potential impacts of the proposed project (including proposed water transfer) on storage refill could be delayed into subsequent water years. If a below-normal water year occurs after implementation of the proposed project, the potential storage refill effects of the proposed project (including a water transfer) would be largest because some spilling (a marginal amount) would be likely under the basis of comparison conditions. Potential storage refill effects likely would be minor if an above-normal or wet water year occurs, because of the large quantity of spilling that probably would occur, regardless of whether the proposed project is implemented. However, it is difficult to predict storage refill effects even with respect to water year types because substantial spilling could occur even in a dry water year (Appendix 2).

Storage refill effects for the proposed project are not considered to be significant given the speculative nature of the potential impacts, and the maintenance of minimum instream flow requirements at all times regardless of when storage refill effects may occur.

Overall, the decrease in reservoir storage under the proposed project, relative to the basis of comparison, would not be of substantial magnitude or duration to adversely impact water supply availability from New Bullards Bar Reservoir. The proposed project would adhere to the operational assumptions and refill criteria requirements described in the EWA EIS/EIR (Reclamation *et al.* 2003), from which the EWA EIS/EIR analyses determined that "*EWA acquisition of stored reservoir water from Yuba County WA would have a less-than-significant effect on water supply* (Reclamation *et al*. 2003) (p. 4-28)." Therefore, based on the analyses presented above and the conclusions previously determined for the EWA Program, potential changes in New Bullards Bar Reservoir storage under the proposed project, relative to the basis of comparison, would result in a less-than-significant impact on surface water supply availability.

Feather River and Oroville Reservoir

Because the proposed project would not be expected to result in Feather River flows or Oroville Reservoir storage levels outside of normal operational parameters, instream flow and reservoir storage affecting water supply availability would not be expected to differ substantially under the proposed project, relative to the basis of comparison. Average differences in simulated monthly mean Yuba River flows at Marysville and the percentage of these flows to Feather River flows at Gridley under the proposed project, relative the RD-1644 interim, over the 83-year simulation period are presented in Table 4-1.

Based on historical records (Table 4-1), Feather River flows are anticipated to be at least twice the volume of total flow is the Yuba River at Marysville, therefore, the influence of the increase or decrease in Yuba River flows under the proposed project on total Feather River flows is not likely to be substantial. Overall, potential changes to Feather River flows under the proposed project, relative to the basis of comparison, would be expected to result in a less-than-significant impact on surface water supply availability.

Although the specific operational scenario for Oroville Reservoir is unknown, reservoir storage changes (due to subsequent refill of New Bullards Bar Reservoir) that are expected to occur as a result of the proposed project would be expected to remain within historic operational ranges. Further, the Refill Agreement between YCWA and DWR would ensure that future refill of water transferred from storage in New Bullards Bar Reservoir resulting from purchases of water from YCWA by DWR would not significantly impact the SWP or CVP.

Therefore, because changes in the Feather River and Oroville Reservoir would be relatively minor under the proposed project, relative to the basis of comparison, and have been previously evaluated for the entire EWA Program in the EWA EIS/EIR, the potential changes associated with the proposed project would result in a less-than-significant impact on water supply availability to water customers, including state and federal water contractors.

Sacramento River

Flows in the Sacramento River are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations and, thus, would not be expected to differ substantially under the proposed project, relative to the basis of comparison. Average differences in simulated monthly mean Yuba River flows at Marysville and the percentage of these flows compared to Sacramento River flows at Freeport expected to occur under the proposed project, relative to RD-1644 interim, over the 83-year simulation period are presented in Table 4-2. Although implementation of the proposed project potentially could alter Sacramento River flows slightly, these changes would be comparable to, or less than, the range described above for the Feather River.

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 4-25) water supply analysis determined that "*Although there would be a change in timing and rate of Sacramento River flows, the annual supply of water to Project or non-Project users would not decrease.*" Because the proposed project would only occur for a period of approximately one-year and would result in relatively minor changes in flow compared to the total volume of flow in the Sacramento River, the analyses presented above is consistent with the conclusions previously determined for the EWA Program. Therefore, potential flow changes due to the proposed project, relative to the basis of comparison, would be a relatively small proportion of total Sacramento River flows during the March 1, 2007 through March 31, 2008 period and, thus, represent a less-than-significant impact on water supply availability to water customers, including CVP and SWP contractors.

Sacramento-San Joaquin Delta

Although the hydrologic pattern may be slightly altered with the implementation of the proposed project, Delta conditions are anticipated to remain within the normal ranges and fluctuations resulting from SWP and CVP operations, which were previously evaluated in the EWA EIS/EIR (Reclamation *et al.* 2003). The use of the YCWA transfer water for the EWA Program would be consistent with DWR's water right permits. Because the water would be used in the EWA Program, the effect should be to provide a beneficial effect upon SWP and/or CVP contractor water supply conditions in 2007. Because the proposed project would supply water to EWA, water supply would not be affected by pumping reductions by the SWP and CVP because EWA assets are used to repay the SWP and CVP for the loss of supply caused by reduced pumping. The proposed project should provide a more reliable water source, which would benefit all water users, including agricultural, environmental, and urban interests. The

SWP and CVP annual supply would be equal to or greater than it would be without the EWA, therefore ensuring greater reliability.

Flows within the Delta could be slightly higher or lower during the proposed project (Table 4-3), but are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations. Although the specific operational scenario associated with the proposed project is uncertain, the projected changes to Delta conditions, relative to the basis of comparison, represent a less-than-significant impact on water supply availability to SWP and CVP customers.

The proposed project would be used for environmental purposes in the Delta or be conveyed through the pumping plants at Clifton Court Forebay into conveyance channels, and either stored in San Luis Reservoir or transported through the California Aqueduct directly to groundwater storage banks for SWP or CVP contractors. Because DWR and Reclamation are the entities responsible for operating the SWP and CVP systems and, likewise, for determining how best to address system-wide needs as environmental conditions change, YCWA is not a participant in the operational decisions that may occur with respect to how transferred water would be managed once it leaves the Yuba River Basin. However, it is anticipated that conveyance of these EWA assets through the SWP/CVP system and into the Delta would be consistent with the procedures established by Reclamation in its 2004 OCAP, and according to the operating principles established by Reclamation and DWR as part of the EWA Program.

Further, coordination with numerous agencies (YCWA, DWR, Reclamation, USFWS, NMFS, and CDFG) has been initiated and would continue to take place to ensure that water supply impacts would not occur, and that water in the Delta would be pumped within the most environmentally protective "windows" that exist when conveyance capacity is available. DWR could elect to store some portion of acquired transfer water associated with the proposed project in San Luis Reservoir.

San Luis Reservoir

DWR likely will store some portion of water acquired from the proposed project in San Luis Reservoir. Because the water is intended for use in the EWA Program, it is intended to potentially provide a beneficial effect upon state and/or federal water contractor supply conditions in 2007.

As discussed in the EWA EIS/EIR (Reclamation *et al.* 2003) (p. 4-35), "*The EWA agencies aim to assure that there would be no uncompensated water cost to the CVP or SWP relative to the baseline requirements. Furthermore, with the EWA, water supply would not be affected by pump reductions because EWA assets would repay the CVP and SWP for the loss of supply caused by reduced Project pumping. The Projects' annual supply would be equal to or greater than it would be without the EWA, therefore ensuring greater reliability. The amount of annual reductions under the Baseline Condition is difficult to predict because of variability in the system.*" To illustrate, the EWA EIS/EIR also states that a portion of "*the EWA water would be supplied to Metropolitan WD from San Luis Reservoir (to protect water from spilling from San Luis Reservoir) prior to when it would be supplied under the Baseline Condition. Metropolitan WD would store the water for use later in the year. Because Metropolitan WD would be receiving the water earlier than it would under the Baseline Condition, the effect on water supply is beneficial* (Reclamation *et al.* 2003) (p. 4-37)."

Therefore, because changes in San Luis Reservoir would be relatively minor under the proposed project, relative to the basis of comparison, and have been previously evaluated for the entire EWA Program in the EWA EIS/EIR, the potential changes associated with the proposed project would result in a less-than-significant impact on water supply.

4.12 Comparison of the Proposed Project to Long-term Instream Flow Requirements of RD-1644

This section provides a summary of the potential for impacts upon resources identified in the CEQA Environmental Checklist associated with implementation of the proposed project, relative to the RD-1644 long-term instream flow requirements (RD-1644 long-term) from March 1, 2007 through March 31, 2008. Although not required by CEQA, this information nevertheless is provided so that decision-makers will have another comparison of potential conditions that could exist in the project area associated with implementation of the proposed 2007 Pilot Program. This section is intended to supplement the evaluation of potential impacts relative to RD-1644 interim presented in earlier sections of this chapter. Additionally, for the period of the Transfer Petition (March 1, 2007 through December 31, 2007), an analysis of the potential for unreasonable impacts to occur upon fisheries, wildlife, beneficial uses of water and other legal uses of water, pursuant to California Water Code analysis requirements for temporary water transfers, is provided in the Water Code Environmental Analysis (Appendix 2).

4.12.1 Aesthetics – Visual Resources

Changes in aesthetics resulting from the proposed project, relative to RD-1644 long-term, would be most evident in the Yuba River and at New Bullards Bar Reservoir because hydrologic changes in other waterbodies (i.e., Sacramento and Feather rivers, Oroville and San Luis reservoirs and the Delta) within the SWP/CVP system generally would be of much smaller increments, relative to total flow or storage volumes, so that project-related changes would be insignificant. Therefore, the discussion below focuses on those waterbodies (i.e., Yuba River and New Bullards Bar Reservoir) where the most direct visual impacts could be observed.

Yuba River

For the majority of the March 2007 through March 2008 period, implementation of the proposed project is expected to result in Yuba River flows that are equal to or greater than flows anticipated with implementation of RD-1644 long-term. In general, flows in the Yuba River under the proposed project would remain within normal operational ranges. However, proposed project flows may be lower than RD-1644 long-term flows during March, May, December, and January, when flows in the river are generally high. Nevertheless, reductions in Yuba River flows under the proposed project, relative to RD-1644 long-term, are not expected to be of sufficient magnitude or duration to result in a significant impact to the visual character of the Yuba River because these reductions are expected to occur during months when flows are seasonally high. Therefore, the proposed project is expected to result in a less-than-significant impact on the aesthetics of the Yuba River.

New Bullards Bar Reservoir

During March 2007, average end of month reservoir storage under the proposed project is expected to be 739,234 acre-feet (i.e. water surface elevation = 1,899 feet msl), compared to 744,049 acre-feet (i.e. water surface elevation = 1,900 feet msl) under RD-1644 long-term.

Depending on hydrological conditions, average end of September 2007 storage in New Bullards Bar Reservoir under the proposed project is expected to be approximately 594,865 acre-feet (i.e. water surface elevation 1,868 feet msl), and reservoir storage under RD-1644 long-term is expected to be approximately 655,432 acre-feet (i.e. water surface elevation = 1,882 feet msl). In March 2008, average end of month reservoir storage under the proposed project is expected to be approximately 725,329 acre-feet (i.e. water surface elevation of 1,896 feet msl), compared to 739,269 acre-feet (i.e. water surface elevation = 1,899 feet msl) under RD-1644 long-term. Although lower water surface elevations are anticipated with the proposed project, relative to RD-1644 long-term, these lower elevations would not be expected to be substantial enough to change the character of the landscape and would not be anticipated to detract from the scenic attractiveness of the area. While the visual impact is expected to minimally affect Class A or B scenic features of New Bullards Bar Reservoir, the proposed project is expected to result in a less-than-significant impact to New Bullards Bar Reservoir aesthetics.

Other Waterbodies

Because the proposed project was included in the EWA visual resources analysis, and would be less than that which was identified for the previously evaluated EWA Program, any potential changes in visual aspects of the landscape character under the proposed project would be expected to be less than those identified for the entire EWA Program. Any minimal reductions in flow, and the temporary nature of these decreases, that may result from the proposed project would not change the character of the landscape or detract from the overall scenic attractiveness of these waterbodies, relative to conditions expected to occur under RD-1644 long-term (see **Table 4-9, Table 4-10, and Table 4-11** for a comparison of the average difference in simulated monthly mean Yuba River flows [at Marysville] between the proposed project and the basis of comparison [RD-1644 long-term] to the total volume of average: Feather River flows [at Gridley], Sacramento River flows [at Freeport], and Delta inflows, respectively). Potential hydrologic (e.g., flow and reservoir water surface elevation) changes due to the proposed project, relative to RD-1644 long-term, would be a relatively minor during the March 2007 through March 2008 period and, thus, represent a less-than-significant impact to the aesthetics of the Sacramento and Feather rivers, New Bullards Bar and San Luis reservoirs, and the Delta.

4.12.2 Air Quality

The groundwater substitution component of the proposed project (i.e., 30,000 acre-feet of groundwater pumping in Schedule 6 years) has the potential to result in air quality impacts related to the generation of criteria pollutants from fossil-fueled pumps. The EWA EIS/EIR (Reclamation *et al.* 2003) presents a detailed analysis of potential air quality impacts associated with groundwater substitution practices, and includes mitigation measures to ensure avoidance of significant air quality impacts.

The proposed project would be conducted in compliance with the mitigation requirements included in the Record of Decision for the EWA EIS/EIR. The basic elements of the air quality mitigation plan are described in Section 4.2.2.2 of this chapter. For purposes of the 2007 Pilot Program, YCWA and the Member Units would follow the mitigation plan when transferring water to the EWA Program, which only would occur during the March 2007 through December 2007 period (Appendix 2).

Table 4-9. Average Difference in Simulated Monthly Mean Flows for the Lower Yuba River (Marysville) Between the Proposed Project and the Basis of Comparison (RD-1644 long-term), Compared to the Total Volume of Average Feather River Flows (Gridley) During the March 2007 through March 2008 Period.

	Mar 2007	Apr 2007	May 2007	Jun 2007	Jul 2007	Aug 2007	Sep 2007	Oct 2007	Nov 2007	Dec 2007	Jan 2008	Feb 2008	Mar 2008
Average Difference in Monthly Mean Flows (cfs)	-149*	342	-192*	262	35	281	165	100	-89*	-300*	-285*	9	-196*
**Feather River Average Monthly Flow (cfs)	7,736	4,418	4,068	4,003	5,301	4,293	3,060	2,365	1,978	4,936	5,712	6,931	7,736
Percent of Feather River Flows (cfs)	1.9	8.0	4.7	6.5	0.7	6.5	5.4	4.2	4.5	6.1	5.0	0.1	2.5

*Average monthly flow less than RD-1644 long-term
**Source: CDEC, period of record 1993 through 2005

Table 4-10. Average Difference in Simulated Monthly Mean Flows for the Lower Yuba River (Marysville) Between the Proposed Project and the Basis of Comparison (RD-1644 long-term), Compared to the Total Volume of Average Sacramento River Flows (Freeport) During the March 2007 through March 2008 Period.

	Mar 2007	Apr 2007	May 2007	Jun 2007	Jul 2007	Aug 2007	Sep 2007	Oct 2007	Nov 2007	Dec 2007	Jan 2008	Feb 2008	Mar 2008
Average Difference in Monthly Mean Flows (cfs)	-149*	342	-192*	262	35	281	165	100	-89*	-300*	-285*	9	-196*
**Sacramento River Average Monthly Flow (cfs)	37,680	28,897	24,686	18,405	15,010	14,387	14,809	12,353	26,089	26,482	35,280	40,619	37,680
Percent of Sacramento River Flows	0.4	1.2	0.8	1.4	0.2	2.0	1.1	0.8	0.3	1.1	0.8	<0.1	0.5

*Average monthly flow less than RD-1644 long-term
**Source: CDEC, period of record 1948 through 2005

Table 4-11. Average Difference in Delta Inflow (cfs) Relative to Average Difference in Simulated Monthly Mean Flows (cfs) for the Lower Yuba River (Marysville) Between the Proposed Project and the Basis of Comparison (RD-1644 Long-term) During the March 2007 Through December 2007 Period

	Mar 2007	Apr 2007	May 2007	Jun 2007	Jul 2007	Aug 2007	Sep 2007	Oct 2007	Nov 2007	Dec 2007
1998-2006 Sacramento River Average Monthly Flow[1]	44,138	32,123	28,526	23,459	20,632	18,406	16,347	12,050	13,513	25,697
1998-2006 Delta Inflow Average Monthly Flow[2]	69,588	52,717	40,826	32,466	26,136	21,944	19,178	15,157	16,423	30,476
Sacramento River Flow Percent of Delta Inflow	63.43%	60.93%	69.87%	72.26%	78.94%	83.88%	85.24%	79.50%	82.28%	84.32%
1948-2005 Sacramento River Average Monthly Flow[3]	37,680	28,897	24,686	18,405	15,010	14,387	14,809	12,353	26,089	26,482
Estimated 1948-2005 Delta Inflow Average Monthly Flow	59,406	47,423	35,330	25,472	19,014	17,153	17,373	15,538	31,706	31,407
Average Difference in Monthly Mean Flows	-149	342	-192	262	35	281	165	100	-89	-300
Average Difference Percent of Delta Inflow	-0.25%	0.72%	-0.54%	1.03%	0.18%	1.64%	0.95%	0.64%	-0.28%	-0.96%

[1] Source: (Reclamation Website 2006) (Table of Average Monthly Flows at Freeport)

[2] Source: (Reclamation Website 2006) (Table of Average Monthly Delta Inflows)

[3] Source: CDEC, Period of Record 1948 through 2005

[4] Differences in simulated mean monthly flows between the proposed project and RD-1644 long-term include both uncontrolled flow releases during flood control operations during wetter water years, and controlled flow releases during drier water years to meet minimum flow requirements on the lower Yuba River. Therefore, reductions in monthly mean flows presented in the table above represent simulated changes that are expected to occur between the proposed project and RD-1644 long-term flows only; these modeled reductions would not result in flow reductions under the proposed project that would cause actual flows to fall below RD-1644 interim minimum instream flow requirements.

4.12.3 Biological Resources – Fisheries and Aquatic Resources

In addition to the analysis of potential impacts on fisheries and aquatic resources resulting from the proposed project, relative to RD-1644 interim, which is discussed in Section 4.3, potential impacts of the proposed project also were analyzed relative to RD-1644 long-term. The following provides a brief summary of potential impacts of the proposed project, relative to RD-1644 long-term. A complete discussion of potential fisheries and aquatic resources impacts associated with the proposed 2007 Pilot Program water transfer, relative to RD-1644 long-term, is presented in Section 4.2 of Appendix 2.

Yuba River

Spring-run Chinook Salmon

The adult immigration and holding life stage primarily extends from March through October, with most Chinook salmon that exhibit spring-run phenotypic immigration timing moving past Daguerre Point Dam during June. Flows in the lower Yuba River throughout the upstream migration period generally remain within ranges sufficient to allow adequate passage of adult spring-run Chinook salmon through the Daguerre Point Dam fish ladders (Daguerre Point Dam fish ladders are not effectively operational at flows above 10,000 cfs). During June, when most early immigrating (i.e., spring-run) Chinook salmon are observed, the proposed project provides equivalent, or substantially higher flows than the basis of comparison over 80 to 85 percent of the exceedance distribution, at both the Smartville and Marysville gages. After passing Daguerre Point Dam, the fish reportedly continue their upstream migration to spend the summer in deep pools in the Narrows Reach below Englebright Dam where they hold until spawning commences in September (SWRCB 2003).

The presence of adult spring-run Chinook salmon below Daguerre Point Dam, during their immigration until holding in the Narrows Reach, is transitory. Water temperatures below Daguerre Point Dam under both the proposed project and the basis of comparison are not expected to substantially affect the upstream migration of spring-run Chinook salmon. Flows and water temperatures under both the proposed project and the basis of comparison are expected to provide essentially equivalent holding habitat conditions in the Narrows Reach from March through October.

Spring-run Chinook salmon spawning reportedly occurs above Daguerre Point Dam from September through November. During September, the proposed project is expected to provide higher flows (generally up to about 200 cfs) than the basis of comparison, which results in an overall average less amount of spawning habitat (87 versus 90 percent of maximum WUA) due to the nature of the spawning habitat–discharge relationship. However, the proposed project provides more spawning habitat during "drier" conditions (i.e., the lowest 40 percent of the cumulative flow distribution). Moreover, higher amounts of spring-run Chinook salmon spawning habitat are expected to be provided by the proposed project than by the basis of comparison (overall average of 91 percent versus 90 percent of maximum WUA) from September through November. Water temperatures above Daguerre Point Dam are cool and nearly identical during September and October under the proposed project and the basis of comparison.

The juvenile rearing life stage of spring-run Chinook salmon is believed to extend year-round. Specific habitat-discharge relationships for juvenile rearing salmonids have not been developed for the lower Yuba River. Available information indicates that physical habitat for this life stage is not limiting under the flow regimes anticipated for either operational scenario. Elevated water temperatures from spring through fall are considered to be the primary stressor to juvenile rearing spring-run Chinook salmon in the lower Yuba River.

Under the proposed project, water temperatures in the lower Yuba River during the juvenile spring-run Chinook salmon over-summer rearing period are anticipated to be substantially lower, and therefore more suitable, than those under the basis of comparison. During the simulated warmest 30 percent of conditions that could occur during late summer and fall, water temperatures at Marysville under the proposed project would be up to 1.5°F lower than those under the basis of comparison below Daguerre Point Dam.

The smolt emigration life stage of spring-run Chinook salmon extends from November through June in the lower Yuba River. Under the proposed project (relative to the basis of comparison), flows are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, January and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (4) lower at low and intermediate levels, and equivalent at high flow levels during May; and (5) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June.

During the month of June portion of the smolt emigration life stage, water temperatures at Marysville under the proposed project are expected to be up to 1.5°F higher than the basis of comparison for the warmest 25 percent of the distribution, when water temperatures equal or exceed 60°F under both alternatives; water temperatures are lower at intermediate (59°F - 60°F) conditions.

Based on the findings of YCWA's recent monitoring studies, and the flow and water temperature analyses conducted for this impact analysis, it is concluded that, relative to the basis of comparison, the proposed project is expected to provide:

- Similar rates of non-indigenous adult Chinook salmon straying;
- Similar adult upstream migration and holding conditions;
- Higher spawning habitat availability during drier flow conditions, and lower spawning habitat availability during wetter conditions in September; higher spawning habitat availability from September through November; and nearly identical spawning water temperatures;
- Substantially lower (up to 1.5°F) and therefore more suitable water temperatures during the juvenile spring-run Chinook salmon over-summer rearing period below Daguerre Point Dam;
- Similar protection against juvenile non-volitional downstream movement; and
- Generally equivalent smolt outmigration conditions.

In conclusion, the proposed project is expected to result in less-than-significant impacts to the lower Yuba River spring-run Chinook salmon population, and is expected to provide an equivalent or higher level of protection, relative to the basis of comparison (RD-1644 long-term).

Fall-run Chinook Salmon

The adult immigration and holding life stage generally extends from August through November, which encompasses the time fall-run Chinook salmon enter the lower Yuba River to the time spawning site selection begins. The majority of fall-run Chinook salmon reportedly enter the lower Yuba River during October and November. Based upon simulated flow analysis, the proposed project flows at the Marysville Gage during August, September, October, and November would be higher most of the time, relative to the basis of comparison. Increased flows would increase the mean width and depth of the river channel, thus potentially increasing the total area of holding habitats, which could decrease the overall holding fish density. Potential increases in flows, under the proposed project, could also be beneficial in facilitating the migration of adult fall-run Chinook salmon to holding habitats in upstream areas. Associated decreases in water temperature (up to 1.5°F) below Daguerre Point Dam could decrease the potential spread of infectious parasitic diseases and, thus, increase the general fitness level of adult fall-run Chinook salmon present in the lower Yuba River during late summer and early fall.

Fall-run Chinook salmon spawning generally extends from October through December. The proposed project is expected to provide higher flows under drier flow conditions than the basis of comparison. Consequently, the proposed project provides more (generally 10 to 20 percent) spawning habitat when spawning habitat is least available, which occurs with about a 60 percent probability. Water temperatures below Daguerre Point Dam during the early part of the spawning and embryo incubation season (i.e., October) could be up to 1°F cooler than under the basis of comparison, and therefore more suitable for spawning and embryo incubation.

The juvenile rearing and outmigration life stage of fall-run Chinook salmon generally extends from December through June in the lower Yuba River. Under the proposed project (relative to the basis of comparison), flows are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during December, January and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (4) lower at low and intermediate levels, and equivalent at high flow levels during May; and (5) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June.

During the month of June portion of the juvenile rearing and outmigration life stage, water temperatures at Marysville under the proposed project are expected to be up to 1.5°F higher than the basis of comparison for the warmest 25 percent of the distribution, when water temperatures equal or exceed 60°F under both alternatives; water temperatures are lower at intermediate (59°F-60°F) conditions.

Based on the findings of YCWA's recent monitoring studies, and the flow and water temperature analyses conducted for this impact analysis, it is concluded that relative to the basis of comparison, the proposed project is expected to provide:

- Substantially higher flows (up to 250 cfs) and lower water temperatures (up to 1.5°F) below Daguerre Point Dam during the late-summer and fall period of the adult immigration and holding life stage;
- Similar rates of non-indigenous salmonid straying;
- More spawning habitat overall, and more spawning habitat (generally 10 to 20 percent) when spawning habitat is least available, which occurs with about a 60 percent probability;
- Lower (up to 1°F) and therefore more suitable water temperature during the early part (i.e., October) of the spawning and embryo incubation season;
- Similar protection against juvenile non-volitional downstream movement; and
- Generally equivalent juvenile rearing and outmigration conditions.

In conclusion, the proposed project is expected to result in less-than-significant impacts to the lower Yuba River fall-run Chinook salmon population, and is expected to provide an equivalent or higher level of protection relative to the basis of comparison (RD-1644 long-term).

Steelhead

The analytical period for the steelhead adult immigration and holding life stage in the lower Yuba River extends from August through March. Based on the simulated flow analysis, there is about a 90 percent or higher probability that flows under the proposed project would be higher than they would be under the basis of comparison from August through October, and about a 70 percent probability of higher flows in November. Potential increases in flow under the proposed project could increase the quantity of usable adult steelhead holding habitat due to increases in water depth, and increases in the longitudinal cross sectional area of the river channel that would occur from increases in river stage elevations. Also, lower water temperatures at Marysville would increase the suitability of migratory corridor and adult holding habitat. Under the proposed project (relative to the basis of comparison), flows are expected to be: (1) generally higher over the range of expected flows during August, September and October; (2) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, January, and March; and (3) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February.

The steelhead spawning period generally extends from January through April, upstream of Daguerre Point Dam. The March through April 2007 steelhead spawning habitat availability under the proposed project was lower than under the basis of comparison (RD-1644 long-term) for approximately 40 percent of the cumulative WUA distribution. The average proposed project WUA was 38 percent of maximum WUA, whereas the basis of comparison average was 42 percent of maximum WUA. Over 90 percent of the maximum WUA occurred for about 10 percent of the cumulative WUA distribution under the proposed project, and about 18 percent of the cumulative WUA distribution under the basis of comparison.

The January through March 2008 steelhead spawning habitat availability under the proposed project was higher than under the basis of comparison (RD-1644 long-term) for approximately 60 percent of the cumulative WUA distribution, and essentially the same for the remainder of the distribution. The average proposed project WUA was 43 percent of maximum WUA, whereas the basis of comparison average was about 38 percent of maximum WUA. The proposed project WUA was over 90 percent of the maximum WUA for about 17 percent of the cumulative WUA distribution, while the basis of comparison WUA was over 90 percent of the maximum WUA for only about 7 percent of the distribution.

Water temperatures above Daguerre Point Dam during the May portion of the embryo incubation period (January through May) are cool (< 56°F) and similar under both the proposed project and the basis of comparison.

The juvenile rearing life stage of steelhead occurs year-round in the lower Yuba River. Specific habitat-discharge relationships for juvenile rearing salmonids have not been developed for the lower Yuba River. Available information indicates that physical habitat for this life stage is not limiting under the flow regimes anticipated for either operational scenario. By contrast, water temperatures from spring through fall are considered to be the primary stressor to juvenile rearing steelhead in the lower Yuba River.

Water temperatures in the lower Yuba River below Daguerre Point Dam during the juvenile steelhead over-summer rearing period are anticipated to be substantially lower and, therefore, more suitable, than those with the basis of comparison. During the simulated warmest 30 percent of conditions that could occur during late summer and fall, water temperatures under the proposed project are expected to be up to 1.5°F lower than those under the basis of comparison.

Steelhead young-of-the-year (YOY) downstream movement is believed to occur from May through September, and yearling or older individuals (smolts) are believed to emigrate from October through May. For the steelhead YOY downstream movement period (May through September), under the proposed project(relative to the basis of comparison) flows are expected to be: (1) lower at low and intermediate levels, and equivalent at high flow levels during May; (2) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June; (3) higher at low flow levels, lower at intermediate levels, and higher at high flow levels during July; and (4) generally higher over the range of expected flow levels during August and September.

It is unclear whether the flow patterns from May through September would influence the downstream movement of YOY steelhead under the proposed project, relative to the basis of comparison. The downstream movement of juvenile anadromous salmonids is stimulated by both physiological and environmental cues. Physical cues, such as rapid increases in flows, may be more closely associated with the downstream movement of juvenile salmonids, rather than sustained flow conditions. Nonetheless, for those YOY steelhead that do move downstream, water temperatures below Daguerre Point Dam during summer and early fall are expected to be substantially lower, and therefore more suitable, under the proposed project relative to the basis of comparison.

For the smolt emigration period (October through May) under the proposed project (relative to the basis of comparison) flows are expected to be: (1) generally higher over the range of expected flow levels during October; (2) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, January and March; (3) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (4) higher at low and intermediate flow levels, and equivalent at high flow levels during April; and (5) lower at low and intermediate levels, and equivalent at high flow levels during May.

During the October month of the smolt emigration life stage, water temperatures at Marysville under the proposed project are expected to be lower (up to 1°F), and therefore more suitable, for the smolt emigration life stage.

Based on the findings of YCWA's recent monitoring studies, and the flow and water temperature analyses conducted for this EA, it is concluded that relative to the basis of comparison, the proposed project is expected to provide:

- Substantially lower (up to 1.5°F) and therefore more suitable water temperatures below Daguerre Point Dam during the late summer and early fall portion of the adult immigration and holding period;
- Generally equivalent or enhanced flow and water temperature conditions during the spawning and embryo incubation life stage;
- Substantially lower (up to 1.5°F) and therefore more suitable water temperatures below Daguerre Point Dam during the juvenile steelhead over-summer rearing period;
- Substantially lower (up to 1.5°F) and therefore more suitable water temperatures below Daguerre Point Dam during the late summer and early fall portion of the juvenile downstream movement life stage; generally equivalent flow and water temperature conditions during the smolt emigration life stage; and
- Similar protection against juvenile non-volitional downstream movement.

In conclusion, the proposed project is expected to result in less-than-significant impacts to the lower Yuba River steelhead population, and is expected to provide an equivalent or higher level of protection relative to the basis of comparison (RD-1644 long-term).

Green Sturgeon

Flows during green sturgeon immigration and holding (February through July) and adult spawning and embryo incubation (March through July) are expected to allow adequate upstream migration and spawning habitat availability, under the proposed project, relative to the basis of comparison. Water temperatures under the proposed project during May through July below Daguerre Point Dam could range from 54°F to 63.5°F. These water temperatures are within the range of water temperatures reported to be suitable for green sturgeon immigration and holding, and spawning and embryo incubation.

Green sturgeon juvenile rearing is reported to occur year-round in their natal stream habitats. Average monthly flows under the proposed project are expected to be generally higher during most months of the year during low flow conditions, and therefore would not be expected to be a limiting factor impacting green sturgeon juvenile habitat availability, relative to the basis of comparison.

Average monthly water temperature in the lower Yuba River under the proposed project would not be expected to exceed the water temperatures reported to be optimal for juvenile green sturgeon growth.

Green sturgeon begin their emigration to the Delta from May through September. Flows during this period are expected to allow juvenile emigration under the proposed project and the basis of comparison. During the lowest 30 percent of the cumulative flow distribution, higher flows during the summer and fall months under the proposed project could potentially be more beneficial to green sturgeon juvenile emigration, relative to the basis of comparison.

Thermal requirements for the green sturgeon juvenile emigration life stage have not been reported; therefore, it is assumed for the purpose of this analysis, that water temperature suitabilities reported for the juvenile rearing life stage also are appropriate for juvenile emigration. Water temperatures under the proposed project would be within the range reported to be suitable for juvenile green sturgeon.

Based on the flow and temperature analyses conducted for this impact analysis, it is concluded that relative to the basis of comparison, the proposed project is expected to provide:

- Similar or better flows and water temperatures during the adult immigration and holding and spawning and embryo incubation life stages;
- Substantially lower water temperatures during over-summer juvenile rearing periods; and
- Similar flows and substantially lower water temperatures during juvenile emigration.

In conclusion, the proposed project is expected to result in less-than-significant impacts to green sturgeon in the lower Yuba River, and is expected to provide an equivalent or higher level of protection, relative to the basis of comparison (RD-1644 long-term).

American Shad

The proportion of lower Yuba River outflow to the lower Feather River flow would be 8 percent higher under the proposed project during the month of April, 5 percent lower during May, and 7 percent higher during the month of June, relative to the basis of comparison (**Table 4-12**). American shad adult immigration and spawning would not be expected to be significantly affected by changes in flows under the proposed project. Flows under the proposed project during April, May, and June are expected to provide flows of sufficient magnitude to attract American shad into the lower Yuba River to spawn. Therefore, the proposed project would be expected to result in less-than-significant impacts to American shad immigration and spawning in the lower Yuba River, relative to the basis of comparison (RD-1644 long-term).

Striped Bass

Striped bass spawning and initial rearing in the lower Yuba River extends from April through June. Flows under the proposed project during April, May and June simulated at Marysville are expected to provide flows of sufficient magnitude to attract striped bass into the lower Yuba River to spawn (see American shad discussion, above). Water temperatures lower than the range reported for spawning (59°F to 68°F) are expected to occur with about a 15 percent higher probability under the proposed project, relative to the basis of comparison. Water temperatures reported to be suitable for rearing (61°F to 73°F) are expected to occur with the same probability under the proposed project, relative to the basis of comparison. The proposed project would be expected to result in less-than-significant impacts to striped bass spawning and initial rearing in the lower Yuba River, relative to the basis of comparison.

Table 4-12. Difference in Proportional Simulated Mean Monthly Flows for Lower Yuba River (Marysville), Relative to the Lower Feather River (Gridley), Between the Proposed Project and RD-1644 Long-term During April through June 2007.

	Apr	May	Jun
Feather River Mean Monthly Flow (cfs)[1]	4,418	4,069	4,003
Yuba River Mean Monthly Flow (cfs) with Proposed Project[2]	2,582	2,883	2,329
Yuba River Mean Monthly Flow (cfs) with RD-1644 Long-term[2]	2,240	3,075	2,066
Difference in Proportional Flow (%)	8	-5	7

[1]Source: CDEC, period of record 1993 through 2005
[2]Simulated at Marysville

New Bullards Bar Reservoir

New Bullards Bar Reservoir Coldwater Fisheries

The proposed project could reduce New Bullards Bar Reservoir storage from 739,234 acre-feet in March 2007 to 594,865 acre-feet by the end of September 2007, depending on hydrological conditions. This reduction corresponds to a change in water surface elevation from approximately 1,899 feet msl to 1,868 feet msl. Under the basis of comparison, the end of September storage in New Bullards Bar Reservoir could be 655,432 acre-feet with a corresponding elevation of 1,882 feet msl.

Potential reductions in coldwater pool storage are not expected to adversely affect New Bullard Bar Reservoir's coldwater fisheries because: (1) coldwater habitat would remain available in the reservoir during all months of the proposed project; (2) physical habitat availability is not believed to be among the primary factors limiting coldwater reservoir fish populations; and (3) anticipated seasonal reductions in storage would not be expected to adversely affect the primary prey species utilized by coldwater fish. Therefore, changes in New Bullards Bar Reservoir storage under the proposed project are expected to result in less-than-significant impacts to coldwater fisheries resources, relative to RD-1644 long-term.

New Bullards Bar Reservoir Warmwater Fisheries

Decreases in the water surface elevation of New Bullards Bar Reservoir by more than 6 feet per month from March through June are 6 percent more likely to occur under the proposed project, relative to RD-1644 long-term. However, reductions in end-of-month water surface elevation in New Bullards Bar Reservoir under the proposed project would not be anticipated to result in substantial reductions in warmwater fish spawning success, because these potential decreases in water surface elevation are not expected to occur during more than two months of any given spawning season. Therefore, potential reductions in water surface elevation under the proposed project are expected to result in less-than-significant impacts on New Bullards Bar Reservoir warmwater fish.

Feather River

Overall, flows in the Feather River would not be expected to differ substantially under the proposed project, relative to RD-1644 long-term (see Table 4-9). Neither physical habitat availability for fish residing in the Feather River, nor immigration of adult or emigration of juvenile anadromous fish, is expected to be substantially affected by the anticipated differences in flows that could occur under the proposed project, relative to RD-1644 long-term. Any differences in flow between the proposed project and RD-1644 long-term are not expected to result in substantial differences in water temperatures or to persist downstream and, therefore, are expected to result in less-than-significant impacts on Feather River fisheries resources.

Oroville Reservoir

Oroville Reservoir water levels are expected to be affected by the proposed project only if DWR has to release additional flows to meet water quality standards in the Delta as a result of YCWA holding back water to refill New Bullards Bar Reservoir after the completion of the proposed project. The potential drawdown of Oroville Reservoir is expected to be minimal given the large size of Oroville Reservoir, and most likely would occur in the winter or spring. The level of drawdown, if any, is expected to be small and within normal operating conditions for Oroville Reservoir. Consequently, potential impacts to Oroville Reservoir fisheries that may result from implementation of the proposed project are expected to be less than significant.

Sacramento River

Overall, flows in the Sacramento River would not be expected to differ substantially under the proposed project, relative to RD-1644 long-term (Table 4-10). Neither physical habitat availability for fish residing in the Sacramento River nor immigration of adult or emigration of juvenile anadromous fish is expected to be substantially affected by the anticipated differences in flows that could occur under the proposed project, relative to RD-1644 long-term. These relatively small differences in flow between the proposed project and RD-1644 long-term are not expected to result in substantial differences in water temperatures and, therefore, are expected to result in less-than-significant impacts on Sacramento River fish resources.

Sacramento-San Joaquin Delta

Provision of water from the proposed project to the EWA Program would be within permitted and authorized SWP/CVP operational and regulatory requirements (or constraints) for the Delta. Although Delta diversions generally can result in fishery impacts, it is expected that the proposed project may have a slight overall benefit to Delta fisheries through its actions that exceed the regulatory baseline established by existing environmental agreements (e.g., EWA Program).

Regardless of the basis of comparison (i.e., RD-1644 interim or RD-1644 long-term) used in these analyses, the expected amount of water entering the Delta as a result of the proposed project is within the levels evaluated in the EWA EIS/EIR (Reclamation *et al.* 2003). The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 9-284) concluded that, "*implementation of the Flexible Purchase Alternative would result in less-than-significant impacts on fisheries and aquatic resources within the Sacramento-San Joaquin Delta Region.*" Because the proposed project is within the quantity of the asset acquisitions evaluated in the EWA EIS/EIR, potential impacts associated with the conveyance of EWA assets that could occur as a result of changes in the magnitude, timing and duration of Delta conditions have been previously addressed by the analyses conducted for the full 185,000 acre-feet Yuba River Basin asset acquisition presented in the EWA EIS/EIR (Reclamation *et al.* 2003).

As presented in Table 4-11, during the March 2007 through March 2008 period, the proposed project could alter monthly mean Delta inflow between 0.03 percent (February 2008) and 1.6 percent (August 2007), relative to the basis of comparison (RD-1644 long-term). Because these values represent the total change in flow on a month-to-month basis, individual flow reductions that could occur in the Delta due to changes in Sacramento River flow (as one component of total Delta inflow) under the proposed project, relative to the basis of comparison, would be expected to result in less-than-significant impacts to Delta fisheries resources.

Potential changes in Delta conditions and resultant impacts on Delta fisheries resources associated with the proposed project water transfer (i.e., up to 125,000 acre-feet) are anticipated to be within the range of that which was previously evaluated for the EWA Program. The complete description of the analytical relationships between the proposed project and the EWA Program, as applied to fisheries and aquatic resources in the Delta, is presented in Section 4.3 and also in Appendix 2 of this IS.

4.12.4 Biological Resources – Terrestrial Resources (Wildlife and Vegetation)

In addition to the analysis of potential impacts on terrestrial resources resulting from the proposed project, relative to RD-1644 interim, that is discussed above in Section 4.4, potential impacts of the proposed project on terrestrial resources also were analyzed relative to RD-1644 long-term. The following provides a brief summary of potential impacts of the proposed project, relative to RD-1644 long-term, on these resources. A complete discussion of potential terrestrial resources impacts associated with the proposed project, relative to RD-1644 long-term, is presented in Section 4.3 of Appendix 2.

Yuba River

Under the proposed project, flows in the lower Yuba River are expected to remain within normal operational ranges. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to RD-1644 long-term) generally are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during November, December, January and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (4) lower at low and intermediate flow levels, and equivalent at high flow levels during May; (5) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June; (6) higher at low flow levels, lower at low flow levels, and higher at high flow levels during July; and (7) higher over the range of flows expected during August, September and October.

Additionally, average increases in monthly mean Yuba River flow under the proposed project, relative to the basis of comparison, would be expected to be less than those identified in the EWA EIS/EIR (see Section 4.3.3 of Appendix 2 for further discussion). Because the proportion of EWA acquisitions associated with the proposed project (i.e., 62,000 acre-feet to 125,000 acre-feet) is less than that which was previously evaluated by the EWA Program, and the proposed project would be implemented for a period of approximately one year, potential effects on river corridor riparian habitat or other sensitive natural communities and associated species would be expected to be less than those identified for the entire EWA Program. Therefore, flow changes expected under the proposed project, relative to the basis of comparison, are anticipated to result in less-than-significant impacts to Yuba River corridor riparian habitat or other sensitive natural communities and associated species.

New Bullards Bar Reservoir

During March 2007, average end of month reservoir storage under the proposed project is expected to be 739,234 acre-feet (i.e. water surface elevation = 1,899 feet msl), compared to 744,049 acre-feet (i.e. water surface elevation = 1,900 feet msl) under RD-1644 long-term. Depending on hydrological conditions, average end of September 2007 storage in New Bullards Bar Reservoir under the proposed project is expected to be approximately 594,865 acre-feet (i.e. water surface elevation 1,868 feet msl), and reservoir storage under RD-1644 long-term is expected to be approximately 655,432 acre-feet (i.e. water surface elevation = 1,882 feet msl). In March 2008, average end of month reservoir storage under the proposed project is expected to be approximately 725,329 acre-feet (i.e. water surface elevation of 1,896 feet msl), compared to 739,269 acre-feet (i.e. water surface elevation = 1,899 feet msl) under RD-1644 long-term.

The reservoir drawdown associated with the proposed project is expected to be similar to the drawdown anticipated under RD-1644 long-term, and is expected to be within historical and recent operation levels. Changes in reservoir water surface levels associated with the proposed project are not expected to adversely impact aquatic and littoral habitat near New Bullards Bar Reservoir that may be used by the California red-legged frog.

Although New Bullards Bar Reservoir supports a pair of nesting southern bald eagles, the proposed project is not expected to significantly impact bald eagles. The reductions in reservoir levels resulting from the proposed project are not expected to be large enough to either substantially affect prey fish populations or substantially increase the distance from the nest to the reservoir surface. The anticipated changes in reservoir levels associated with the proposed project are not expected to significantly impact the foraging success of bald eagles inhabiting New Bullards Bar Reservoir.

Additionally, although water surface elevation reductions are anticipated with the proposed project, these decreases are not expected to significantly impact the vegetation and wildlife at New Bullards Bar Reservoir. The anticipated lower water surface elevations at New Bullards Bar Reservoir are not expected to significantly impact any moderate to high value vegetation or wildlife habitat.

Surface Streams and Wetlands

In the past, CDFG has expressed concern regarding the potential impacts of the groundwater substitution component of YCWA water transfers to surface streams and wetlands due to surface-groundwater interactions. This topic is addressed in Section 4.1.3 of Appendix 2.

Feather River

Flows within the Feather River may be higher under the proposed project than under RD-1644 long-term during most hydrologic conditions (Table 4-9), but are anticipated to remain within the range of normal instream flows and flow fluctuations resulting from Oroville Reservoir releases. Specific operations of the Feather River system as a result of the proposed project are presently uncertain. However, the potential slight change in flows is not expected to significantly impact the vegetation and wildlife communities along the Feather River, relative to RD-1644 long-term.

Oroville Reservoir

Oroville Reservoir surface water levels are not anticipated to significantly change with implementation of the proposed project, relative to RD-1644 long-term, and, therefore, are not expected to result in significant impacts on the wildlife or vegetation at Oroville Reservoir. The operation of Oroville Reservoir is expected to remain within normal operational parameters.

Sacramento River

Flows within the lower Sacramento River may change under the proposed project relative to RD-1644 long-term during the proposed project (Table 4-10), but are anticipated to remain within the normal flow ranges and fluctuations resulting from SWP and CVP operations. Specific operations of the Sacramento River system as a result of the proposed project are uncertain at this time. However, the potential change in flows is not expected to significantly impact the vegetation and wildlife communities along the lower Sacramento River, relative to RD-1644 long-term.

Sacramento-San Joaquin Delta

Inflows to the Delta may be slightly higher or lower under the proposed project (Table 4-11), but are expected to remain within the range of normal flow ranges and fluctuations resulting from SWP and CVP operations, which were previously evaluated in the EWA Draft EIS/EIR (Reclamation *et al.* 2003). Specific operations of the Delta system as a result of the proposed project are presently uncertain, but would remain within authorized operational constraints. Therefore, the potential changes to Delta inflows are not expected to significantly impact the vegetation and wildlife communities within the Delta, relative to RD-1644 long-term.

San Luis Reservoir

DWR is expected to store a portion of the proposed project transfer water in San Luis Reservoir. The specific manner in which DWR will operate San Luis Reservoir is unknown, however, if proposed project transfer water is stored in the reservoir, there is potential for a slight beneficial effect upon near-shore habitat areas through increased water surface level elevations. Drawdown of San Luis Reservoir for the purpose of delivering the proposed project transfer water is expected to occur within normal SWP/CVP operational practices for the reservoir and according to existing regulatory requirements or limitations. Therefore, the proposed project is expected to result in less-than-significant impacts on wildlife or vegetation of San Luis Reservoir.

South of Delta Groundwater Banks – Groundwater Recharge Basins

DWR may store proposed project transfer water in groundwater banks south of the Delta. This operation includes spreading water in recharge basins for recharge and storage into the groundwater banks - temporarily increasing habitat for waterfowl, wading birds, and shorebirds. No additional areas are expected to be flooded or inundated as a result of the proposed project. The proposed project also is not expected to result in development or cultivation of any native untilled land. Overall, less-than-significant impacts on wildlife and vegetation are expected with implementation of the proposed project.

4.12.5 Cultural Resources

Drawdown of water from New Bullards Bar Reservoir for the purposes of providing transfer water to the EWA Program is subject to consideration under Section 106 of the National Historic Preservation Act as discussed in the EWA EIS/EIR (Reclamation *et al.* 2003). During the April 2007 through September 2007 period, which represents the months when New Bullards Bar Reservoir storage and water surface elevations would be anticipated to be the lowest, monthly mean water surface elevations in New Bullards Bar Reservoir would not fall below 1,868 feet msl under the proposed project. Thus, the proposed project is not anticipated to result in water surface elevations in New Bullards Bar Reservoir that would be lower than historic normal operations and, therefore, would not result in creation of a new drawdown zone. Because potential impacts on cultural resources due to potential exposure of formerly unexposed resources beneath the water would be avoided, implementation of the proposed project, relative to RD-1644 long-term, would be expected to result in a less-than-significant impact on cultural resources.

4.12.6 Geology and Soils

Although implementation of the proposed project has the potential to result in higher levels of groundwater pumping, relative to RD-1644 long-term, given the historical trends, the potential for land surface subsidence from groundwater extraction in the North Yuba or South Yuba groundwater subbasins is small. Additionally, YCWA's Groundwater Management Plan includes actions that require coordination between YCWA and DWR to conduct monitoring for potential land surface subsidence (YCWA 2005b). In the event that inelastic subsidence is observed and documented in conjunction with declining groundwater elevations, YCWA would further investigate and identify appropriate actions to avoid adverse impacts. Additionally, groundwater pumping only would occur during a Schedule 6 water year, and the maximum amount of transfer water that could be derived from groundwater would be 30,000 acre-feet. Therefore, due to the small potential for groundwater substitution to occur in association with the proposed project, and the minimal potential for occurrence of subsidence within the groundwater wells during operation of the proposed project and the implementation of the Groundwater Management Plan, the proposed project would be expected to have a less-than-significant impact on geology and soils.

4.12.7 Hydrology and Water Quality

In addition to the analyses of potential impacts on hydrology and water quality resulting from the proposed project, relative to RD-1644 interim, that are discussed above in Sections 4.7 through 4.9, potential impacts of the proposed project also were analyzed relative to RD-1644 long-term. The following provides a brief summary of potential impacts of the proposed project, relative to RD-1644 long-term. A complete discussion of potential hydrology and water quality impacts associated with the proposed project, relative to RD-1644 long-term, is presented in Section 4.1 of Appendix 2.

4.12.7.1 Surface Water Quality

Yuba River

Under the proposed project, flows in the lower Yuba River are expected to remain within normal operational ranges. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to RD-1644 long-term) generally are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during November, December, January and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (4) lower at low and intermediate flow levels, and equivalent at high flow levels during May; (5) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June; (6) higher at low flow levels, lower at low flow levels, and higher at high flow levels during July; and (7) higher over the range of flows expected during August, September and October.

Reductions in Yuba River flows under the proposed project, relative to flows under implementation of RD-1644 long-term, are not expected to be of sufficient magnitude or duration to result in an increase in the concentration of contaminants (refer to Section 4.7.7.2 above, and Section 4.1.2 of Appendix 2 for a full environmental analysis of this resource topic). Flow increases expected to occur under the proposed project, relative to RD-1644 long-term, may provide a beneficial effect to the water quality in the lower Yuba River by increasing the dilution of contaminants. Therefore, less-than-significant impacts on the surface water quality of the Yuba River are expected to result from implementation of the proposed project.

New Bullards Bar Reservoir

During March 2007, average end of month reservoir storage under the proposed project is expected to be 739,234 acre-feet (i.e. water surface elevation = 1,899 feet msl), compared to 744,049 acre-feet (i.e. water surface elevation = 1,900 feet msl) under RD-1644 long-term. Depending on hydrological conditions, average end of September 2007 storage in New Bullards Bar Reservoir under the proposed project is expected to be approximately 594,865 acre-feet (i.e. water surface elevation 1,868 feet msl), and reservoir storage under RD-1644 long-term is expected to be approximately 655,432 acre-feet (i.e. water surface elevation = 1,882 feet msl). In March 2008, average end of month reservoir storage under the proposed project is expected to be approximately 725,329 acre-feet (i.e. water surface elevation of 1,896 feet msl), compared to 739,269 acre-feet (i.e. water surface elevation = 1,899 feet msl) under RD-1644 long-term.

Monthly decreases in reservoir storage under the proposed project, relative to RD-1644 long-term, are not expected to be of substantial magnitude or duration to adversely impact New Bullards Bar Reservoir water quality (please refer to Section 4.7.7.2 above, and to Appendix 2 for a full environmental analysis on this resource topic). YCWA would ensure that sufficient carryover water is available in New Bullards Bar Reservoir in 2008 to meet all contractual, regulatory, and environmental needs. Therefore, less-than-significant impacts on New Bullards Bar Reservoir water quality are anticipated with implementation of the proposed project.

Feather River

The proposed project could result in increased or decreased instream flows in the Feather River, relative to RD-1644 long-term (Table 4-9**)** (refer to Section 4.7.7.2 above and to Appendix 2 for a full environmental analysis of this resource topic). The increases in flows expected under the proposed project, relative to RD-1644 long-term, may provide a beneficial effect to the water quality in the Feather River by increasing the dilution of contaminants. Therefore, less-than-significant impacts on Feather River surface water quality are expected with implementation of the proposed project.

Oroville Reservoir

Oroville Reservoir water levels are not expected to be substantially affected by the proposed project, relative to RD-1644 long-term, and, thus, are expected to result in less-than-significant impacts on Oroville Reservoir water quality.

Sacramento River

The proposed project could result in increased or decreased instream flows in the Sacramento River, relative to RD-1644 long-term (Table 4-10) (refer to Section 4.7.7.2 above and to Appendix 2 for a full environmental analysis of this resource topic). The increases in flows expected under the proposed project, relative to RD-1644 long-term, may provide a beneficial effect to the water quality in the Sacramento River by increasing the dilution of contaminants. Therefore, less-than-significant impacts on Sacramento River surface water quality are expected with implementation of the proposed project.

Sacramento-San Joaquin Delta

DWR is responsible for mitigating its water quality impacts as required under the 1995 Delta Water Quality Control Plan (SWRCB 1995). Some operational changes may have to be made to meet these standards, but DWR's ability to meet these standards will not be compromised under the proposed project, relative to RD-1644 long-term.

If the proposed project is implemented in 2007, then provision of the transfer water would occur through the EWA Program. Under EWA, carriage water is used as a mechanism to maintain Delta water quality standards (Reclamation *et al.* 2003) by increasing Delta outflows to protect Delta water quality by either maintaining or preventing increases in chloride and bromide concentrations within the Delta during periods of increased pumping. Because bromide is primarily present in the Delta as a result of seawater intrusion, the use of carriage water to increase Delta outflow and hold ocean salts at the same point they were before pumping was increased would result in no increase in bromide concentrations. Water quality, including salinity, bromide, and the potential for THM and bromate formation, would not be altered in a way that would result in adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality (Reclamation *et al.* 2003). Therefore, less-than-significant impacts on Delta water quality are expected to occur with implementation of the proposed project.

San Luis Reservoir

To the extent that proposed project transfer water is stored in San Luis Reservoir during summer and fall months when potential concerns related to the low point occur, the transfer of this water potentially could provide a beneficial effect. Although the SWP operations related to the proposed project water transfer are unknown, it is expected that DWR would operate according to prevailing regulatory water quality and environmental protection requirements, and that San Luis Reservoir water elevations would remain within normal operating ranges. Therefore, the proposed project is expected to result in a less-than-significant impact on San Luis Reservoir water quality.

4.12.7.2 Groundwater Resources

Groundwater substitution was used by YCWA and its Member Units to support water transfers in 1991, 2001 and 2002 (MWH 2005). Based on the experience gained from these water transfers, extracted water quantities are to be well within the groundwater aquifer's ability to recharge in a reasonable amount of time (MWH 2005). Further, although groundwater substitution may result in temporary localized declines in groundwater levels, programmatic monitoring and mitigation measures exist to address this potential consideration (MWH 2005).

For the proposed project, the maximum amount of water that would be derived from groundwater substitution is 30,000 acre-feet in Schedule 6 years (according to the 2007 Pilot Program Fisheries Agreement [Appendix A to Appendix 2 of this IS]), which only would occur during the proposed water transfer operations (March 2007 through December 2007). Based on the information presented in the Groundwater Analysis, which is included as Appendix C of the Water Code Environmental Analysis (Appendix 2), the extraction of this amount of water will result in conditions that are within an acceptable range for the groundwater basin. Operation of the 2007 groundwater substitution program and the projected post-transfer basin conditions would not cause significant or unreasonable impacts to the environment (MWH 2005). These expected conditions along with the basin management procedures implemented by YCWA and the Member Units would result in no significant unmitigated third-party impacts to other groundwater users within the Yuba Groundwater Basin. The water transferred during the proposed project would not strain the water supply or affect the overall conditions of the North Yuba or South Yuba subbasins, and would not contribute to, or result in, conditions of overdraft.

YCWA and DWR's coordinated implementation of the Groundwater Program for the Yuba Groundwater Basin will provide protection of Yuba County's groundwater resources. Please refer to Appendix 2 for a more complete discussion of how the proposed project may affect groundwater resources. Overall, less-than-significant impacts on local and south-of-the-Delta groundwater resources are expected with implementation of the proposed project.

4.12.7.3 Flood Control

Yuba River

Over the 83-year simulation period, the highest flow of the cumulative flow distribution for the proposed project at Marysville during any month is 21,342 cfs. The designed Yuba River levee capacity is 135,000 cfs, which is much higher than the expected proposed project flows. Therefore, river flows are expected to be maintained well below the river channel carrying capacity during the proposed project. The proposed project also would not affect levee stability because a substantial flow increase, relative to RD-1644 long-term, is not expected as a result of the proposed project. For most months of the flood control season, flows in the highest 20 percent of the cumulative flow distribution under the proposed project are similar to or slightly lower than flows in this part of the distribution under RD-1644 long-term; during October, November, and April flows in the highest 20 percent of the cumulative flow distribution are slightly higher under the proposed project than under RD-1644 long-term. Because the additional flows under the proposed project are only slightly higher than the flows under RD-1644 long-term, and the flows expected in the river are well below the river channel capacity, the proposed project is anticipated to result in a less-than-significant impact on flood control operations in the Yuba River.

New Bullards Bar Reservoir

Entering the flood season, the New Bullards Bar Reservoir storage under the proposed project is anticipated to be lower than under RD-1644 long-term. During each month of the flood control season, New Bullards Bar Reservoir storage levels under the proposed project are expected to be similar to or less than storage levels under RD-1644 long-term. Lower New Bullards Bar Reservoir storage levels could lessen the number of flood releases or the amount of water needing to be released. The additional space made available in New Bullards Bar Reservoir because of the proposed project, relative to RD-1644 long-term, is expected to have a slight beneficial impact on flood control operations.

Feather River

Under the proposed project, Feather River flows may increase below the confluence of the Yuba River, although they are anticipated to remain within the normal range of flow releases and flow fluctuations that result from normal SWP operations. Additionally, potential increases in flow associated with the proposed project during the October through May flood season generally would be expected to be relatively minor, compared to the total flow in the Feather River. As presented in Table 4-9, the proposed project could alter monthly mean Feather River flows between 0.1 percent (February 2008) and 6.1 percent (December 2007) during the October through May flood season, relative to RD-1644 long-term. Because flows under the proposed project are not expected to substantially increase, relative to RD-1644 long-term, and are considerably less than that which was previously evaluated for the entire EWA Program, the proposed project is not anticipated to exceed Feather River channel capacity (i.e., 210,000 cfs) or impact Feather River levee stability. Therefore, the proposed project, relative to RD-1644 long-term, is expected to have a less-than-significant impact on flood control operations in the Feather River.

Oroville Reservoir

As described in the Hydrologic Analysis (Appendix B to Appendix 2 of this IS), Oroville Reservoir water levels would be affected by the proposed project only if DWR was required to release additional flows to meet water quality standards in the Delta as a result of YCWA refilling New Bullards Bar Reservoir after completion of the proposed project. However, it is unlikely that Delta water quality would be impaired during flood events and, thus, releases would be expected to occur within the required parameters of current Oroville Reservoir flood control operations, rather than in response to Delta water quality standards. Likewise, YCWA would manage operations at New Bullards Bar Reservoir for flood control purposes, and would not secure water for refill purposes until after the peak of the October through May flood season. Therefore, implementation of the proposed project would not be expected to conflict with Oroville Reservoir operations because storage and water surface elevations would be maintained below the dedicated flood control space. Overall, the proposed project, relative to RD-1644 long-term, would have a less-than-significant impact on flood control operations in Oroville Reservoir.

Sacramento River

Under the proposed project, Sacramento River flows may increase below the confluence of the Feather River, although they are anticipated to remain within the normal range of flow releases and flow fluctuations that result from SWP and CVP operations. Additionally, potential increases in flows associated with the proposed project during the flood season generally are expected to be minor, relative to the total volume of flow in the Sacramento River. As presented in Table 4-10, the proposed project could alter monthly mean Sacramento River flows between less than 0.1 percent (February 2008) and 1.2 percent (April 2007) during the October through May flood control period, relative to RD-1644 long-term. Because substantial increases in flows are not expected with implementation of the proposed project, relative to RD-1644 long-term, the proposed project also is not anticipated to impact Sacramento River levee stability. Therefore, the proposed project, relative to RD-1644 long-term, is expected to have a less-than-significant impact on flood control operations in the Sacramento River.

Sacramento-San Joaquin Delta

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 15-17) analysis determined that, "*Because the Delta annually receives higher inflows than would occur with the EWA, and the increases in inflow would not occur during the Delta's highest water stages, December through February, the effect on the Delta would be less than significant*." Similarly, the proposed project would only occur for a period of approximately one-year and would result in relatively minor changes to Delta inflows, compared to the total volume of Delta inflow from the Sacramento River (Table 4-11). Because the proposed project is less than that which was identified for the previously evaluated EWA Program, the proposed project would not be expected to decrease levee stability or significantly impact flood control operations in the Delta.

Therefore, potential changes in Delta conditions under the proposed project, relative to RD-1644 long-term, are expected to be relatively minor and to result in a less-than-significant impact on Delta flood control operations.

4.12.8 Recreation

In addition to the analysis of potential impacts on recreation resources resulting from the proposed project, relative to RD-1644 interim, which is discussed above in Section 4.10, potential impacts of the proposed project also were analyzed relative to RD-1644 long-term. The following provides a brief summary of potential impacts of the proposed project, relative to RD-1644 long-term. A complete discussion of potential impacts to recreation resources associated with the proposed project, relative to RD-1644 long-term, is presented in Section 4.4 of Appendix 2.

Yuba River

Under the proposed project, flows in the lower Yuba River are expected to remain within normal operational ranges. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to RD-1644 long-term) generally are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during November, December, January and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (4) lower at low and intermediate flow levels, and equivalent at high flow levels during May; (5) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June; (6) higher at low flow levels, lower at low flow levels, and higher at high flow levels during July; and (7) higher over the range of flows expected during August, September and October.

Yuba River flows under the proposed project are expected to be higher than flows under RD-1644 long-term during some months. During some water year types, Yuba River flows under the proposed project are expected to be less than flow under RD-1644 long-term, although they are anticipated to remain within the range of normal flow levels and flow fluctuations. Any impacts on river recreation activities are expected to be minimal, and possibly beneficial. The increased flows could benefit rafting, other boating opportunities, and angling opportunities. In addition, the slight increase in flows is not expected to adversely impact recreational opportunities by changing water temperatures in the Yuba River. During the recreation use season, the water temperatures simulated at Daguerre Point Dam under the proposed project and RD-1644 long-term are similar (always within 0.1°F of each other) and water temperatures simulated at Marysville did not increase or decrease by more than 2.5°F under the proposed project, relative to RD-1644 long-term. Therefore, the water temperature changes associated with the proposed project are not expected to be of sufficient magnitude to reduce the recreational opportunities on the Yuba River. Therefore, less-than-significant impacts on recreation resources are expected to occur as a result of the proposed project.

New Bullards Bar Reservoir

Cottage Creek boat ramp is unusable when the reservoir water surface level is below 1,822 feet above msl, and Dark Day boat ramp is unusable when the reservoir water surface level is below 1,798 feet above msl. Emerald Cove Marina is operable at all reservoir levels. During the recreation use season there would be an additional 0.2 percent probability under the proposed project that surface water elevations would decrease below the 1,798 feet msl threshold over the 83-year simulation period. During the recreation use season there would be an additional 1.0 percent probability under the proposed project that surface water elevations would decrease below the 1,822 feet msl threshold. Decreases in reservoir water surface elevations below the boat ramp levels with implementation of the proposed project are most likely to occur at the end of the recreation season, and during dry or critical water year types. Based on the low probability of occurrence and the timing of the occurrence, the proposed project is expected to result in less-than-significant impacts on boat ramp use at New Bullards Bar Reservoir. Lower reservoir water surface levels would generally affect boat ramps prior to affecting other recreational activities (e.g., swimming or fishing). If boat ramps remain usable, it is assumed that there are sufficient water levels in the reservoir to sustain all other recreational activities.

Therefore, less-than-significant impacts on recreational opportunities at New Bullards Bar Reservoir are expected under the proposed project.

Feather River

Flows in the Feather River potentially would be higher under the proposed project, relative to RD-1644 long-term (Table 4-9). Increased flows potentially would improve recreational opportunities during most months and flow schedules. Overall, the range of flows in the Feather River anticipated under the proposed project would be within normal operating ranges and, therefore, would not be expected to result in significant impacts on recreational opportunities on the Feather River. Additionally, the slight increase in flows is not expected to significantly impact water temperatures in the Feather River and, therefore, also is not expected to reduce the recreational opportunities on the Feather River.

Oroville Reservoir

Water levels in Oroville Reservoir during the primary recreation season (May through September) are expected to remain within normal operational parameters under the proposed project, relative to RD-1644 long-term. Therefore, the proposed project is expected to result in less-than-significant impacts on recreational opportunities at Oroville Reservoir.

Sacramento River

Flows within the lower Sacramento River may be higher or lower during the proposed project, relative to RD-1644 long-term (Table 4-10), although they are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations. Although specific operations of the Sacramento River system as a result of the proposed project are uncertain, the potential changes in flow are not expected to significantly impact recreation resources, relative to RD-1644 long-term, and may be slightly beneficial. Also, the slight flow increase is not expected to significantly impact water temperatures in the Sacramento River and, therefore, is not expected to reduce the recreational opportunities on the Sacramento River.

Sacramento-San Joaquin Delta

Flows within the Delta could be slightly higher or lower during the proposed project (Table 4-11), although they are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations, which were previously evaluated in the EWA Draft EIS/EIR (Reclamation *et al.* 2003). Although specific operations of the Delta system are uncertain as a result of the proposed project, the potential slight increases in flow are not expected to significantly impact recreation resources, relative to RD-1644 long-term.

San Luis Reservoir

DWR potentially would store some portion of the proposed project transfer water in San Luis Reservoir. Increased storage levels at San Luis Reservoir therefore could be anticipated during primary recreation season (May through September) and may provide a beneficial effect on recreational opportunities at the reservoir. The proposed project would not be anticipated to lower reservoir water surface elevations affecting boat ramp accessibility. Therefore, the proposed project is expected to result in less-than-significant impacts on recreation activities at San Luis Reservoir.

Groundwater Recharge Basins

The groundwater recharge basins located south of the Delta provide habitat for waterfowl and water birds and provide recreational opportunities for bird watching. The potential increase in water stored in south-of-Delta groundwater banks possibly could increase habitat for waterfowl and water birds at the recharge basins and, therefore, is expected to result in less-than-significant impacts on bird watching opportunities at the groundwater recharge basins.

4.12.9 Utilities and Service Systems – Water Supply Availability

In addition to the analysis of potential impacts on utilities and service systems resulting from the proposed project, relative to RD-1644 interim, which is discussed above in Section 4.11, potential impacts of the proposed project also were analyzed relative to RD-1644 long-term. The following provides a brief summary of potential impacts of the proposed project, relative to RD-1644 long-term. A complete discussion of potential utilities and service system impacts associated with the proposed project, relative to RD-1644 long-term, is presented in Section 4.1.1 of Appendix 2.

Yuba River

The proposed project is expected to result in a change in the hydrologic pattern of the Yuba River below New Bullards Bar Reservoir, although flows within the lower Yuba River are expected to remain within normal operational ranges. Under the proposed project, flows in the lower Yuba River are expected to remain within normal operational ranges. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to RD-1644 long-term) generally are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during November, December, January and March; (2) equivalent at low flow levels, higher at intermediate levels, and equivalent at high flow levels during February; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (4) lower at low and intermediate flow levels, and equivalent at high flow levels during May; (5) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June; (6) higher at low flow levels, lower at low flow levels, and higher at high flow levels during July; and (7) higher over the range of flows expected during August, September and October.

For most of the March 2007 through March 2008 period, flow exceedance plots indicate that implementation of the proposed project is expected to result in flows in the Yuba River that are equal to or greater than flows anticipated under RD-1644 long-term. Overall, the annual supply of water is not expected to decrease to a level that would impair water supply availability. Additionally, YCWA would continue its historic practices of providing surface water supply deliveries to its Member Units or implementation of groundwater substitution practices, thereby avoiding potentially significant impacts on agricultural water supplies within the YCWA service area.

Hydrologic changes in the lower Yuba River under the proposed project, relative to RD-1644 long-term, therefore, are expected to result in a less-than-significant impact on surface water supply availability for water agencies and their customers or contractors who utilize the Yuba River as a water supply source.

New Bullards Bar Reservoir

Implementation of the proposed project would alter the hydrologic pattern relative to RD-1644 long-term; however, reservoir storage and water surface elevations at New Bullards Bar Reservoir are expected to remain within normal operational parameters. During March 2007, average end of month reservoir storage under the proposed project is expected to be 739,234 acre-feet (i.e. water surface elevation = 1,899 feet msl), compared to 744,049 acre-feet (i.e. water surface elevation = 1,900 feet msl) under RD-1644 long-term. Depending on hydrological conditions, average end of September 2007 storage in New Bullards Bar Reservoir under the proposed project is expected to be approximately 594,865 acre-feet (i.e. water surface elevation 1,868 feet msl), and reservoir storage under RD-1644 long-term is expected to be approximately 655,432 acre-feet (i.e. water surface elevation = 1,882 feet msl). In March 2008, average end of month reservoir storage under the proposed project is expected to be approximately 725,329 acre-feet (i.e. water surface elevation of 1,896 feet msl), compared to 739,269 acre-feet (i.e. water surface elevation = 1,899 feet msl) under RD-1644 long-term.

Downstream flow impacts can result when water has been released from reservoir storage for transfer purposes and the storage volume subsequently must be refilled with incoming water that otherwise would be spilled or bypassed. The reduction in spills or bypass flows could reduce flows downstream of the reservoir by as much as the quantity of the transferred amount of water. The proposed project would result in a minimum reduction in storage of 62,000 acre-feet in New Bullards Bar Reservoir by the end of September 2007, and could affect the probability, or at a minimum the timing and duration, of spilling the following year (or subsequent years, if no spilling occurs in 2008). Relative to RD-1644 long-term, spill and storage refill effects associated with the proposed project would be the same as those previously discussed in Section 4.11.

Overall, the decrease in reservoir storage under the proposed project, relative to RD-1644 long-term, would not be of a substantial enough magnitude or duration to adversely impact water supply availability from New Bullards Bar Reservoir. Therefore, based on the analyses presented above, potential changes in New Bullards Bar Reservoir storage under the proposed project, relative to RD-1644 long-term, would result in a less-than-significant impact on surface water supply availability.

Feather River and Oroville Reservoir

Because the proposed project is not expected to result in Feather River flows or Oroville Reservoir storage levels outside of normal operational parameters, instream flow and reservoir storage affecting water supply availability is not expected to differ substantially under the proposed project, relative to RD-1644 long-term. Average differences in simulated monthly mean Yuba River flows at Marysville and the percentage of these flows to Feather River flows at Gridley under the proposed project, relative the RD-1644 long-term, over the 83-year simulation period are presented in Table 4-9.

Based on historical records (Table 4-9), Feather River flows in 2007 and 2008 are anticipated to be approximately twice the volume of total flows in the Yuba River at Marysville during most months. Therefore, the influence of the increase or decrease in Yuba River flows under the proposed project on total Feather River flows is not likely to be substantial. Overall, potential changes to Feather River flows under the proposed project, relative to RD-1644 long-term, are expected to result in a less-than-significant impact on surface water supply availability.

Although the specific operational scenario for Oroville Reservoir is unknown, reservoir storage changes (due to subsequent refill of New Bullards Bar Reservoir) that are expected to occur as a result of the proposed project would be expected to remain within historic operational ranges. Further, the Refill Agreement between YCWA and DWR would ensure that future refill of water transferred from storage in New Bullards Bar Reservoir resulting from purchases of water from YCWA by DWR would not significantly impact the SWP or CVP.

Therefore, because changes in the Feather River and Oroville Reservoir would be relatively minor under the proposed project, relative to RD-1644 long-term, and have been previously evaluated for the entire EWA Program in the EWA EIS/EIR, the potential changes associated with the proposed project would result in a less-than-significant impact on water supply availability to water customers, including state and federal water contractors.

Sacramento River

Flows in the Sacramento River are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations and, thus, would not be expected to differ substantially under the proposed project, relative to RD-1644 long-term. Average differences in simulated monthly mean Yuba River flows at Marysville and the percentage of these flows compared to Sacramento River flows at Freeport expected to occur under the proposed project, relative to RD-1644 long-term, over the 83-year simulation period are presented in Table 4-10. Although implementation of the proposed project potentially could alter Sacramento River flows slightly, these changes would be comparable to, or less than, the range described above for the Feather River.

Because the proposed project would only occur for a period of approximately one-year and would result in relatively minor changes in flow compared to the total volume of flow in the Sacramento River, the analyses presented above is consistent with the conclusions previously determined for the EWA Program. Therefore, potential flow changes due to the proposed project, relative to RD-1644 long-term, are expected to be a relatively small proportion of total Sacramento River flows during the March 2007 through March 2008 period and, thus, represent a less-than-significant impact on water supply availability to water customers, including state and federal water contractors.

Sacramento-San Joaquin Delta

Although the hydrologic pattern may be slightly altered with the implementation of the proposed project, Delta conditions are anticipated to remain within the normal ranges and fluctuations resulting from SWP and CVP operations, which were previously evaluated in the EWA EIS/EIR (Reclamation 2003). Because the water would be used in the EWA Program, the result should be to provide a beneficial effect upon state and/or federal water contractor supply conditions in 2007. Although the specific operational scenario associated with the proposed project is uncertain, the projected changes to Delta conditions, relative to RD-1644 long-term, represent a less-than-significant impact on water supply availability to state and federal water customers.

As previously discussed, DWR and Reclamation are the entities responsible for operating the SWP and CVP systems and, likewise, for determining how best to address system-wide needs as environmental conditions change. YCWA is not a participant in the operational decisions that may occur with respect to how transferred water would be managed once it leaves the

Yuba River Basin. However, it is anticipated that conveyance of EWA assets through the SWP/CVP system and into the Delta would be consistent with the procedures established by Reclamation in its 2004 OCAP, and according to the operating principles established by DWR and Reclamation as part of the EWA Program.

San Luis Reservoir

DWR likely will store some portion of water acquired from the proposed project in San Luis Reservoir. Because the water is intended for use in the EWA Program, it is intended to potentially provide a beneficial effect upon state and/or federal water contractor supply conditions in 2007. Therefore, because changes in San Luis Reservoir would be relatively minor under the proposed project, relative to RD-1644 long-term, and have been previously evaluated for the entire EWA Program in the EWA EIS/EIR, the potential changes associated with the proposed project would result in a less-than-significant impact on water supply availability to water customers, including state and federal water contractors.

Chapter 5

Other Impact Considerations

CEQA requires specific analysis of cumulative impacts and short-term uses of the environment versus long-term productivity (Title 14 CCR §15126.2). This chapter addresses the broader, indirect, and more qualitative impact issues associated with the above CEQA requirements for the proposed project.

5.1 Cumulative Impacts

Cumulative impacts are addressed within the context of question XVII (b) of the Environmental Checklist completed to satisfy the CEQA requirements for an IS (Appendix 1). Cumulative impacts are considered for the incremental effect of the proposed project when added to other past, present, and probable future actions, regardless of which agency or entity undertakes them. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over time. Each resource evaluation includes a discussion of how the environmental effects of the proposed project would contribute to cumulative conditions in the project location. For this analysis, the effects of past, present, and reasonably foreseeable future projects were considered. Projects identified for inclusion in the cumulative analyses are described below.

5.1.1 Other Related Projects

The EWA Program for 2007 likely will include upstream acquisitions, stored water, and 2006 carryover surface supply. In addition to the EWA Program, DWR's Dry Year Water Purchase Program and the Critical Water Shortage Contingency Plan (if needed), the Environmental Water Program, and Reclamation's CVPIA Level 4 Wildlife Refuge Water Purchase Program may need to acquire north of the Delta water supply options during 2007. These programs will need to be coordinated between DWR and Reclamation. Some of the information presented below is based on the DWR and Reclamation water purchase agreement for the EWA (DWR and Reclamation 2002).

5.1.1.1 Environmental Water Account Water Transfers

Under the EWA Program, assets acquired by DWR and Reclamation are used to manage water for environmental purposes while decreasing conflicts in use of water in the Bay-Delta estuary. Implementation of the EWA Program provides the Project and Management Agencies (NMFS, USFWS, and CDFG) with a more flexible means of managing water operations and fish protection measures to achieve fish recovery opportunities, while also providing improvements in water supply reliability and water quality in the Delta. DWR has been successful in creating water assets of over 150,000 to more than 200,000 acre-feet annually in 2001 through 2004.

5.1.1.2 DWR Dry Year Water Purchase Program Acquisitions

In 2001 and 2002, the Dry Year Water Purchase Program acquired approximately 138,800 acre-feet and 22,000 acre-feet of water, respectively (YCWA 2004). DWR initiated the Dry Year Water Purchase Program for 2003 and 2004, but the amounts of water purchased were lower (11,355 and 487 acre-feet, respectively) (DWR Website 2005a; DWR Website 2005b). In August 2004, DWR announced its plans to implement the Dry Year Water Purchase Program beginning in 2005. The Dry Year Water Purchase Program is open to all agencies and is intended to reduce the possibility of adverse economic impacts and hardship associated with water supply shortages. The quantity of water to be acquired in any year is unknown and depends on requests made by the participants, if any, in the Dry Year Water Purchase Program, what options are exercised in their contracts, available SWP pumping capacity and environmental conditions in the Delta. Much of this water is purchased from north of the Delta during dry years. Currently, it is unknown whether DWR will implement the Dry Year Water Purchase Program in 2007. However, if 2007 were to be a dry water year, then the program could be implemented, and YCWA water could be acquired if it was available.

Because there is a low probability that the hydrological conditions in late 2006 and early 2007 will be such that any YCWA transfer water can be transferred to the DWR Dry Year Program in 2007, this IS does not analyze such a transfer. If, because of the hydrological conditions that occur in late 2006 and early 2007, YCWA and DWR decide to pursue such a transfer, then YCWA will prepare a supplement to this IS and file a supplemental petition or request the SWRCB for approval of the transfer.

5.1.1.3 CALFED Environmental Water Program

The Environmental Water Program will continue to acquire water to assist in carrying out the goals of CALFED's Ecosystem Restoration Program Plan in 2007.

5.1.1.4 Reclamation CVPIA Level 4 Wildlife Refuge Water Purchase Program

CVPIA requires the U.S. Department of Interior (Interior) to acquire additional water supplies to meet optimal waterfowl habitat management needs at national wildlife refuges in California's Central Valley, certain state wildlife management areas, and the Grassland Resource Conservation District (collectively know as refuges). The optimum water supply levels are referred to as Level 4. The annual water acquisition goal is 163,000 acre-feet to meet full Level 4 requirements at the refuges. Typical annual water acquisition needs are lower because refuge water supplies are partially met in most years by rainfall, runoff, and/or local supplies (Reclamation 2005). For the 2005 contract year (March 2004 through February 2005), 73,024 acre-feet were acquired (pers. comm., Meier 2005).

5.1.1.5 Sacramento Valley Water Management Program Short-term Agreement

Phase 8 of the SWRCB's Bay-Delta water rights proceedings has evolved to a settlement between DWR, Reclamation, export interests, and certain water rights holders in the Sacramento Valley, including YCWA. This settlement has resulted in a short-term agreement between the parties. As part of the short-term agreement, YCWA has agreed to provide 15,000 acre-feet of water for the program in dry years. The water will be made available through groundwater substitution.

5.1.1.6 Other Water Transfers

Other water transfers between currently unknown and unidentified parties also may be proposed and undertaken in 2007. YCWA currently is not considering any other water transfers for 2007. There is a high likelihood that other local or regional transfers may occur in the Sacramento Valley and Delta in 2007 that cannot be identified at this time.

5.1.2 Potential Cumulative Impacts

5.1.2.1 Yuba River

YCWA in prior years has undertaken transfers similar to the proposed project water transfer and has prepared environmental documentation for each transfer (Reclamation 1997; Reclamation 1999; YCWA 2004; YCWA and SWRCB 2001; YCWA and SWRCB 2002; YCWA and SWRCB 2003). These past evaluations and subsequent reviews of the water transfer effects (YCWA 2002; YCWA 2003a; YCWA 2005a), have not identified any significant adverse or unreasonable environmental impacts upon legal users of the water or upon fish, wildlife, vegetation, recreation, or other beneficial uses of the water. Yuba River adult Chinook salmon population trends have remained stable or increased over time, including during periods of water transfers. For example, the 2001-2003 Yuba River salmon spawning escapements were approximately 23,000 to 29,000 salmon in each year, well above the average annual escapement levels over the past 45 years. The most recent 8-year period of escapement records (1996 through 2003) is higher than any other 8-year period of Chinook salmon escapement on the Yuba River since data have been collected (over the past 50 years).

Fisheries monitoring programs instituted in 2001, 2002 and 2004 to collect data regarding YCWA's water transfer effects on fisheries found no conclusive evidence of adverse impacts (YCWA 2002; YCWA 2003a; YCWA 2005a). While much of the existing information is inconclusive, protections such as minimizing fluctuations during spawning periods and implementing ramping rates at the ends of transfers have reduced the potential for unreasonable adverse effects on Yuba River fisheries.

5.1.2.2 Sacramento-San Joaquin Delta and Environmental Water Account

The EWA will allow further curtailment of Delta pumping to reduce the entrainment of fish at the SWP Banks Pumping Plant to achieve benefits beyond the existing environmental baseline. Pumping could be increased to move water controlled by the EWA when substantial impacts on sensitive fish are not likely to occur. However, the ultimate/final pumping pattern will remain within the possible patterns that the SWP is allowed under the existing SWRCB Delta Water Quality Control Plan.

Most water transfers likely will be exported through the Delta during summer and fall months to maximize benefits to migrating winter-run Chinook salmon and minimize adverse effects on delta smelt. The EWA is expected to make relatively small changes in the overall operations of the SWP and CVP facilities. Operational changes to the SWP and CVP in 2007 generally can be characterized as shifts in pumping rates at the SWP and CVP Delta diversion pumps, shifts in storage and release patterns at SWP/CVP reservoirs, shifts in groundwater pumping in local areas, and shifts in surface water storage release patterns in local areas. Overall, programs such as the EWA, the Dry Year Water Purchase Program, and the Critical Water Shortage Reduction Marketing Program will benefit instream resources by reducing Delta pumping and the entrainment of fish at the Delta pumping plants. Programs such as the EWA will rely primarily on surface water in wet years and shift to reliance on groundwater in dry years.

The EWA transfer from YCWA may affect Oroville Reservoir storage levels if releases have to be made to prevent water quality impacts in the Delta during the period when New Bullards Bar Reservoir is being refilled. Changes in storage levels and release patterns at Oroville Reservoir also may result from changes in operations at the Banks Pumping Plant in the Delta as a result of other EWA projects. In most instances, changes in operations would lead to temporary increases in reservoir storage levels. In some instances, the EWA could borrow water from upstream reservoirs, (i.e., Shasta Reservoir on the Sacramento River) thereby lowering reservoir storage levels.

The nature of the EWA Program, specifically the acquisition of up to approximately 200,000 acre-feet of water annually from various sources, along with the regulatory framework currently in place, makes the potential for significant and/or unreasonable adverse cumulative impacts during 2007 implementation highly unlikely. The EWA Program is being implemented and will be adaptively managed to actually maintain and/or benefit both Delta fisheries and contractor water supplies.

Early in 2001, DWR prepared an environmental document addressing the specific impacts from implementing the Year 2001 Water Transfer Agreement between YCWA and DWR for support of CALFED's EWA (DWR 2001a). This document provides additional background information on the larger program of establishing numerous other individual assets to create the EWA, as specified in the CALFED ROD, dated August 28, 2000. Additional environmental documents were prepared annually for additional assets, as appropriate. In 2004, the EWA Final EIS/EIR was released, which evaluated numerous transfer scenarios including transfers from YCWA to Delta users. The conclusion in the Final EIS/EIR and by the USFWS and NMFS was that the EWA transfers would not likely adversely affect delta smelt, Sacramento River winter-run Chinook salmon and critical habitat, Central Valley spring-run Chinook salmon, and Central Valley steelhead (NMFS 2004a; Reclamation *et al.* 2004a; USFWS 2004).

5.1.3 Conclusion

For the 2007 Pilot Program, cumulative effects are not considered to be unreasonable. Environmental considerations have been strongly integrated into the design of the related projects described above. Salmon populations in the lower Yuba River remain healthy since transfers were first initiated in the late 1980s. Less information is available for steelhead, but there is no conclusive information demonstrating any unreasonable impacts to this species. The regulatory framework currently in place and the use of the proposed project transfer water for environmental purposes in the EWA leads to the conclusion that there would be no unreasonable cumulative effects.

5.2 Relationship Between Short-term Uses and Long-term Productivity

The CEQA guidelines state that due consideration should be given to both short-term and long-term effects in preparation of an environmental document (Title 14 CCR §15126.2(a)). Short-term refers to the time period that includes the immediate implementation of the project and long-term refers to the time period that includes the operation life of the project facilities and beyond.

The duration of the proposed project will be approximately one year. Chapters 3 and 4 discuss the potential short-term environmental impacts due to implementation of the proposed 2007 Pilot Program. As described in these chapters, implementation of the 2007 Pilot Program would not result in any significant impacts on environmental resources. The long-term productivity of the environment also would not be adversely affected. As a pilot program, the proposed project may result in refinement of certain elements of the Proposed Yuba Accord, based on the outcome of the 2007 Pilot Program implementation. The potential effects of implementing the Proposed Yuba Accord over a longer term will be fully evaluated in an EIR/EIS, currently under preparation by YCWA, DWR, and Reclamation.

Implementation of the proposed 2007 Pilot Program would not result in the loss of long-term environmental resources or productivity.

Chapter 6

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Chapter 7

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7.2 Personal Communications

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Appendix 1

Environmental Checklist

Introduction to the Environmental Checklist

This appendix provides the Environmental Checklist form completed by YCWA as required by CEQA. Chapters 3 and 4 of the Initial Study provide the explanations of responses made to the questions on the checklist. Chapter 4 describes measures that have been incorporated into the proposed project as necessary to reduce impacts to less-than-significant levels, and indicates the findings as to the significance of each impact.

The following terminology is used to evaluate the level of significance of the Environmental Checklist impact topics:

> A finding of *no impact* is made when the analysis concludes that the proposed project would not affect the environmental issue, relative to the basis of comparison (RD-1644 interim instream flow requirements).
>
> An impact is considered *less than significant* if the analysis concludes that there would be no substantial adverse change in the environment, relative to the basis of comparison, and that no mitigation is needed.
>
> An impact is considered *less than significant with mitigation* if the analysis concludes that there would be no substantial adverse change in the environment, relative to the basis of comparison, with the incorporation of the mitigation measures into the proposed project (identified in Chapter 2 and Chapter 4 of the Initial Study).
>
> An impact is considered *potentially significant* if the analysis concludes that there could be a substantial adverse effect on the environment.

Mitigation refers to measures or procedures adopted by the project proponent to avoid, reduce, or compensate for the proposed project's potentially adverse effects on the environment. As described in Chapters 3 and 4, the proposed 2007 Pilot Program includes compliance with mitigation measures adopted by agencies under the Environmental Water Account (EWA) Short-term Program decision documents. These documents include the Bureau of Reclamation's NEPA Record of Decision (March 2004), the California Department of Water Resources CEQA Notice of Determination (March 2004), the Department of Water Resources CEQA Findings (March 2004), and Mitigation, Monitoring and Reporting Program (Chapter 6 of EWA Final EIS/EIR, January 2004).

ENVIRONMENTAL CHECKLIST

Project Information

1. Project Title: Proposed Extension Petition for the Interim Instream Flow Requirements under State Water Resources Control Board Revised Water Right Decision 1644
2. Lead Agency Name and Address: Yuba County Water Agency
1402 D Street
Marysville, CA 95901
3. Contact Person and Phone Number: Curt Aikens, General Manager (530) 741-6278
4. Project Location: Yuba County
5. Project Sponsor's Name and Address: Yuba County Water Agency
1402 D Street
Marysville, CA 95901
6. General Plan Designation: N/A
7. Zoning: N/A
8. Description of Project:
9. Surrounding Land Uses and Setting:
10. Other public agencies whose approval is required: State Water Resources Control Board, California Department of Water Resources, and California Department of Fish and Game

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology / Soils
☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality	☐ Land Use / Planning
☐ Mineral Resources	☐ Noise	☐ Population / Housing
☐ Public Resources	☐ Recreation	☐ Transportation / Traffic
☐ Utilities / Service Systems	☐ Mandatory Findings of Significance	☒ None After Mitigation

DETERMINATION (To be completed by the Lead Agency)

On the basis of this initial evaluation:

I find that the proposed project **COULD NOT** have a significant effect on the environment, and a **NEGATIVE DECLARATION** will be prepared. ☐

I find that although the proposed project **COULD** have a significant effect on the environment, there **WILL NOT** be a significant effect in this case because revisions in the project have been made by or agreed to by the applicant. A **MITIGATED NEGATIVE DECLARATION** will be prepared. ☒

I find that the proposed project **MAY** have a significant effect on the environment, and an **ENVIRONMENTAL IMPACT REPORT** or its functional equivalent is required. ☐

I find that the proposed project **MAY** have a "potentially significant impact" or "potentially significant unless mitigated impact" on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An **ENVIRONMENTAL IMPACT REPORT** is required, but it must analyze only the effects that remain to be addressed. ☐

I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects a) have been analyzed adequately in an earlier EIR or **NEGATIVE DECLARATION** pursuant to applicable standards and b) have been avoided or mitigated pursuant to an earlier EIR, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required. ☐

Curt Aikens
Signature

10/2/06
Date

CURT AIKENS
Printed name

YUBA COUNTY WATER AGENCY
For

EVALUATION OF ENVIRONMENTAL IMPACTS

1. A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).
2. All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.
3. Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.
4. "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact". The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from Section XVII, "Earlier Analyses", may be cross-referenced).
5. Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA Process, an effect has been adequately analyzed in an earlier EIR or negative declaration Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:
   a) Earlier Analysis Used. Identify and state where they are available for review.
   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
   c) Mitigation Measures. For effects that are "Less then Significant with Mitigation Measures Incorporated", describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.
6. Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.
7. Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.
8. This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.
9. The explanation of each issue should identify:
   a) The significance criteria or threshold, if any, used to evaluate each question; and
   b) The mitigation measure identified, if any, to reduce the impact to less than significance.

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS. Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒
II. AGRICULTURAL RESOURCES. In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997), prepared by the California Department of Conservation as an optional model for use in assessing impacts on agricultural and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use?	☐	☐	☐	☒

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
III. AIR QUALITY.				
Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied on to make the following determinations.				
Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or project air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒
IV. BIOLOGICAL RESOURCES. Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modification, on any species identified as sensitive, candidate, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or the U.S. Fish and Wildlife Service?	☐	☐	☒	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or the U.S. Fish and Wildlife Service?	☐	☐	☒	☐

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Have a substantial adverse effect on federally protected wetlands, as defined by §404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒
V. CULTURAL RESOURCES. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource, as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource, pursuant to §15064.5?	☐	☐	☒	☐
c) Directly or indirectly destroy a unique paleontological resource or site, or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
VI. GEOLOGY AND SOILS. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map, issued by the State Geologist for the area, or based on other substantial evidence of a known fault? (Refer to Division of Mines and Geology Special Publication 42.)?	☐	☐	☐	☒
ii. Strong seismic ground shaking?	☐	☐	☐	☒
iii. Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv. Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable, as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☒	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1997), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste disposal systems, where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
VII. HAZARDS AND HAZARDOUS MATERIALS. Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials, substances, or waste into the environment?	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites, compiled pursuant to Government Code §65962.5, and, as a result, create a significant hazard to the public or environment?	☐	☐	☐	☒
e) Be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport? If so, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) Be located in the vicinity of a private airstrip? If so, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury, or death from wildland fires, including areas where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
VIII. HYDROLOGY AND WATER QUALITY. Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through alteration of the course of a stream or river, in a manner which would result in substantial on- or off-site erosion or siltation?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in on- or off-site flooding?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map, or other flood hazard delineation map?	☐	☐	☐	☒
h) Place structures that would impede or redirect flood flows within a 100-year flood hazard area?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury, or death from flooding, including flooding resulting from the failure of a levee or dam?	☐	☐	☒	☐

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
j) Result in inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒
IX. Land Use and Planning. Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with the applicable land use plan, policy, or regulation of any agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒
X. Mineral Resources. Would the project:				
a) Result in the loss of availability of a known mineral resource that is or would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒
XI. Noise. Would the project:				
a) Generate or expose people to noise levels in excess of standards established in a local general plan or noise ordinance, or in other applicable local, state, or federal standards?	☐	☐	☐	☒
b) Generate or expose people to excessive groundborne vibrations or groundborne noise levels?	☐	☐	☐	☒
c) Create a substantial permanent increase in ambient noise levels in the vicinity of the project (above levels without the project)?	☐	☐	☐	☒
d) Create a substantial temporary or periodic increase in ambient noise levels in the vicinity of the project, in excess of noise levels existing without the project?	☐	☐	☐	☒

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
e) Be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport? If so, would the project expose people residing or working in the project area to excess noise levels?	☐	☐	☐	☒
f) Be in the vicinity of a private airstrip? If so, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
XII. POPULATION AND HOUSING. Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
XIII. PUBLIC SERVICES. Would the project:				
a) Result in significant environmental impacts from construction associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XIV. RECREATION. Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities, such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☒
XV. TRANSPORTATION/TRAFFIC. Would the project:				
a) Cause a substantial increase in traffic, in relation to existing traffic and the capacity of the street system (i.e., a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	☒
b) Exceed, individually or cumulatively, the level of service standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Cause a change in air traffic patterns, including either an increase in traffic levels or a change in location, that results in substantial safety risks?	☐	☐	☐	☒
d) Contain a design feature (e.g., sharp curves or a dangerous intersection) or incompatible uses (e.g., farm equipment) that would substantially increase hazards?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XVI. UTILITIES AND SERVICE SYSTEMS. Would the project:				
a) Exceed wastewater treatment restrictions or standards of the applicable Regional water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources or are new or expanded entitlements needed?	☐	☐	☒	☐
e) Result in a determination, by the wastewater treatment provider that serves or may serve the project, that it has adequate capacity to service the project's anticipated demand, in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations as they relate to solid waste?	☐	☐	☐	☒

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII. MANDATORY FINDINGS OF SIGNIFICANCE. Would the project:				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of any fish or wildlife species, cause any fish or wildlife to drop below self-sustaining levels, threaten or eliminate a plant or animal community, reduce the number or restrict the range of any rare, protected, special, or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	☒	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

Discussion:

a) Based on the discussions of fisheries, terrestrial resources, and cultural resources in sections of Chapter 4 of the Initial Study, the proposed project would have a less-than-significant impact with fisheries and cultural resources impact avoidance measures incorporated.

b) Chapter 5 of the Initial Study evaluates potential cumulative impacts of the proposed project. The proposed project would not result in cumulatively considerable effects.

c) The proposed project would not have a substantial environmental effect on human beings, either directly or indirectly (see Chapters 3 and 4 of the Initial Study).

Appendix 2

Environmental Analysis
for the
Proposed Yuba County Water Agency
One-Year Water Transfer to the
California Department of Water Resources and
2007 Pilot Program Lower Yuba River Accord
Fisheries Agreement

ENVIRONMENTAL ANALYSIS

for the

PROPOSED YUBA COUNTY WATER AGENCY ONE-YEAR WATER TRANSFER TO THE CALIFORNIA DEPARTMENT OF WATER RESOURCES AND 2007 PILOT PROGRAM LOWER YUBA RIVER ACCORD FISHERIES AGREEMENT

Prepared for

Yuba County Water Agency

DEPARTMENT OF WATER RESOURCES STATE OF CALIFORNIA

California Environmental Protection Agency
STATE WATER RESOURCES CONTROL BOARD

Prepared by

HDR | SWRI Surface Water Resources, Inc.

October 2006

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List of Acronyms

ASIP	Action Specific Implementation Plan
Basin Plan	Central Valley Regional Water Quality Control Plan
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin Delta Estuary
BVID	Browns Valley Irrigation District
BWD	Brophy Water District
CALFED	CALFED Bay-Delta Program
CCR	California Code of Regulations
CCWD	Contra Costa Water District
CDEC	California Data Exchange Center
CDFG	California Department of Fish and Game
CDPR	California Department of Parks and Recreation
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CID	Cordua Irrigation District
Corps	U.S. Army Corps of Engineers
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CWUA	composite weighted usable area
D-1644	State Water Resources Control Board Water Right Decision 1644
DCMWC	Dry Creek Mutual Water Company
Delta	Sacramento-San Joaquin Delta
DPS	distinct population segment
Dry Year Program	Dry Year Water Purchase Program
DWR	California Department of Water Resources
E/I	export-to-inflow ratio
EC	electrical conductivity
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
EWA	Environmental Water Account
FERC	Federal Energy Regulatory Commission
FOR	Friends of the River
ft/s	feet per second
HIC	Hallwood Irrigation Company
HSC	habitat suitability criteria
Interior	U.S. Department of the Interior

mg/L	milligrams per liter
msl	mean sea level
MWD	Metropolitan Water District
NEPA	National Environmental Policy Act
NGOs	non-governmental organizations
NMFS	National Marine Fisheries Service
NYI	North Yuba Index
PEIS/EIR	Programmatic Environmental Impact Statement/Environmental Impact Report
PG&E	Pacific Gas and Electric Company
RD-1644	State Water Resources Control Board Revised Water Right Decision 1644
Reclamation	Bureau of Reclamation
RM	River Mile
RMF	River Management Fund
RMT	River Management Team
ROD	Record of Decision
RST	Rotary Screw Traps
RWD	Ramirez Water District
RWQCB	Regional Water Quality Control Board
SRA	State Recreation Area
SWP	State Water Project
SWRCB	State Water Resources Control Board
SYRCL	South Yuba River Citizens League
SYWD	South Yuba Water District
TBI	The Bay Institute
TDS	total dissolved solids
TU	Trout Unlimited
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
VAKI	VAKI RiverWatcher System
WQCP	Water Quality Control Plan
WWD	Wheatland Water District
WUA	weighted useable area
YCWA	Yuba County Water Agency
YOY	young-of-year
YRI	Yuba River Index
Yuba Accord	Proposed Lower Yuba River Accord
Yuba Project	Yuba River Development Project

Chapter 1
Introduction

Temporary water transfers have been used as an important mechanism to distribute water throughout California and are considered an effective means of minimizing the overall environmental effects of and increasing the operational flexibility of the State Water Project (SWP) and the Central Valley Project (CVP) (SWRCB 1995). Over the past 16 years, the Yuba County Water Agency (YCWA) has conducted several water transfers to the California Department of Water Resources (DWR) and other water agencies to enhance water supply reliability, protect water quality in the Sacramento-San Joaquin Delta (Delta) (i.e., salinity control), and improve environmental conditions.

1.1 Project Proponent and Purpose

This Environmental Analysis presents the assessment required by California Water Code §1727 regarding the potential for unreasonable impacts upon fish, wildlife, or other instream beneficial uses and upon any legal user of the water.

YCWA has filed a petition (the Transfer Petition) pursuant to Water Code §1725, for a water transfer from March 1, 2007 through December 31, 2007 between YCWA and the California Department of Water Resources (DWR). The proposed project as described in the Transfer Petition involves YCWA transferring water from New Bullards Bar Reservoir using Yuba River Development Project (Yuba Project) facilities to DWR *via* the lower Yuba River, lower Feather River, Sacramento River, and the Delta. YCWA proposes to release water (including water transferred) according to the instream flow schedules that are specified in the "Fisheries Agreement for the 2007 Lower Yuba River Pilot Program" (2007 Pilot Program Fisheries Agreement) (**Appendix A**).

Additionally, YCWA is requesting State Water Resources Control Board (SWRCB) approval of a temporary change in its water-right permit to enable YCWA to operate the Yuba Project to provide minimum instream flows in the lower Yuba River between March 1, 2007 and March 31, 2008 consistent with the proposed 2007 Pilot Program Fisheries Agreement. These operations also would provide transfer water to DWR. Sources of water to meet the flow schedules and for the transfer potentially would include: (1) stored water from New Bullards Bar Reservoir; and/or (2) surface water made available through an increase in groundwater pumping (groundwater substitution program) by farmers within YCWA Member Units during dry year conditions (i.e., groundwater pumping in Schedule 6 years). Most of the stored reservoir water would remain in surface storage at New Bullards Bar Reservoir in the absence of the proposed transfer. The groundwater substitution program involves YCWA Member Units use of groundwater supplies in place of: (1) diverting surface water flows from the lower Yuba River; or (2) receiving surface water diversion allocations from YCWA.

1.2 Purpose and Need for the Proposed Project

The proposed project would enable a one-year water transfer of up to 125,000 acre-feet of water from YCWA to DWR. The 2007 Pilot Program would provide YCWA revenue, assist DWR in meeting a substantial portion of the Environmental Water Account (EWA) Program asset acquisition goal for 2007, and provide both agencies with a forum to test key elements of the Proposed Yuba Accord.

DWR is a CALFED Project Agency responsible for administering the EWA Program, including banking, borrowing, transferring, selling, and arranging for the conveyance of EWA water supply and EWA assets. DWR and the Bureau of Reclamation (Reclamation) are responsible for seeking to acquire approximately 200,000 acre-feet of water on behalf of the EWA Program annually. DWR also acquires water for its annual Dry Year Water Purchase Program (Dry Year Program) for use in the State Water Project (SWP) and Central Valley Project (CVP) service areas. If a portion of the YCWA transfer water is not needed for the EWA, and if the hydrological conditions are such that the 2007 DWR Dry Year Water Purchase Program seeks to acquire water, then DWR may elect to use the water for the 2007 Dry Year Water Purchase Program.

Because there is a low probability that the hydrological conditions in late 2006 and early 2007 will be such that any YCWA transfer water can be transferred to the DWR Dry Year Program in 2007, this EA does not analyze such a transfer. If, because of the hydrological conditions that occur in late 2006 and early 2007, YCWA and DWR decide to pursue such a transfer, then YCWA will prepare a supplement to this EA and file a supplemental petition or request the SWRCB for approval of the transfer.

1.3 Regulatory Compliance

This Environmental Analysis provides detailed results of the environmental assessment conducted to evaluate whether implementation of the proposed project would result in any unreasonable impacts on fish, wildlife, or other instream beneficial uses, in accordance with Water Code §1727. SWRCB RD-1644 specifies the instream flow requirements in the lower Yuba River. In this analysis, the long-term flow requirements identified in RD-1644 are used as the regulatory baseline of comparison to evaluate potential impacts of the proposed project, because these flow requirements otherwise would be in effect if the proposed project were not implemented.

The following sections provide information related to YCWA's petition to the SWRCB regarding temporary changes to YCWA's water right permits in order to implement the proposed project, the SWRCB's statutory provisions under the California Water Code, and exemption of the proposed temporary water transfer from the California Environmental Quality Act (CEQA) under Water Code §1729.

Guidance on the proper scope of the environmental analysis necessary to comply with Water Code §1727 has been provided by past SWRCB decisions associated with temporary water transfers. The following analysis has been prepared consistent with that guidance. Although this analysis is specific to the proposed 2007 Pilot Program, past water transfer analyses were reviewed and used as appropriate. Information presented in this document builds upon YCWA's environmental analyses of recent temporary water transfers (YCWA 2004; YCWA *et al.* 2005; YCWA and SWRCB 2002; YCWA and SWRCB 2003).

1.3.1 Petitions to State Water Resources Control Board

YCWA has filed a petition with the SWRCB under the provisions of Water Code §1725 *et. seq.*, and in conformance with the specific requirements of the California Code of Regulations (CCR) §794 for temporary changes to YCWA's water right permit 15026 to add, during the term of proposed project, the SWP and CVP points diversion/rediversion and place of use that are necessary for water transfers between YCWA and DWR. In addition to the proposed changes in point of diversion, place of use and purpose of use, YCWA has filed a separate petition with the SWRCB to modify the terms of YCWA's water right permits to change the effective date of RD-1644 long-term instream flow requirements from March 1, 2007 to April 1, 2008. An Initial Study/Mitigated Negative Declaration (IS/MND), pursuant to CEQA, will be submitted to the SWRCB to analyze the potential environmental effects of the second petition.

1.3.1.1 Change in Point of Rediversion

YCWA's current petition includes a request to change the authorized points of rediversion in YCWA's permit to add the Clifton Court Forebay (SWP facility) and the Tracy Pumping Plant (CVP facility).

1.3.1.2 Change in Place of Use

YCWA's petition includes a request to expand the place of use in YCWA's permit from the YCWA service area in Yuba County (YCWA Permit No. 15026) for DWR to include the SWP and CVP service areas in the California Central Valley: SWP (as shown on map 1878-1, 2, 3, and 4 on file with Application No. 5629); and CVP (as shown on map 214-208-12581 on file with Application No. 5626).

1.3.1.3 Change in Purpose of Use

YCWA's petition includes a proposed change in the purpose of use in YCWA's permit to include the additional uses of municipal supply, salinity control, and water quality control to the present authorized uses of irrigation, domestic, industrial, recreational, and fish mitigation and enhancement.

1.3.2 State Water Resources Control Board's Statutory Provisions

Pursuant to Water Code §1725 *et. seq.*, the SWRCB Division of Water Rights is authorized to approve temporary changes in YCWA's permits, allowing the transfer or exchange of water, or water rights if the proposed temporary changes:

- Would not injure any other legal user of the water; and
- Would not unreasonably affect fish, wildlife, or other instream beneficial uses.

This Environmental Analysis provides an evaluation of the potential impacts on fish, wildlife, and other instream beneficial uses [Water Code §1727(b)(2)].

1.3.3 California Environmental Quality Act Exemption

As described in CCR §15282 (v), and Water Code §1729, temporary water transfers of up to one year in duration are statutorily exempt from CEQA. The proposed water transfer meets these requirements and definitions within the CCR and Water Code and, therefore, is exempt from CEQA.

Chapter 2
Description of 2007 Pilot Program

2.1 Project Area

YCWA will release water from New Bullards Bar Reservoir and through Englebright Reservoir into the lower Yuba River in Yuba County to implement the 2007 Pilot Program Fisheries Agreement instream flow schedules and the 2007 water transfer to DWR. DWR will receive and convey YCWA transfer water in the Sacramento River and Delta and potentially may store a portion of the transfer water in San Luis Reservoir or groundwater banks south of the Delta (**Figure 2-1**).

2.2 Project Background

The SWRCB conducted hearings in 1992 and 2000 that led to the adoption of Water Right Decision 1644 (Decision D-1644 or D-1644) on March 1, 2001. After considering new evidence presented by YCWA, several local water districts in Yuba County, and a coalition of conservation non-governmental organizations (NGOs) in legal challenges to D-1644, the court remanded D-1644 to the SWRCB for reconsideration. Following a two-day hearing, the SWRCB issued RD-1644 on July 16, 2003. RD-1644 contains only minor changes from D-1644.

Since D-1644 was issued, YCWA has been engaged in a set of separate but related negotiations with the parties to the D-1644 litigation, state and federal fisheries agencies, water supply agencies, and other parties to try to resolve flow and other fisheries issues on the lower Yuba River. These collaborative interest-based initiatives led to the development of three interrelated proposed agreements: (1) *"Principles of Agreement for Lower Yuba River Fisheries Agreement"* (Fisheries Agreement); (2) *"Outline of Proposed Principles of Agreements with YCWA Member Units in Connection with Proposed Settlement of SWRCB D-1644"* (Conjunctive Use Agreements); and (3) *"Agreement for the Long-term Purchase of Water from Yuba County Water Agency by the Department of Water Resources and the Bureau of Reclamation"* (Water Purchase Agreement), and related actions. These proposed agreements collectively are known as the Proposed Lower Yuba River Accord (Proposed Yuba Accord).

In January 2006, the parties to the Proposed Yuba Accord signed the 2006 Pilot Program Fisheries Agreement, which contained minimum instream flow requirements for the lower Yuba River for the period of April 1, 2006 through February 28, 2007. On April 5, 2006, the SWRCB issued Order WR 2006-0009, which granted YCWA's petition to extend the effective date of the RD-1644 interim instream flow requirements from April 21, 2006 to March 1, 2007. On April 10, 2006, the SWRCB's Division of Water Rights issued WR-2006-0010-DWR, which approved YCWA's petition for the 2006 Pilot Program water transfer. Due to hydrologic conditions in the Delta (e.g., unbalanced conditions), YCWA was not able to transfer water to DWR for use in the EWA Program in 2006. However, the 2006 Pilot Program Fisheries Agreement flow schedules remain in effect through February 28, 2007.

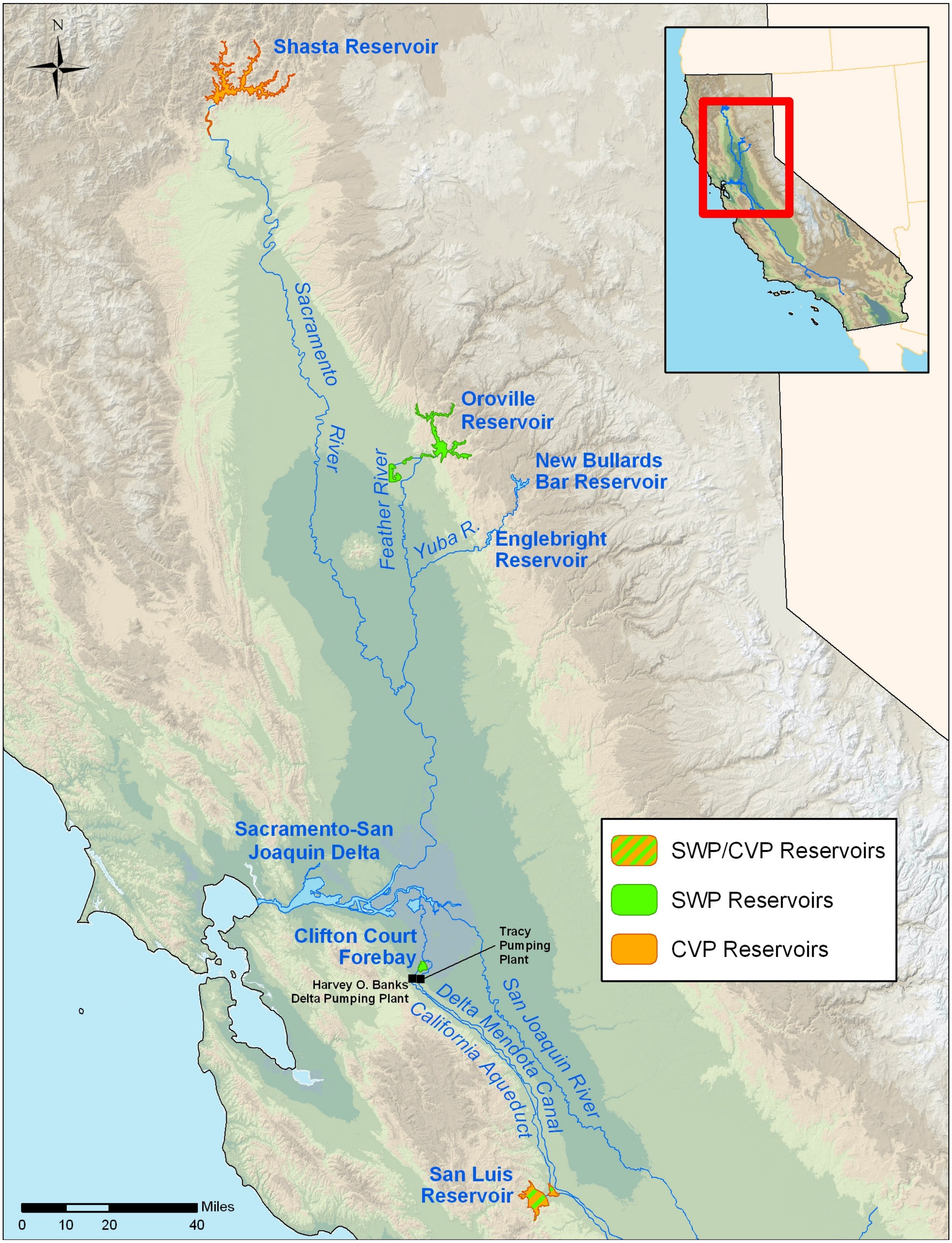

Figure 2-1. Project Area

YCWA anticipates completing the necessary environmental documentation and processing of petitions for the Proposed Yuba Accord prior to April 1, 2008. The parties to the Proposed Yuba Accord have drafted the 2007 Pilot Program Fisheries Agreement, which specifies the instream flow requirements in the lower Yuba River for the period of March 1, 2007 through March 31, 2008. Additionally, YCWA and DWR are collaborating in the one-year water transfer agreement, which incorporates certain accounting practices that are specific to, and necessary for, calculating the volume of water transferred by implementation of the flows specified in the 2007 Pilot Program Fisheries Agreement. In almost all respects, the transfer of water from YCWA to DWR is a pilot program, which will serve not only the intent of a water transfer between the parties, but also as a test and validation of several key elements of the proposed settlement agreements that are the Proposed Yuba Accord.

The current petition to the SWRCB is for the temporary change in place of use, point of rediversion, and purpose of use in YCWA's water right permits to facilitate a one-year water transfer associated with the re-operation of YCWA facilities to implement the proposed project. No releases of water pursuant to the agreements between YCWA and DWR will confer any appropriative, public trust, or other right to water on any person or entity.

2.3 2007 Proposed Project Hydrology

Hydrologic changes to lower Yuba River flows and New Bullards Bar Reservoir storage and water surface elevations that would be anticipated under the proposed project are described in the Hydrologic Analysis (**Appendix B**) and in the following sections.

2.3.1 Lower Yuba River Instream Flow Requirements

The RD-1644 long-term instream flow requirements are scheduled to become effective on March 1, 2007 (**Table 2-1**). The RD-1644 long-term instream flow requirements are used as the basis of comparison in this Environmental Analysis because these flow requirements otherwise would be in effect if the proposed project is not implemented.

Table 2-1. Long-term Instream Flow Requirements - Revised Water Right Decision 1644.

	Wet, Above Normal, and Below Normal Years (cfs)		Dry Years (cfs)	
Period	**Smartville Gage**	**Marysville Gage**	**Smartville Gage**	**Marysville Gage**
Sep 15-Oct 14	700	250	500	250
Oct 15-Apr 20	700	500	600	400
Apr 21-Apr 30	--	1,000	--	1,000
May 1-May31	--	1,500	--	1,500
Jun 1	--	1,050	--	1,050
Jun 2	--	800	--	800
Jun 3-Jun 30	--	800	--	800
Jul 1	--	560	--	560
Jul 2	--	390	--	390
Jul 3	--	280	--	280
Jul 4-Sep 14	--	250		250
Period	**Critical Years (cfs)**		**Extreme Critical Years (cfs)**	
Sep 15-Oct 14	400	250	400	250
Oct 15-Apr 20	600	400	600	400
Apr 21-Apr 30	--	1,000	--	500
May 1-May31	--	1,100	--	500
Jun 1	--	800	--	500
Jun 2	--	800	--	500
Jun 3-Jun 30	--	800	--	500
Jul 1	--	560	--	500
Jul 2	--	390	--	390
Jul 3	--	280	--	280
Jul 4-Sep 14	--	250	--	250

RD-1644 long-term minimum instream flow requirements vary by water year type as defined by the Yuba River Index (YRI). The YRI is a water year hydrologic classification index that is based on the unimpaired runoff of the Yuba River for the period of record from 1921 to 1994 and is defined by: (1) the current year's April through July Yuba River unimpaired runoff (50 percent proportional weighting); (2) the current year's October through March Yuba River unimpaired runoff (30 percent proportional weighting); and (3) the previous year's YRI (20 percent proportional weighting).

Yuba River flows are measured at Smartville near Englebright Reservoir at the upper end of the lower Yuba River (Smartville Gage – U.S. Geological Survey (USGS) Station No. 11418000) and at Marysville, about 6 miles upstream of the mouth of the Yuba River (Marysville Gage - USGS Station No. 11421500).

The following sections provide a description of proposed project elements including the 2007 Pilot Program Fisheries Agreement flow schedules and Yuba Project operations.

2.3.1.1 2007 Pilot Program Fisheries Agreement

Flow Schedules

The NYI is an indicator of the amount of water available in the North Yuba River at New Bullards Bar Reservoir that could be utilized to achieve proposed project flow schedules on the lower Yuba River through operations of the reservoir **(Figure 2-2)**. The NYI is comprised of two components: (1) active storage in New Bullards Bar Reservoir at the commencement of the current water year; and (2) total inflow to New Bullards Bar Reservoir for the current water year, including diversions from the Middle Yuba River and Oregon Creek to New Bullards Bar Reservoir.

The water year hydrologic classification for the Yuba River to determine the flow requirements of Yuba County Water Agency's water right permits shall be based on the North Yuba Index. Determinations of a year's flow schedule year type shall be made in February, March, April, and May and for any subsequent updates.

Flow Schedule Year Type	North Yuba Index Thousand Acre-Feet (TAF)
Schedule 1	Equal to or greater than 1,400
Schedule 2	Equal to or greater than 1,040 and less than 1,400
Schedule 3	Equal to or greater than 920 and less than 1,040
Schedule 4	Equal to or greater than 820 and less than 920
Schedule 5	Equal to or greater than 693 and less than 820
Schedule 6	Equal to or greater than 500 and less than 693

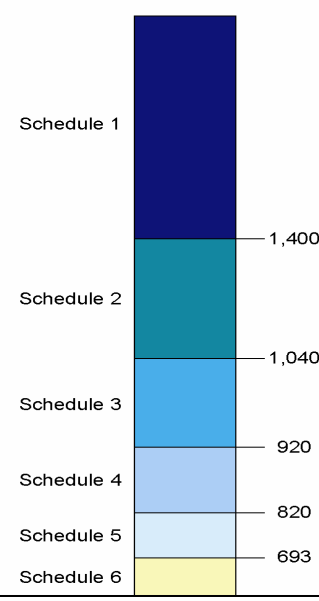

Figure 2-2. Flow Schedule Year Types Based on the North Yuba Index for Establishing Required Flows During the 2007 Pilot Program.

As noted, RD-1644 long-term instream flow requirements are determined by the YRI, whereas instream flows to be met under the proposed project are determined by the NYI. The YRI includes five water year types (wet, above normal, below normal, dry, and critical). The NYI has six water year types, which approximately correspond to the 2007 Pilot Program Fisheries Agreement flow schedules 1 through 6.

The proposed project flow schedules primarily were developed to achieve maximum benefit to lower Yuba River anadromous salmonid fisheries resources under a range of hydrologic conditions that potentially could occur in the Yuba River Basin. These flow schedules were developed in consultation with jurisdictional fisheries agencies (CDFG, NMFS, USFWS), and with NGO participation. The combination of the six flow schedules in conjunction with the NYI for determining which flow schedule would be used during a particular hydrologic year is intended to provide a more tailored set of flows for the lower Yuba River than the flows that would be achieved under RD-1644 flow requirements. The flow schedule numbers increase as hydrologic water years become drier. During wetter years (Schedules 1 and 2), minimum flow requirements under the proposed project represent the range of optimum conditions in the lower Yuba River for all salmonid life stages. Schedules 3 through 6 would occur during drier years (mostly dry and critical water years). These flow schedules were developed to provide instream flow ranges that would protect fisheries resources by maintaining sufficient flows during key life stages such as adult immigration and holding, spawning and embryo incubation, and juvenile rearing and smolt emigration. For some species of salmonids, these life stages occur during the summer and late fall when seasonal water temperatures typically reach peak levels.

Peak flows in the Yuba River during wetter year classes under unimpaired flow conditions generally would occur during the month of April. During drier year classes, peak flows tend to be skewed from May to April (**Figure 2-3**). Consistent with this trend, the proposed project flow schedules were developed to provide peak flows earlier in the spring during drier water years. These flow patterns could facilitate the emigration of juvenile salmonids before water temperatures reach their seasonal peaks during the summer months and also could provide lower water temperatures during the late summer and fall for juvenile rearing and adult immigration life stages.

Except as otherwise stated in the 2007 Pilot Program Fisheries Agreement, YCWA would comply with the flow schedule requirements in **Table 2-2** during the period of the proposed project. Schedules 1-6 in Table 2-2 specify the minimum instream flow requirements measured at the Marysville Gage, and Schedules A and B specifies minimum instream flow requirements at the Smartville Gage. The Smartville Gage flows may control at certain times of the year depending on diversion patterns from the lower Yuba River; at other times of the year, the Marysville Gage flow requirements would control. Smartville Gage flow schedules (A and B) were developed only for months when those flows might control (i.e., in the fall and winter months). During the late spring and summer months, the irrigation demands at the Daguerre Point Dam, added to the minimum flow requirements at the downstream Marysville Gage, will always control the required releases; thus, no Smartville Gage requirements were developed for those months.

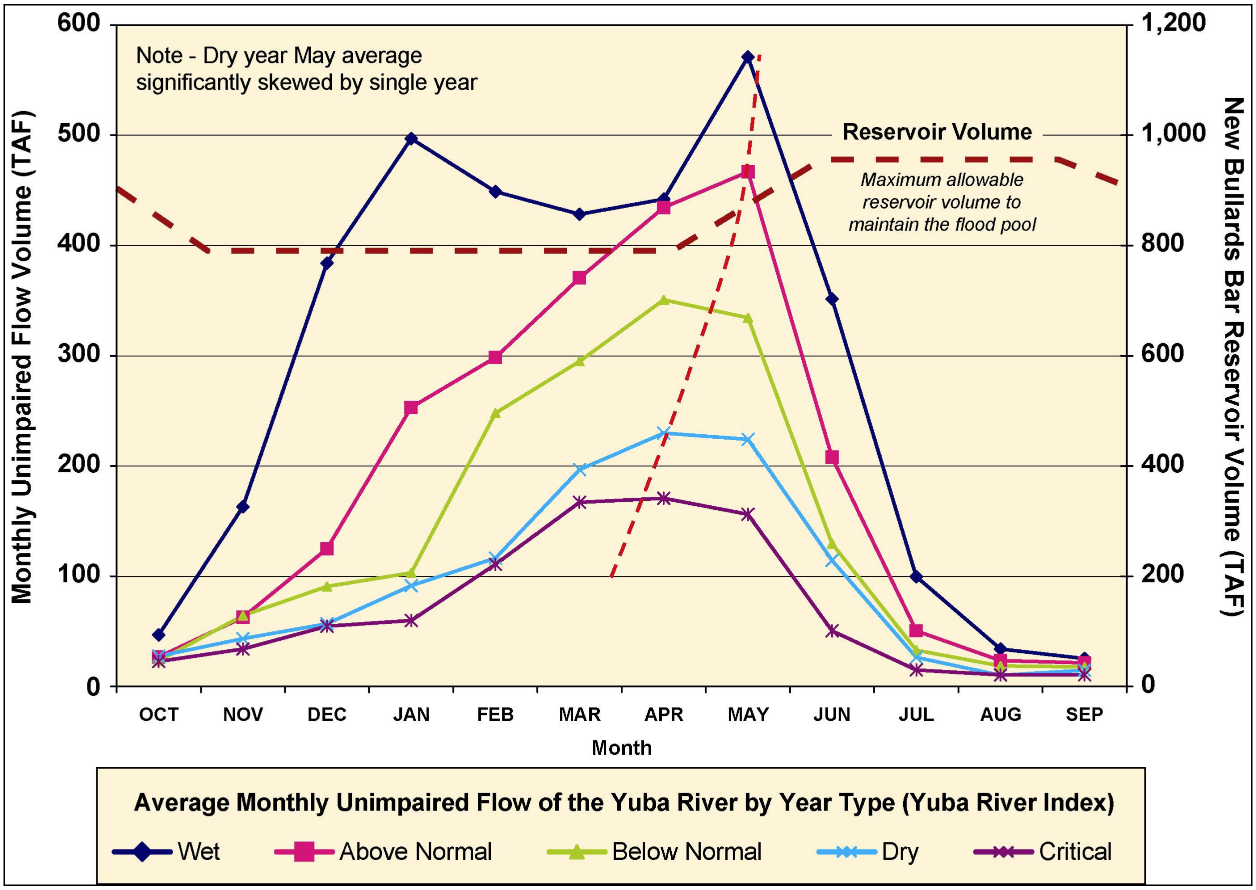

Figure 2-3. Average Monthly Unimpaired Flow Volumes at the Smartville Gage from 1922 through 2004.

Table 2-2. 2007 Pilot Program Fisheries Agreement Lower Yuba River Instream Flow Schedules.

MARYSVILLE GAGE (cfs)															
	APR		MAY		JUN		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	Total Volume (AF)
Schedule	1-15	16-30	1-15	16-31	1-15	16-30	1-31	1-31	1-30	1-31	1-30	1-31	1-31	1-29	
1	1,000	1,000	2,000	2,000	1,500	1,500	700	600	500	500	500	500	500	500	531,178
2	700	800	1,000	1,000	800	500	500	500	500	500	500	500	500	500	385,788
3	700	700	900	900	500	500	500	500	500	500	500	500	500	500	367,738
4	600	900	900	600	400	400	400	400	400	400	500	500	500	500	330,846
5	500	600	600	400	400	400	400	400	400	400	500	500	500	500	303,672
6	350	500	500	400	300	150	150	150	350	350	350	350	350	350	210,349
* Indicated flows represent average volumes for the specified time period. Actual flows may vary from the indicated flows according to established criteria. * Indicated Schedule 6 flows do not include an additional 30 TAF available from groundwater substitution to be allocated according to established criteria.															
SMARTVILLE GAGE (cfs)															
A	700	-	-	-	-	-	-	-	700	700	700	700	700	700	-
B	600	-	-	-	-	-	-	-	500	600	600	550	550	550	-
* Schedule A used with Schedules 1, 2, 3 and 4 at Marysville Gage. * Schedule B used with Schedules 5 and 6 at Marysville Gage.															

Because some of the RD-1644 long-term instream flow requirements are higher than the instream flow schedules that are specified in the 2007 Pilot Program Fisheries Agreement, operation of the Yuba Project to comply with both RD-1644 long-term flow requirements as well as the 2007 Pilot Program flow schedules would have the potential to cause severe shortages in subsequent water years. Therefore, for the purposes of the analysis presented in this Environmental Analysis, the proposed project is defined as implementation of a water transfer utilizing the 2007 Pilot Program Fisheries Agreement flow schedules and RD-1644 interim flow requirements, whichever is higher on any particular day.

The flow schedules described in the 2007 Pilot Program Fisheries Agreement are based largely on the flow schedules developed as part of the settlement process for the Proposed Yuba Accord. Although the Proposed Yuba Accord flow schedules are designed to supplant the existing instream flow requirements, for the purposes of the 2007 Pilot Program, the RD-1644 interim instream flow requirements still will be in place. During some months under certain water availability conditions (i.e., water year types), the minimum flows specified in the 2007 Pilot Program Fisheries Agreement are less than instream flows required under interim RD-1644. On days when this occurs, flows under the proposed project always will meet, at a minimum, the RD-1644 interim instream flow requirements. On days when the flows under 2007 Pilot Program Fisheries Agreement will be higher, they will govern YCWA's operations of the Yuba Project facilities.

The specific flow schedule that would be implemented during the 2007 Pilot Program would be determined by the value of the NYI illustrated in Figure 2-2, with potential adjustments for dry year storage.

2.3.1.2 River Management Team

During the course of the proposed 2007 transfer, and in accordance with the 2007 Pilot Program Fisheries Agreement, a RMT will be convened to provide input for lower Yuba River operations. The RMT would consist of a Planning Group and an Operations Group. The Planning Group would include representatives of the parties to the 2007 Pilot Program Fisheries Agreement, which are YCWA, NMFS, USFWS, CDFG, DWR, Reclamation, PG&E, and the NGOs. The Operations Group would include one representative each of: (1) YCWA; (2) PG&E; (3) CDFG, NMFS, and USFWS, where the one representative would rotate between these three agencies; (4) the NGOs; and (5) DWR.

Actions that could be undertaken by the Planning Group include the following:

- Setting the flow schedule for any surface water operations;
- Altering instream flow requirements as appropriate (within specified limits) to achieve maximum fisheries resource benefits;
- Developing and implementing fisheries monitoring studies on the lower Yuba River; and
- Allocating expenditures from the River Management Fund (RMF).

The Operations Group would meet and hold conference calls as necessary to carry out the actions identified above. If necessary to carry out its functions, the Planning Group may convene a Technical Working Group, which would include such members as the Planning Group may appoint. Each Planning Group principal representative may designate one or more secondary representative(s) who may participate in the Planning Group discussion of a given issue. The Operations Group would provide YCWA with guidance in the implementation and alteration of flow schedules, as well as other actions agreed upon by the Planning Group. Each Operations Group member may designate in its discretion additional technical experts to participate in the Operations Group's discussions of issues (Appendix A, 2007 Pilot Program Fisheries Agreement).

Temporary Alteration of Flow Schedule

The RMT, through a decision by its Planning Group, could decide to temporarily alter applicable instream flow requirements in the 2007 Pilot Program Fisheries Agreement (within specified limits) at any time during the proposed project, so long as the agreed-to instream flows would comply with the applicable requirements of YCWA's FERC license and YCWA's water right permits.

Alterations to the 2007 Pilot Program Fisheries Agreement's instream flow schedules could occur only during March through October of the proposed project. Any alterations to the instream flows would not: (1) cause decreases from the minimum instream flows specified under the proposed project of more than 20 percent; (2) shift the timing of flows released from New Bullards Bar Reservoir specified under the proposed project by more than six weeks; (3) reduce the amount of stored water remaining in New Bullards Bar Reservoir at the end of the calendar year during which the temporary alteration occurs below the amount that would result without the temporary alteration; or (4) result in a net decrease in the total amount of water released for the applicable minimum instream flow requirements for the calendar year. Absent RMT consensus, changes to applicable instream flow requirements in 2007 Pilot Program Fisheries Agreement flows would not occur (Appendix A).

Any alterations to the 2007 Pilot Program Fisheries Agreement's instream flow schedules approved by the RMT would have to result in flows that were equal to or greater than the minimum flows required by applicable regulatory requirements.

2.3.1.3 River Management Fund

The RMF is established as an element of the Proposed Yuba Accord with the purpose of funding studies and research on the lower Yuba River to investigate the impacts and effects of the Proposed Yuba Accord flow schedules. During the term of the proposed project, YCWA will make payments to the RMF in accordance with the terms of the 2007 Pilot Program Fisheries Agreement. Disbursement of RMF funds will be directed by the RMT. The RMT would adopt a structure for fund allocation based on specific prioritized goals for monitoring, studies, actions and activities. Money from the RMF may be spent for any of the following actions:

- Monitoring and evaluating the effectiveness of the implementation of the 2007 Pilot Program Fisheries Agreement, including flow schedules, and the 2007 water transfer agreement;
- Evaluating the condition of fisheries resources in the lower Yuba River;
- Evaluating the viability of lower Yuba River fall-run Chinook salmon and any subpopulations of the Central Valley steelhead distinct population segment (DPS) and spring-run Chinook salmon Evolutionarily Significant Units (ESUs) that may exist in the lower Yuba River;
- Implementing habitat improvement and non-flow enhancement actions and activities;
- Purchasing water for augmentation of instream flows in the lower Yuba River above the minimum flow requirements specified by the flow schedules (Table 2-2);
- Retaining expert advice for specific technical questions;
- Retaining an expert or experts for dispute resolution processes; or

- Paying local shares of grant-funded projects for fish or fish habitat in the lower Yuba River, specifically to facilitate unique grant matching opportunities.

YCWA would continue to directly fund certain data collection activities and studies on the lower Yuba River. Specifically, YCWA would continue to fund the collection of flow and water temperature data including daily instream flows at the Smartville and Marysville gages, and hourly records of water temperatures at Marysville, Smartville, and Daguerre Point Dam. Additionally, YCWA will continue to fund and conduct the redd dewatering and fry stranding studies through the completion of the study plan that has been submitted to the SWRCB (see Appendix B for a more detailed discussion of carryover storage).

2.3.2 New Bullards Bar Reservoir

2.3.2.1 New Bullards Bar Reservoir Carryover Storage

YCWA would temporarily modify normal storage and water release operations of its Yuba Project facilities, including New Bullards Bar Reservoir, to implement the 2007 Pilot Program Fisheries Agreement that would allow for the provision of water for DWR acquisition. YCWA's operational target storage level for the end of September is 705,000 acre-feet for New Bullards Bar Reservoir without the proposed project. This storage amount is the target storage specified in YCWA's power purchase contract with PG&E for the Yuba Project. An additional part of the LYR Accord Pilot Program operations for 2007 is an end of September target storage in New Bullards Bar reservoir of 650,000 acre-ft, which is 55,000 acre-ft lower than the operationally target previously used by YCWA. The lower storage target for the end of September results in increased releases from storage during the summer months of wetter years when storage operations govern the release schedule from New Bullards Bar Reservoir.

For the 2007 water year, the starting storage condition (end-of-September New Bullards Bar storage) is estimated to be about 695,000 acre-ft. In 2006, the starting storage in New Bullards Bar Reservoir was 708,000 acre-ft. For the purposes of evaluating potential impacts to beneficial uses, the 2007 hydrology was assumed to be identical to the 2006 water year. The difference in starting carryover storage between the 2006 and 2007 water years is assumed to have no discernable effect on lower Yuba River or system-wide flows and/or water temperatures. This difference in starting storage would also result in no changes to operations in New Bullards Bar during the fall of 2007. The only potential effect this slight difference in starting storage may have on actual operations of New Bullards Bar Reservoir will be to delay by a few days the onset of spills if conditions during the winter of 2007 are very wet.

2.3.2.2 New Bullards Bar Reservoir Refill Conditions/Procedures

YCWA would refill New Bullards Bar Reservoir from North Yuba River flows under a schedule mutually agreed upon by DWR and YCWA titled "*New Bullards Bar Reservoir Refilling Conditions and Procedures for Water Transfer from Yuba to the Department*" (Refill Agreement). The Refill Agreement is intended to ensure that future refill of water released from storage in New Bullards Bar Reservoir resulting in purchases of water from YCWA by DWR would not adversely impact the SWP or CVP. The procedures included in the Refill Agreement provide for an accounting of refill of New Bullards Bar Reservoir resulting from the proposed project during balanced conditions in the Delta.

Chapter 3
Analysis Framework

YCWA's implementation of the proposed 2007 Pilot Program would result in flow changes in the Yuba, Feather, and Sacramento rivers within the project study area, relative to the basis of comparison. Water surface elevations and storage volumes at New Bullards Bar Reservoir would vary under the proposed project from those that would occur under the basis of comparison. DWR would acquire the proposed project transfer water for use in the EWA Program, potentially affecting water resources of the Delta, San Luis Reservoir, and groundwater banks south of the Delta. Based on the California Water Code §1727, proposed project operations have the potential to affect the following resources:

- Water Supply Availability
- Surface Water Quality
- Groundwater Resources
- Fisheries and Aquatic Resources
- Terrestrial Resources (Wildlife and Vegetation)
- Recreation

3.1 Overview of the Analytical Approach

The evaluation of potential impacts on the resources identified above is based upon a comparison of potential changes in instream flows, water temperatures, and reservoir storage and water surface elevations that could occur with implementation of the proposed project relative to the conditions that could occur under RD-1644 long-term instream flow requirements (i.e., the basis of comparison). Additionally, the analysis considers the potential effects upon the Yuba Groundwater Basin associated with 30,000 acre-feet of groundwater pumping that could be implemented during a Schedule 6 year.

Implementation of the proposed project would result in the following:

- Changes in YCWA's Yuba Project operations on the Yuba River to implement proposed 2007 Pilot Program Fisheries Agreement instream flow schedules for the protection of lower Yuba River fisheries.
- In Schedule 6 years, YCWA Member Units may implement groundwater substitution operations utilizing groundwater supplies for agricultural irrigation purposes instead of diverting or receiving some Yuba River water supplies.
- DWR would acquire transfer water for use in the 2007 EWA Program, potentially affecting water operations in the Feather River, the Sacramento River, and the Delta.
- DWR may convey transfer water and store a portion of the transfer water in San Luis Reservoir or groundwater banks south of the Delta.
- YCWA operations to refill New Bullards Bar Reservoir potentially could affect Oroville Reservoir.

3.1.1 Evaluation of Yuba River Development Project and Yuba Groundwater Basin Operations

3.1.1.1 Yuba River Development Project

YCWA would operate the Yuba Project to implement the proposed 2007 Pilot Program Fisheries Agreement. The transfer water that DWR would acquire for the EWA Program would be embedded within the instream flow schedules. The maximum amount of the transfer would not exceed 125,000 acre-feet. Evaluation of potential changes in the operations of the Yuba Project associated with implementation of the proposed project involved assessment of potential changes in reservoir water surface elevation and storage over an 83-year simulation period, relative to the basis of comparison (RD-1644 long-term flow requirements). Changes in these conditions were evaluated using analytical thresholds to determine if the proposed project would result in an unreasonable impact to the resources listed above. In addition, potential changes in river flows and water temperatures were evaluated over an 83-year simulation period, relative to the basis of comparison, to determine if changes in river flows or water temperatures of sufficient magnitude and duration would occur that may result in an unreasonable impact to the resources provided in and around the river. The analyses of potential changes in the Yuba Project operations for the individual resources are provided in Chapter 4.

3.1.1.2 Yuba Groundwater Basin

The evaluation of potential impacts of the proposed project upon the Yuba Groundwater Basin, including the North Yuba and South Yuba subbasins, is based upon the "*Analysis of the Groundwater Substitution Portion of the Yuba County Water Agency-CALFED Environmental Water Account/Department of Water Resources 2007 Transfer*" included as **Appendix C** to this EA. This study provides a description of the groundwater basin, groundwater occurrence and development, and groundwater storage conditions and presents an evaluation of past groundwater substitution effects upon the basin. The findings of this study are summarized in Chapter 4, Section 4.1.3, Groundwater Resources.

3.1.2 Use of Earlier Analysis – Environmental Water Account EIS/EIR

Reclamation, DWR, USFWS, NMFS and CDFG (Reclamation *et al.* 2003) completed an environmental analysis of the EWA Program, including characterization of probable water transfer volumes from YCWA. The EWA Draft EIS/EIR evaluated potential impacts on the SWP/CVP system facilities based on potential supplies of up to a range of 200,000 to 600,000 acre-feet from water sellers north of the Delta, depending upon water year type. The impact analysis in the EWA Draft EIS/EIR specifically assumed that YCWA would supply up to 100,000 acre-feet of stored reservoir water from New Bullards Bar Reservoir and up to 85,000 acre-feet of water made available through groundwater substitution practices by YCWA Member Units (page 2-35, Table 2-5). Because the 2007 Pilot Program Fisheries Agreement total transfer volume is within this probable maximum water transfer amount (total of up to 185,000 acre-feet evaluated in the EWA EIS/EIR for YCWA), this EA utilizes the earlier environmental analyses conducted by DWR and Reclamation. Conclusions from the EWA EIS/EIR for the Yuba River, New Bullards Bar Reservoir, Feather River, Oroville Reservoir, Sacramento River, the Delta, San Luis Reservoir and south-of-Delta groundwater banks are summarized in the individual resource sections of Chapter 4, when relevant. The EWA Draft EIS/EIR, Final EIS/EIR, and ROD are available for viewing at Reclamation's web page: [www.usbr.gov].

Chapter 4
Environmental Setting and Impacts

This chapter of the EA describes the environmental setting and the potential impacts of implementing the proposed project described in Chapter 2. This chapter also describes the impact analysis methodology and significance criteria, and the analytical results used to identify the potential impacts to beneficial uses associated with implementation of the proposed project.

For each resource category, the Environmental Setting section characterizes the resource features of the project study area that may be affected by implementation of the proposed project. As discussed in Chapter 3 (Analysis Framework), the proposed transfer of water to the EWA Program has been evaluated by DWR and Reclamation in the Environmental Water Account EIS/EIR (Reclamation *et al.* 2003; Reclamation *et al.* 2004a). Reclamation prepared a Record of Decision (ROD) to document its decision to implement the provisions of the preferred alternative termed the Flexible Purchase Alternative (Reclamation *et al.* 2003; Reclamation *et al.* 2004b) and the California Department of Water Resources (DWR) certified the Final EIS/EIR and issued a Notice of Determination (NOD) (DWR 2004b). The EWA Program will sunset on December 31, 2007, which corresponds to the end of the 2007 Pilot Program water transfer.

The proposed project does not include any new construction of water facilities, infrastructure, or any other type of construction or land disturbance and, therefore, will not have any construction-related effects. In accordance with Water Code §1727, this Environmental Analysis draws conclusions regarding whether the proposed project "*would unreasonably affect fish, wildlife, or other instream beneficial uses*." Instream beneficial uses analyzed in this document include surface water supply availability, surface water quality, groundwater resources, fisheries and aquatic resources, terrestrial resources (wildlife and vegetation), recreation, and carryover storage. Because of the mitigation commitments required of water districts selling water under the EWA (EWA Final EIS/EIR and Record of Decision for the Short-Term Environmental Water Account Final EIS/EIR (Reclamation *et al.* 2004a)), additional environmental topics are discussed in this section, including air quality and cultural resources.

The following sections provide a detailed discussion of the potential for the proposed project to result in unreasonable impacts on fish, wildlife, or other instream beneficial uses of the water (Water Code §1727), relative to RD-1644 long-term instream flow requirements.

4.1 Water Resources

4.1.1 Water Supply Availability

4.1.1.1 Environmental Setting

The surface waterbodies potentially affected by the proposed project include New Bullards Bar Reservoir, the lower Yuba River, Oroville Reservoir and the lower Feather River, the Sacramento River, the Delta, and San Luis Reservoir.

Yuba River

The Yuba River Basin drains approximately 1,339 square miles of the western Sierra Nevada slope, including portions of Yuba, Sierra, Placer, and Nevada counties. The primary watercourses of the upper watershed are the South, Middle and North Yuba rivers. Both the upper and lower watersheds (above and below Englebright Dam, respectively) have been extensively developed for water supply, hydropower production, and flood control. Operators of upper watershed projects include PG&E, Nevada Irrigation District, and South Feather Water and Power Agency. The Yuba Project, which is operated by YCWA, includes water project operations in both the upper and lower watersheds. The Yuba Project, completed in 1969, includes New Bullards Bar Dam and Reservoir, New Colgate Powerhouse, Englebright Reservoir, and the Narrows II Powerhouse.

New Bullards Bar Reservoir

The flow in the Yuba River is partially controlled by New Bullards Bar Reservoir, the largest reservoir in the watershed. It stores approximately 966,000 acre-feet of water, has a surface area of approximately 4,800 acres when full, and regulates winter and spring drainage from approximately 489 square miles of watershed on the Yuba River. YCWA stores water in New Bullards Bar Reservoir to provide for instream flows for fisheries protection, flood control, power generation, recreation, and to provide irrigation water to Member Units that have both water rights and water service contracts. YCWA also has supplied water from New Bullards Bar Reservoir for municipal, industrial, and fish and wildlife purposes through several temporary water transfers, each lasting less than one year.

Feather River and Oroville Reservoir

The Feather River flows south for 67 miles from Oroville Reservoir and empties into the Sacramento River near Verona. Flows in the Feather River are controlled primarily by DWR's Oroville Reservoir, which stores 3.5 million acre-feet of water. A minimum flow of 600 cfs is maintained in the 8-mile low-flow section of the Feather River between the Fish Barrier Dam and the Thermalito Afterbay Outlet. A minimum flow of approximately 1,700 cfs is maintained in the 59-mile high flow section of the Feather River below the Thermalito Afterbay Outlet. Average flows in the Feather River during July and August are 7,600 cfs during wet years, 5,750 cfs during above-normal years, 4,700 cfs during below normal years, 4,050 cfs during dry years, and 2,950 cfs during critically dry years (YCWA 1998).

Sacramento River

The Sacramento River, which originates in the Cascade and Siskiyou Mountains of northern California and terminates in the Delta, is the largest river in California. Flows in the Sacramento River are controlled primarily by Reclamation's operation of Shasta Reservoir. In addition, release flows from both Oroville and Shasta reservoirs are coordinated by DWR and Reclamation, respectively, to meet water supply and environmental needs downstream and in the Delta. Flows on the Sacramento River at Keswick in July and August average approximately 12,500 cfs during wet years, 9,200 cfs during above-normal years, 7,600 cfs during below-normal years, 7,300 cfs during dry years, and 6,100 cfs during critically dry years (YCWA 1998). NMFS requires that Reclamation maintain a minimum release from Keswick Dam of 3,250 cfs from October 1 to March 31. No additional specific flow requirements have been identified for fish in the lower Sacramento River.

Sacramento-San Joaquin Delta

The Delta, located at the confluence of the Sacramento and San Joaquin rivers, serves as the major hub for the operations of both the SWP and CVP. DWR operates its Harvey O. Banks Pumping Plant in the southern Delta to lift water into the California Aqueduct for delivery to SWP customers in the San Joaquin Valley and to southern California. Reclamation operates the Tracy Pumping Plant to lift water from the southern Delta into the Delta-Mendota Canal to serve CVP water contractors in the San Joaquin Valley and the Tulare Basin. Current SWP and CVP operations in the Delta are governed by a series of regulations and agreements with SWRCB, USFWS, NMFS, and CDFG. These regulations and agreements limit the volumes of water that may be exported from the Delta, based on Delta hydrodynamics, water quality, and potential impacts on fisheries as determined by fish population monitoring at the pumps and in the Delta system.

Water conditions in the south Delta are influenced to varying degrees by natural tidal fluctuations, San Joaquin River flow and quality, local agricultural drainage water, SWP and CVP export pumping, local diversions, operation of the Delta Cross Channel and tidal barrier facilities, channel capacity, and regulatory constraints. These factors affect water levels and availability at some local diversion points. When the SWP and CVP are exporting water, water levels in local channels can be drawn down. Also, flows can diverge and converge in some channels. If local agricultural drainage water is pumped into the channels where circulation is poor, water quality can be affected. The South Delta Temporary Barriers Project, initiated in 1991, has been used to provide short-term improvement of water conditions for the south Delta. The South Delta Temporary Barriers Project involves the seasonal installation of four barriers—one in Middle River, two in Old River, and one in Grant Line Canal. Three of the barriers are designed to improve water levels and circulation for agricultural diversions. These barriers are installed by DWR and Reclamation on a seasonal basis, as needed, to improve water levels and water quality.

San Luis Reservoir

San Luis Reservoir is an off-stream storage reservoir operated jointly by the SWP and CVP with a capacity of 2,041,000 acre-feet. San Luis Reservoir is located 12 miles west of the city of Los Banos on San Luis Creek, between the eastern foothills of the Diablo Range and the western foothills of the San Joaquin Valley in Merced County (DWR 2001c). This major off-stream reservoir of the joint-use San Luis Complex stores excess winter and spring flows from the Delta and supplies water to service areas for both state and federal water contractors (DWR 2001c).

4.1.1.2 Impact Assessment Methodology

The analysis of the potential for unreasonable impacts on surface water supply availability associated with the proposed project within the affected waterbodies, listed above, was based on the following criterion:

- Reductions in reservoir storage or river flows, relative to RD-1644 long-term instream flow requirements, of sufficient frequency and duration, to unreasonably impact the water supply availability to customers and/or contractors.

Increases in reservoir water surface elevation or river flows were considered to have no unreasonable impact upon water supply availability.

4.1.1.3 Impact Assessment

Yuba River

The proposed project would result in a change in the hydrologic pattern of the Yuba River below New Bullards Bar Reservoir, although flows within the lower Yuba River would remain within normal operational ranges. Under the proposed project, flows in the lower Yuba River below New Bullards Bar Reservoir are expected to be similar to the basis of comparison (RD-1644 long-term), and remain with normal operational ranges. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to the basis of comparison) are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during November, December and March; (2) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (3) lower at low and intermediate flow levels, and equivalent at high flow levels during May; (4) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June; (5) higher at low flow levels, lower at low flow levels, and higher at high flow levels during July; and (6) higher over the range of flows expected during August, September and October.

The annual supply of water would not decrease and there would not be unreasonable impacts upon water supply availability. Additionally, YCWA would continue historic practices of providing surface water supply deliveries to its Member Units and/or implementation of groundwater substitution practices, thereby avoiding unreasonable impacts on agricultural water supplies within the YCWA service area. Therefore, no unreasonable impacts to surface water supply availability would be expected for water agencies and their customers or contractors that utilize the Yuba River, under the proposed project, relative to the basis of comparison.

New Bullards Bar Reservoir

Implementation of the proposed project would alter the hydrologic pattern relative to the basis of comparison; however, reservoir storage and water surface elevations at New Bullards Bar Reservoir would remain within normal operational parameters. During most months, simulated end-of-month reservoir storage under the proposed project would be less than storage under the basis of comparison over approximately 80 percent to 100 percent of the cumulative distribution. Depending on hydrological conditions, average end of September 2007 storage in New Bullards Bar Reservoir under the proposed project would be approximately 594,865 acre-feet, and average end-of-September storage under the basis of comparison would be approximately 655,432 acre-feet.

Downstream flow impacts can result when water has been released from reservoir storage for transfer purposes and the storage volume subsequently must be refilled with incoming water that otherwise would be spilled or bypassed. The reduction in spills or bypass flows could reduce flows downstream of the reservoir by as much as the quantity of the transferred amount of water.

Any analysis of storage refill (carryover storage) effects is highly speculative because these potential impacts are directly related to future water conditions that cannot be accurately predicted. Water management decisions in California are based on daily conditions occurring in a variety of water year types, and specific management decisions for future years are difficult to forecast; therefore, the following discussion is considered speculative and based on hypothetical situations.

The proposed project would result in a minimum reduction in storage of 62,000 acre-feet in New Bullards Bar Reservoir during March 2007 through December 2007, and could affect the probability, or at least the timing and duration, of spilling in the following year (or subsequent years). Spills would not occur as early, or may be smaller, under the proposed project compared to the basis of comparison. During a subsequent dry or critically dry year, it is possible that no spilling would take place regardless of whether the proposed project occurs; thus, potential impacts of the proposed project (including proposed water transfer) on storage refill could be delayed into subsequent water years. If a below-normal water year occurs after implementation of the proposed project, the potential storage refill effects of the proposed project (including a water transfer) would be largest because some spilling (a marginal amount) would be likely under the basis of comparison conditions. Potential storage refill effects likely would be minor if an above-normal or wet water year occurs, because of the large quantity of spilling that probably would occur, regardless of whether the proposed project is implemented. However, it is difficult to predict storage refill effects even with respect to water year types because substantial spilling could occur even in a dry water year (Appendix B).

The decrease in reservoir storage under the proposed project, relative to the basis of comparison, is not expected to be of sufficient magnitude or duration to adversely impact water supply availability from New Bullards Bar Reservoir.

The proposed project would adhere to the operational assumptions and refill criteria requirements described in the EWA EIS/EIR (Reclamation *et al.* 2003), from which the EWA EIS/EIR analyses determined that "*EWA acquisition of stored reservoir water from Yuba County WA would have a less-than-significant effect on water supply* (Reclamation *et al*. 2003) (p. 4-28)." Therefore, based on the analyses presented above and the conclusions previously determined for the EWA Program, no unreasonable impacts to surface water supply availability are anticipated at New Bullards Bar Reservoir under the proposed project.

Feather River and Oroville Reservoir

Because the proposed project would not be expected to result in Feather River flows or Oroville Reservoir storage levels outside of normal operational parameters, instream flow and reservoir storage affecting water supply availability would not be expected to differ substantially under the proposed project, relative to the basis of comparison. Average differences in simulated monthly mean Yuba River flows at Marysville and the percentage of these flows to Feather River flows at Gridley under the proposed project, relative the RD-1644 long-term, over the 83-year simulation period are presented in **Table 4-1**. Feather River flows are generally much higher than Yuba River flows; therefore, the influence of Yuba River flows on total Feather River flows is not likely to be substantial. Overall, potential changes to Feather River flows would not be expected to result in unreasonable impacts upon surface water availability for water supply purposes.

Although the specific operational scenario for Oroville Reservoir is unknown, reservoir storage changes (due to subsequent refill of New Bullards Bar Reservoir) that are expected to occur as a result of the proposed project would be expected to remain within historic operational ranges. Further, the Refill Agreement between YCWA and DWR would ensure that future refill of water transferred from storage in New Bullards Bar Reservoir resulting from purchases of water from YCWA by DWR would not significantly impact the SWP or CVP.

Table 4-1. Average Difference in Simulated Monthly Mean Flows for the Lower Yuba River (Marysville) Between the Proposed Project and the Basis of Comparison (RD-1644 long-term), Compared to the Total Volume of Average Feather River Flows (Gridley) During the March 2007 through December 2007 Period.

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Difference in Monthly Mean Flows (cfs)	-149*	342	-192*	262	35	281	165	100	-89*	-300*
**Feather River Average Monthly Flow (cfs)	7,736	4,418	4,068	4,003	5,301	4,293	3,060	2,365	1,978	4,936
Percent of Feather River Flows (cfs)	1.9	8.0	4.7	6.5	0.7	6.5	5.4	4.2	4.5	6.1

*Average monthly flow less than RD-1644 long-term
**Source: CDEC, period of record 1993 through 2005

Feather River flows are generally much higher than Yuba River flows; therefore, the influence of Yuba River flows on total Feather River flows is not likely to be substantial. Overall, potential changes to Feather River flows would not be expected to result in unreasonable impacts upon surface water availability for water supply purposes.

Although the specific operational scenario for Oroville Reservoir is unknown, reservoir storage changes (due to subsequent refill of New Bullards Bar Reservoir) that are expected to occur as a result of the proposed project would be expected to remain within historic operational ranges. Further, the Refill Agreement between YCWA and DWR would ensure that future refill of water transferred from storage in New Bullards Bar Reservoir resulting from purchases of water from YCWA by DWR would not significantly impact the SWP or CVP.

Although the specific operational scenario for Oroville Reservoir is unknown, reservoir storage changes (due to subsequent refill of New Bullards Bar Reservoir) that are expected to occur as a result of the proposed project would be expected to remain within historic operational ranges. Further, the Refill Agreement between YCWA and DWR would ensure that future refill of water transferred from storage in New Bullards Bar Reservoir resulting from purchases of water from YCWA by DWR would not significantly impact the SWP or CVP.

Therefore, because changes in the Feather River and Oroville Reservoir would be relatively minor under the proposed project, relative to the basis of comparison, and have been previously evaluated for the entire EWA Program in the EWA EIS/EIR, the potential changes associated with the proposed project would not be expected to result in unreasonable impacts upon surface water availability for water supply purposes.

Sacramento River

Flows in the Sacramento River are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations and, thus, would not be expected to differ substantially under the proposed project, relative to the basis of comparison. Average differences in simulated monthly mean Yuba River flows at Marysville and the percentage of these flows compared to Sacramento River flows at Freeport expected to occur under the proposed project, relative to RD-1644 long-term, over the 83-year simulation period are presented in **Table 4-2**. Although implementation of the proposed project potentially could alter Sacramento River flows slightly, these changes would be comparable to, or less than, the range described above for the Feather River.

Table 4-2. Average Difference in Simulated Monthly Mean Flows for the Lower Yuba River (Marysville) Between the Proposed Project and the Basis of Comparison (RD-1644 long-term), Compared to the Total Volume of Average Sacramento River Flows (Freeport) During the March 2007 through December 2007 Period.

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Difference in Monthly Mean Flows (cfs)	-149*	342	-192*	262	35	281	165	100	-89*	-300*
**Sacramento River Average Monthly Flow (cfs)	37,680	28,897	24,686	18,405	15,010	14,387	14,809	12,353	26,089	26,482
Percent of Sacramento River Flows	0.4	1.2	0.8	1.4	0.2	2.0	1.1	0.8	0.3	1.1
*Average monthly flow less than RD-1644 long-term **Source: CDEC, period of record 1948 through 2005										

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 4-25) water supply analysis determined that "*Although there would be a change in timing and rate of Sacramento River flows, the annual supply of water to Project or non-Project users would not decrease.*" Because the proposed project would only occur for a period of approximately one-year and would result in relatively minor changes in flow compared to the total volume of flow in the Sacramento River, the analyses presented above is consistent with the conclusions previously determined for the EWA Program. Therefore, potential flow changes due to the proposed project, relative to the basis of comparison, would be a relatively small proportion of total Sacramento River flows during the March 1, 2007 through December 31, 2007 period and, thus, are not expected to unreasonably affect water supply availability to water customers, including CVP and SWP contractors, relative to the basis of comparison.

Sacramento-San Joaquin Delta

Although the hydrologic pattern may be slightly altered with the implementation of the proposed project, Delta conditions are anticipated to remain within the normal ranges and fluctuations resulting from SWP and CVP operations, which were previously evaluated in the EWA EIS/EIR (Reclamation *et al.* 2003). The use of the YCWA transfer water for the EWA Program would be consistent with DWR's water right permits. Because the water would be used in the EWA Program, the effect should be to provide a beneficial effect upon SWP and/or CVP contractor water supply conditions in 2007. Because the proposed project would supply water to EWA, water supply would not be affected by pumping reductions by the SWP and CVP because EWA assets are used to repay the SWP and CVP for the loss of supply caused by reduced pumping. The proposed project should provide a more reliable water source, which would benefit all water users, including agricultural, environmental, and urban interests. The SWP and CVP annual supply would be equal to or greater than it would be without the EWA, therefore ensuring greater reliability.

Flows within the Delta could be slightly higher or lower during the proposed project (**Table 4-3**), but are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations. Although the specific operational scenario associated with the proposed project is uncertain, the projected changes to Delta conditions are not expected to unreasonably impact water supply availability to SWP and CVP customers, relative to the basis of comparison.

Table 4-3 Average Difference in Delta Inflow (cfs) Relative to Average Difference in Simulated Monthly Mean Flows (cfs) for the Lower Yuba River (Marysville) Between the Proposed Project and the Basis of Comparison (RD-1644 Long-term) During the March 2007 Through December 2007 Period.

	Mar 2007	Apr 2007	May 2007	Jun 2007	Jul 2007	Aug 2007	Sep 2007	Oct 2007	Nov 2007	Dec 2007
1998-2006 Sacramento River Average Monthly Flow[1]	44,138	32,123	28,526	23,459	20,632	18,406	16,347	12,050	13,513	25,697
1998-2006 Delta Inflow Average Monthly Flow[2]	69,588	52,717	40,826	32,466	26,136	21,944	19,178	15,157	16,423	30,476
Sacramento River Flow Percent of Delta Inflow	63.43%	60.93%	69.87%	72.26%	78.94%	83.88%	85.24%	79.50%	82.28%	84.32%
1948-2005 Sacramento River Average Monthly Flow[3]	37,680	28,897	24,686	18,405	15,010	14,387	14,809	12,353	26,089	26,482
Estimated 1948-2005 Delta Inflow Average Monthly Flow	59,406	47,423	35,330	25,472	19,014	17,153	17,373	15,538	31,706	31,407
Average Difference in Monthly Mean Flows	-149	342	-192	262	35	281	165	100	-89	-300
Average Difference Percent of Delta Inflow	-0.25%	0.72%	-0.54%	1.03%	0.18%	1.64%	0.95%	0.64%	-0.28%	-0.96%

[1] Source: (Reclamation Website 2006) (Table of Average Monthly Flows at Freeport)
[2] Source: (Reclamation Website 2006) (Table of Average Monthly Delta Inflows)
[3] Source: CDEC, Period of Record 1948 through 2005
[4] Differences in simulated mean monthly flows between the proposed project and RD-1644 long-term include both uncontrolled flow releases during flood control operations during wetter water years, and controlled flow releases during drier water years to meet minimum flow requirements on the lower Yuba River. Therefore, reductions in monthly mean flows presented in the table above represent simulated changes that are expected to occur between the proposed project and RD-1644 long-term flows only; these modeled reductions would not result in flow reductions under the proposed project that would cause actual flows to fall below RD-1644 interim minimum instream flow requirements.

The proposed project would be used for environmental purposes in the Delta or be conveyed through the pumping plants at Clifton Court Forebay into conveyance channels, and either stored in San Luis Reservoir or transported through the California Aqueduct directly to groundwater storage banks for SWP or CVP contractors. Because DWR and Reclamation are the entities responsible for operating the SWP and CVP systems and, likewise, for determining how best to address system-wide needs as environmental conditions change, YCWA is not a participant in the operational decisions that may occur with respect to how transferred water would be managed once it leaves the Yuba River Basin. However, it is anticipated that conveyance of these EWA assets through the SWP/CVP system and into the Delta would be consistent with the procedures established by Reclamation in its 2004 OCAP, and according to the operating principles established by Reclamation and DWR as part of the EWA Program.

Further, coordination with numerous agencies (YCWA, DWR, Reclamation, USFWS, NMFS, and CDFG) has been initiated and would continue to take place to ensure that water supply impacts would not occur, and that water in the Delta would be pumped within the most environmentally protective "windows" that exist when conveyance capacity is available. DWR could elect to store some portion of acquired transfer water associated with the proposed project in San Luis Reservoir.

San Luis Reservoir

DWR likely will store some portion of water acquired from the proposed project in San Luis Reservoir. Because the water is intended for use in the EWA Program, it is intended to potentially provide a beneficial effect upon state and/or federal water contractor supply conditions in 2007.

As discussed in the EWA EIS/EIR (Reclamation *et al.* 2003) (p. 4-35), "*The EWA agencies aim to assure that there would be no uncompensated water cost to the CVP or SWP relative to the baseline requirements. Furthermore, with the EWA, water supply would not be affected by pump reductions because EWA assets would repay the CVP and SWP for the loss of supply caused by reduced Project pumping. The Projects' annual supply would be equal to or greater than it would be without the EWA, therefore ensuring greater reliability. The amount of annual reductions under the Baseline Condition is difficult to predict because of variability in the system*." To illustrate, the EWA EIS/EIR also states that a portion of "*the EWA water would be supplied to Metropolitan WD from San Luis Reservoir (to protect water from spilling from San Luis Reservoir) prior to when it would be supplied under the Baseline Condition. Metropolitan WD would store the water for use later in the year. Because Metropolitan WD would be receiving the water earlier than it would under the Baseline Condition, the effect on water supply is beneficial* (Reclamation *et al.* 2003) (p. 4-37)."

Therefore, because changes in San Luis Reservoir would be relatively minor under the proposed project, relative to the basis of comparison, and have been previously evaluated for the entire EWA Program in the EWA EIS/EIR, the potential changes associated with the proposed project would not result in an unreasonable impact upon water supply at San Luis Reservoir.

4.1.2 Surface Water Quality

4.1.2.1 Environmental Setting

The following section provides a discussion of the water quality setting for the Yuba River, New Bullards Bar Reservoir, Feather River, Oroville Reservoir, Sacramento River, the Delta, and San Luis Reservoir.

Yuba River and New Bullards Bar Reservoir

The Yuba River is the largest tributary to the Feather River. Forest land is the primary land use and land cover for the Yuba River Basin, comprising about 85 percent of the land cover (USGS 2002). The forestland in the Yuba River Basin is located in the foothills of the Sierra Nevada, which experienced a substantial amount of gold mining, including placer and hard rock mining. Mercury was used in the basin to recover gold from both placer deposits and ore-bearing minerals. Residual mercury from those operations has been detected in invertebrate and fish communities nearby and downstream from the gold mining operations (May *et al.* 2000; Slotton *et al.* 1997).

The general water quality of the lower Yuba River is considered good and has improved in recent decades due to control of hydraulic and dredge mining operations, and the establishment of minimum instream flows (CDFG 1989). Dissolved oxygen concentrations, total dissolved solids, pH, hardness, alkalinity, and turbidity are well within acceptable or preferred ranges for salmonids and other key freshwater biota (Reclamation *et al.* 2003).

YCWA currently supplies raw water exclusively for agricultural purposes in YCWA's service area. YCWA is proposing to sell and deliver water to DWR, which has contracting agencies that have water treatment plants that would make YCWA water available for municipal supply.

Feather River

The Feather River is a large tributary to the Sacramento River. Flows in the lower Feather River are controlled mainly by releases from Oroville Reservoir, the second largest reservoir within the Sacramento River Basin, and by flow from the Yuba River, a major tributary. Forest land is the major (about 78 percent of total) land use or land cover for the Feather River Basin. Gold mining also was an important land use in the Sierra Nevada foothills that are part of the Feather River Basin. The Yuba and the Bear rivers both flow into the lower Feather River. Both the Yuba River and the Bear River basins have been affected by past gold mining and contribute mercury to the lower Feather and Sacramento rivers (May *et al.* 2000). Constituents of concern for the Feather River, according to the Clean Water Act Section 303(d) list, include diazinon, Group A pesticides, mercury and unknown toxicity. Potential sources of these constituents include agriculture, urban runoff, storm sewers, resource extraction and other unknown sources (Reclamation *et al.* 2003).

Oroville Reservoir

Oroville Reservoir primarily is used for water supply, power generation, flood control, fish and wildlife enhancement, and recreational purposes (DWR 2001c). Water quality in Oroville Reservoir is influenced by tributary streams, of which the Middle Fork Feather River, North Fork Feather River, and South Fork Feather River contribute the bulk of the inflow to the reservoir. Water quality in Oroville Reservoir generally is more influenced by recreation activities and other historical land-based activities (i.e., mining) than by SWP operations. Overall, based on preliminary on-going investigations being conducted under the Oroville Facilities FERC Relicensing studies (DWR Website 2005c), Oroville Reservoir water quality typically meets Central Valley Regional Water Quality Control Plan (Basin Plan) objectives for intended beneficial uses. Preliminary information indicates infrequent and minor exceedances for some constituents (DO, pH and nutrients) and more frequent exceedances of some metals (arsenic, aluminum and iron). Elevated metals concentrations potentially are related to wind disturbances and movement of bottom sediments, as well as from storm runoff events.

Sacramento River

The lower Sacramento River receives urban runoff, either directly or indirectly (through tributary inflow), from the cities of Sacramento, Roseville, Folsom, and their surrounding communities. The Natomas East Main Drainage Canal discharges to the Sacramento River immediately upstream of the confluence with the American River. This canal transfers both agricultural discharges and urban runoff into the Sacramento River.

Sacramento River water quality monitoring studies indicate that the river's water is generally of high quality (Brown and Caldwell *et al.* 1995; Larry Walker Associates 1996; Larry Walker Associates 1991). Concentrations of some trace elements (particularly copper and zinc) frequently approach limits established by regulatory agencies while other metals such as lead, cadmium, mercury, and silver also may approach these limits. Much of the trace element loadings in the Sacramento River are from non-permitted sources. Acid mine drainage contributes cadmium, copper, and zinc, while agricultural return flows typically contribute chromium and nickel. Discharges of urban runoff and seasonal agricultural runoff are the principal sources of water quality problems in the Sacramento River near its confluence with the American River (Corps 1991). Water quality of the Sacramento River near its confluence with the American River ranges from medium to good for numerous beneficial uses (SWRCB 1994).

Sacramento-San Joaquin Delta

Water quality in the Delta is influenced by a combination of environmental and institutional variables, including upstream pollutant loading, water export and diversions within and upstream of the Delta, and agricultural activities in the Delta. The tidal currents carry large volumes of seawater back and forth through the Bay-Delta Estuary with each tide cycle. The mixing zone of saltwater and freshwater can shift 2 to 6 miles depending on the tides, and may reach far into the Delta during periods of low inflow. Thus, the inflow of the tributaries into the Delta is essential in maintaining Delta water quality.

Metals, pesticides and petroleum hydrocarbons enter the Delta through several means, including agricultural runoff, municipal and industrial wastewater discharge, urban runoff, recreational uses, river inflow, and atmospheric deposition (SFEP 1992). The concentrations of these pollutants in the Delta vary geographically and seasonally. The toxic effects of pollutants on aquatic life can vary with flow levels.

In January 2005, DWR biologists identified and reported an unexpected decline of pelagic (i.e., open-water) organisms in the Delta. A draft white paper titled, *Interagency Ecological Program 2005 Workplan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary*, discussed the findings and was distributed among Interagency Ecological Program (IEP) agencies. Subsequently, a study plan was developed to begin intensive data analysis and technical studies into the causes of the decline. The IEP agencies provided approximately $2 million to support the initial studies, and a study plan was designed to continue to explore historical data and to clarify the nature of the decline and preliminarily screen possible explanations for the decline from among three broad categories: (1) ecological effects of non-indigenous species introductions, (2) unexpected effects of recent changes in water project operations, and (3) toxic effects of agricultural chemicals and blue-green algae. The correct explanation involves one, or a combination of these factors.

The IEP currently is in the process of finalizing its 2006/2007 work plan, which is being developed to expand on the efforts conducted as part of the initial 2005 studies focusing on pelagic organism declines. Because this work has yet to be conducted, it would be speculative to include a more detailed discussion of potential water quality impacts associated with these pelagic organism issues, as they relate to the proposed project, at this time. Due to the short-term nature (i.e., one year) of the proposed project, it is unlikely that new information will become available prior to completion of the proposed project. However, the proposed project would be operated pursuant to the constraints identified in the biological opinions that were issued for the CVP and SWP OCAP, which represent the best available science and management direction to date.

San Luis Reservoir

In general, the natural inflow from the San Luis Reservoir watershed is insignificant relative to the reservoir's capacity (DWR 2001c). Most of the reservoir's water is pumped from the California Aqueduct and the Delta-Mendota Canal via the O'Neill Forebay through the Gianelli Pumping-Generating Plant during the winter and spring (DWR 2001c). Water enters and exits San Luis Reservoir from a common inlet/outlet tower (DWR 2001c). In addition, Reclamation pumps water out of San Luis Reservoir in a westerly direction to San Felipe Division Water contractors through the Pacheco Pumping Plant and the Santa Clara Tunnel (DWR 2001c). San Luis Reservoir water is delivered to the San Joaquin Valley, the Santa Clara Valley, and Southern California when water supply in the California Aqueduct and the Delta Mendota Canal is insufficient (DWR 2001c).

In San Luis Reservoir, the low-point problem and associated algal growth is the primary water quality concern. In San Luis Reservoir, the low point refers to a range of minimum reservoir levels that occur in late summer and fall. The low-point problem is produced by a combination of warm-season algae growth and decreasing summer water levels (Reclamation *et al.* 2003). High algae content reduces the effectiveness of water treatment and can affect the quality and taste of treated water. As the reservoir is progressively drawn down below 300,000 acre-feet, increasing amounts of algae may enter the intake, and water quality problems can arise. Typically, taste and odor concerns associated with algal growth in the reservoir are more serious water quality concerns during drought years (DWR 2001c). In the fall, especially during drought years, a greater demand by SWP contractors creates lower water levels in the reservoir (DWR 2001c). Because of the improved light penetration and greater likelihood of establishment of a thermocline in the reservoir, algal blooms, consisting primarily of the blue-green algae *Aphanizomenon flosaquae*, are more likely to occur (DWR 2001c). During fall months, winds blow accumulated blue-green algae toward the intake, and taste and odor concerns may result (DWR 2001c). The EWA EIS/EIR (Reclamation *et al.* 2003) presents a detailed description of the San Luis Reservoir low-point topic.

4.1.2.2 Impact Assessment Methodology

The analysis of potential impacts on surface water quality associated with the proposed project within potentially affected waterbodies was based on the following criteria:

- Decrease in reservoir storage, of sufficient magnitude or duration relative to the basis of comparison, to result in an increase in the concentration of contaminants.
- Decrease in river flow, of sufficient magnitude or duration relative to the basis of comparison, to result in an increase in the concentration of contaminants.

Increases in reservoir storage or river flows under the proposed project, relative to the basis of comparison, were considered to have a slightly beneficial, or no effect, upon surface water quality due to the potential for increased dilution of contaminants.

Consultation with the Central Valley Regional Water Quality Control Board (RWQCB) related to the proposed YCWA water transfer to DWR in 2005 led to the identification of potential concerns regarding the possibility of a shift in hardness levels of the waterbodies receiving the proposed project water inflow. Therefore, a discussion of this topic is provided following the waterbody specific analyses presented in this section. Determination of the potential for an unreasonable impact is based on the following criterion:

- Increased potential for a substantial shift in hardness levels of the waterbodies receiving the proposed project source water, relative to the basis of comparison, of sufficient magnitude that the potential for increased bioavailability of metals would occur (e.g., substantially lower hardness level in the source water than in the receiving water).

4.1.2.3 Impact Assessment

Yuba River

The proposed project could result in changes in instream flows in the Yuba River, relative to the basis of comparison. Under the proposed project, flows in the lower Yuba River below New Bullards Bar Reservoir are expected to be similar to the basis of comparison (RD-1644 long-term), and remain with normal operational ranges. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to the basis of comparison) are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during November, December and March; (2) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (3) lower at low and intermediate flow levels, and equivalent at high flow levels during May; (4) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June; (5) higher at low flow levels, lower at low flow levels, and higher at high flow levels during July; and (6) higher over the range of flows expected during August, September and October. Additionally, reductions in lower Yuba River flows under the proposed project, relative to the basis of comparison, are not expected to be of sufficient magnitude or duration to result in an increase in the concentration of contaminants.

The EWA EIS/EIR water quality analysis identified past YCWA water transfers to the EWA Program as ranging between approximately 162,000 acre-feet (2002) and 172,000 acre-feet (2001), although a maximum of up to 185,000 acre-feet was evaluated for impact analysis purposes (Reclamation *et al.* 2003). Based on data from previous transfers, flows in the lower Yuba River flow would be greater than the flows under the EWA Baseline Condition (Reclamation *et al.* 2003). The EWA (2003) (p. 5-82) analysis concluded that, "*Increases in lower Yuba River flow would allow dilution of water quality constituents, including pesticides and fertilizers present in agricultural run-off. As a result, increases in flow would not be of sufficient frequency and magnitude to affect water quality in such as way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality. Therefore, potential flow-related changes to water quality under the Flexible Purchase Alternative would be less than significant*."

Similar to the EWA water quality analysis, flow increases expected to occur in the Yuba River under the proposed project, relative to the basis of comparison, may provide a beneficial effect to surface water quality by increasing the dilution of contaminants. Because the proportion of

EWA asset acquisitions associated with the proposed project is less than that which was identified for the previously evaluated EWA Program, it also is anticipated that Yuba River water temperature changes resulting from the proposed project would be less than that which was identified for the EWA Program. Therefore, unreasonable impacts on the surface water quality of the Yuba River are not expected to result due to implementation of the proposed project.

New Bullards Bar Reservoir

Implementation of the proposed project would alter the hydrologic pattern relative to the basis of comparison; however, reservoir storage and water surface elevations at New Bullards Bar Reservoir would remain within normal operational parameters. During March 2007, average end of month reservoir storage under the proposed project would 739,234 acre-feet, compared to 744,049 acre-feet under the basis of comparison. Depending on hydrological conditions, end of September 2007 storage in New Bullards Bar Reservoir under the proposed project would be approximately 594,865 acre-feet, and reservoir storage under the basis of comparison would be approximately 655,432 acre-feet. In December 2007, average end of month reservoir storage under the proposed project would be 587,506 acre-feet, compared to 630,319 acre-feet under the basis of comparison.

The EWA EIS/EIR water quality analysis for New Bullards Bar Reservoir determined that, "*…differences in median water surface elevation and reservoir storage would not be of sufficient magnitude and frequency to affect long-term water quality in such as way that would result in adverse effects to designated beneficial uses, exceedance of existing regulatory standards or substantial degradation of water quality. Consequently, potential effects to water quality would be less than significant* (Reclamation *et al.* 2003) (p. 5-71)."

Under the proposed project, monthly decreases in reservoir storage under the proposed project, relative to the basis of comparison, would not be of sufficient magnitude or frequency to increase concentrations of contaminants. YCWA would ensure that sufficient carryover water is available in New Bullards Bar Reservoir in 2008 to meet all contractual, regulatory, and environmental needs (refer to Appendix B for additional discussion). Therefore, because changes in New Bullards Bar Reservoir would be relatively minor under the proposed project, relative to the basis of comparison, and have been previously evaluated for the entire EWA Program in the EWA EIS/EIR, the potential changes associated with the proposed project would not be anticipated to result in unreasonable impacts to water quality at New Bullards Bar Reservoir.

Feather River

The proposed project could result in changes in flows in the Feather River, relative to the basis of comparison. Average differences in simulated monthly mean Yuba River flows at Marysville and the percentage of these flows to Feather River flows at Gridley under the proposed project, relative the RD-1644 long-term, over the 83-year simulation period are presented in Table 4-1.

As presented in Table 4-1, the proposed project could alter monthly mean Feather River flows between 0.7 percent (July) and 8.0 percent (April), relative to the basis of comparison. Because these values represent the total change in flow on a month-to-month basis, individual flow reductions that could occur in the Feather River under the proposed project, relative to the basis of comparison, are not expected to be of sufficient magnitude or duration to result in an increase in the concentration of contaminants.

The EWA EIS/EIR Feather River water quality analysis determined that, "*…any differences in flow would not be of sufficient frequency and magnitude to affect water quality in a way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality. Therefore, potential flow- related changes to water quality under the Flexible Purchase Alternative would be less than significant (*Reclamation *et al.* 2003) (pp. 5-79 – 5-80)." The EWA analyses also concluded that water temperature at the mouth of the Feather River "*would infrequently be increased by up to 0.7°F and would otherwise be essentially equivalent to or less than water temperatures relative to the Baseline Condition*", and these water temperature differences "*would not be of sufficient frequency and magnitude to affect water quality in a way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality. Consequently, potential water temperature-related changes to water quality would be less than significant* (Reclamation *et al.* 2003) (p. 5-81)."

Similar to the EWA water quality analysis, flow increases expected to occur in the Feather River under the proposed project, relative to the basis of comparison, may provide a beneficial effect to surface water quality by increasing the dilution of contaminants. Because the proportion of EWA asset acquisitions associated with the proposed project is less than that which was identified for the previously evaluated EWA Program, it may be anticipated that Feather River water temperature changes resulting from the proposed project would be less than that which was identified for the EWA Program. Therefore, unreasonable impacts on the surface water quality of the Feather River are not expected to result from implementation of the proposed project.

Oroville Reservoir

In the EWA EIS/EIR (Reclamation *et al.* 2003), total transfers made in the Upstream from the Delta Region would range from 50,000 to 600,000 acre-feet, limited by hydrologic year and conveyance capacity through the Delta. The EWA water quality analysis determined that, "*…implementation of the Flexible Purchase Alternative would not adversely affect concentrations of water quality constituents or water temperatures in Lake Oroville. As a result, any differences in water surface elevation and reservoir storage would not be of sufficient magnitude and frequency to affect water quality in such as way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards or substantial degradation of water quality. Consequently, potential effects to water quality would be less than significant (*Reclamation *et al.* 2003) (p. 5-65)."

Because the proportion of EWA asset acquisitions associated with the proposed project (i.e., 62,000 to 125,000 acre-feet) is less than that which was identified for the previously evaluated EWA Program, and the proposed project also was included in the EWA water quality analysis, any potential changes in Oroville Reservoir water surface elevation under the proposed project would be expected to be less than those identified for the entire EWA Program. Therefore, the proposed project, relative to the basis of comparison, would not result in unreasonable impacts on Oroville Reservoir water quality.

Sacramento River

Flows in the Sacramento River are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations and, thus, would not be expected to differ substantially under the proposed project, relative to the basis of comparison. Average differences in simulated monthly mean Yuba River flows at Marysville and the percentage of these flows compared to Sacramento River flows at Freeport expected to occur under the proposed project, relative to RD-1644 long-term, over the 83-year simulation period are presented in Table 4-2.

As presented in Table 4-2, the proposed project could alter monthly mean Sacramento River flows between 0.2 percent (July 2007) and 1.4 percent (June 2007), relative to the basis of comparison. Because these values represent the total change in flow on a month-to-month basis, individual flow reductions that could occur in the Sacramento River under the proposed project, relative to the basis of comparison, are not expected to be of sufficient magnitude or duration to result in an increase in the concentration of contaminants.

In the EWA EIS/EIR water quality analysis, it was determined that, "…*increases in Sacramento River flow at Freeport during the summer months would allow dilution of water quality constituents, including pesticides and fertilizers present in agricultural run-off. As a result, any differences in flow under the Flexible Purchase Alternative would not be of sufficient frequency and magnitude to affect water quality in a way that would result in long-term adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality. Therefore, potential flow-related changes to water quality under the Flexible Purchase Alternative would be less than significant* (Reclamation *et al.* 2003) (pp. 5-76 – 5-77)." In addition, potential water temperature-related changes to water quality would be less than significant (Reclamation *et al.* 2003).

Similar to the EWA water quality analysis conducted for the Sacramento River, flow increases expected to occur under the proposed project, relative to the basis of comparison, may provide a beneficial effect to the water quality in the Sacramento River by increasing the dilution of contaminants. Therefore, the proposed project, relative to the basis of comparison, would not result in unreasonable impacts on the surface water quality of the Sacramento River.

Sacramento-San Joaquin Delta

DWR is responsible for mitigating its water quality impacts as required under the 1995 Delta Water Quality Control Plan (SWRCB 1995). Some operational changes may have to be made to meet these standards, but DWR's ability to meet these standards will not be compromised under the proposed project, relative to the basis of comparison.

As presented in Table 4-3, the proposed project could alter monthly mean Delta inflow between 0.25 percent (March 2007) and 1.64 percent (August 2007), relative to the basis of comparison. Because these values represent the total change in flow on a month-to-month basis, individual flow reductions that could occur in the Delta due to changes in Sacramento River flow (as one component of total Delta inflow) under the proposed project, relative to the basis of comparison, are not expected to be of sufficient magnitude or duration to result in an increase in the concentration of contaminants.

The Central Valley Regional Water Quality Control Board has presented recommendations for establishing a Total Maximum Daily Load (TMDL) for methylmercury in the Sacramento-San Joaquin Delta Estuary (CVRWQCB 2006). The report contains an analysis of the mercury impairment, a review of the primary sources, a linkage between methylmercury sources and impairments, and recommended mercury reductions to eliminate impairments. The Sacramento Basin (Sacramento River + Yolo Bypass) contributes approximately 80% or more of the total mercury fluxing through the Delta. While Cache Creek and the upper Sacramento River (above Colusa) watersheds contribute the most mercury, the report identifies the Feather River watershed, which contains the Yuba River, as a relatively large mercury loading source with high mercury concentrations in suspended sediments. As a result, RWQCB staff recommends total mercury load reductions from the Feather River watershed, as well as numerous other watersheds within the Sacramento Basin. Because sediment in the lower Yuba River is not anticipated to be disturbed by flow fluctuations (i.e., pulses) or flow ranges outside of historic ranges, the proposed project would not result in an unreasonable impact to Delta water quality with regard to mercury loading.

If implemented in 2007, provision of the transfer water would occur through the EWA Program. Under EWA, carriage water is used as a mechanism to maintain Delta water quality standards (Reclamation *et al.* 2003) by increasing Delta outflows to protect Delta water quality by either maintaining or preventing increases in chloride and bromide concentrations within the Delta during periods of increased pumping. Because bromide is primarily present as a result of seawater intrusion, the use of carriage water to increase Delta outflow and hold ocean salts at the same point they were before pumping was increased would result in no increase in bromide concentrations. Water quality, including salinity, bromide, and the potential for THM and bromate formation, would not be altered in a way that would result in adverse effects to designated beneficial uses, exceedance of existing regulatory standards, or substantial degradation of water quality (Reclamation *et al.* 2003). Therefore, no unreasonable impacts to Delta water quality are expected to occur as a result of the proposed project.

Additionally, DWR monitors SWP water quality to ensure that SWP water supplies meet the Department of Health Services drinking water standards and Article 19 Water Quality Objectives for long-term SWP contracts. The objective of the SWP water quality monitoring program is to maintain project water at a quality acceptable for recreation, agriculture, and public water supply for the present and future under a policy of multiple uses of SWP facilities. These uses include fishing, boating, and water contact sports. DWR analyzes the water for physical parameters such as water temperature, specific conductance, and turbidity and more than 60 different chemical constituents, including inorganic chemicals, pesticides, and organic carbon potential. The monitoring program has stations throughout the SWP, including the O'Neill Forebay in San Luis Reservoir, the California Aqueduct, and terminal reservoirs such as Silverwood Lake, Lake Perris, Pyramid Lake, and Castaic Lake.

San Luis Reservoir

To the extent that proposed project transfer water is stored in San Luis Reservoir during summer and fall months when potential concerns related to the low point occur, the transfer of this water potentially could provide a beneficial effect. Although the SWP operations related to the proposed project transfer are unknown, it is expected that DWR would operate according to prevailing regulatory water quality and environmental protection requirements and that San Luis Reservoir water elevations would remain within normal operating ranges. Therefore, the proposed project would not be expected to result in unreasonable impacts upon San Luis Reservoir water quality.

Discussion of Potential Water Quality Concerns Related to Hardness Levels

The RWQCB requested that the 2005 and 2006 Water Code Environmental Analysis provide information regarding hardness levels of the waterbodies potentially affected by the proposed water transfers. The RWQCB had determined that water transfers have the potential to impact water quality when the waterbodies are of substantially different hardness levels. In particular, if the transfer source water has a lower water hardness level than the receiving water, there is the potential for the transfer to cause a shift (reduction) in hardness levels in the receiving water, thereby causing metals in the water to become more bioavailable than they were previously (pers. comm., McHenry 2005a; pers. comm., McHenry 2005b). The potential for water quality impacts depends upon the dilution potential and on the concentrations of metals in the affected waterbodies. The following provides a discussion of hardness levels in the affected water systems, as provided by the RWQCB (pers. comm., McHenry 2005b; pers. comm., Niiya 2005) and an assessment of the potential impacts of the proposed project.

The RWQCB indicated that the hardness levels for the Yuba and Feather rivers are generally in the range of 40 milligrams per liter (mg/L) $CaCO_3$. Data for the Feather River for the period of March through November 2002 indicated a low value of 37 mg/L $CaCO_3$ and a high of 40 mg/L $CaCO_3$ (pers. comm., McHenry 2005b). Sacramento River (near Freeport) hardness levels were reported to range from a low of 26 mg/L $CaCO_3$ to a high of 160 mg/L $CaCO_3$ for the period of January 1998 through November 2002 (pers. comm., Niiya 2005). Hardness levels for the Delta are reported to be in the range of 90 to 100 mg/L $CaCO_3$ (CCWD Website 2005). According to the RWQCB, these ranges of hardness levels between the affected water systems do not represent a significant water quality issue for the proposed project.

Additionally, because the Feather River and Sacramento River flows are substantially higher than the Yuba River flows under implementation of the proposed project, there is adequate dilution potential (of Yuba River water) to reduce the possibility of a shift in hardness levels that would result in a water quality concern in any of the receiving waterbodies.

4.1.3 Groundwater Resources

Groundwater resources are described and evaluated in detail in the Groundwater Analysis (MWH 2005), the EWA EIS/EIR (Reclamation *et al.* 2003), and the "*Analysis of the Groundwater Substitution Portion of the Yuba County Water Agency-CALFED Environmental Water Account/Department of Water Resources 2007 Transfer*" included as Appendix C. Information presented below is based upon these documents.

4.1.3.1 Environmental Setting

Groundwater

Yuba Groundwater Subbasin

The 2007 YCWA groundwater substitution component (i.e., up to 30,000 acre-feet in a Schedule 6 year) of the proposed project would utilize the Yuba County groundwater subbasin. The groundwater subbasin is described below in association with the environmental impacts analysis.

South-of-the-Delta Groundwater Banks

DWR potentially would store a portion of the proposed project transfer water in groundwater banks south of the Delta within the San Joaquin Groundwater Basin. The specific groundwater banking operations associated with the proposed project are not known at this time. The EWA EIS/EIR (Reclamation *et al.* 2003) provides detailed information regarding South-of-Delta Groundwater Banks, including participating agencies in Kern County that could be utilized as part of the EWA. Groundwater in the South San Joaquin Groundwater Basin historically has been heavily used, and excessive groundwater withdrawals have caused substantial declines in groundwater levels. However, as reported in the EWA EIS/EIR (Reclamation *et al.* 2003), groundwater levels have substantially increased relative to pre-project groundwater levels in several groundwater banks.

4.1.3.2 Impact Assessment Methodology

As part of the Pilot Program, YCWA potentially could transfer up to a total of 125,000 acre-feet of water into the Yuba River between March 1, 2007 and December 31, 2007. Under the proposed project, water will be supplied from surface water storage in New Bullards Bar Reservoir and a portion may be from substitution of groundwater for surface water deliveries by several Member Units. The maximum amount of water that could be derived from groundwater substitution is 30,000 acre-feet, which only would occur during a Schedule 6 water year.

The evaluation of potential impacts of the proposed project upon the Yuba Groundwater Basin, including the North Yuba and South Yuba subbasins, is based upon the "*Analysis of the Groundwater Substitution Portion of the Yuba County Water Agency-CALFED Environmental Water Account/Department of Water Resources 2007 Transfer*" (Appendix C). Additionally, the evaluation of potential groundwater resources impacts due to the proposed project is relies upon the assessments provided in the Groundwater Analysis (MWH 2005) and the analyses in the EWA EIS/EIR (Reclamation *et al.* 2003). In these assessments, the groundwater recharge rate of the Yuba County groundwater subbasin first was determined. Then, historic groundwater level data were critically reviewed to evaluate the rate of aquifer recovery associated with historic water transfers (i.e., transfers that utilized groundwater substitution operations). To evaluate the potential impacts on non-Member Unit groundwater well users, available documentation of mitigation measures performed in support of the historic transfers also were reviewed.

4.1.3.3 Impact Assessment

Groundwater substitution was used by YCWA and its Member Units to support water transfers in 1991, 2001 and 2002 (MWH 2005). Based on the experience gained from these water transfers, extracted quantities will be well within the aquifer's ability to recharge in a reasonable amount of time (Appendix C). Further, although groundwater substitution may result in temporary localized declines in groundwater levels, programmatic monitoring and mitigation measures exist to address this potential effect (Appendix C).

For the proposed project, the maximum amount of water that would be derived from groundwater substitution is 30,000 acre-feet. Based on the information presented in the Groundwater Analysis (Appendix C), the extraction of this amount of water will result in conditions that are within an acceptable range for the groundwater basin. Operation of the 2007 groundwater substitution program and the projected post-transfer basin conditions would not cause significant or unreasonable impacts to the environment. Additionally, these expected conditions along with the basin management procedures implemented by YCWA and Member Units would result in no significant unmitigated third-party impacts to other groundwater users within the basin. The water transferred as part of the proposed project would not strain the water supply or overall conditions of the North Yuba or South Yuba subbasins, and would not contribute to, or result in, conditions of overdraft.

Yuba Groundwater Subbasin

Currently, groundwater is the primary source of drinking water and surface water is the primary source of irrigation water in the Yuba River Basin. Historically, however, groundwater also was a primary source of irrigation water, and signs of overdraft were apparent by the 1980's. As a result of these overdraft trends, actions were taken to replace groundwater with surface water for irrigation purposes. Subsequent to the development of the Yuba River Operating Program, deliveries of surface water began with the completion of the initial phase of the South Yuba Canal in 1983. Extension of the canal continues to this day with increasing areas of the South Yuba subbasin receiving surface water with a concomitant reduction in groundwater use. Groundwater storage has recovered to the extent that current groundwater storage in the South Yuba subbasin is nearing the levels of the pre-development era.

Groundwater Recharge Rates

Since construction of the South Yuba Canal, the estimated increase in groundwater storage for the South Yuba Basin has ranged from 15,100 acre-feet to 21,200 acre-feet per year, depending on hydrologic conditions (Appendix C). Recharge is faster adjacent to the river, because all of the stream channels and floodplain deposits along the Yuba River act as a large water intake area for recharge of the subbasin (Appendix C).

Groundwater Levels

Increased groundwater pumping in support of water transfers could cause localized declines of groundwater levels, or the development of cones of depression near pumping wells. For example, the 2001 transfer operations affected wells in the Las Quintas area (through lower groundwater levels). Because of the lower levels, either reduced well pumping capacity or loss of pumping capacity occurred. In response, the Cordua Irrigation District (the member district for this area) lowered the pumps and/or deepened the wells for five residences. Ultimately, no significant long-term or unmitigated impacts to the residents of this area occurred.

The EWA EIS/EIR recognized that changes in groundwater levels could cause multiple secondary effects. Declining groundwater levels could result in: (1) increased groundwater pumping cost due to increased pumping depth, (2) decreased yield from groundwater wells due to reduction in the saturated thickness of the aquifer, (3) reduced groundwater in storage, and (4) decrease of the groundwater table to a level below the vegetative root zone, which could result in environmental effects (Reclamation *et al.* 2003).

The EWA groundwater analysis for the North Yuba and South Yuba groundwater subbasins determined that groundwater substitution could result in temporary drawdown that exceeds historical seasonal fluctuations (Reclamation *et al.* 2003). In addition, estimates of an upper bound for regional water level declines associated with an EWA groundwater transfer are up to 19 feet for both the North Yuba and South Yuba subbasins. However, the actual water level declines would generally be less than this amount.[1] The EWA analysis also concluded that groundwater substitution transfers could result in groundwater declines in excess of seasonal variation and these effects on groundwater levels potentially could be significant. To reduce these effects, in addition to the monitoring activities discussed above, the groundwater mitigation measures further specify that YCWA would be required to establish monitoring programs for EWA-related transfers. These programs would monitor groundwater level fluctuations within the local pumping area and if significant effects were to occur, then YCWA and/or its Member Units would be responsible for mitigation. These mitigation measures would reduce effects to less than significant levels (Reclamation *et al.* 2003).

[1] Grinnell (2002) indicated regional groundwater declines associated with a 65,000 acre-foot transfer from the North Yuba subbasin were on the order of 10 feet.

As previously discussed in the EWA EIS/EIR (2003), to address these potential local declines in future transfers involving groundwater substitution, DWR, YCWA and the Member Units have implemented a cooperative monitoring program that will ensure immediate remedial action would be taken to mitigate any identified impacts from a groundwater substitution (see Groundwater Management, below.)

Interaction with Surface Water

All of the stream channels and floodplain deposits along the Yuba River act as a large water intake area for recharge of the groundwater subbasin (Appendix C). Because groundwater substitution could be used to support higher river flows during Schedule 6 years, effects to riparian and aquatic habitats along the Feather and Yuba Rivers would be unlikely during the one-year that the proposed project would occur. Any loss from the river that would occurs in response to transfer pumping is accounted for by the required instream flow rate. Large flows would be maintained in these rivers that would continue to support aquatic and riparian resources at levels that would exist in the absence of the proposed project.

In the EWA EIS/EIR (2003), the analysis for the North Yuba and South Yuba groundwater subbasins has previously determined that, "*river flows could be reduced through pumping close to the Bear River to the south, or the Yuba River that flows through the subbasins. The Feather River borders the area on the west but pumping in support of water transfers does not occur near the river. Pumping could adversely affect the riparian and aquatic habitats and downstream water users. However, effects to riparian and aquatic habitats along the Feather and Yuba Rivers would be unlikely. Large flows would be maintained in these rivers that would continue to support aquatic and riparian resources at levels that would exist in the absence of a transfer to EWA.*"

The portion of the Bear River that most likely could be affected by the proposed project has only limited connection with adjacent groundwater that would be pumped. Wetlands, primarily irrigated rice cultures, exist in the area and pumping activities could reduce groundwater availability as a source of the wetlands' water supply. However, the amount of water applied for irrigation and the resulting return flows would be largely unchanged under the proposed project, relative to the basis of comparison, and would continue to support wetlands (Reclamation *et al.* 2003).

In addition to the Groundwater Management tasks YCWA employs to protect groundwater resources (see below) as part of the EWA, DWR implements a Well Review process to reduce potential impacts on surface waters. As described in the EWA EIS/EIR, groundwater pumping for EWA groundwater substitution transfers could reduce flows in nearby surface water bodies and these effects could be potentially significant (Reclamation *et al.* 2003). To reduce these effects, the EWA groundwater mitigation measures require assessment of measures to avoid and minimize any significant potential effects of an EWA transfer. (Reclamation *et al.* 2003) states, "*Through the Well Review process of the groundwater mitigation measures, the purchasing agency would review the location and screened interval of the proposed production wells. If data were insufficient to show that pumping would not result in adverse effects, production wells within 2 miles of a surface water body could be required to meet well depth criteria. Furthermore, the Well Review may determine that pumping activities should be limited to a specified depth in some areas, in order to avoid hydraulic interaction between pumping and overlying surface water systems. In addition to the well review, the groundwater mitigation measures provide guidance for the establishment of a local monitoring and mitigation program designed to identify and mitigate local impacts. These mitigation measures would reduce effects to less than significant levels.*"

Therefore, if necessary, the Well Review may determine that pumping activities associated with the proposed project should be limited to certain wells, or to a specified depth in some areas, in order to avoid hydraulic interaction between pumping and overlying surface water systems.

Groundwater Quality

Potential groundwater quality impacts associated with increased groundwater withdrawals in the North Yuba and South Yuba subbasins that may occur as part of the proposed project include the migration of reduced quality water. Groundwater underlying Beale Air Force Base on the eastern boundary of the South Yuba subbasin is contaminated and being remediated (Grinnell 2002 *as cited in* Reclamation *et al.* 2003). In addition, high nitrate levels are present in the boundaries of Dry Creek Mutual Water Company (Reclamation *et al.* 2003), and the upward migration of saline water from the deeper aquifers is of concern near Wheatland in the southeastern portion of the South Yuba subbasin. Although plans to supply surface water to this area are in the preliminary planning phase, this area currently relies on groundwater, which may cause the upward migration of saline water (Grinnell 2002 and Aikens 2003 *as cited in* Reclamation *et al.* 2003).

With the exception of these areas, groundwater is of good quality with a median total dissolved solids (TDS) concentration of 277 mg/L and 224 mg/L for the North and South Yuba subbasins, respectively. Because groundwater extraction associated with past water transfers was a sufficient distance from these potential problem areas, it is anticipated that the proposed project also would avoid these areas and, thus, avoid any adverse groundwater quality impacts.

Groundwater Management

YCWA has a number of water transfer policies that help guide agency operations. These policies specify that groundwater transfers should not result in unmitigated third party impacts, or cause overdraft. BVID also has a set of principles and policies addressing groundwater substitution transfers (Reclamation *et al.* 2003).

Through previous transfers, YCWA has learned that conjunctive use operations can cause isolated and site-specific effects. If an immediate response is provided, significant short-term or long-term impacts normally can be avoided completely.

Over the past decade, YCWA and its Member Units have taken an active and progressive role in managing the groundwater resources of the subbasin. YCWA also works with DWR in monitoring the basin and has been instrumental in extending the monitoring network of wells in the basin. Several of the districts in Yuba County have adopted groundwater management plans and YCWA adopted a groundwater management plan (compliant with AB 3030 SB 1938) during February 2005. YCWA and the districts participating in water transfers meet regularly to discuss the management of the basins. As part of basin management, YCWA, DWR, and the Member Units have instituted a monitoring plan to record in detail the water levels and water quality of the basins. The monitoring plan will be included in the water transfer contract with DWR.

The groundwater management approach for groundwater substitution transfers in Yuba County is embodied in three principles, as follows:

- Closely monitor conditions to watch for any potential significant impacts and to gain a better understanding of the groundwater resource;

- Immediately respond to any significant impacts that occur and mitigate those impacts with appropriate measures; and
- Utilize the transfer and associated activities to further the goal of effective management of the water resources of Yuba County through conjunctive use of groundwater and surface water.

YCWA and DWR coordinated implementation of the Groundwater Program for the Yuba Basin will protect Yuba County's groundwater resources. Overall, no unreasonable impacts upon local groundwater resources would occur related to the proposed project.

South-of-the-Delta Groundwater Banks

DWR may store a portion of water associated with the proposed project in groundwater banks located in the San Joaquin Groundwater Basin, south of the Delta. Storing excess transfer water in groundwater banks would make storage space available in San Luis Reservoir available for 2008.

As discussed in the EWA EIS/EIR (Reclamation *et al.* 2003), groundwater in the South San Joaquin Groundwater Basin has historically been used heavily, and excessive groundwater withdrawals have caused substantial declines in groundwater levels. Thus, groundwater resources in the San Joaquin Groundwater Basin have experienced overdraft conditions in past years. Although groundwater levels have increased since the beginning of banking operations, a large amount of storage capacity is available in the underlying aquifer. The purchase of storage space for EWA water (used to recharge the underlying aquifer) would increase the EWA agencies' operational flexibility because EWA assets could be stored if they were available at times that they could not be used immediately. The banked EWA water would also benefit south of Delta water contractors by increasing groundwater levels in their underlying basins.

The EWA EIS/EIR states that, "*EWA groundwater purchase and direct extraction from these banking facilities could result in declines of groundwater levels; however, the levels would generally remain higher than they would have been absent the banks. In contrast to the affected subbasins discussed previously, no estimated groundwater declines exist for this region. Groundwater banking agencies have policies that do not allow greater extraction of groundwater than the project has banked. Banking participants have signed MOUs and Agreements to monitor and regulate these declines. The MOUs, Agreements, and monitoring programs developed by these banks provide assurances that participating banking agencies have a sufficient level of monitoring and management to address effects if they occur* (Reclamation *et al.* 2003)." The EWA EIS/EIR further states that, "*migration of reduced quality groundwater and distribution of reduced quality water into the aqueduct system are two types of potential water quality effects associated with increased groundwater withdrawals for EWA asset acquisition. The banking projects' MOUs, agreements, and monitoring activities address many of these groundwater quality concerns*."

In addition to the monitoring activities and the water quality control measures incorporated into south of Delta water contractor's operations, the *Interim DWR Water Quality Criteria for Acceptance of Non-Project Water into the SWP* (DWR 2001b) protects the quality of the water transported within SWP aqueducts (Reclamation *et al.* 2003). All groundwater that is directly pumped from the banking projects and conveyed into the California aqueduct must comply with criteria requiring that all non-Project water entering the SWP aqueducts remain within or exceed historical water quality levels. Prior to the transfer, an established facilitation group must review the request for input and the DWR must give final approval (DWR 2001b).

Further, groundwater transfers to the EWA Project Agencies must not only meet the approval of Kern County Water Agency, but also must gain the approval of the banking participants and meet the operation criteria set forth by the MOUs and agreements. These MOUs and agreements specify operational parameters and priorities for participating entities, monitoring requirements, and mitigation strategies. Consequently, all potential impacts associated with the groundwater purchase and direct recovery operations conducted in accordance with local groundwater management requirements for the EWA Program would be less than significant (Reclamation *et al.* 2003)."

If groundwater basins south of the Delta were used to store water from the proposed project, the amount of water that would be extracted from them would be equivalent to the amount that is deposited. Storage of the proposed project transfer water potentially could result in beneficial impacts upon the groundwater basin by increasing groundwater levels, if only temporarily. Eventual extraction of the water potentially could result in groundwater declines, subsidence, or groundwater quality degradation. However, transfer water utilized in the EWA Program is subject to certain mitigation provisions. Groundwater banking participants have signed MOUs or other agreements that ensure mitigation of potential adverse impacts through monitoring and regulation of groundwater declines, subsidence and water quality conditions. Therefore, the proposed project, relative to the basis of comparison, would not be expected to result in unreasonable impacts to south-of-Delta groundwater banks.

4.2 Fisheries and Aquatic Resources

The evaluation of potential impacts on fisheries and aquatic resources due to the proposed project focuses on the reservoirs where operational changes are anticipated (New Bullards Bar and Oroville), the rivers used for the conveyance of the transfer water (Yuba, Feather, and Sacramento), and the Delta.

4.2.1 Environmental Setting

4.2.1.1 New Bullards Bar Reservoir

New Bullards Bar Reservoir has steeply sloped sides created from the flooding of a deep canyon. New Bullards Bar Reservoir supports both coldwater and warmwater fisheries including rainbow trout, kokanee salmon, brown trout, largemouth bass, smallmouth bass, crappie, sunfish, and bullhead (U.C. Davis Website 2004). Although warmwater fish species are known to occur in New Bullards Bar Reservoir (crappie, largemouth and smallmouth bass, and sunfish), limited recreational fisheries exist for these warmwater fish species. New Bullards Bar Reservoir supports an important salmonid fishery and is reported as having some of the best kokanee salmon fishing throughout the State of California (U.C. Davis Website 2004).

4.2.1.2 Yuba River

Based on general differences in hydraulic conditions, channel morphology, geology, water conditions, and fish species distribution, CDFG (1989) divided the lower Yuba River into the following four reaches:

- **Narrows Reach** – extends from Englebright Reservoir to the downstream terminus of the Narrows (River Mile [RM] 23.9 to RM 21.9); topography is characterized by steep canyon walls;

- **Garcia Gravel Pit Reach** – extends from the Narrows downstream to Daguerre Point Dam (RM 21.9 to RM 11.5);
- **Daguerre Point Dam Reach** – extends from Daguerre Point Dam downstream to the upstream area of Feather River back water influence (just east of Marysville) (RM 11.5 to RM 3.5); and
- **Simpson Lane Reach** – begins at the upstream area of Feather River back water influence and extends to the confluence with the Feather River (RM 3.5 to RM 0).

The lower Yuba River consists of the approximately 24-mile section extending from Englebright Dam, the first impassable fish barrier along the river, downstream to the confluence with the Feather River near Marysville. Water temperatures are colder upstream of Daguerre Point Dam than downstream of Daguerre Point Dam during the warmer months of the year. Water diversions occur in the vicinity of Daguerre Point Dam, which result in lower flows downstream, primarily during the summer and fall months. Also, during summer months, Yuba River water temperatures progressively warm from the release point downstream of Englebright Dam to the confluence with the Feather River. Yuba River water temperatures generally are cooler than those in the Feather River around the Yuba-Feather river confluence (YCWA 2003).

Species of primary management concern evaluated in this analysis include those that are recreationally or commercially important, or are listed under the federal and state ESA, such as Central Valley steelhead (federally listed threatened species), Central Valley fall-run Chinook salmon (federal species of concern), Central Valley spring-run Chinook salmon (state and federally listed threatened species), southern distinct population segment of green sturgeon (federally threatened), American shad, and striped bass. Resident fish in the lower Yuba River include rainbow trout, smallmouth bass, largemouth bass, Sacramento sucker, Sacramento pikeminnow, common carp, stickleback, and sculpin (YCWA 2004).

The differences in habitat characteristics (e.g., substrates, flows, water temperatures) of the 24 miles of the lower Yuba River suggests a gradient of potential use by Chinook salmon and steelhead. The upper reaches represent the best habitat for spawning and rearing.

Species Occurrence, Status, and Life Stage Habitat Requirements

Spring-run Chinook Salmon

Spring-run Chinook salmon cannot reliably be distinguished from fall-run Chinook salmon during spawning, rearing and emigration periods because of overlapping spawning periods, juvenile sizes, and other life history traits (YCWA 2000). Reported information on the life history and habitat requirements of Central Valley spring-run Chinook salmon can be found in the *Report to the Fish and Game Commission: A Status Review of the Spring-Run Chinook Salmon* (CDFG 1998) and *Habitat Restoration Actions to Double Natural Production of Anadromous Fish in the Central Valley of California* (USFWS 1995b).

The Central Valley spring-run Chinook salmon is listed as a threatened ESU under both the federal and state ESAs. Critical habitat for this ESU, which includes the lower Yuba River, was designated on September 2, 2005. Several factors have contributed to the state and federally "threatened' status of Central Valley spring-run Chinook salmon. Major in-basin factors contributing to the decline were migration barriers, hydraulic mining, and water diversions. Hydraulic mining in the Yuba River watershed from 1850 to 1885 caused extensive habitat destruction. Between 1900 and 1941, debris dams constructed by the California Debris

Commission, now owned and operated by the Corps on the lower Yuba River to retain hydraulic mining debris, completely or partially blocked the migration of Chinook salmon and steelhead to historic spawning and rearing habitats (CDFG 1991b; Wooster and Wickwire 1970; Yoshiyama *et al.* 1996). Water diversions also contributed to poor habitat conditions below the dams, especially in dry years. Today, Englebright Dam, completed in 1941 by the California Debris Commission and now owned and operated by the Corps, completely blocks spawning runs of Chinook salmon and steelhead, and is the upstream limit of fish migration.

Since the completion of New Bullards Bar Reservoir in 1970 by YCWA, higher, colder flows in the lower Yuba River have improved conditions for over-summering and spawning of spring-run Chinook salmon in the lower Yuba River. Relatively small numbers of Chinook salmon that exhibit spring-run phenotypic characteristics have been observed (CDFG 1998). Although precise escapement estimates are not available, the USFWS testified at the 1992 SWRCB lower Yuba River hearing that *"…a population of about 1,000 adult spring-run Chinook salmon now exists in the lower Yuba River"* (SWRCB Website 2005). The installation of a VAKI RiverWatcher fish imaging system in the North and South Fish Ladders at Daguerre Point Dam in 2003 has provided an opportunity to count Chinook salmon as they migrate through the lower Yuba River. During 2005, the year in which the VAKI operated continuously during the February through June period, 1,021 Chinook salmon (including grilse) were observed (CDFG, preliminary, unpublished data). Only four Chinook salmon were observed passing Daguerre Point Dam during the month of February; most Chinook salmon passing Daguerre Point Dam during this period were observed during the month of June. Chinook salmon redd surveys have been conducted during late August through September by CDFG since 2000. Historically, September was the peak month of spring-run Chinook salmon spawning, although some temporal overlap with fall-run Chinook salmon occurs (CDFG 2002; Myrick and Cech 2001; Rich 1987; SWRCB Website 2005). The number of Chinook salmon redds observed by CDFG during September has ranged between 66 and 288 during 2000 through 2005, although redd superimposition during some years has precluded accurate redd counts. The recent VAKI and redd observations have not been used to attempt to estimate the total spring-run Chinook salmon escapement in the lower Yuba River. Also, the origins of the early migrating and spawning fish and their genetic relationship with fall-run Chinook salmon are unknown. Hatchery-reared spring-run Chinook salmon were planted in the lower Yuba River during the 1970s and adipose fin-clipped (e.g., hatchery) Chinook salmon have been observed both by the VAKI and during carcass surveys.

Adult Immigration and Holding

Adult spring-run Chinook salmon immigration and holding primarily occurs in the Yuba River from March through October (Vogel and Marine 1991); upstream migration generally peaks in May (SWRI 2002). The adult immigration and holding life stages are evaluated together, because it is difficult to determine the thermal regime that Chinook salmon have been exposed to in the river prior to spawning. Elevated water temperatures and increased adult holding habitat densities can influence the number and virulence of common microparisites affecting immigrating adult salmonids (Spence *et al.* 1996). Water temperatures also can influence the timing of adult spawning and the egg viability of holding females. Adult Chinook salmon prefer to hold in run and pool habitats during their upstream migration to spawning areas. Preferred holding water depths for these habitats are usually greater than 6.2 feet (Moyle 2002). The acceptable water temperature range for adults immigrating upstream and holding is 57°F to 67°F (NMFS 1997). However, water temperatures above 64°F reportedly could cause the many diseases that commonly affect immigrating and holding Chinook salmon to become virulent (EPA 2001).

Adult Spawning

In the Central Valley, spring-run Chinook salmon spawning has been reported to primarily occur during September through mid-November, with spawning peaking in mid-September (DWR 2004a; DWR 2004c; Moyle 2002; Vogel and Marine 1991). In the Yuba River, spring-run Chinook salmon spawning reportedly occurs in the lower Yuba River from September through November (CDFG 1991a). Approximately 60 percent of the Chinook salmon population in the lower Yuba River spawn above Daguerre Point Dam (SWRCB 2003). In the lower Yuba River, Chinook salmon redds have been observed in the Garcia Gravel Pit Reach (primarily above Parks Bar) by mid-September (CDFG 2000). Characteristics of spawning habitats that are directly related to flow include water depth and velocity. Chinook salmon spawning reportedly occurs in water velocities ranging from 1.2 ft/s to 3.5 ft/s. Chinook salmon redd construction and spawning typically occurs at water depths greater than 0.5 feet.

Embryo Incubation

Spring-run Chinook embryo incubation primarily occurs in the lower Yuba River from September through March (CALFED and YCWA 2005). The intragravel residence times of incubating eggs and alevins (yolk-sac fry) are highly dependent upon water temperatures. Maximum Chinook salmon embryo survival reportedly occurs in water temperatures ranging from 41°F to 56°F (USFWS 1995b).

Juvenile Rearing

Spring-run Chinook salmon juvenile rearing is believed to extend year-round (Moyle 2002). Although some portion of an annual year-class may emigrate as post-emergent fry (individuals less than 45 mm in length), most are believed to rear in the upper Sacramento river and tributaries during the winter and spring and emigrate as juveniles (individuals greater than 45 mm in length, but not having undergone smoltification) or smolts (silvery colored fingerlings having undergone the smoltification process in preparation for ocean entry).

Juvenile salmonid growth, survival, and successful smoltification are influenced by various environmental and physiological factors, including photoperiod and water temperature. During juvenile rearing and smolt emigration, salmonids prefer stream margin habitats with sufficient depths and velocities to provide suitable cover and foraging opportunities. Chinook salmon reportedly utilize river channel depths ranging from 0.9 feet to 2.0 feet (Raleigh *et al.* 1986). Water velocities observed being utilized most frequently by juvenile Chinook salmon range from 0 ft/s to 1.3 ft/s (Raleigh *et al.* 1986). The water temperature reported for maximum growth of juvenile Central Valley Chinook salmon is 66.2°F (Cech and Myrick 1999).

Smolt Emigration

The timing of juvenile emigration from the spawning and rearing grounds varies among the tributaries of origin, and can occur during the period extending from October through April (Vogel and Marine 1991). Spring-run Chinook salmon smolt emigration generally occurs from November through June in the lower Yuba River (CALFED and YCWA 2005; CDFG 1998; SWRI 2002).

Fall-run Chinook Salmon

In the Central Valley, fall-run Chinook salmon are the most numerous of the four salmon runs, and continue to support commercial and recreational fisheries of significant economic importance. Fall-run Chinook salmon is currently the largest run of Chinook salmon utilizing the Sacramento River and its tributaries. The San Joaquin River tributaries also support runs of fall-run Chinook salmon.

The CDFG began making annual estimates of fall-run Chinook salmon spawning escapement (i.e., the number of salmon that "escape" the commercial and sport fisheries and return to spawn) in the lower Yuba River in 1953. From 1953 to 1971, escapement estimates ranged from 1,000 fish in 1957 to 37,000 fish in 1963, and averaged 12,906 fish. From 1972 to 2001, fall-run Chinook salmon spawning escapement was higher on average than that which occurred during the pre-New Bullards Bar Dam period (1953 to 1971), averaging about 15,000 fish per year (CALFED and YCWA 2005).

Adult Immigration and Holding

Adult fall-run Chinook salmon immigration and holding generally occurs in the lower Yuba River from August through November (CALFED and YCWA 2005). Adult fall-run Chinook salmon generally begin migrating upstream annually in July, with minimal immigration continuing through December in most years (NMFS 2004; Vogel and Marine 1991). Adult fall-run Chinook salmon immigration generally peaks in November, and typically greater than 90 percent of the run has entered the river by the end of November (CDFG 1992; CDFG 1995). The immigration timing of fall-run Chinook salmon tends to be temporally similar from year-to-year because it is largely dictated by cues (photoperiod, maturation, and other season environmental cues) that exhibit little year-to-year variation.

Adult Spawning

The timing of adult Chinook salmon spawning activity is strongly influenced by water temperatures. When daily average water temperatures decrease to approximately 60°F, female Chinook salmon begin to construct nests (redds) into which their eggs (simultaneously fertilized by males) are eventually released. Fertilized eggs are subsequently buried with streambed gravel. In general, the lower Yuba River fall-run Chinook salmon spawning and embryo incubation period extends from October through December (CALFED and YCWA 2005). It should also be noted that if water temperature conditions are sufficiently low (i.e., ≤ 60°F), spawning activity may begin in September (Moyle 2002).

Embryo Incubation

Fall-run Chinook salmon embryo incubation in the lower Yuba River generally occurs from October through March. The intragravel residence times of incubating eggs and alevins (yolk-sac fry) are highly dependent upon water temperatures.

Juvenile Rearing and Outmigration

Fall-run juvenile rearing and outmigration in the lower Yuba River primarily occurs from December through June (CALFED and YCWA 2005; SWRI 2002). Fall-run Chinook salmon fry emergence generally occurs from late-December through March (Moyle 2002). Water temperatures reported to be optimal for rearing of Chinook salmon fry and juveniles are between 45°F and 65°F (NMFS 2002; Rich 1987; Seymour 1956). Raleigh et al. (Raleigh *et al.*

1986) reviewed the available literature on Chinook salmon thermal requirements and suggested a suitable rearing temperature upper limit of 75°F and a range of approximately 53.6°F to 64.4°F. Zedonis and Newcomb (Zedonis and Newcomb 1997) report that the smoltification process may become compromised at water temperatures above 62.6°F. Fall-run Chinook salmon outmigration generally occurs within several weeks of emergence from gravels. Temperatures required during outmigration are believed to be about the same as those required for successful rearing, as discussed above.

Steelhead

Central Valley steelhead is federally listed as "threatened" under the ESA. Historical information on Central Valley steelhead populations is limited. Steelhead ranged throughout accessible tributaries and headwaters of the Sacramento and San Joaquin rivers before major dam construction, water development, and other watershed disturbances. Historical declines in steelhead abundance have been attributed largely to dams that eliminated access to most of their historic spawning and rearing habitat, and restricted steelhead to less suitable habitat below the dams. Other factors that have contributed to the decline of steelhead and other salmonids include habitat modification, over-fishing, disease and predation, inadequate regulatory mechanisms, climate variation, and artificial propagation (NMFS 1996).

CDFG estimated that only approximately 200 steelhead spawned in the lower Yuba River before New Bullards Bar Reservoir was completed in 1969. From 1970 to 1979, CDFG annually stocked 27,270 to 217,378 fingerlings, yearlings, and sub-catchables from Coleman National Fish Hatchery into the lower Yuba River (McEwan and Nelson 1991; NMFS 1996). Based on angling data, CDFG estimated a run size of 2,000 steelhead in the lower Yuba River in 1975. The current status of this population is unknown, but it appears to be stable and able to support a significant sport fishery (McEwan and Jackson 1996). The Yuba River is currently managed for natural steelhead production.

Adult Immigration and Holding

The immigration of adult steelhead in the lower Yuba River reportedly occurs from August through March, with peak immigration from October through February (CALFED and YCWA 2005; McEwan and Nelson 1991). For this IS, the adult immigration and holding life stages will be evaluated together, because it is difficult to determine the thermal regime that steelhead have been exposed to in the river prior to spawning and, in order be sufficiently protective of pre-spawning fish, water temperatures that provide high adult survival and high egg viability must be available throughout the entire freshwater immigration and holding period. Water temperatures can affect the timing of adult spawning and migrations, and can affect the egg viability of holding females. Few studies have been published that examine the effects of water temperature on either immigration or holding, and none have been recent (Bruin and Waldsdorf 1975; McCullough *et al.* 2001). The available studies suggest that adverse effects could occur to immigrating and holding steelhead at water temperatures that exceed the mid 50°F range, and that immigration could be delayed if water temperatures approach approximately 70°F (Bruin and Waldsdorf 1975; McCullough *et al.* 2001).

Adult Spawning

Steelhead spawning generally occurs from January through April in the lower Yuba River (CALFED and YCWA 2005; CDFG 1991a). Optimal spawning temperatures have been reported to range from 39°F to 52°F (CDFG 1991b). Salmonids typically deposit eggs within a range of depths and velocities that minimize the risk of desiccation as seasonal water levels recede, and that maintain high oxygen levels and remove metabolic wastes from the redd (Spence *et al.* 1996). Water depth range preference for spawning steelhead has been most frequently observed between 0.3 and 4.9 feet (Moyle 2002). The reported preferred water velocity for steelhead spawning is 1.5 feet per second (ft/s) to 2.0 ft/s (USFWS 1995b).

Embryo Incubation

Steelhead embryo incubation generally occurs from January through May in the lower Yuba River (CALFED and YCWA 2005; CDFG 1991a; SWRI 2002). Few studies have been published regarding the effects of water temperature on steelhead spawning and embryo incubation (Redding and Schreck 1979; Rombough 1988). From the available literature, water temperatures in the low 50°F range appear to support high embryo survival, with substantial mortality to eggs reportedly occurring at water temperatures in the high 50°F range and above 60°F (Redding and Schreck 1979; Velsen 1987). Optimal egg incubation temperatures have been reported to range from 48°F to 52°F (CDFG 1991b).

Juvenile Rearing

Juvenile steelhead often rear in the lower Yuba River for one year or more (SWRI 2002). Both seasonal and anthropogenic fluctuations in river flows affect juvenile steelhead habitat quantity and quality. Within freshwater environments, juvenile salmonids select specific microhabitats where water depth and velocity fall within a specific range or where certain hydraulic properties occur. Juvenile steelhead prefer water depths and velocities that provide adequate cover and foraging opportunities. The reported optimal water velocity for juvenile steelhead is 0.9 ft/s (USFWS 1995b). Juvenile steelhead reportedly most often utilize water depths of approximately 15 inches (McEwan 2001).

Like other salmonids, growth, survival, and successful smoltification of juvenile steelhead are affected by water temperature. The duration of steelhead residence in freshwater is long relative to that of fall-run Chinook salmon, making the juvenile life stage of steelhead more susceptible to the influences of water temperature, particularly during the over-summer rearing period. The preferred range of water temperatures for juvenile steelhead is reportedly 62.6°F to 68.0°F (Cech and Myrick 1999).

Smolt Emigration

Juvenile steelhead smolt emigration can occur in the Yuba River from October through May (CALFED and YCWA 2005; SWRI 2002). River flow may be important in facilitating downstream movement of steelhead smolts. Smolt emigration is prompted by factors (e.g., photoperiod, instream flow, and water temperature), that induce the fish to emigrate once a physiological state of readiness has been achieved (Groot and Margolis 1991). The reported optimum water temperature range for successful smoltification of juvenile steelhead is 44.0°F to 52.3°F (Myrick and Cech 2001; Rich 1987). River flows may be an important factor influencing the rate at which steelhead smolts migrate downstream, although factors influencing the actual speed of migration remain poorly understood. Steelhead smolts that emigrate later (e.g., May) during the emigration period may undergo a more rapid parr-smolt transformation as seasonal water temperatures increase (Spence *et al.* 1996).

Southern Distinct Population Segment of Green Sturgeon

The green sturgeon is the most widely distributed member of the sturgeon family *Acipenseridae* (68 FR 4433 (January 29, 2003)). In California, historical spawning populations existed only in the Sacramento, Eel, and Klamath-Trinity river systems. A number of presumed spawning populations (Eel River, South Fork Trinity River, San Joaquin River) have been lost, and the only known spawning in California now occurs in the Sacramento and Klamath river systems (Moyle 2002; NMFS 2002). Green sturgeon are reported to spawn in the Feather River, though this claim is not substantiated (NMFS 2002). Green sturgeon reportedly still regularly occur in the Bear and Yuba rivers (CDFG Website 2002). Daguerre Point Dam restricts the upstream migration of green sturgeon in the lower Yuba River. Although green sturgeon have been known to utilize fish ladders (Peake *et al.* 1997), the fish ladders on Daguerre Point Dam are not adequately designed to allow passage by sturgeon. The Daguerre Point Dam fish ladders are pool and weir type structures that require fish to jump from step to step as they ascend weirs located on each side of the dam (NMFS 2001). This type of swimming behavior would not be expected to commonly occur due to the benthic nature of sturgeon. Therefore, Daguerre Point Dam is considered a barrier to the upstream migration of green sturgeon in the lower Yuba River.

Specific life history requirements have not been developed for green sturgeon populations within tributaries of the Sacramento River; therefore, for the purpose of this environmental assessment, life history requirements for green sturgeon in the Sacramento River are assumed to be the same in the lower Yuba River.

Green sturgeon are anadromous and are the most marine-oriented of the Pacific Coast sturgeon species (68 FR 4433 (January 29, 2003)). Green sturgeon are thought to spawn every three to five years (68 FR 4433 (January 29, 2003)), and may spawn as frequently as every two years (70 FR 17386 (April 6, 2005)). In the Sacramento River, green sturgeon spawning occurs during late spring and early summer above Hamilton City, and perhaps as far upstream as Keswick Dam (CDFG 2000). Adults begin their inland migration in late-February (Moyle *et al.* 1995), and enter the Sacramento River between February and late July (Moyle 2002). The water temperature tolerance of immigrating adult green sturgeon reportedly ranges from 44.4°F to 60.8°F (USFWS 1995b). The spawning period generally extends from March through July, with peak spawning occurring between April and June (Moyle *et al.* 1995). Green sturgeon reportedly tolerate spawning water temperatures ranging from 50°F to 70°F (CDFG 2001). Water temperatures above 68°F are reportedly lethal to green sturgeon embryos (Cech *et al.* 2000). Green sturgeon larvae first feed at about 10 days post-hatch, and metamorphosis to the juvenile life stage is generally complete at 45 days. Juveniles spend one to three years in fresh water before they enter the ocean (68 FR 4433 (January 29, 2003)). Growth of juvenile green sturgeon is reportedly optimal at a water temperature of 59°F and reduced at water temperatures exceeding 66.2°F (Cech *et al.* 2000). Juvenile green sturgeon are taken in traps at the Red Bluff Diversion Dam and the Glenn-Colusa Irrigation District pumping facility in Hamilton City, primarily in the months of May through August. Peak counts occur in the months of June and July (68 FR 4433 (January 29, 2003)). Juvenile emigration may reportedly extend through September (Environmental Protection Information Center *et al.* 2001)

Because the literature does not report on green sturgeon water temperature preferences during juvenile emigration, the water temperature requirement for juvenile rearing are considered to also be applicable to juvenile emigration. Green sturgeon disperse widely in the ocean after their out-migration from freshwater (68 FR 4433 (January 29, 2003)).

American Shad

American shad are native to the Atlantic coast and were introduced into the Sacramento River in the 1800s (Moyle 2002). In the Sacramento River and its tributaries, such as the Yuba River, homing behavior is generally assumed to guide American shad to their natal rivers to spawn, although there is some evidence to suggest that the numbers of shad spawning in major tributaries are proportional to flows of each river at the time the shad arrive. They also are capable of timing their migrations to river outflows (Quinn and Adams 1996). However, spawning fish tagged in one year are most likely to return to the same river in following years if they are repeat spawners (Johnson and Dropkin 1995). Adult American shad typically enter Central Valley rivers from April through early July (CDFG 1986), with the majority of immigration and spawning occurring from mid-May through June (Urquhart 1987). In the lower Yuba River, adult immigration and spawning is believed to primarily occur from April through June. Water temperature is an important factor influencing the timing of American shad spawning, which takes place mostly in the main channels of rivers. Peak spawning reportedly occurs at water temperatures between 51.2°F and 62.6°F (Moyle 2002). Approximately 70 percent of the spawning run is composed of first time spawners (Moyle 2002). When suitable spawning conditions are found, American shad school and broadcast their eggs throughout the water column.

Striped Bass

Adult striped bass are present in Central Valley rivers throughout the year, with peak abundance occurring during the spring months (CDFG 1971; DeHaven 1979; DeHaven 1977). Striped bass spawn in water temperatures ranging from 59°F to 68°F (Moyle 2002). Therefore, spawning may begin in April, but peaks in May and early-June (Moyle 2002).

Sacramento River tributaries seem to be nursery areas for young striped bass (CDFG 1971; CDFG 1986). Juvenile and sub-adult fish have been reported to be abundant in the lower American River and lower Yuba River during the fall (DeHaven 1977). Optimal water temperatures for juvenile striped bass rearing have been reported to range from approximately 61°F to 73°F (USFWS 1988).

Summary of Recent Water Transfer Fisheries Monitoring Studies and Findings

The Yuba River is one of many Central Valley rivers that has been utilized in water transfer projects for a number of years. The following discussion provides a summary of YCWA's recent water transfers and related monitoring studies and evaluations performed in 2001, 2002, and 2004. Monitoring studies were not conducted in 2003 because a research permit, authorizing take of federally listed species, as required for monitoring by Section 10 of the federal ESA, was not issued in that year.

In 2001, 2002, 2003 and 2004, YCWA and other local water agencies initiated water transfers from New Bullards Bar Reservoir through the Yuba River to satisfy a variety of downstream water needs. No substantial amounts of water were transferred in 2005 or 2006. YCWA water transfer amounts and periods were as follows:

Year	Acre-feet	Transfer Period
2001	172,000 acre-feet	July 1 through mid-October 2001
2002	157,050 acre-feet	Mid-June through mid-September 2002
2003	65,000 acre-feet	Mid-July through mid-October 2003
2004	100,487 acre-feet	July 1 through September 28, 2004

The primary fisheries issues evaluated in recent water transfer monitoring and evaluation studies include issues associated with: (1) juvenile steelhead downstream movement; (2) adult Chinook salmon immigration and the potential for increased straying of non-native fish into the lower Yuba River; and (3) water temperatures in the lower Yuba River and Feather River.

Juvenile steelhead and adult Chinook salmon were monitored during the 2001, 2002 and 2004 Yuba River water transfers utilizing rotary screw traps (RSTs) and adult ladder trapping. In June 2003, an automated fish detection system was installed at the Daguerre Point Dam fish ladders to improve the overall efficiency of adult Chinook salmon monitoring). Due to the differences in the characteristics of the water transfers (i.e., a distinct ramp-up period in 2001 but not in 2002 or 2004), patterns of juvenile steelhead downstream movement that were observed in 2001 were not similar to those observed in 2002 or 2004. Additionally, monitoring program complications and inherent natural variation between 2001, 2002, and 2004 (associated with water year type and the abundance, timing and distribution of juvenile steelhead, among other parameters) complicate the use of the observations to draw definitive conclusions regarding the effects of water transfers on juvenile steelhead in the lower Yuba River. However, the studies and evaluation undertaken in 2004 provide an assessment of potential short-term effects of the 2004 water transfers on lower Yuba River fisheries (specifically regarding juvenile steelhead movement and adult Chinook salmon immigration).

Discussions among YCWA and fisheries resources agencies (i.e., CDFG, USFWS and NMFS) resulted in modification of the operations associated with the 2004 water transfer. Specifically, CDFG suggested several measures to avoid potential adverse impacts upon anadromous fish resources of the lower Yuba River. In response to these discussions, YCWA maintained minimum instream flow levels to avoid substantial increases or decreases in lower Yuba River flow at the initiation of the 2004 water transfers. Additionally, YCWA operated the Yuba Project such that changes in flow were gradual. Also, as requested by CDFG, the monitoring and evaluation studies of lower Yuba River fisheries conducted in 2002 were continued in 2004.

The initial observations and reported findings of the monitoring and evaluation studies undertaken during 2001, 2002, and 2004 are summarized below.

Juvenile Steelhead Downstream Movement

Resource agencies involved in the management of fisheries resources in the lower Yuba River have indicated concern that YCWA water transfers potentially can induce the downstream movement of juvenile steelhead due to increases in instream flows associated with water transfer operations. The potential movement of juvenile steelhead over Daguerre Point Dam (RM 11) restricts subsequent rearing to those areas downstream of Daguerre Point Dam, because juvenile steelhead are not able to readily pass back upstream of Daguerre Point Dam. Conditions downstream of Daguerre Point Dam may be more or less suitable for juvenile steelhead rearing during the post-water transfer period, depending upon several factors, including post-water transfer water temperatures as influenced by ambient conditions.

This section summarizes the observations made based upon monitoring and evaluation studies conducted during the 2001, 2002 and 2004 YCWA water transfers. It is noted that due to differences in monitoring program implementation during these years of study, it is problematic to conclude definitive trends from the data. However, based upon the substantial differences in juvenile steelhead downstream movements (RST catch data) noted between the 2001 study, and the 2002 and 2004 studies, it does appear that the increases in juvenile steelhead downstream movement associated with the initiation of the 2001 water transfers were avoided due to a more gradual ramping-up of flows that occurred in 2002 and 2004.

The 2001 water transfer was characterized by a relatively large, rapid ramp-up period. Beginning approximately July 1, 2001, water transfers increased flows in the lower Yuba River over a few days by about 1,200 cfs and generally were sustained through late August when ramping down began. On July 8, 2001, a week subsequent to the start of the 2001 water transfers, the daily catch at the CDFG Hallwood Boulevard (RM 7) RST increased from less than ten young-of-the-year (YOY) steelhead juveniles per day, to more than 450 YOY per day (CDFG unpublished data). The next week, daily catches decreased to about 190 YOY per day. In the following weeks, while the transfers were continuing, daily catches decreased further, but still surpassed catches prior to the water transfers. Thus, potentially associated with the ramping-up of the 2001 water transfers, juvenile steelhead moved downstream from the upstream reaches of the lower Yuba River to areas downstream of Hallwood Boulevard. The relationship between a rapid increase in flow and a large peak in the number of juvenile steelhead captured at the RSTs may indicate that the water transfer affected downstream movement of juvenile steelhead, possibly over Daguerre Point Dam into the lower Yuba River, or into the lower Feather River.

In response to the 2001 water transfer observations, discussions regarding flow and water temperature patterns and coincident fish behavior, including juvenile steelhead downstream movement, YCWA, NMFS, USFWS, CDFG, and NGO representatives collaboratively developed a rigorous monitoring and evaluation plan for YCWA water transfers. Additionally, these entities created an instream flow release schedule for the water transfers to avoid a rapid increase in flow when the transfers begin to minimize or avoid impacts upon anadromous fish in the lower Yuba River.

During the 2002, 2003, and 2004 water transfers, YCWA operated the Yuba Project in a manner that maintained instream flows in the lower Yuba River at a relatively stable rate in the late spring, with gradual changes in flow rates through initiation of the water transfer. Maintenance of more stable and gradually changing flows during this period (June through July), rather than a large, rapid ramp-up such as occurred during the 2001 water transfer, appeared to minimize the potential for transfer-related inducement of juvenile salmonid downstream movement.

Monitoring data (RST catch data) for 2002 and 2004 water transfers indicate that the large peak in downstream movement of juvenile steelhead observed in 2001 did not occur in 2002 or 2004. During the 2002 water transfer evaluation, the abundances and the temporal distributions of juvenile steelhead passing Daguerre Point Dam and Hallwood Boulevard were estimated. In addition, several observations were made regarding the possible relationship between juvenile steelhead downstream movement and flow, water temperature, and the initiation, ramp-down and termination of the 2002 water transfers. The RST catch data from the 2002 water transfers do not suggest an association between the initiation of the water transfers and the downstream movement of juvenile steelhead. This information suggests that a large increase in the numbers of juvenile steelhead moving downstream such as that which occurred at the initiation of the 2001 transfers may be avoided by maintaining a more gradual increase in flows through the initiation of water transfers. Downstream movement of juvenile steelhead during the water transfers may be associated with the rate of flow increase from the water transfer, rather than the eventual maximum flow or a response to water temperature change. In 2004, neither the RST catch data nor the estimated abundances suggest an association between the initiation of the water transfers and the downstream movement of juvenile steelhead.

The juvenile steelhead catch data from the 2002 water transfers suggest a site-specific variation in the relationship between juvenile steelhead downstream movement (both timing and abundance), and the ramp-down of transfer flows. During the 2002 extended ramp-down period (31 days), the number of juvenile steelhead moving downstream from upstream of Daguerre Point Dam decreased considerably relative to the number of juvenile steelhead moving downstream during the preceding period of relatively high and stable flows. It appears that juvenile steelhead generally ceased movement past Daguerre Point Dam concurrently with the ramp-down of the water transfers. By contrast, the largest numbers of juvenile steelhead moved downstream past Hallwood Boulevard during the ramp-down period. However, this peak is not clearly associated with the flow ramp-down initiation, but may be more closely related to the subsequent increase in water temperatures. Hence, it appears that the juvenile steelhead responses to the ramp-down of flows associated with the 2002 water transfers may differ by river reach.

The 2004 Yuba River water transfers were characterized by a significantly shorter ramp-down period (5 days) than the 2002 water transfers. Unlike the 2002 observations, the 2004 data did not indicate a site-specific variation in the relationship between juvenile steelhead downstream movement (both timing and abundance) and the ramp-down of transfer flows. The number of juvenile steelhead moving past the three RST sites decreased during the ramp-down of flows.

During both 2002 and 2004, a greater number of steelhead juveniles moved past the Daguerre Point Dam RST relative to the Hallwood Boulevard RST location. Statistical evaluation of the 2002 and 2004 data indicate that the percentage of fish moving downstream past these locations was not significantly different between the two years of data (YCWA 2005). During the 2002 water transfers investigations, the estimated abundance of juvenile steelhead passing the Daguerre Point Dam RST significantly exceeded the estimated abundance of juvenile steelhead passing the Hallwood Boulevard RST (by approximately 80,000 fish), which may or may not have been associated with the water transfers and/or the presence of Daguerre Point Dam. However, the results of the 2002 water transfers study did not have sufficient resolution to determine the reasons for the significant difference in abundance estimates between monitoring sites, and the experimental design did not allow for determination of the fate of the fish that moved passed the Daguerre Point Dam RSTs. Potential losses of fish may be attributed to mortality encountered while passing the Daguerre Point Dam, diversion of fish through the Hallwood-Cordua diversion canal, or mortality or residualization within the Middle Yuba River study reach (between upstream and downstream RST locations) (YCWA 2005). Three potential factors may explain the large differences in the estimated total number of juvenile steelhead passing each of the three RST locations. First, juvenile steelhead moving from upstream of the Daguerre Point Dam may experience relatively high mortality rates at Daguerre Point Dam and in the river reaches between Daguerre Point Dam and Kibbe Road, as well as between Kibbe Road and Hallwood Boulevard. Although some proportion of the emigrating juvenile steelhead population likely suffered mortality from factors such as predation, disease, natural mortality, and entrainment, it is unlikely that factors such as these alone are able to explain the large observed difference in estimated total abundance between the Daguerre, Kibbe, and Hallwood RSTs.

Second, juvenile steelhead moving past the Daguerre RSTs may not have moved past the Kibbe and Hallwood RSTs before the end of the sampling period. The multi-modal temporal distributions of daily RST catches observed in 2002 and 2004 suggest a periodic variation in the magnitude of downstream moving steelhead in response to some environmental cue (e.g., out-migration prompted by changes in lunar cycles). Also, the habitats between the Daguerre RST and the Hallwood RST may be conducive to rearing, and juvenile steelhead may have temporarily taken up residence in this reach, thus potentially avoiding capture in the Kibbe or Hallwood RST during the study period.

Third, the difference in abundance estimates between the Daguerre and Hallwood Boulevard RST locations also may be partially explained by sampling and analytical error. Differences in RST operations and the placement of the RSTs within the hydraulic spectrum of the river potentially may have caused discrepancies in catch between the traps. For example, slight variations in the capture efficiency tests caused by dissimilarities in the local hydrology where the tests were conducted could produce large differences in capture efficiencies which, in turn, could affect the estimation of the total abundance at each trap location.

It is important to note that the above discussion does not attempt to describe direct causal relationships, and instead only discusses the potential relationships between selected abiotic and biotic factors in the lower Yuba River during the 2002 and 2004 water transfers. The analysis of only two years of quantifiable and calibrated RST capture data, in conjunction with one year of uncalibrated RST catch trends, is not sufficient to definitively determine specific biologic responses of juvenile steelhead to changes in flow and water temperature. The presentation of this data merely shows the potential correlation between the timing of such environmental factors with the spatial and temporal distribution of juvenile steelhead during water transfers in 2001, 2002, and 2004.

In summary, water transfer monitoring in 2001, 2002, and 2004 indicate that the character of the initiation of the water transfers potentially can affect juvenile steelhead downstream movement. In 2001, an increase in the number of downstream moving juvenile steelhead was observed coincident with the relatively rapid and large increase in streamflow at the onset of the water transfer. However, in 2002 and 2004, when increases in streamflow during the initiation of the water transfers were relatively small and gradual, increases in the numbers of downstream moving juvenile steelhead were not observed.

Adult Chinook Salmon Immigration

In the past, hypotheses have been suggested regarding the potential relationships between the water transfers and the relative abundance of adipose fin-clipped and non-adipose fin-clipped immigrating adult Chinook salmon. Specifically, concern has been raised regarding the potential for the Yuba River water transfers via decreased water temperatures and increased flow, relative to the Feather River, to encourage the straying of Feather River hatchery Chinook salmon into the Yuba River. YCWA and CDFG monitoring efforts in 2001, 2002, 2003, and 2004 water transfer years indicated that Chinook salmon of hatchery origin ascended the fish ladders at Daguerre Point Dam in the lower Yuba River during both the water transfer and non-transfer periods. Chinook salmon of hatchery origin also have been observed ascending the Yuba River in non-transfer years (CDFG unpublished data).

Adult Chinook salmon monitoring study results during the 2001 and 2002 water transfers potentially indicated some correspondence with water temperatures, suggesting that the cooler water temperatures potentially associated with the water transfers may have encouraged some straying of non-native adult Chinook salmon into the Yuba River. However, because only the 2002 data were statistically analyzed, the reliance upon only one year of data restricted the confidence in, and overall applicability of, such a tentative conclusion. Further, a number of unexpected procedural difficulties were encountered during the 2002 study implementation leading to unequal distribution of sampling effort at the fish ladders and low number of sampling days representing the water transfer study period (i.e., less than 15 percent of the study period). These issues, combined with the incorrect assumption that salmon counts before, during and after the water transfers were distributed as Poisson variables with constant but distinct rates[2], likely lead to underestimation of adult Chinook salmon abundance. However, despite the procedural difficulties and low reliability of the resulting abundance estimates, the 2002 study led to three general observations.

- The temporal distribution of the combined adult Chinook salmon catch, displaying a large increase in catch coincident with the decreases in flow and increases in water temperature associated with the ramp-down of the water transfers, was more likely a reflection of the adult immigration life stage periodicity expected for fall-run Chinook salmon. Fall-run Chinook salmon typically begin entering the upstream portions of the lower Yuba River in increasing numbers during the late-summer and early fall months (coinciding with the 2002 post-transfer period). Chinook salmon displaying spring-run Chinook salmon life history characteristics in the lower Yuba River generally begin entering the lower Yuba River, in much fewer numbers than fall-run Chinook salmon, at an earlier time that coincided with the 2002 pre-transfer and transfer periods.
- The 2002 immigration rates for non-adipose fin-clipped adult Chinook salmon suggested that the relatively high water transfer flows did not attract salmon immigrants because otherwise a greater immigration rate would have been observed during the transfer period relative to the pre- and post-transfer periods.
- The estimates of the proportions of adipose fin-clipped adult Chinook salmon to the total number of adult Chinook salmon immigrating into the lower Yuba River before, during and after the 2002 water transfers did not indicate the attraction of non-natal (adipose fin-clipped) adult Chinook salmon during the transfer period, because the calculated proportions were based on the abundance and immigration rate estimates for the periods under comparison that were not fully reliable, particularly for adipose fin-clipped adult Chinook salmon.

In June 2003, the VAKI RiverWatcher system (VAKI), an infrared and video graphic device used to classify and enumerate adult fish, was installed at the Daguerre Point Dam fish ladders. During the 2004 study period (May 1 through September 30, 2004), the VAKI was utilized to monitor migration pattern and abundance estimates of adipose fin-clipped and non-adipose fin-clipped adult Chinook salmon immigrating into the lower Yuba River before, during and after the 2004 water transfer. The use of the VAKI as a counting device, and CDFG's processing of the resulting VAKI counts, photographs, and silhouettes enabled a more efficient and reliable collection of data than in 2002. The data were used to obtain estimates of the immigration rates (fish/day), abundance estimates of adipose fin-clipped and non-adipose fin-clipped adult Chinook salmon, and proportions of adipose fin-clipped adult Chinook salmon. The resulting

[2] A Chi-square analysis indicated that during the 2004 survey, neither the adipose fin-clipped or the non-adipose fin-clipped Chinook salmon migrated with constant but distinct rates for the pre-transfer, transfer, and post-transfer periods, suggesting that the assumption that salmon counts before, during and after the water transfers were distributed as Poisson variables with constant but distinct rates, that was used to estimate the 2002 abundance of adipose fin-clipped and non-adipose fin-clipped Chinook salmon, probably was incorrect.

data set permitted intense statistical evaluation including Chi-square analysis, multiple regression analysis and multivariate time series analysis, providing a more thorough assessment of the potential effects of the 2004 water transfer on the immigration of Chinook salmon into the lower Yuba River, and of the relationship between Chinook salmon immigration and Yuba River flows and water temperatures, relative to the Feather River, than could be performed in previous years. The findings of these analyses led to the following general conclusions.

- The temporal distributions of the daily counts of adipose fin-clipped and non-adipose fin-clipped adult Chinook salmon likely were reflections of Chinook salmon adult immigration life stage periodicity, with the relatively abundant fall-run Chinook salmon mostly migrating during the post-transfer period.
- As the 2004 study period progressed, more adipose fin-clipped and non-adipose fin-clipped Chinook salmon were observed immigrating into the Yuba River, but not necessarily resulting from an attraction to the cooler waters of the lower Yuba River, or to a relative increase in Yuba River flows with respect to the Feather River flows. The 2004 abundance estimates and immigration rates for adipose fin-clipped and non-adipose fin-clipped adult Chinook salmon suggest that the relatively high flows and low water temperatures observed during the transfer period did not necessarily attract salmon immigrants; otherwise, greater abundances and immigration rates would have been observed during the transfer period relative to the pre- and post-transfer periods.
- The estimates of the proportions of clipped adult Chinook salmon to the total number of adult Chinook salmon immigrating into the lower Yuba River did not suggest the attraction of non-natal adult Chinook salmon during the 2004 transfer period, because the proportion calculated for the transfer period was not greater than the proportions for the pre-transfer and post-transfer periods.
- Multivariate time series analyses indicate that the immigration rates of non-adipose fin clipped and adipose-fin clipped Chinook salmon in 2004 are not significantly associated with: (1) attraction flows, defined as the difference between Yuba River and Feather River flows; or (2) attraction water temperatures, defined as the difference between Yuba River and Feather River water temperatures.
- Analyses of the 2002 and 2004 water transfers studies data indicate that water transfers that do not involve a large, rapid ramp-up and that are characterized by relatively high and stable flows (between 1,000 cfs (2004) and 1,400 cfs (2002) during July and August), do not appear to attract non-natal adult Chinook salmon into the Yuba River.

Water Temperatures

Water temperatures measured at the Smartville site (at RM 24, approximately 2 miles downstream of Englebright Dam) during the 2004 water transfers study period are representative of the relatively stable, low water temperatures associated with reservoir releases occurring during May through October. Smartville daily mean water temperatures did not display large fluctuations between consecutive days, but did show an overall increasing temporal trend in daily average water temperature from 51.6°F on May 1 to 55.9°F on October 1, 2004.

Daily mean water temperatures during the 2004 study period for monitoring sites farther downstream retained an overall increasing temporal trend from May 1 through October 1, which dissipated as distance from the dam increased, reflecting the progressive warming and increasing diurnal variation in downstream lower Yuba River water temperatures. Average daily water temperatures progressively increased as the site location approached the Yuba-Feather river confluence, and the daily water temperature ranges became progressively larger. For example, at Parks Bar (RM 18) daily water temperature minimum and maximum differed, on average, by 4.5°F, while at Long Bar (RM 14), the daily water temperature minimum and maximum differed by 5.4°F. At Daguerre Point Dam (RM 11), the differences between the minimum and maximum daily water temperatures averaged 7.6°F, while at the Marysville (RM 6) and Simpson Lane (RM 3) water temperature monitoring locations, the average difference was approximately 9.4°F and 9.9°F, respectively.

From May 1 through October 1, 2004, Feather River water temperatures at monitoring locations upstream and downstream of the confluence with the lower Yuba River were consistently higher than those of the lower Yuba River. Downstream of the Yuba-Feather river confluence, daily average water temperatures were consistently lower on the left bank of the Feather River than on the right bank, suggesting that the cooling effect of lower Yuba River water temperatures predominantly affects the left bank of the Feather River. Moreover, based upon the regression analysis performed, the influence of lower Yuba River flows on Feather River water temperatures is reduced considerably within the first 2 miles of river occurring downstream of the confluence of the Yuba and Feather rivers.

4.2.1.3 Oroville Reservoir

Like many other California foothill reservoirs, Oroville Reservoir is steep-sided, has large water surface elevation fluctuations, and a low surface area-to-volume ratio. It is a warm, monomictic reservoir that thermally stratifies in the spring, destratifies in the fall, and remains destratified throughout the winter. Due to the stratification, Oroville Reservoir has been said to contain a "two-story" fishery, supporting both coldwater and warmwater fisheries that are thermally segregated for most of the year. The coldwater fish use the deeper, cooler, well-oxygenated hypolimnion, whereas the warmwater fish are found in the warmer, shallower, epilimnetic and littoral zones. Once Oroville Reservoir destratifies in the fall, the two fishery components mix in their habitat utilization.

Oroville Reservoir's coldwater fishery primarily is composed of coho salmon and brown trout, although rainbow trout and lake trout are periodically caught. The coldwater fisheries for coho salmon and brown trout are sustained by hatchery stocking because natural recruitment to the Oroville Reservoir coldwater fishery is very low. A "put-and-grow" hatchery program is currently in use, where salmonids are raised at CDFG hatcheries and stocked in the reservoir as juveniles, with the intent that these fish will grow in the reservoir before being caught by anglers (DWR 2001c).

The Oroville Reservoir warmwater fishery is a regionally important self-sustaining fishery. The black bass fishery is the most significant, both in terms of angler effort and economic influence on the area. Spotted bass are the most abundant bass species in Oroville Reservoir, followed by largemouth, redeye, and smallmouth bass, respectively. Catfish are the next most popular warmwater fish at Oroville Reservoir, with both channel and white catfish present in the lake. White and black crappies also are found in Oroville Reservoir, though populations fluctuate widely from year to year. Bluegill and green sunfish are the two primary sunfish species in Oroville Reservoir. Although common carp are considered by many to be a nuisance species, they are abundant in Oroville Reservoir (DWR 2001c). The primary forage fish in Oroville Reservoir are wakasagi and threadfin shad. Threadfin shad intentionally were introduced in

1967 to provide forage for game fish, whereas the wakasagi migrated down from an upstream reservoir in the mid-1970s.

4.2.1.4 Feather River

The lower Feather River begins at the Low Flow Channel, which extends 8 miles from the Fish Barrier Dam (RM 67) to the Thermalito Afterbay Outlet (RM 59). The lower Feather River from the Fish Barrier Dam to Honcut Creek supports a variety of anadromous and resident fish species. The most important fish species in terms of sport fishing is the fall-run Chinook salmon, although striped bass and American shad also are common targets for anglers. Fall-run Chinook salmon may enter the river as early as August and begin spawning in September. Spawning typically continues through December, with October and November constituting the peak spawning months in the lower Feather River.

Several other native and exotic fish species are found in the Feather River including spring-run Chinook salmon, steelhead, and Sacramento splittail. In the Feather River, the basic life history of spring-run Chinook salmon is similar to fall-run Chinook salmon. Spawning may occur a few weeks earlier for spring-run (as compared to fall-run), but there is no clear distinction between the two runs due to the disruption of spatial separation by Oroville Reservoir. Fish exhibiting the typical life history of spring-run Chinook salmon are found holding at the Thermalito Afterbay Outlet and the Fish Barrier Dam as early as March. At present, the genetic distinctness of Feather River spring-run Chinook salmon is undetermined.

Adult steelhead typically ascend the Feather River from September through January (YCWA *et al.* 2005). The residence time of adult steelhead in the Feather River after spawning, and adult steelhead post-spawning mortality, are currently unknown. It appears that most of the natural steelhead spawning in the Feather River occurs in the Low Flow Channel, particularly in the upper reaches near Hatchery Ditch. It is unknown whether steelhead spawn below the Thermalito Afterbay Outlet (YCWA *et al.* 2005). However, based on the spawning habitat available, it is very likely that at least some steelhead spawn below the Thermalito Afterbay Outlet. Soon after emerging from the gravel, a small percentage appears to emigrate. The remainder of the population rears in the river for at least six months to one year. Recent studies have confirmed that juvenile steelhead rearing (and probably adult steelhead spawning) is most concentrated in small secondary channels within the Low Flow Channel (YCWA *et al.* 2005). The smaller substrate size and greater amount of cover (compared to the main river channel) likely make these side channels more suitable for steelhead spawning.

4.2.1.5 Sacramento River

The upper Sacramento River is often defined as the portion of the river from Princeton (RM 163), the approximate downstream extent of salmonid spawning in the Sacramento River, to Keswick Dam (the upstream extent of anadromous fish migration and spawning). The lower Sacramento River is generally defined as that portion of the river from Princeton to the Delta, at approximately Chipps Island (near Pittsburg). The lower Sacramento River is predominantly channelized, leveed, and bordered by agricultural lands. The Sacramento River serves as an important migration corridor for anadromous fish moving between the Pacific Ocean and/or the Delta and upper river/tributary spawning and rearing habitats.

In excess of 30 fish species are known to use the Sacramento River. Of these, a number of both native and introduced species are anadromous. Anadromous species include Chinook salmon, steelhead, green and white sturgeon, striped bass, and American shad. The upper Sacramento

River is of primary importance to native anadromous species, and is presently utilized for spawning and early life stage rearing, to some degree, by all four runs of Chinook salmon (i.e., fall, late-fall, winter, and spring runs) and steelhead. Consequently, various life stages of the four races of Chinook salmon, and steelhead, can be found in the upper Sacramento River throughout the year. Other Sacramento River fish are considered resident species, which complete their lifecycle entirely within freshwater, often in a localized area. Resident species include rainbow and brown trout, largemouth and smallmouth bass, channel catfish, sculpin, Sacramento pikeminnow, Sacramento sucker, hardhead, and common carp (Reclamation 1991).

Many of the fish species utilizing the upper Sacramento River also use the lower river to some degree, even if only as a migratory pathway to and from upstream spawning and rearing grounds. For example, adult Chinook salmon and steelhead primarily use the lower Sacramento River as an immigration route to upstream spawning habitats, and as an emigration route to the Delta. The lower river also is used by other fish species (e.g., Sacramento splittail and striped bass) that make little use of the upper river (i.e., upstream of RM 163). Overall, fish species composition in the lower portion of the Sacramento River is similar to that of the upper Sacramento River and includes resident and anadromous cold- and warmwater species. Many fish species that spawn in the Sacramento River and its tributaries depend on river flows to carry their larval and juvenile life stages to downstream nursery habitats. Native and introduced warmwater fish species primarily use the lower river for spawning and rearing, with juvenile anadromous fish species also using the lower river, to some degree, for rearing.

4.2.1.6 Sacramento-San Joaquin Delta

The Delta provides spawning and nursery habitat for more than 40 resident and anadromous fish species, including delta smelt, Sacramento splittail, American shad, and striped bass. The Delta also is a migratory corridor and seasonal rearing habitat for the various runs of Chinook salmon and steelhead.

Many factors have contributed to the decline of Delta species, including loss of habitat, contaminant input (water quality degradation), entrainment in diversions, and introduction of non-native aquatic species. The Delta is a network of channels through which water, nutrients, and aquatic food resources are moved and mixed by tidal action. Pumps and siphons divert water for Delta irrigation and municipal and industrial use or into CVP and SWP canals. River inflow, Delta Cross Channel operations, and diversions (including agricultural and municipal diversion and export pumping) affect Delta species through changes in habitat conditions (e.g., salinity intrusion) and mortality attributable to entrainment in diversions.

4.2.1.7 San Luis Reservoir

San Luis Reservoir provides habitat for both coldwater and warmwater fisheries. The game fish found in San Luis Reservoir include largemouth bass, crappie, sunfish, striped bass, and bullhead.

4.2.2 Impact Analysis

This EA considers the potential for unreasonable impacts upon fisheries resources in the waterbodies potentially influenced by the proposed project including the lower Yuba River, New Bullards Bar Reservoir, Feather River, Oroville Reservoir, Sacramento River, and the Delta. The impact analysis methodology utilized to conduct this EA is described below.

4.2.2.1 Reservoir Impact Assessment Methodology

The analysis of potential impacts on reservoir fisheries associated with the proposed project was based on consideration of anticipated seasonal changes in reservoir storage under the proposed project, relative to the basis of comparison (RD-1644 long-term). The potential changes in reservoir storage levels in New Bullards Bar Reservoir were based upon information provided in the Hydrologic Analysis (Appendix B). The analysis of reservoir storage for Oroville Reservoir was performed qualitatively based on anticipated potential changes in operations associated with the proposed project, to the extent that this information was available, and primarily from assessments conducted for recent water transfer years (YCWA 2004; YCWA and SWRCB 2002).

Potential changes in reservoir water surface elevations were considered for the analysis of potential increases in the frequency of warmwater fish nest-dewatering events, and decreases in coldwater pool volume that could occur under the proposed project, relative to the basis of comparison.

San Luis Reservoir

DWR may store a portion of the proposed project transfer water in San Luis Reservoir. To the extent that some of the transfer water (potentially up to 125,000 acre-feet by the end of the transfer period) is stored in San Luis Reservoir, the proposed transfer may have a potentially beneficial effect upon San Luis Reservoir fisheries resources. The storage volume associated with the proposed project transfer potentially would provide increased habitat for reservoir species. Water stored in San Luis Reservoir likely would be held only for a short period prior to delivery to water contractors. Generally, it is expected that operations of San Luis Reservoir would remain within normal operational parameters, and the proposed project water transfer would not result in significant impacts on San Luis Reservoir fisheries. Therefore, San Luis Reservoir is not further discussed in the impact analysis.

Reservoir Coldwater Fisheries

Coldwater fish in the reservoirs reside primarily within the reservoir's metalimnion (middle of the reservoir) and hypolimnion (near the bottom) where water temperatures remain suitable during the period when reservoirs are thermally stratified (i.e., April through November). Reduced reservoir storage during this period could reduce the reservoir's coldwater pool volume, thereby reducing the quantity of habitat available to coldwater fish species during these months. The analysis of potential impacts on reservoir coldwater fisheries associated with the proposed project was based on the following criterion:

- A decrease in reservoir storage during April through November, which would reduce the coldwater pool, relative to the basis of comparison, of sufficient magnitude or duration to adversely affect long-term population levels of coldwater fish.

Reservoir Warmwater Fisheries

Warmwater fish species in reservoirs use the warm upper layer of the reservoir and nearshore littoral habitat throughout most of the year. Seasonal changes in reservoir storage, as it affects reservoir water surface elevation (feet msl) can directly affect the reservoir's warmwater fish resources. Decreases in reservoir water surface elevation during the primary spawning period for nest building warmwater fish (March into June) may result in reduced initial year-class strength through warmwater fish nest "dewatering."

To assess potential elevation-related impacts on warmwater fish in the evaluated reservoirs, the magnitude of change (feet msl) in reservoir water surface elevation occurring each month of the spawning period (i.e., March through June) for nest-building fish under the proposed project relative to the basis of comparison was considered, when available. Review of available literature suggests that, on average, self-sustaining black bass populations in North America experience a nest success (i.e., the nest produces swim-up fry) rate of 60 percent (Friesen 1998; Goff 1986; Hunt and Annett 2002; Hurley 1975; Knotek and Orth 1998; Kramer and Smith 1962; Latta 1956; Lukas and Orth 1995; Neves 1975; Philipp *et al.* 1997; Raffetto *et al.* 1990; Ridgway and Shuter 1994; Steinhart 2004; Turner and MacCrimmon 1970).

A study by CDFG, which examined the relationship between reservoir water surface elevation fluctuation rates and nesting success for black bass, suggests that a reduction rate of approximately 6 feet per month or greater would result in 60 percent nest success for largemouth bass and smallmouth bass (Lee and Jones-Lee 1999). Therefore, a decrease in reservoir water surface elevation of 6 feet or more per month was selected as the threshold beyond which spawning success of nest-building warmwater fish could potentially result in population effects. The analysis of potential effects on warmwater fisheries associated with the proposed water transfer was based on the following criterion:

- A decrease in reservoir water surface elevation of six feet or more per month, relative to the basis of comparison, of sufficient frequency to substantially affect population levels of warmwater fish during the extended spawning period (i.e., March through June).

4.2.2.2 Rivers Methodology

Yuba River

Both qualitative and quantitative assessments were utilized to evaluate the potential operational impacts on fisheries resources. Qualitative analyses are conducted based on a combination of literature reviews, reference to previous monitoring studies and reports on the Yuba River fisheries. Hydrologic modeling was performed in order to provide a quantitative basis from which to assess potential impacts of the proposed project on fisheries resources and their associated aquatic habitats within the project area. Specifically, the hydrologic modeling methods used an 83-year simulation period of hydrology in the Yuba River watershed to simulate flows that would be expected under the proposed project and the basis of comparison. The simulation applied a set of rules and reservoir releases for both the proposed project and the basis of comparison in which the starting reservoir level was known, utilizing the hydrologic period of record extending from 1922 through 2004, to produce a set of flow exceedance plots for the March 1, 2007 through December 31, 2007 simulation period. The plots illustrate the distribution of flows under the proposed project and the basis of comparison (Appendix B). Flow exceedance curves represent the probability, as a percent of time that modeled flows would be met or exceeded at a given location during a certain time period. Therefore, the plots demonstrate the cumulative probability distribution of flows that could occur for each month at a given river location over the simulation period. Flow exceedance curves were developed by ranking the simulated flows for each month from largest to smallest, and the probability of exceedance was then calculated for each flow value based on its rank (i.e., 1.0 to 99.0 percent).

Exceedance curves are particularly useful for examining flow changes that could occur at lower flow levels. Results from past instream flow studies indicate that Chinook salmon spawning habitat is most sensitive to changes in flow during lower flow conditions, during either dry year classes or the driest months of the year (CDFG 1994; USFWS 1985).

The potential impacts of simulated flows on the adult spawning life stage of Chinook salmon in the lower Yuba River were evaluated by examining the spawning habitat available for the months of September through December of the spawning season, as expressed as weighted usable area (WUA). The analysis included summing the WUAs that correspond to average monthly flows during the Chinook salmon spawning season within one reach for spring-run (above Daguerre Point Dam), and two reaches for the fall-run (above and below Daguerre Point Dam). Steelhead spawning habitat availability was examined from March through April, 2007 for one reach above Daguerre Point Dam (**Appendix D**).

For analytical purposes, September through November was evaluated for spring-run Chinook salmon spawning habitat availability. In addition, the month of September was emphasized because September was assumed to represent a distinct period of spring-run Chinook salmon spawning. Fall-run Chinook salmon spawning was assumed to occur from October through December, although considerable temporal and spatial overlap in spawning occurs between these two runs. These time periods were used to compare the potential impacts of the proposed project on spring and fall-run Chinook salmon spawning habitat availability, relative to the basis of comparison, using WUA-flow relationships.

CDFG (1991a) described spawning WUA-flow relationships for both fall-run Chinook salmon and steelhead. The steelhead WUA-flow relationships are not as reliable, because they were not based upon depth, velocity and substrate data collected on the lower Yuba River steelhead redds. Instead, steelhead WUA-flow relationships were developed from habitat suitability criteria (HSC) recommended by Bovee (1978). The comparison of Bovee's steelhead HSC curves with HSC curves developed for the species in the lower Feather River, lower American River, and Trinity River suggests that Bovee's criteria may not be representative of steelhead spawning in the Central Valley. Nonetheless, steelhead spawning habitat availability for the months of March through April were evaluated using the CDFG (1991a) relationships, because they represent the best available information.

Yuba River water temperature analyses were conducted for the months of May through October. During these months, solar radiation and ambient air temperature may cause water temperatures in the Yuba River below Englebright Reservoir to increase to levels that can be stressful to anadromous and resident salmonids, and other species of management concern. During November through April, water temperatures in the lower Yuba River are generally cool and, for this EA, are assumed not to cause thermal impacts on salmonids and other fish species in the river.

An evaluation of lower Yuba River water temperatures associated with the proposed project was conducted by assessing water temperature exceedance plots generated using simulated monthly flows from May through October (Appendix B). Simulated monthly water temperatures were used to assess potential impacts of the proposed project relative to the basis of comparison for the following species and life stages which occur, or partially occur, during the period extending from May through October:

- Spring-run Chinook Salmon
  - Adult Immigration and Holding
  - Adult Spawning
  - Embryo Incubation

  - Juvenile Rearing
  - Smolt Emigration
- Fall-run Chinook Salmon
  - Adult Immigration and Holding
  - Adult Spawning
  - Embryo Incubation
  - Juvenile Rearing and Outmigration
- Steelhead
  - Adult Immigration and Holding
  - Juvenile Rearing
  - Embryo Incubation
  - Smolt Emigration
- Green Sturgeon (Southern Distinct Population Segment)
  - Adult Immigration and Holding
  - Adult Spawning
  - Embryo Incubation
  - Juvenile Rearing
  - Juvenile Emigration
- American Shad
  - Adult Immigration and Spawning
- Striped Bass
  - Adult Spawning
  - Initial Rearing

The flow and water temperature exceedance analyses provided are based on modeled monthly mean flows, and linear regression analysis of water temperature parameters such as air temperature and flow volume. Monthly mean flows and water temperatures evaluated here do not describe daily variations that could occur in the river as a result of dynamic flow and climatic conditions. However, this modeling represents the best available information, and monthly modeling results are useful for comparative purposes where, in theory, the inherent limitations of the approach are embedded in both the proposed project and the baseline condition. Modeled water temperature and flow values were utilized to detect the frequency and magnitude of potential changes to flows and water temperatures under the proposed project and the basis of comparison (RD-1644 long-term).

Feather and Sacramento Rivers

An evaluation of the potential impacts from the proposed project on fisheries resources and aquatic habitats in the Feather and Sacramento rivers was made by comparing the total contribution of monthly mean flows from New Bullards Bar Reservoir surface water releases under both the proposed project and basis of comparison (Table 4-1 and Table 4-2). To evaluate the potential range of impacts to fisheries resources in the Sacramento and Feather rivers, the difference in simulated average monthly mean flows at the Marysville Gage between the proposed project and the basis of comparison were compared to average monthly mean flows in the Sacramento River at Freeport, and the lower Feather River at Gridley.

Although the specific release pattern associated with the proposed project is unknown at this time and will depend on SWP/CVP operational conditions as they develop, flow releases will be subject to operational constraints, and within normal operational ranges.

Sacramento-San Joaquin Delta

The proposed project would provide water to DWR for use in the EWA Program in 2007. DWR personnel were consulted regarding the anticipated pumping, export, and delivery operations associated with the proposed project. The evaluation of potential impacts upon Delta fisheries resources considers whether DWR's acquisition of the YCWA transfer water would result in changes in SWP operations that could result in the following:

- Conflict with existing regulatory compliance requirements related to Delta export pumping
- Increased pumping at the Delta pumping facilities above levels authorized in existing permits

Regulatory documentation considered in the evaluation includes:

- 1995 SWRCB Delta Water Quality Control Plan
- 2004 NMFS Biological Opinion on OCAP
- 2005 USFWS Biological Opinion on OCAP
- 2005 NMFS Biological Opinion on the Yuba River Development Project License Amendment

Additionally, an evaluation of the potential impacts from the proposed project on fisheries resources and aquatic habitats in the Delta was conducted by comparing the total contribution of monthly mean flows from New Bullards Bar Reservoir surface water releases under both the proposed project and basis of comparison. To evaluate the potential range of impacts to aquatic resources in the Delta, the difference in simulated average monthly mean flows at the Marysville Gage between the proposed project and the basis of comparison were compared to average monthly mean flows in the Sacramento River at Freeport, which contributes to total Delta inflow.

The percent contributions of Sacramento River flows to Delta inflows for each month of the March 2007 through December 2007 time period (Table 4-3) were calculated as the scaled ratios of the averages of Sacramento River monthly mean flows (cfs) at the Freeport Gage, to the averages of monthly Delta inflows (cfs) reported by Reclamation in the tables of Delta Outflow Computations for the years 1998 through 2006 (www.usbr.gov/mp/cvo/pmdoc.html). These percent contributions of Sacramento River flows to total Delta inflows were evaluated to determine the potential impacts from the proposed project on fisheries resources and aquatic habitats in the Delta.

Although the specific release pattern associated with the proposed project is unknown at this time and will depend on SWP/CVP operational conditions as they develop, flow releases will be subject to operational constraints that are within normal operational ranges.

4.2.2.3 Environmental Impacts

New Bullards Bar Reservoir

New Bullards Bar Reservoir Coldwater Fisheries

The proposed project could reduce New Bullards Bar Reservoir storage from 739,234 acre-feet in March 2007 to 594,865 acre-feet by the end of September 2007, depending on hydrological conditions. This reduction corresponds to a change in water surface elevation from approximately 1,899 feet msl to 1,868 feet msl. Under the basis of comparison (RD-1644 long-term), the end of September storage in New Bullards Bar Reservoir could be 655,432 acre-feet with a corresponding elevation of 1,882 feet msl.

Anticipated reductions in reservoir storage associated with the proposed project would not be expected to adversely impact the New Bullard Bar Reservoir's coldwater fisheries because New Bullards Bar Reservoir is a deep, steep-sloped reservoir with ample coldwater pool reserves. Throughout the period of operations of New Bullards Bar Reservoir (1969 through present), which encompasses the most extreme critically dry year on record, the coldwater pool in New Bullards Bar Reservoir has not been depleted. In fact, since 1993, coldwater pool availability in New Bullards Bar Reservoir has been sufficient to accommodate year-round utilization of the lower river outlets, at the direction provided by CDFG, in order to provide the coldest water possible to the lower Yuba River. Therefore, potential reductions in coldwater pool storage would not be expected to adversely affect New Bullard Bar Reservoir's coldwater fisheries because: (1) coldwater habitat would remain available in the reservoir during all months of the proposed project; (2) physical habitat availability is not believed to be among the primary factors limiting coldwater reservoir fish populations; and (3) anticipated seasonal reductions in storage would not be expected to adversely affect the primary prey species utilized by coldwater fish. Therefore, impacts to coldwater fisheries resources, relative to the basis of comparison from changes in end-of-month storage at New Bullards Bar Reservoir under the proposed project would be less than significant.

New Bullards Bar Reservoir Warmwater Fisheries

The spawning period for warmwater fish is believed to generally extend from March through June. Decreases in the water surface elevation of New Bullards Bar Reservoir by more than 6 feet per month from March 2007 through June 2007 are 6 percent more likely to occur under the proposed project relative to the basis of comparison. Reductions in end-of-month water surface elevation in New Bullards Bar Reservoir under the proposed project would not be anticipated to result in substantial reductions in warmwater fish spawning success, because the results suggest that these potential decreases in water surface elevation would not be expected to occur during more than two months of any given spawning season. In addition, a 60 percent nest success rate or greater would be achieved during some months of any annual spawning season, which would be expected to provide sufficient recruitment of individuals into the population over the 83-year simulation period. Therefore, impacts upon warmwater fisheries that may be present in New Bullards Bar Reservoir from potential reductions in water surface elevation under the proposed project would be less than significant.

Oroville Reservoir

Oroville Reservoir water levels would be affected by the proposed project only if DWR had to release additional flows to meet water quality standards in the Delta as a result of YCWA holding back water to refill New Bullards Bar Reservoir associated with the proposed project. The potential drawdown of Oroville Reservoir would be minimal given the much larger size of Oroville Reservoir, and most likely would occur in winter or spring. The level of drawdown, if any, would be small and within normal operating conditions for Oroville Reservoir. Consequently, potential impacts to Oroville Reservoir fisheries would be less than significant.

Yuba River

Anadromous Salmonid Utilization of the Lower Yuba River During the Proposed Project

Central Valley steelhead and two runs (i.e., fall-run and spring-run) of Chinook salmon utilize the lower Yuba River. The following life stages of these species/runs are present in the lower Yuba River at various times throughout the year: (1) adult immigration and holding; (2) adult spawning; (3) embryo incubation; (4) juvenile rearing; and (4) juvenile outmigration/smolt emigration. Most fall-run Chinook salmon migrate out of the lower Yuba River as post-emergent fry prior to reaching smolt size; spring-run Chinook salmon and steelhead typically rear in the river for extended periods of time, relative to fall-run Chinook salmon, migrating out as larger, smolt-sized individuals. The following sections describe the anadromous salmonid species and life stages occurring in the lower Yuba River, and the potential changes to instream flows and water temperatures that could occur during the proposed project, relative to the basis of comparison, on a month-to-month basis from March 1, 2007 through December 31, 2007.

Other Species of Primary Management Concern Utilization of the Lower Yuba River During the Proposed Project

USFWS photographic evidence of green sturgeon and captures of juveniles in rotary screw traps in the Feather River downstream of its confluence with the Yuba River (USFWS 1995a) provide evidence that suggests that tributaries to the Sacramento River may provide suitable spawning habitat for green sturgeon. Records of angler catches of green sturgeon in the Feather River coinciding with their spawning season further supports this theory. Based on this information, five life stages could potentially occur in the lower Yuba River at various times throughout the year: (1) adult immigration and holding; (2) adult spawning; (3) embryo incubation; (4) juvenile rearing; and (5) juvenile emigration. The potential utilization of the lower Yuba River by green sturgeon warrants an evaluation of potential impacts to the species associated with potential changes in flow and water temperature under the proposed project, relative to the basis of comparison.

Despite being non-native, American shad are considered an important sport fish in the Central Valley, and are managed accordingly. Therefore, the American shad immigration and spawning life stage in the lower Yuba River will be evaluated for potential impacts associated with changes in flow and water temperature under the proposed project, relative to the basis of comparison. Also non-native, the striped bass lifestages of adult spawning and initial juvenile rearing are evaluated.

4.2.2.4 Results

Operations and Resultant Flows

The analysis of potential impacts to lower Yuba River anadromous salmonids and other species of management concern uses cumulative probability distributions to examine potential differences in flow that could occur under the proposed project and the basis of comparison

(RD-1644 long-term) from March 1, 2007 through December 31, 2007. Of special concern are flow conditions that could potentially occur during dry and critical water years. These flows roughly correspond to the lowest 30 percent of flows simulated for the lower Yuba River for the 83-year analytical period. Therefore, as an impact indicator of flow conditions, special emphasis is placed on the lowest 30 percent of the cumulative flow distribution.

Results of the simulation period are presented in the following sections utilizing flow exceedance plots for the two control points for minimum instream flows on the lower Yuba River (the Smartville Gage and the Marysville Gage). Each plot (see Attachment A to Appendix B) compares the proposed project (flow regime based on the flow schedules included in the 2007 Pilot Program Fisheries Agreement) versus the basis of comparison (flow regime based on RD-1644 long-term flow requirements).

All of the exceedance plots share certain characteristics. First, as is further described in the hydrological analysis (Appendix B) for the 2007 Pilot Program, different dispatch, reservoir, and operating rules govern the proposed project and the basis of comparison. In addition to different minimum flow release requirements, the proposed project and the basis of comparison utilize different indices (see Appendix B), and have different reservoir dispatch rules based on those different flow schedules and indices.

Second, because the outlet capacity of the Narrows I and Narrows II powerhouses that release flow to the lower Yuba River totals 4,170 cfs, flows above that level are uncontrolled (spilling over the top of Englebright Dam). Differences in flows between the proposed project and the basis of comparison above that level therefore tend to be a function of river and reservoir operations in response to storm and flood control requirements.

Finally, in wetter year classes, annual Yuba River operations are primarily driven by flood control requirements. In the winter months of wetter year classes, maintenance of appropriate flood pool space may require releases well in excess of required minimums. During the summer months of wetter year classes, releases in excess of required minimum flows and delivery obligations are often required to draw down the reservoir to an appropriate level going into the succeeding fall and winter season. In drier year types, under both the proposed project and the basis of comparison, storm and flood operations cease to be a major influence in operations decisions early in the season, and the Yuba Project is operated to meet minimum flow requirements and consumptive demands. This can be observed in the exceedance plots, where in the driest 30 percent of years the plots of the Marysville Gage flows tend to correspond to the minimum requirements of the proposed project and the basis of comparison.

The following sections describe and discuss flow and water temperature difference between the proposed project and basis of comparison, and potential effects on fisheries and aquatic resources in the lower Yuba River.

March 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Fall-run Chinook Salmon (Juvenile Rearing and Outmigration)
- Steelhead (Adult Immigration and Holding; Adult Spawning; Juvenile Rearing; Smolt Emigration)

- Green Sturgeon (Adult Immigration and Holding; Adult Spawning; Juvenile Rearing)

Simulated Actual Flows

Simulated flows at both the Smartville Gage and Marysville Gage generally reflect flood control operations and/contributory precipitation accretions, and exceed 700 cfs with about a 90 percent probability.

April 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Fall-run Chinook Salmon (Juvenile Rearing and Outmigration)
- Steelhead (Adult Spawning; Juvenile Rearing and Smolt Emigration)
- Green Sturgeon (Adult Immigration and Holding; Adult Spawning; Juvenile Rearing)
- American Shad (Adult Immigration and Spawning)
- Striped Bass (Adult Spawning and Initial Rearing)

Simulated Actual Flows

For nearly 90 percent of the flow exceedance distribution, flows at the Smartville Gage simulated under the proposed project are higher (from approximately 100 cfs up to 670 cfs) than those simulated under the basis of comparison. At the highest flow levels (above about 4,200 cfs, which are expected to occur with about a 10 percent probability), flows under the proposed project and the basis of comparison are equivalent.

Flows simulated under the proposed project at the Marysville Gage are up to approximately 670 cfs higher than flows under the basis of comparison for 88 percent of the cumulative flow exceedance distribution. Flows at the highest flow levels (above about 4,200 cfs which are expected to occur with about a 12 percent probability), under the proposed project and basis of comparison are equivalent.

May 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Fall-run Chinook Salmon (Juvenile Rearing and Outmigration)
- Steelhead (Embryo Incubation; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation; Juvenile Rearing; Juvenile Emigration)
- American Shad (Adult Immigration and Spawning)
- Striped Bass (Adult Spawning and Initial Rearing)

Simulated Actual Flows

Flows simulated under the basis of comparison at the Smartville Gage are generally higher than the proposed project (up to 620 cfs) when flows exceed 3,000 cfs, which occurs with about a 50 percent probability. Flows simulated under the basis of comparison at the Marysville Gage are higher than the proposed project (up to 620 cfs) when flows exceed 2,000 cfs, which occurs with about a 50 percent probability.

During a proportion of the lowest 30 percent of the cumulative flow distribution, flows under the proposed project at both the Marysville and Smartville gages are between 200 and 600 cfs lower than under the basis of comparison. Lower flows in May under the proposed project than under the basis of comparison during these drier years occur due to an intentional operational shift in spring peak flows from late-spring to early-spring (e.g., late-May to April). This temporal shift in flows was designed to mimic Yuba River unimpaired flow patterns that would occur during drier year classes. During the lowest 8 percent of the cumulative flow distribution, flows under the proposed project at both gages are similar to or higher (up to 245 cfs) than under the basis of comparison.

Water Temperature

During May, average water temperatures simulated at Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 54.4°F to 55.2°F.

During May, average water temperatures simulated at Marysville under the proposed project and under the basis of comparison are similar (within 0.2°F of each other) for most of the water temperature exceedance distribution, and range from approximately 54.0°F to 58.5°F. However, for 6 percent of the warmest 10 percent of the distribution, water temperatures under the proposed project are approximately 1.5°F lower than under the basis of comparison.

June 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Fall-run Chinook Salmon (Juvenile Rearing and Outmigration)
- Steelhead (Juvenile Rearing)
- Green Sturgeon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation; Juvenile Rearing; Juvenile Emigration)
- American Shad (Adult Immigration and Spawning)
- Striped Bass (Adult Spawning and Initial Rearing)

Simulated Actual Flows

Simulated flows at the Smartville Gage under the proposed project are equivalent or higher, relative to the basis of comparison, at the highest flow levels (which occur with about a 20 percent probability). Flows under the proposed project are slightly lower than the basis of comparison during the lowest 25 percent of the cumulative flow distribution, but remain higher than 1,000 cfs.

Simulated flows at the Marysville Gage under the proposed project are lower (about 100 to 250 cfs) during the lowest 10 to 25 percent of the cumulative flow distribution, relative to the basis of comparison, but higher at intermediate flow levels.

Water Temperature

During June, water temperatures simulated above Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 57.2°F to 57.9°F.

Water temperatures simulated at Marysville during June range from 57.2°F to 62.6°F under the proposed project, and from 57.2°F to 61.8°F under the basis of comparison. During the warmest 26 percent of the water temperature exceedance distribution for June, water temperatures simulated at Marysville under the proposed project are similar to or higher (up to approximately 1.8°F) than those under the basis of comparison. For the remainder of the distribution, water temperatures under the proposed project are similar to or lower (up to 1°F) than those under the basis of comparison.

July 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing)
- Steelhead (Juvenile Rearing)
- Green Sturgeon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation; Juvenile Rearing; Juvenile Emigration)

Simulated Actual Flows

Simulated flows under the proposed project at the Smartville Gage are expected to be higher than the basis of comparison during the highest flow conditions (above approximately 2,700 cfs) which are expected to occur with about a 20 percent exceedance probability, and lower during the intermediate flow range (about 1,700 to 2,700 cfs), which is expected to occur with about a 20 to 50 percent probability. During the lowest flow conditions which are expected to occur with nearly a 50 percent probability, flows under the proposed project remain between approximately 1,100 and 1,700 cfs, and are higher than the basis of comparison.

Simulated flows under the proposed project at the Marysville Gage are expected to be higher than the basis of comparison during the highest flow conditions (above approximately 1,700 cfs) which are expected to occur with about a 20 percent exceedance probability, and lower during the intermediate flow range (about 700 to 1,700 cfs) which is expected to occur with about a 20 to 55 percent probability. In addition, flows under the proposed project are expected to be higher (generally about 200 cfs) than under the basis of comparison during drier conditions, which are expected to occur with up to about a 45 percent probability.

Water Temperature

During July, water temperatures simulated at Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 58.0°F to 58.2°F.

During July, water temperatures simulated at Marysville range from 59.1°F to 64.2°F under the basis of comparison, and from 59.1°F to 63.6°F under the proposed project. During about the warmest 45 percent of the water temperature exceedance distribution for July, water temperatures simulated at Marysville under the proposed project are lower (up to 1.5°F) than those under the basis of comparison. For the remaining central portion of the cumulative probability distribution (about 50 to 75 percent), simulated average water temperatures under the proposed project are less than 62°F, but are up to approximately 2.1°F higher than those under the basis of comparison.

August 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Juvenile Rearing)
- Fall-run Chinook Salmon (Adult Immigration and Holding)
- Steelhead (Adult Immigration and Holding; Juvenile Rearing)
- Green Sturgeon (Juvenile Rearing and Juvenile Emigration)

Simulated Actual Flows

During the lowest flow conditions, which are expected to occur with a 35 percent probability, flows under the proposed project at the Smartville Gage are expected to remain between about 1,000 cfs and 1,500 cfs, whereas simulated flows under the basis of comparison are not expected to exceed 1,200 cfs. At flows higher than about 1,700 cfs, which are expected to occur with about a 50 percent probability, flows under the proposed project are generally 200 to 400 cfs higher relative to the basis of comparison.

During the lowest flow conditions, which are expected to occur with a 35 percent probability, flows under the proposed project at the Marysville Gage are expected to remain between 350 cfs and 500 cfs, whereas simulated flows under the basis of comparison are not expected to exceed 250 cfs. At flows higher than about 800 cfs, which are expected to occur with about a 50 percent probability, flows under the proposed project are generally 200 to 400 cfs higher relative to the basis of comparison.

Water Temperature

During August, water temperatures simulated at Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 57.2°F to 57.4°F (Figure A5-7).

During August, water temperatures simulated at Marysville range from 58.3 °F to 62.6°F under the proposed project, and from 58.4°F to 63.2°F under the basis of comparison.

During the warmest water temperature conditions during August, which are expected to occur with about a 35 percent probability, water temperatures simulated at Marysville under the proposed project are lower (up to 1.5°F) than those under the basis of comparison. For the remainder of the water temperature exceedance distribution, average water temperatures under the proposed project and under the basis of comparison are within 1.0°F.

September 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation; Juvenile Rearing)
- Fall-run Chinook Salmon (Adult Immigration and Holding)
- Steelhead (Adult Immigration and Holding; Juvenile Rearing)
- Green Sturgeon (Juvenile Rearing and Juvenile Emigration)

Simulated Actual Flows

Flows under the proposed project at the Smartville Gage are expected to be higher (up to 100 to 200 cfs) than the basis of comparison with about a 90 percent probability. Flows equal to or higher than 700 cfs are expected to occur under the proposed project with about a 98 percent probability, whereas flows under the basis of comparison are expected to exceed 700 cfs with about a 60 percent probability.

Flows under the proposed project at the Marysville Gage are expected to be higher (from about 100 to 250 cfs) than the basis of comparison with about a 95 percent probability. Flows equal to or higher than 500 cfs are expected to occur under the proposed project with about a 90 percent probability, whereas flows under the basis of comparison are expected to exceed 500 cfs with about a 65 percent probability.

Water Temperature

During September, water temperatures simulated at Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 58.2°F to 58.3°F.

During September, water temperatures simulated at Marysville generally range from about 59.2°F to 62.6°F under the proposed project, and from 59.3°F to 63.4°F under the basis of comparison. During the warmest 30 percent of the water temperature exceedance distribution for September, water temperatures simulated at Marysville under the proposed project are expected to be lower (about 1.5°F) than those under the basis of comparison. For the remainder of the water temperature exceedance distribution, average water temperatures under the proposed project are generally up to 1°F lower than the basis of comparison.

October 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation; Juvenile Rearing)
- Fall-run Chinook Salmon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation)
- Steelhead (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Juvenile Rearing)

Simulated Actual Flows

Flows at both the Smartville Gage and the Marysville Gage under the proposed project are expected to be higher than the basis of comparison with more than a 95 percent probability. At the Marysville Gage, under the proposed project 500 cfs is expected to be equaled or exceeded with about a 95 percent probability, but only with about a 5 percent probability under the basis of comparison.

Water Temperature

During October, water temperatures simulated at Daguerre Point Dam under the proposed project and under the basis of comparison are similar (always within 0.1°F of each other) and range from approximately 55.4°F to 55.7°F.

For nearly the entire water temperature exceedance distribution during the month of October at the Marysville Gage, simulated average water temperatures under the proposed project are expected to be lower (up to approximately 1.0°F) than those under the basis of comparison.

November 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Adult Spawning; Juvenile Rearing; Smolt Emigration)
- Fall-run Chinook Salmon (Adult Immigration and Holding; Adult Spawning)
- Steelhead (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Juvenile Rearing)

Simulated Actual Flows

Flows at both the Smartville Gage and the Marysville Gage under the proposed project are expected to be higher than flows under the basis of comparison during lower flow conditions (about 700 cfs or less), which occur with nearly a 70 percent probability. At both gages, flows are expected to be lower under the proposed project at intermediate flow levels (about 700 to 2,500 cfs) which are expected to occur with a 10 to 20 percent probability.

December 2007

Species, Run and Life Stage Occurrence

- Spring-run Chinook Salmon (Juvenile Rearing and Smolt Emigration)
- Fall-run Chinook Salmon (Adult Spawning; Juvenile Rearing and Outmigration)
- Steelhead (Adult Immigration and Holding; Juvenile Rearing; Smolt Emigration)
- Green Sturgeon (Juvenile Rearing)

Simulated Actual Flows

Flows at the Smartville Gage and the Marysville Gage during 60 percent of the cumulative flow distribution generally reflect flood control operations and/or contributory precipitation accretions. During lower flow conditions (700 cfs or less), which are expected to occur with about a 35 percent probability, flows are expected to be slightly higher under the proposed project than flows under the basis of comparison. At both gages, flows are expected to be lower under the proposed project at intermediate flow levels (about 700 to 4,100 cfs), which are expected to occur with a 10 to 60 percent probability.

Spawning Habitat Availability

Spring-run Chinook Salmon

Spring-run Chinook salmon reportedly spawn from September through November (CDFG 1991a) in the Garcia Gravel Pit Reach, downstream to Daguerre Point Dam (SWRCB 2003). Thus, the spring-run Chinook salmon spawning habitat analysis focused on the annual spawning habitat availability for the Yuba River reach upstream of Daguerre Point Dam during the spawning months of September, October and November (**Figure 4-1**). During these months, the annual spawning habitat availability under the proposed project was slightly higher than under the basis of comparison (i.e., RD-1644 long-term). The proposed project provided an average of 91 percent of maximum WUA, while under the basis of comparison the annual spawning habitat availability averaged 90 percent of maximum WUA. Over the simulation period, annual spawning habitat availability indexes of at least 80 percent of the maximum WUA were achieved 89 percent of the time under the proposed project, and 83 percent of the time under RD-1644 long-term.

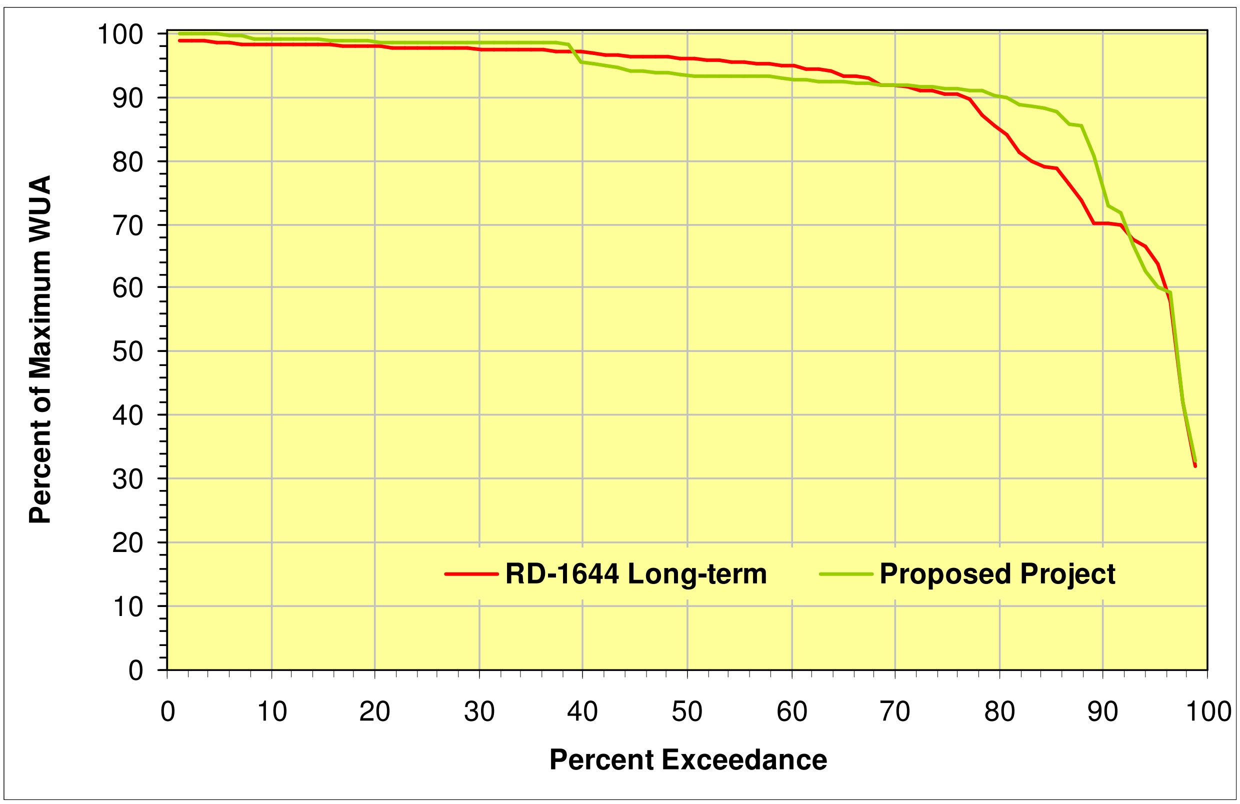

Figure 4-1. Exceedance Plot Comparison of the Annual Spring-Run Chinook Salmon Spawning Habitat Availability, as Represented by WUA Upstream of Daguerre Point Dam, During September through November Under the Proposed Project and Under the RD-1644 Long-term Instream Flow Requirements.

The spring-run Chinook salmon spawning habitat analysis also emphasized the month of September, because this is the only month during the spring-run Chinook salmon spawning period that is assumed to not temporally overlap with fall-run Chinook salmon spawning

(CDFG 2000). For September, Chinook salmon spawning habitat availability, expressed as percent maximum WUA, under the proposed project was lower (up to about 10 percent) than under the basis of comparison for approximately 57 percent of the cumulative WUA distribution, and was higher (up to approximately 5 percent) than under the basis of comparison for the remainder of the distribution (**Figure 4-2**). Overall, over the entire simulation period, the proposed project provided an average of about 87 percent of maximum WUA, and the basis of comparison provided about 90 percent of maximum WUA. Under the proposed project, approximately 99 to 100 percent of the maximum WUA was provided for 42 percent of the cumulative WUA distribution, whereas the basis of comparison did not provide spawning habitat over about 96 percent of maximum WUA.

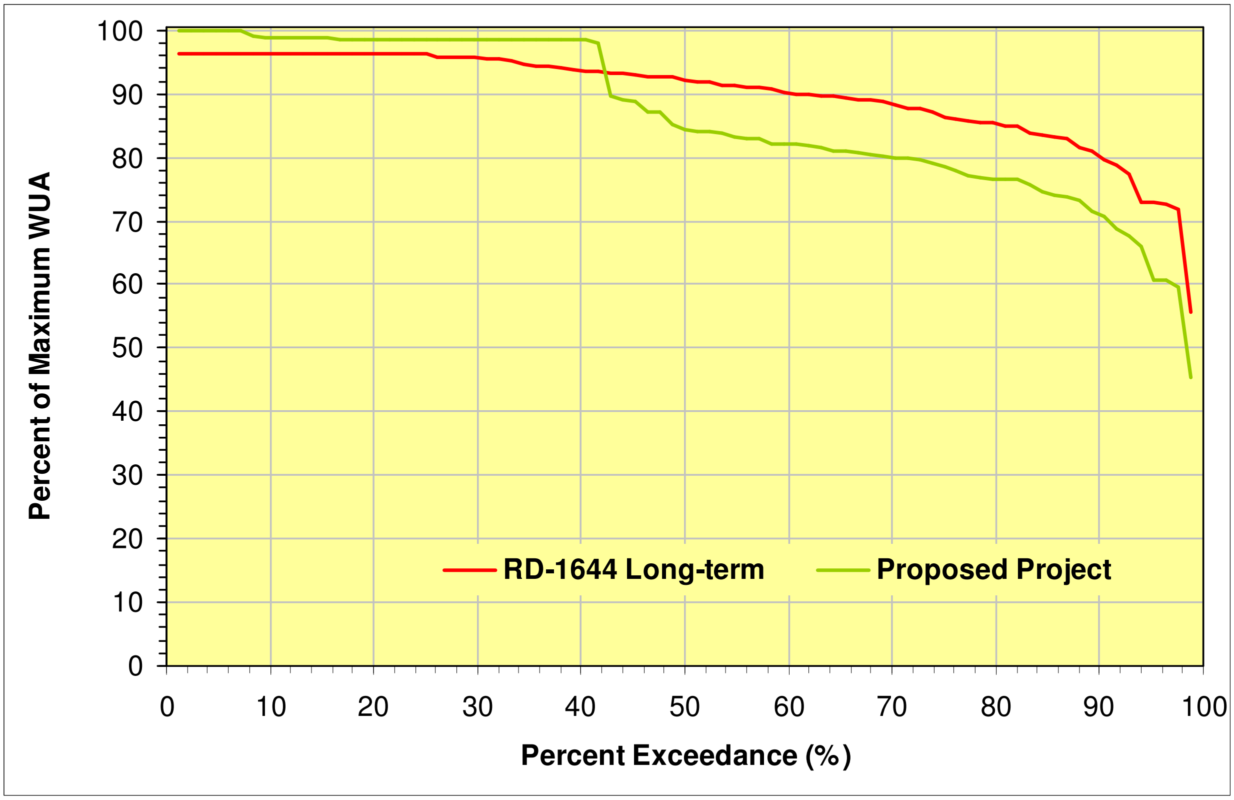

Figure 4-2. Exceedance Plot Comparison of Spring-Run Chinook Salmon Spawning Habitat Availability, as Represented by WUA Upstream of Daguerre Point Dam, During September Under the Proposed Project and Under the RD-1644 Long-term Instream Flow Requirements.

Fall-run Chinook Salmon

The fall-run Chinook salmon spawning habitat analysis focused on the months of October through December. WUA estimates were utilized to estimate the annual spawning habitat availability upstream and downstream of Daguerre Point Dam. Over the entire simulation period, Chinook salmon spawning habitat availability under the proposed project was generally higher than under the basis of comparison (**Figure 4-3**). Over the entire simulation period, the proposed project achieved an average annual probability of 86 percent of maximum WUA, whereas the basis of comparison (RD-1644 long-term) achieved an average annual 81 percent of maximum WUA. Under the proposed project, over 90 percent of the maximum WUA was achieved about 62 percent of the cumulative WUA distribution, while under the basis of comparison 90 percent of maximum WUA was achieved for only approximately 48 percent of the cumulative WUA distribution. The percentage of maximum WUA was generally higher (up to approximately 20 percent) under the proposed project than under the basis of comparison for about 50 percent of the cumulative WUA distribution.

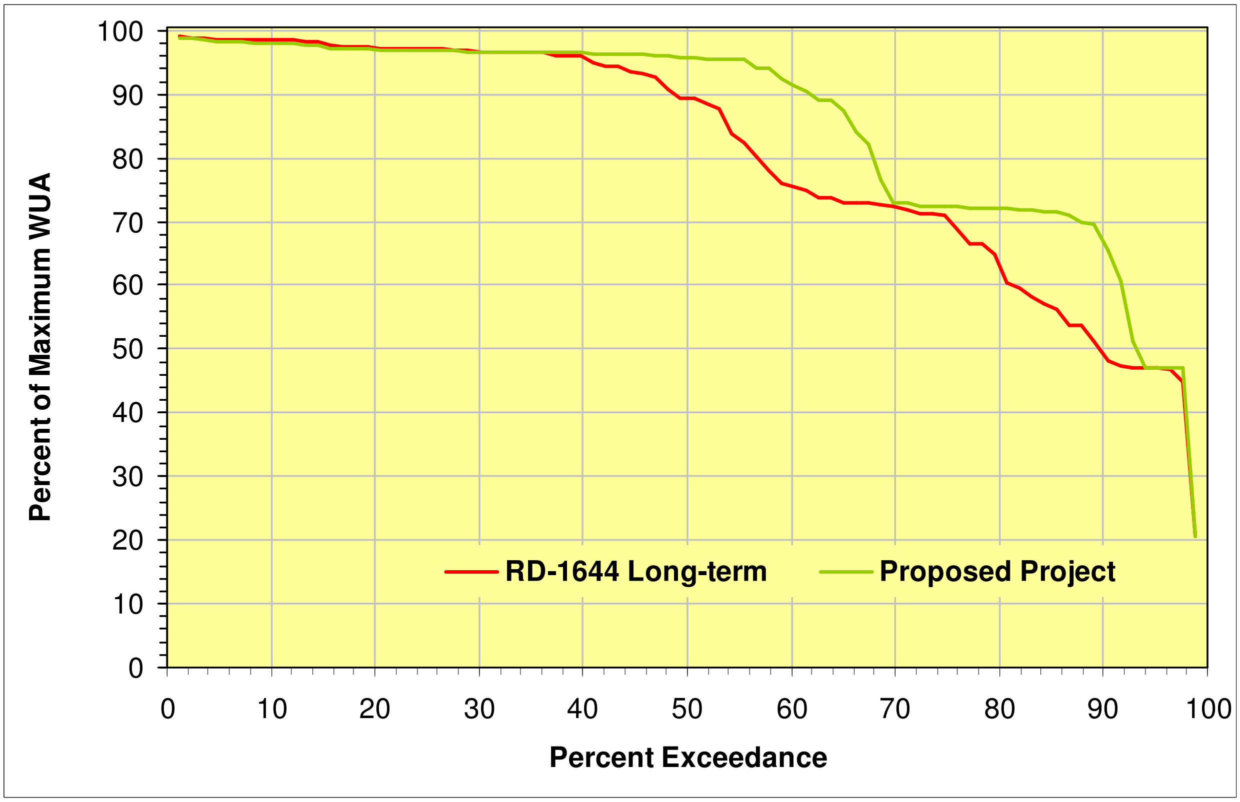

Figure 4-3. Exceedance Plot Comparison of the Annual Fall-Run Chinook Salmon Spawning Habitat Availability, as Represented by WUA Upstream and Downstream of Daguerre Point Dam, During October through December 2007 Under the Proposed Project and Under the RD-1644 Long-term Instream Flow Requirements.

Steelhead

The steelhead spawning period generally extends from January through April (CALFED and YCWA 2005). Most steelhead spawning activity in the lower Yuba River is believed to take place upstream of Daguerre Point Dam (CALFED and YCWA 2005). Consequently, the steelhead spawning habitat analysis was focused upstream of Daguerre Point Dam. Because the duration of the proposed project extends from March 1 through December 31, 2007, and does not include the whole steelhead spawning period, one cumulative distribution of the annual scaled composite WUA was generated for steelhead spawning.

The March through April 2007 steelhead spawning habitat availability under the proposed project was lower than under the basis of comparison (RD-1644 long-term) for approximately 40 percent of the cumulative WUA distribution (**Figure 4-4**). Overall, the average proposed project WUA was 38 percent of maximum WUA, whereas the basis of comparison average was 42 percent of maximum WUA. Over 90 percent of the maximum WUA occurred for about 10 percent of the cumulative WUA distribution under the proposed project, and about 18 percent of the cumulative WUA distribution under the basis of comparison. However, when the entire steelhead spawning season (January through April) is considered, the proposed project is expected to provide equivalent or enhanced amounts of steelhead spawning habitat, and is addressed in the IS.

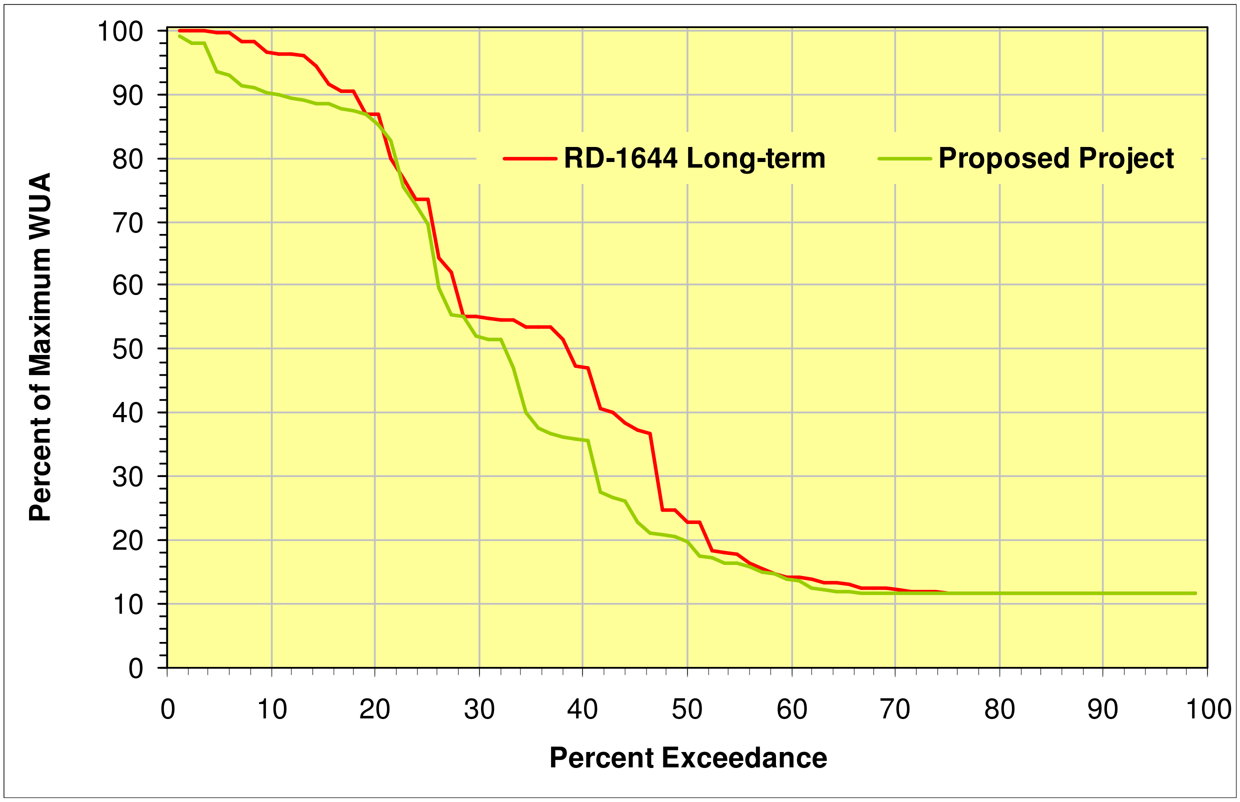

Figure 4-4. Exceedance Plot Comparison of the Annual Steelhead Spawning Habitat Availability, as Represented by WUA Upstream of Daguerre Point Dam, During March through April 2007 Under the Proposed Project and Under the RD-1644 Long-term Instream Flow Requirements.

Fisheries Issues Related to Recent Water Transfers

The discussion of potential fisheries resources impacts for the lower Yuba River also focuses on issues raised related to recent water transfers and a subsequent synthesis of species-specific potential impacts. Specifically, the topics addressed in this evaluation include:

- Potential Effects on Juvenile Salmonid Movement in the Yuba River
  - Inducement of Juvenile Salmonid Downstream Movement
  - Downstream Extension of Cold Water Habitat
- Potential Effects on Attraction of Non-native Adult Chinook Salmon in the Yuba River
- Cold Water Reserves for Fall Releases from New Bullards Bar Reservoir
- Potential Redd Dewatering and Juvenile Stranding

Juvenile Salmonid Downstream Movement

Water transfers characterized by substantial increases in flows at the onset of the transfer, particularly when initiated in summer months when flows are at the instream minimum levels, have the potential to result in adverse impacts to aquatic resources. CDFG indicates that a significant increase in the magnitude of flow is a primary factor that induces steelhead and Chinook salmon to outmigrate (CDFG 2004).

In 2004, the total ramp-up for the water transfer was 122 cfs over the course of two days; a 67 cfs increase in flows from June 30 to July 1, 2004 and a 55 cfs increase in flows from July 1 to July 2, 2004 (at the Smartville Gage). The 2004 water transfer monitoring and evaluation studies did not observe or report any consistent trend between juvenile steelhead counts (at the rotary screw traps) and Yuba River streamflow prior to, during, or immediately following initiation of the 2004 water transfer. Under the proposed project, a pronounced ramp-up is not anticipated because the flow schedules under the 2007 Pilot Program Fisheries Agreement were designed to minimize such occurrences, and because flow increases during spring 2007 are not expected to exceed those which occurred during 2004. Therefore, the proposed project would not be expected to result in the inducement of juvenile salmonid downstream movement from above Daguerre Point Dam to below Daguerre Point Dam in the lower Yuba River, or from the Yuba River to the Feather River.

Downstream Extension of Coldwater Habitat

Resource agency representatives also have expressed concern regarding the creation or extension of coldwater habitat in the lower Yuba River associated with water transfer operations. As discussed previously (Summary of Recent Water Transfer Fisheries Monitoring Studies and Findings), it appears that water transfers may be associated with the extension of cooler water temperatures farther downstream in the lower reaches of the Yuba River (i.e., below Daguerre Point Dam). Generally, such extension of coldwater habitat further downstream can be beneficial to fisheries resources by providing a larger area of suitable habitat. However, once the transfer terminates, if the extended cool water habitat is not maintained, areas of suitable cool water habitat may shift upstream, and fish in the lower downstream reaches that do not also shift upstream may be subjected to stressful water temperatures.

In the Yuba River, habitat in the lower river below Daguerre Point Dam and, in particular, below Hallwood Boulevard generally is considered poor over-summering habitat for juvenile salmonids, relative to reaches upstream of Daguerre Point Dam (see Yuba River Environmental Setting). CDFG has identified concerns regarding the decreased survival of fish remaining in the lower reaches of the river following the end of the water transfer due to elevated water temperatures and increased predation (CDFG 2004).

Water temperatures in the lower Yuba River below Daguerre Point Dam during the period of the year (May through October) included in the water temperature analysis are consistently lower much of the time under the proposed project, relative to the basis of comparison. Simulated water temperatures in the lower reaches of the lower Yuba River (i.e., represented by the Marysville Gage) are anticipated to be more suitable for juvenile steelhead from the period extending from May through October 2007 under the proposed project, relative to the basis of comparison. However, it is recognized that water temperature conditions are variable and are influenced by climatic conditions, and should continue to be monitored during the proposed project.

Potential Effects on Attraction of Non-native Adult Chinook Salmon in the Lower Yuba River

Chinook salmon straying is fairly common in Central Valley streams throughout the Chinook salmon distribution. However, introducing non-native Chinook salmon (especially of hatchery origin) at high rates may be detrimental to the overall well-being of self-sustaining natural Chinook salmon populations, such as those in the Yuba River. Although some straying of non-indigenous Chinook salmon into the lower Yuba River occurs every year, resource agencies have expressed concern regarding the potential for the lower Yuba River water transfers via decreased water temperatures and increased proportions of flow, relative to the Feather River, to encourage non-natal Feather River hatchery Chinook salmon to stray into the lower Yuba River.

As described in the *Summary of Recent Water Transfer Fisheries Monitoring Studies and Findings*, some straying of anadromous salmonids into the lower Yuba River is a natural phenomenon, and also occurs every year under various prevailing water conditions. It should be recognized that increases in lower Yuba River flows, whether from water transfers, increased minimum instream flow requirements ordered by the SWRCB, or flood flow releases potentially may attract salmonids into the lower Yuba River. Additionally, straying of non-Yuba River origin adult Chinook salmon can be influenced by Feather River flows, hatchery release location and timing, and other factors.

Overall, based on the findings of monitoring studies conducted for recent YCWA water transfers, the flow and water temperature differences between the proposed project and the basis of comparison are not expected to increase straying of non-indigenous adult salmonids in the lower Yuba River.

Coldwater Reserves for Fall Releases from New Bullards Bar Reservoir

During previous water transfers involving YCWA, concern has been expressed about the loss of coldwater reserves for fall releases from New Bullards Bar Reservoir. Monitoring conducted for the SWRCB following YCWA's 1997 water transfer to Reclamation indicates that a reduction of 75,000 acre-feet did not significantly reduce available coldwater storage. In addition, water temperature profiles in the reservoir indicate that the thermocline (the depth zone of a lake or reservoir in which there is a rapid decrease in temperature with water depth) extends to depths of 50 to 60 feet in late summer and early fall. Below a depth of about 120 feet, water temperatures are relatively low and stable (40°F to 45°F) ((YCWA 2004); Appendix 2). The low-level penstock outlet draws water at reservoir elevations from 1,623 to 1,675 feet. It is expected that the proposed project would result in less-than-significant impacts to the coldwater pool.

Potential Redd Dewatering and Juvenile Stranding

Revised flow reduction and fluctuation criteria for the lower Yuba River were established in the 2005 NMFS Biological Opinion for the Yuba River Development Project License Amendment (FERC No. 2246). The revised flow reduction and fluctuation criteria were developed to be more protective than previous requirements of juvenile salmonids from stranding and of salmonid redds from dewatering. The following conditions stipulated in the Biological Opinion were developed to protect salmonid redds from dewatering (NMFS 2005):

- Once the daily project release or bypass level is achieved, fluctuations in the streamflow level downstream of Englebright Dam due to changes in project operations shall not vary up or down by more than 15 percent of the average daily flow.
- During the period from September 15 to October 31, YCWA shall not reduce the flow downstream of Englebright Dam to less than 55 percent of the maximum five-day average release or bypass level that has occurred during that September 15 to October 31 period or the minimum streamflow requirement that would otherwise apply, whichever is greater.
- During the period from November 1 to March 31, YCWA shall not reduce the flow downstream of Englebright Dam to less than the minimum streamflow release or bypass established under (4) above; or 65 percent of the maximum five-day average flow release or bypass that has occurred during that November 1 to March 31 period;

or the minimum streamflow requirement that would otherwise apply, whichever is greater.

Additional detail is provided in the NMFS Biological Opinion (NMFS 2005).

Substantial decreases in instream flows at the conclusion or "ramp-down" phase of water transfers are of concern because of the potential that fish stranding could result when flows in the river decrease. As juvenile salmonids grow, they move from the shallower back water/side channel habitats to faster water associated with the main channel. However, stranding or isolation of juvenile salmonids can occur in side pools or channels with an increasing gradient towards the main channel if these areas become isolated from the main river channel due to flow reductions. It is recognized that there are side channels along the lower Yuba River that could become isolated from the main river channel if flow reductions at the end of the transfer period are not managed carefully. In addition to complying with the flow reductions and fluctuation criteria in the NMFS 2005 BO, during the proposed project YCWA would implement a maximum ramp-down rate of 200 cfs per day, in four increments of about 50 cfs each, as was done for the 2004 water transfer (YCWA 2004). These proposed rates are more restrictive than the ramp-down rates in the current SWRCB RD-1644 interim regulatory baseline.

YCWA also is obligated to complete a fry stranding and redd dewatering study that was developed collaboratively with NMFS, USFWS, and CDFG. The NMFS 2005 BO states that the results of this study will be used as the basis for developing a flow reduction and fluctuation management plan (FRFMP) for the lower Yuba River. This FRFMP is expected to be designed and implemented in a way that will further minimize potential take of listed species resulting from flow reductions and fluctuations downstream of Englebright Dam.

4.2.2.5 Summary of Evaluation Considerations and Conclusions

Yuba River

Spring-run Chinook Salmon

The adult immigration and holding life stage primarily extends from March through October, with most Chinook salmon that exhibit spring-run phenotypic immigration timing moving past Daguerre Point Dam during June. Flows in the lower Yuba River throughout the upstream migration period generally remain within ranges sufficient to allow adequate passage of adult spring-run Chinook salmon through the Daguerre Point Dam fish ladders (Daguerre Point Dam fish ladders are not effectively operational at flows above 10,000 cfs). During June, when most early immigrating (i.e., spring-run) Chinook salmon are observed, the proposed project provides equivalent, or substantially higher flows than the basis of comparison over 80 to 85 percent of the exceedance distribution, at both the Smartville and Marysville gages. After passing Daguerre Point Dam, the fish reportedly continue their upstream migration to spend the summer in deep pools in the Narrows Reach below Englebright Dam where they hold until spawning commences in September (SWRCB 2003).

The presence of adult spring-run Chinook salmon below Daguerre Point Dam, during their immigration until holding in the Narrows Reach, is transitory. Water temperatures below Daguerre Point Dam under both the proposed project and the basis of comparison are not expected to substantially affect the upstream migration of spring-run Chinook salmon. Flows and water temperatures under both the proposed project and the basis of comparison are expected to provide essentially equivalent holding habitat conditions in the Narrows Reach from March through October.

Spring-run Chinook salmon spawning reportedly occurs above Daguerre Point Dam from September through November. During September, the proposed project is expected to provide higher flows (generally up to about 200 cfs) than the basis of comparison, which results in an overall average less amount of spawning habitat (87 versus 90 percent of maximum WUA) due to the nature of the spawning habitat–discharge relationship. However, the proposed project provides more spawning habitat during "drier" conditions (i.e., the lowest 40 percent of the cumulative flow distribution). Moreover, higher amounts of spring-run Chinook salmon spawning habitat are expected to be provided by the proposed project than by the basis of comparison (overall average of 91 percent versus 90 percent of maximum WUA) from September through November. Water temperatures above Daguerre Point Dam are cool and nearly identical during September and October under the proposed project and the basis of comparison.

The juvenile rearing life stage of spring-run Chinook salmon is believed to extend year-round. Specific habitat-discharge relationships for juvenile rearing salmonids have not been developed for the lower Yuba River. Available information indicates that physical habitat for this life stage is not limiting under the flow regimes anticipated for either operational scenario. Elevated water temperatures from spring through fall are considered to be the primary stressor to juvenile rearing spring-run Chinook salmon in the lower Yuba River.

Under the proposed project, water temperatures in the lower Yuba River during the juvenile spring-run Chinook salmon over-summer rearing period are anticipated to be substantially lower, and therefore more suitable, than those under the basis of comparison. During the simulated warmest 30 percent of conditions that could occur during late summer and fall, water temperatures at Marysville under the proposed project would be up to 1.5°F lower than those under the basis of comparison below Daguerre Point Dam.

The smolt emigration life stage of spring-run Chinook salmon extends from November through June in the lower Yuba River. Under the proposed project (relative to the basis of comparison), flows are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, and March; (2) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (3) lower at low and intermediate levels, and equivalent at high flow levels during May; and (4) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June.

During the month of June portion of the smolt emigration life stage, water temperatures at Marysville under the proposed project are expected to be up to 1.5°F higher than the basis of comparison for the warmest 25 percent of the distribution, when water temperatures equal or exceed 60°F under both alternatives, but lower at intermediate (54°F - 60°F) conditions.

Based on the findings of YCWA's recent monitoring studies, and the flow and water temperature analyses conducted for this impact analysis, it is concluded that, relative to the basis of comparison, the proposed project is expected to provide:

- Similar rates of non-indigenous adult Chinook salmon straying;
- Similar adult upstream migration and holding conditions;
- Higher spawning habitat availability during drier flow conditions, and lower spawning habitat availability during wetter conditions in September; higher spawning habitat availability from September through November; and nearly identical spawning water temperatures;

- Substantially lower (up to 1.5°F) and therefore more suitable water temperatures during the juvenile spring-run Chinook salmon over-summer rearing period below Daguerre Point Dam;
- Similar protection against juvenile non-volitional downstream movement; and
- Generally equivalent smolt outmigration conditions.

In conclusion, the proposed project is not expected to result in unreasonable impacts to the lower Yuba River spring-run Chinook salmon population, and is expected to provide an equivalent or higher level of protection, relative to the basis of comparison (RD-1644 long-term).

Fall-run Chinook Salmon

The adult immigration and holding life stage generally extends from August through November, which encompasses the time fall-run Chinook salmon enter the lower Yuba River to the time spawning site selection begins. The majority of fall-run Chinook salmon reportedly enter the lower Yuba River during October and November. Based upon simulated flow analysis, the proposed project flows at the Marysville Gage during August, September, October, and November would be higher most of the time, relative to the basis of comparison. Increased flows would increase the mean width and depth of the river channel, thus potentially increasing the total area of holding habitats, which could decrease the overall holding fish density. Potential increases in flows, under the proposed project, could also be beneficial in facilitating the migration of adult fall-run Chinook salmon to holding habitats in upstream areas. Associated decreases in water temperature (up to 1.5°F) below Daguerre Point Dam could decrease the potential spread of infectious parasitic diseases and, thus, increase the general fitness level of adult fall-run Chinook salmon present in the lower Yuba River during late summer and early fall.

Fall-run Chinook salmon spawning generally extends from October through December. The proposed project is expected to provide higher flows under drier flow conditions than the basis of comparison. Consequently, the proposed project provides more (generally 10 to 20 percent) spawning habitat when spawning habitat is least available, which occurs with about a 60 percent probability. Water temperatures below Daguerre Point Dam during the early part of the spawning and embryo incubation season (i.e., October) could be up to 1°F cooler than under the basis of comparison, and therefore more suitable for spawning and embryo incubation.

The juvenile rearing and outmigration life stage of fall-run Chinook salmon generally extends from December through June in the lower Yuba River. Under the proposed project (relative to the basis of comparison), flows are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during December and March; (2) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (3) lower at low and intermediate levels, and equivalent at high flow levels during May; and (4) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June.

During the month of June portion of the juvenile rearing and outmigration life stage, water temperatures at Marysville under the proposed project are expected to be up to 1.5°F higher than the basis of comparison for the warmest 25 percent of the distribution, when water temperatures equal or exceed 60°F under both alternatives.

Based on the findings of YCWA's recent monitoring studies, and the flow and water temperature analyses conducted for this impact analysis, it is concluded that relative to the basis of comparison, the proposed project is expected to provide:

- Substantially higher flows (up to 250 cfs) and lower water temperatures (up to 1.5°F) below Daguerre Point Dam during the late-summer and fall period of the adult immigration and holding life stage;
- Similar rates of non-indigenous salmonid straying;
- More spawning habitat overall, and more spawning habitat (generally 10 to 20 percent) when spawning habitat is least available, which occurs with about a 60 percent probability;
- Lower (up to 1°F) and therefore more suitable water temperature during the early part (i.e., October) of the spawning and embryo incubation season;
- Similar protection against juvenile non-volitional downstream movement; and
- Generally equivalent juvenile rearing and outmigration conditions.

In conclusion, the proposed project is not expected to result in unreasonable impacts to the lower Yuba River fall-run Chinook salmon population, and is expected to provide an equivalent or higher level of protection relative to the basis of comparison (RD-1644 long-term).

Steelhead

The analytical period for the steelhead adult immigration and holding life stage in the lower Yuba River extends from August through March. Based on the simulated flow analysis, there is about a 90 percent or higher probability that flows under the proposed project would be higher than they would be under the basis of comparison from August through October, and about a 70 percent probability of higher flows in November. Potential increases in flow under the proposed project could increase the quantity of usable adult steelhead holding habitat due to increases in water depth, and increases in the longitudinal cross sectional area of the river channel that would occur from increases in river stage elevations. Also, lower water temperatures at Marysville would increase the suitability of migratory corridor and adult holding habitat. Under the proposed project (relative to the basis of comparison), flows are expected to be equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during December and March.

The steelhead spawning period generally extends from January through April, upstream of Daguerre Point Dam. The March through April 2007 steelhead spawning habitat availability under the proposed project was lower than under the basis of comparison (RD-1644 long-term) for approximately 40 percent of the cumulative WUA distribution. The average proposed project WUA was 38 percent of maximum WUA, whereas the basis of comparison average was 42 percent of maximum WUA. Over 90 percent of the maximum WUA occurred for about 10 percent of the cumulative WUA distribution under the proposed project, and about 18 percent of the cumulative WUA distribution under the basis of comparison.

Water temperatures above Daguerre Point Dam during the May portion of the embryo incubation period (January through May) are cool (< 56°F) and similar under both the proposed project and the basis of comparison.

The juvenile rearing life stage of steelhead occurs year-round in the lower Yuba River. Specific habitat-discharge relationships for juvenile rearing salmonids have not been developed for the lower Yuba River. Available information indicates that physical habitat for this life stage is not limiting under the flow regimes anticipated for either operational scenario. By contrast, water temperatures from spring through fall are considered to be the primary stressor to juvenile rearing steelhead in the lower Yuba River.

Water temperatures in the lower Yuba River below Daguerre Point Dam during the juvenile steelhead over-summer rearing period are anticipated to be substantially lower and, therefore, more suitable, than those with the basis of comparison. During the simulated warmest 30 percent of conditions that could occur during late summer and fall, water temperatures under the proposed project are expected to be up to 1.5°F lower than those under the basis of comparison.

Steelhead young-of-the-year (YOY) downstream movement is believed to occur from May through September, and yearling or older individuals (smolts) are believed to emigrate from October through May. For the steelhead YOY downstream movement period (May through September), under the proposed project(relative to the basis of comparison) flows are expected to be: (1) lower at low and intermediate levels, and equivalent at high flow levels during May; (2) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June; (3) higher at low flow levels, lower at intermediate levels, and higher at high flow levels during July; and (4) generally higher over the range of expected flow levels during August and September.

It is unclear whether the flow patterns from May through September would influence the downstream movement of YOY steelhead under the proposed project, relative to the basis of comparison. The downstream movement of juvenile anadromous salmonids is stimulated by both physiological and environmental cues. Physical cues, such as rapid increases in flows, may be more closely associated with the downstream movement of juvenile salmonids, rather than sustained flow conditions. Nonetheless, for those YOY steelhead that do move downstream, water temperatures below Daguerre Point Dam during summer and early fall are expected to be substantially lower, and therefore more suitable, under the proposed project relative to the basis of comparison.

For the smolt emigration period (October through May) under the proposed project (relative to the basis of comparison) flows are expected to be: (1) generally higher over the range of expected flow levels during October; (2) equivalent or slightly higher at low flow levels, lower at intermediate flow levels, and equivalent at high flow levels during November, December, and March; (3) higher at low and intermediate flow levels, and equivalent at high flow levels during April; and (4) lower at low and intermediate levels, and equivalent at high flow levels during May.

During the October month of the smolt emigration life stage, water temperatures at Marysville under the proposed project are expected to be lower, and therefore more suitable, for the smolt emigration life stage.

Based on the findings of YCWA's recent monitoring studies, and the flow and water temperature analyses conducted for this EA, it is concluded that relative to the basis of comparison, the proposed project is expected to provide:

- Substantially lower (up to 1.5°F) and therefore more suitable water temperatures below Daguerre Point Dam during the late summer and early fall portion of the adult immigration and holding period;

- Generally equivalent water temperature conditions during the spawning and embryo incubation life stage, and slightly lower spawning habitat conditions during March and April of the January through April spawning period;
- Substantially lower (up to 1.5°F) and therefore more suitable water temperatures below Daguerre Point Dam during the juvenile steelhead over-summer rearing period;
- Substantially lower (up to 1.5°F) and therefore more suitable water temperatures below Daguerre Point Dam during the late summer and early fall portion of the juvenile downstream movement life stage; generally equivalent flow and water temperature conditions during the smolt emigration life stage; and
- Similar protection against juvenile non-volitional downstream movement.

In conclusion, the proposed project is not expected to result in unreasonable impacts to the lower Yuba River steelhead population, and is expected to provide an equivalent or higher level of protection relative to the basis of comparison (RD-1644 long-term).

Green Sturgeon

Flows during green sturgeon immigration and holding (February through July) and adult spawning and embryo incubation (March through July) are expected to allow adequate upstream migration and spawning habitat availability, under the proposed project, relative to the basis of comparison. Water temperatures under the proposed project during May through July below Daguerre Point Dam could range from 54°F to 63.5°F. These water temperatures are within the range of water temperatures reported to be suitable for green sturgeon immigration and holding, and spawning and embryo incubation.

Green sturgeon juvenile rearing is reported to occur year-round in their natal stream habitats. Average monthly flows under the proposed project are expected to be generally higher during most months of the year during low flow conditions, and therefore would not be expected to be a limiting factor impacting green sturgeon juvenile habitat availability, relative to the basis of comparison.

Average monthly water temperature in the lower Yuba River under the proposed project would not be expected to exceed the water temperatures reported to be optimal for juvenile green sturgeon growth.

Green sturgeon begin their emigration to the Delta from May through September. Flows during this period are expected to allow juvenile emigration under the proposed project and the basis of comparison. During the lowest 30 percent of the cumulative flow distribution, higher flows during the summer and fall months under the proposed project could potentially be more beneficial to green sturgeon juvenile emigration, relative to the basis of comparison.

Thermal requirements for the green sturgeon juvenile emigration life stage have not been reported; therefore, it is assumed for the purpose of this analysis, that water temperature suitabilities reported for the juvenile rearing life stage also are appropriate for juvenile emigration. Water temperatures under the proposed project would be within the range reported to be suitable for juvenile green sturgeon.

Based on the flow and temperature analyses conducted for this impact analysis, it is concluded that relative to the basis of comparison, the proposed project is expected to provide:

- Similar or better flows and water temperatures during the adult immigration and holding and spawning and embryo incubation life stages;

- Substantially lower water temperatures during over-summer juvenile rearing periods; and
- Similar flows and substantially lower water temperatures during juvenile emigration.

In conclusion, the proposed project is not expected to result in unreasonable impacts to green sturgeon in the lower Yuba River, and is expected to provide an equivalent or higher level of protection, relative to the basis of comparison (RD-1644 long-term).

American Shad

The proportion of lower Yuba River outflow to the lower Feather River flow would be 8 percent higher under the proposed project during the month of April, 5 percent lower during May, and 7 percent higher during the month of June, relative to the basis of comparison (**Table 4-4**). American shad adult immigration and spawning would not be expected to be significantly affected by changes in flows under the proposed project. Flows under the proposed project during April, May, and June are expected to provide flows of sufficient magnitude to attract American shad into the lower Yuba River to spawn. Therefore, the proposed project would not be expected to result in unreasonable impacts to American shad immigration and spawning in the lower Yuba River, relative to the basis of comparison.

Table 4-4. Difference in proportional simulated mean monthly flows for the lower Yuba River (Marysville), relative to the lower Feather River (Gridley), between the Proposed Project and RD-1644 Long-term during April through June 2007

	Apr	May	Jun
Feather River Mean Monthly Flow (cfs)[1]	4,418	4,069	4,003
Yuba River Mean Monthly Flow (cfs) with Proposed Project[2]	2,582	2,883	2,329
Yuba River Mean Monthly Flow (cfs) with RD-1644 Long-term[2]	2,240	3,075	2,066
Difference in Proportional Flow (%)	8	-5	7

[1]Source: CDEC, period of record 1993 through 2005
[2]Simulated at Marysville

Striped Bass

Striped bass spawning and initial rearing in the lower Yuba River extends from April through June. Flows under the proposed project during April, May and June simulated at Marysville are expected to provide flows of sufficient magnitude to attract striped bass into the lower Yuba River to spawn (see American shad discussion, above). Water temperatures lower than the range reported for spawning (59°F to 68°F) are expected to occur with about a 15 percent higher probability under the proposed project, relative to the basis of comparison. Water temperatures reported to be suitable for rearing (61°F to 73°F) are expected to occur with the same probability under the proposed project, relative to the basis of comparison. The proposed project would not be expected to result in unreasonable impacts to striped bass spawning and initial rearing in the lower Yuba River, relative to the basis of comparison.

Feather River

Overall, flows in the Feather River would not be expected to differ substantially under the proposed project, relative to the basis of comparison. The difference in average simulated monthly mean flows (Marysville Gage) and the percentage of these flows to Feather River (Gridley Gage) flows under the proposed project relative to the basis of comparison for the 83-year simulation period are represented in Table 4-1.

These potential monthly changes in flow would not be of sufficient magnitude to significantly affect Feather River fisheries resources. Neither physical habitat availability for fish residing in the Feather River nor immigration of adult or emigration of juvenile anadromous fish would be expected to be substantially affected by the anticipated differences in flows that could occur under the proposed project, relative to the basis of comparison. These relatively small differences in flow between the proposed project and the basis of comparison are not expected to result in substantial differences in water temperatures, would not persist downstream and, therefore, would not result in unreasonable impacts to fish resources in the lower Feather River.

Sacramento River

Although the specific release pattern is uncertain at this time and will depend on SWP/CVP operational conditions as they develop over the summer, the release, when it occurs, will be subject to operational constraints, and within normal operational parameters.

The proposed project would not compromise compliance with environmental regulations that specify minimum flow requirements for winter-run and spring-run Chinook salmon, and Central Valley steelhead. Required releases from New Bullards Bar Reservoir, Englebright Reservoir, and Oroville Reservoir for the protection of fisheries resources would continue to be made by YCWA and DWR.

Overall, flows in the Sacramento River would not be expected to differ substantially under the proposed project, relative to the basis of comparison. The difference in average simulated monthly mean flows at the Marysville Gage for the 83-year simulation period between the proposed project and the basis of comparison and the percentage of these flows to Sacramento River (Freeport) flows are represented in Table 4-2.

These potential changes in flow would not be of sufficient magnitude to result in significant impacts to Sacramento River fisheries resources. Neither physical habitat availability for fish residing in the Sacramento River nor immigration of adult or emigration of juvenile anadromous fish would be significantly affected by the anticipated differences in flows that could occur under the proposed project, relative to the basis of comparison. These relatively small differences in flow between the proposed project and the basis of comparison are not expected to result in substantial differences in water temperatures, would not result in water temperature differences in the Sacramento River and, therefore, would not result in unreasonable impacts to fish resources in the Sacramento River.

Sacramento-San Joaquin Delta

The current regulatory requirements for managing Delta exports include:

- 1995 SWRCB Delta Water Quality Control Plan
- 2004 NMFS Biological Opinion on OCAP
- 2005 USFWS Biological Opinion on OCAP

Compliance with the environmental agreements and requirements specified in these regulations would preclude the occurrence of significant impacts on fish as a result of the pumping from the Delta of the water made available by the proposed project. DWR would provide YCWA water transfer water only to SWP or CVP water contractors within the service area (or place of use) as authorized in DWR's water right permits. Provision of the YCWA transfer water through the EWA Program would be within permitted and authorized operational and regulatory requirements (or constraints). Consequently, the proposed project water would become part of the overall SWP or CVP water supply with attendant environmental limitations for exporting water from the Delta. The impacts on the Delta from SWP/CVP making full use (within prescribed constraints) of its pumping capacities and any necessary mitigation have been documented (Reclamation 2004).

Potential Delta impacts associated with EWA asset acquisitions were addressed through separate environmental compliance processes (i.e., NEPA, CEQA, ESA), which included preparation of an EIS/EIR and corresponding Action Specific Implementation Plan (ASIP). Based on the analyses, conclusions and mitigation measures presented in the EWA EIS/EIR and ASIP, a Record of Decision (Reclamation *et al.* 2004b) was issued by Reclamation and the EIR was certified by DWR (DWR 2004b). Thus, the necessary regulatory compliance requirements of NEPA and CEQA have been satisfied for the EWA Program. Similarly, federal and state ESA compliance requirements have been satisfied through the ASIP process. In particular, the USFWS concurred in its Programmatic Biological Opinion on the EWA Program that the EWA was not likely to adversely affect delta smelt or its critical habitat (USFWS 2004). Similarly, NMFS found that the EWA was not likely to adversely affect Sacramento River winter-run Chinook salmon and its critical habitat, Central Valley spring-run Chinook salmon, and Central Valley steelhead (NMFS 2004).

Completed in 2004, the EWA Final EIS/EIR analyzed EWA Program actions through 2007. As described in the EWA Draft EIS/EIR (2003), the Flexible Purchase Alternative included potential asset acquisitions from the Yuba River Basin in the amount of: (1) 100,000 acre-feet of stored reservoir water; and (2) 85,000 acre-feet of groundwater, both of which could be provided to the EWA Program by YCWA (Reclamation *et al.* 2003).

Additionally, as presented in Table 4-3, during the March 2007 through December 2007 period, the proposed project could alter monthly mean Delta inflow between 0.18 percent (July) and 1.6 percent (August), relative to the basis of comparison (RD-1644 long-term). Because these values represent the total change in flow on a month-to-month basis, individual flow reductions that could occur in the Delta due to changes in Sacramento River flow (as one component of total Delta inflow) under the proposed project, relative to the basis of comparison, would not be expected to result in unreasonable impacts to Delta fisheries resources.

The expected amount of water entering the Delta as a result of the transfer element of the proposed project is within the levels evaluated in the EWA Final EIS/EIR (Reclamation *et al.* 2004b). The proposed project would result in the potential for DWR to acquire a minimum of 62,000 acre-feet and a maximum of 125,000 acre-feet of transfer water. Therefore, the total quantity of YCWA water (i.e., up to 125,000 acre-feet) proposed for transfer in 2007 is less than the maximum asset acquisition (185,000 acre-feet) identified for the Yuba River Basin as part of the EWA Program.

Although Delta diversions generally can result in fishery impacts, findings supporting the conclusion that habitat conditions resulting from implementation of the EWA Program (i.e., Flexible Purchase Alternative) would result in beneficial effects on fisheries resources in the Delta, as described in the EWA Draft EIS/EIR (2003), are as follows.

- The ratio between exports and Delta inflow (E/I ratio) has been identified as an indicator of the vulnerability of fish and macroinvertebrates to direct and indirect impacts resulting from SWP and CVP operations (Reclamation *et al.* 2003). The E/I ratio limits are identified in the 1995 Water Quality Control Plan, with the greatest reductions in exports, relative to inflows, occurring during the biologically sensitive February through June period. As part of the EWA Program, export pumping would be curtailed in July if the density data shows that fish species of primary management concern are present at the SWP and CVP pumping facilities. The occurrence and density of fish species of primary management concern would be determined from routine salvage monitoring. This practice would be effective in preventing potential salvage-related adverse effects at the SWP and CVP pumping facilities.

- The average annual Chinook salmon and steelhead salvage estimates would decrease in all 15 years simulated, and delta smelt and splittail salvage estimates would decrease in 14 out of the 15 years simulated. Although there would be increases in salvage in individual months and in some years, annual salvage estimates for delta smelt, Chinook salmon, steelhead, splittail and striped bass would decrease, relative to the Baseline Condition.

- The EWA water transfers would provide a benefit by decreasing the frequency of reverse flows and reducing the magnitude when reverse flows would still occur. Overall, such changes would be considered a benefit to juvenile salmonid emigration and the transport of planktonic eggs and larvae (Reclamation *et al.* 2003).

The EWA Draft EIS/EIR (2003) generally concluded that implementation of the Flexible Purchase Alternative would result in beneficial or less-than-significant impacts on fisheries and aquatic resources within the Sacramento-San Joaquin Delta Region (p. ES-21). Because the 2007 YCWA transfer water is within the quantity of the asset acquisitions evaluated in the EWA EIS/EIR, potential impacts associated with the conveyance of EWA assets that could occur as a result of changes in the magnitude, timing and duration of Delta conditions have been previously addressed by the analyses conducted for the full 185,000 acre-feet Yuba River Basin asset acquisition presented in the EWA EIS/EIR (2003). Thus, potential changes in Delta conditions and resultant impacts on Delta fisheries resources associated with the YCWA transfer water (i.e., 125,000 acre-feet) in 2007 are anticipated to be within the range of that which was previously evaluated for the EWA Program and no further analyses are required.

Water transfers such as the proposed project have been identified as an effective means of minimizing overall environmental effects and increasing SWP/CVP operational flexibility (SWRCB 1995). Consequently, potential impacts on Delta fisheries resources resulting from the proposed project would be less than significant given the on-going compliance with existing environmental requirements, the presence of EWA assets that could be used to offset any potential impacts, and the ability to enhance EWA assets through the transfer to DWR. In addition, the EWA Project Agencies also will coordinate EWA water acquisition and transfer actions with federal (USFWS and NMFS), state (DWR and CDFG), other CALFED agencies, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, the Senate Bill [SB] 1086 program, the Corps' Sacramento and San Joaquin Basin Comprehensive Study, the Riparian Habitat Joint Venture, the Central Valley Project Improvement Act (CVPIA), the Central Valley Habitat Joint Venture, and the Grassland Bird Conservation Plan) that could affect management of evaluated species. Coordination will avoid conflicts among management objectives.

4.3 Terrestrial Resources (Wildlife and Vegetation)

CDFG's Wildlife Habitat Relationship Program identifies 249 species of wildlife that use the valley and foothill habitats of the California Central Valley. These include 151 species of birds, 65 species of mammals, and 33 species of reptiles and amphibians. Riparian zones in the Central Valley, the only terrestrial habitat that potentially could be affected by the proposed project, provide migratory corridors, food, and cover for wildlife species typical of riverine and upland areas. Numerous special-status and sensitive wildlife and plant species are found in the Sacramento River Basin including wildlife species that utilize riparian habitats, such as Swainson's hawk (*Buteo swainsoni*), bald eagle (*Haliaeetus leucocephalus*) western yellow-billed cuckoo (*Coccyzus americanus*), willow flycatcher (*Empidonax traillii*), western pond turtle (*Emys marmorata*), and valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*).

4.3.1 Environmental Setting

4.3.1.1 Yuba River

The Yuba River Basin is located on the eastern edges of the Sacramento Valley. It is bounded by the Feather River to the west, the Bear River to the south, Honcut Creek to the north and the Sierra foothills to the east. The primary land use is agriculture, with rice, pasture, and fruit and nut trees accounting for most of the crops. Rice fields are flooded in fall for rice stubble decomposition and the creation of wintertime waterfowl habitat. Agricultural drains and canals support wetland vegetation in some areas and provide habitat for wetland-associated species. In addition to agricultural land, the valley floor supports non-native grassland. Approximately two-thirds of the Yuba River Basin is in the Sierra Nevada foothills. Vegetation communities and their associated wildlife species in this portion of the basin include blue oak woodland, and valley oak woodland. In addition to the wildlife species identified above for the Sacramento River Basin, the foothill yellow-legged frog and the California red-legged frog also are identified as terrestrial species of management concern in the Yuba River Basin.

Foothill Yellow-Legged Frog

One occurrence (1997) of foothill yellow-legged frog (*Rana boylii*) in the Yuba River area is recorded in CDFG's California Natural Diversity Database (CNDDB). This record is from Grizzly Gulch, which runs into Oregon Creek about 2 miles from upper New Bullards Bar Reservoir and is 4 to 5 miles from the location where flows would be released to the Yuba River. There are no records of foothill yellow-legged frog occurrences along the lower Yuba River below Englebright Reservoir. Historically, foothill yellow legged frogs were found in the Coast Ranges from the Santiam River drainage in Oregon (Mehama and Marion Counties) to the San Gabriel River Drainage in California (Los Angeles County), and along the west slopes of the Sierra Nevada/Cascade Crest in most of central and northern California. The elevation range of the foothill yellow-legged frog extends from near sea level to about 6,000 feet in the Sierra Nevada. Foothill yellow legged frogs have disappeared from about 45 percent of their historic range in California and 66 percent of their historic range in the Sierra Nevada Mountains. Based on the results of recent surveys conducted on the Pit, North Fork Feather, North Fork Mokelumne, and Middle Fork Stanislaus rivers, breeding populations of foothill yellow-legged frogs documented on these regulated rivers have all been below 3,000 feet in elevation, with the majority of the frogs occurring at elevations at or below 2,600 feet (Pacific Gas and Electric Company 2004).

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-60) analysis recognized that, "*Another consequence of altered hydrological conditions is the presence of amphibian species in river mainstems where they were previously confined to tributaries. Dams, particularly those created for power generation have often reduced flows to such a degree that newly created slow moving water habitats attract frogs such as the foothill yellow-legged frog (FYLF). These frogs lay eggs March through May, and the tadpoles metamorphose three to four months later. Frogs at this stage are highly vulnerable to non-volitional movements because of increased flows. However, a search of the CNDDB and current literature did not reveal any occurrences of species such as the FYLF in the mainstems of the rivers being affected by EWA actions*." Because the closest reported occurrence of the foothill yellow-legged frog is approximately 4 or more miles from where releases into the lower Yuba River would occur, and this species has been previously evaluated for the entire EWA Program in the EWA EIS/EIR, the proposed project is not expected to affect the foothill yellow-legged frog.

California Red-legged Frog

The California red-legged frog was federally listed as threatened on June 24, 1996 (67 FR 57830-57831). On November 3, 2005, the USFWS proposed new critical habitat for the California red-legged frog that includes 51 units in 23 counties, including Yuba County. Yuba County contains one (YUB-1, Little Oregon Creek) of the 51 proposed critical habitat units, and this unit consists of: (1) approximately 6,322 acres of land surrounding Little Oregon Creek, which flows southwesterly into New Bullards Bar Reservoir; and (2) land surrounding the Little Oregon Creek finger of New Bullards Bar Reservoir. YUB-1 is considered an area that is essential for the conservation of California red-legged frog because it contains all the primary constituent elements for the species including aquatic breeding habitat, non-breeding aquatic habitat, upland habitat and dispersal habitat, and is occupied by the species. California red-legged frogs are relatively prolific breeders, usually laying egg masses during or shortly following large rainfall events in late winter or early spring. The breeding period for the California red-legged frog typically extends from November through early April (Storer 1925). Adult frogs often utilize dense, shrubby or emergent vegetation closely associated with deep-water pools with fringes of cattails and dense stands of overhanging vegetation such as willows (USFWS 2002). Frogs living in coastal drainages are rarely inactive, whereas those found in interior sites where temperatures are lower may become inactive for long periods (USFWS 2002). Additionally, adult frogs that have access to permanent water will generally remain active throughout the summer. If water is not available, upland habitat areas provide important dispersal, estivation and summer habitat for the species (USFWS 2002).

4.3.1.2 New Bullards Bar Reservoir

Vegetative communities adjacent to New Bullards Bar Reservoir predominantly are oak woodland types with some chaparral, and mixed conifer and montane hardwood communities occurring at higher elevations. The oak woodland communities include live oak (*Quercus wizlizenii*), blue oak (*Quercus douglasii*), and foothill pine (*Pinus sabiniana)*, with several species of understory shrubs and forbs including poison oak (*Toxicodendron diversilobum*), manzanita (*Arctostaphylos* sp.), California wild rose (*Prunus,* sp.), and lupine (*Lupinus).* The reservoir shoreline is mostly devoid of vegetation as a result of clearings and frequent fluctuations in surface water elevations. Wildlife consists of species that typically use oak woodlands and chaparral habitats in the Central Valley.

New Bullards Bar Reservoir supports a pair of nesting southern bald eagles, a species listed as endangered under the California Endangered Species Act (CESA) and listed as threatened under the federal ESA. Bald eagle production may be adversely affected by extreme drawdown of reservoirs during the period when eagle chicks are in the nest.

Bald Eagle

Throughout most of California, the bald eagle breeding season extends from approximately January through August (CDFG Website 2004). Females generally lay between one and three eggs. The most common clutch size, however, reportedly is two eggs (Stalmaster 1987). Females and males incubate the eggs with incubation generally lasting approximately 35 days. Both parents bring prey feed the eaglets prior to fledging, which generally occurs 11 to 12 weeks after hatching. Fledglings disperse from the nest area as early as several weeks after fledging.

Bald eagles currently nest throughout the western United States, including California. Historically, bald eagles nested throughout California near seacoasts, major rivers, and lakes. As of 1999, 188 known nesting territories existed in 58 California counties (up from 28 in 1978) (CDFG Website 2004). Hundreds of additional bald eagles migrate into California during winter months from nesting territories throughout Washington, Oregon, Alaska, and Canada.

Bald eagle habitat generally can be described in terms of nesting and wintering requirements, but foraging habitat also has some specific attributes that vary geographically and seasonally. Bald eagles usually nest in the same territories year after year but may use alternate nest sites (as many as five may occur) within the territory. Nesting habitat in California is described as multistoried forests with old-growth trees and snags that are near water (Anthony *et al.* 1982); Zeiner et al. 1990). Foraging habitat for bald eagles includes lakes, rivers, oceans, shorelines, and occasionally, deserts, grasslands, and alpine (Stalmaster 1987). In northern California, most bald eagles nesting near reservoirs forage on fish (PG&E 2002).

4.3.1.3 Feather River

Although levees restrict the extent of riparian and wetland vegetation along the Feather River, this system still supports a diversity of riparian, and wetland vegetation and wildlife communities. Willow scrub riparian habitat occupies frequently flooded areas closest to the river. Cottonwoods are more prominent in less frequently flooded areas, but still require and tolerate regular inundation. Valley oaks occupy the least flooded portion of the river. Backwater areas support freshwater emergent wetlands, which contribute to increasing the overall habitat diversity of the river. Wildlife consists of species typically found in riparian habitats of the Central Valley.

4.3.1.4 Oroville Reservoir

Habitats adjacent to Oroville Reservoir are predominantly oak woodland with some chaparral. The oak woodland habitat includes live oak, blue oak, and foothill pine, with several species of understory shrubs and forbs including poison oak, manzanita, California wild rose, and lupine. The reservoir rim is mostly devoid of vegetation as a result of regular and frequent fluctuations in water elevations. Wildlife consists of species that are typically associated with oak woodlands and chaparral habitats in the Central Valley. In addition, large numbers of waterfowl and gulls overwinter in the Thermalito Afterbay, although few use the lake itself.

4.3.1.5 Sacramento River

Much of the Sacramento River is confined by levees that reduce the natural diversity of riparian vegetation. Agricultural land (rice, dry grains, pastures, orchards, vineyards, and row and truck crops) is common along the lower reaches of the Sacramento River, but is less common in the upper portions. The bands of riparian vegetation that occur along the Sacramento River are similar to those found along the lower American River, but are somewhat narrower and not as botanically diverse. The riparian communities consist of Valley oak, cottonwood, wild grape, box elder (*Acer negundo*), elderberry (*Sambucus mexicanus*), and willow. The largest and most significant tract of riparian forest remaining on the Sacramento River is a stretch between Chico Landing and Red Bluff. Freshwater, emergent wetlands occur in the slow moving backwaters and are primarily dominated by tules (*Scirpus acutus* var. *occidentalis*), cattails, rushes, and sedges (SAFCA and Reclamation 1994). Although riparian vegetation occurs along the Sacramento River, these areas are confined to narrow bands between the river and the river side of the levee.

The wildlife species inhabiting the riparian habitats along the lower Sacramento River are essentially the same as those found along the lower American River. These include, but are not limited to, wood duck great blue heron (*Ardea herodias*), great egret (*Ardea alba*), green heron (*Butorides virescens*), black phoebe (*Sayornis nigricans*), ash-throated flycatcher (*Myiarchus cinerascens*), sora (*Porzana carolina*), great horned owl (*Bubo virginianis*), Swainson's hawk (*Buteo swainsoni*), California ground squirrel (*Spermophilus beecheyi*), and coyote (*Canis latrans*). The freshwater/emergent wetlands represent habitat for many wildlife species, including reptiles and amphibians such as the western pond turtle, bullfrog (*Rana catesbeiana*), and Pacific Chorus Frog (*Pseudacris regilla*). Agricultural areas adjacent to the river also represent foraging habitat for many raptor species.

4.3.1.6 Sacramento–San Joaquin Delta

Most of the vegetation in the Delta consists of irrigated agricultural fields and associated ruderal (disturbed), non-native vegetation fringes that border cultivated fields. Throughout much of the Delta, these areas border the levees of various sloughs, channels, and other waterways within the historic floodplain. Native habitats include remnant riparian vegetation that persists in some areas, with brackish and freshwater marshes also being present. Saline wetlands consist of pickleweed (*Salicornia virginica*), cord grass (*Spartina* sp.), glasswort (*Salicornia* sp.), saltgrass (*Distichlis spicata*), sea lavender (*Limonium californicum*), arrow grass (*Triglochin* spp.), and shoregrass (*Monanthochloe littoralis*). These wetlands are very sensitive to fluctuations in water salinity, which are determined by water flows into the Delta (SFEP 1993).

There are pockets of water resulting from old channels of the river that have been cut off, or where dredge-mining activities have left deep depressions. These backwater areas typically contain large fringes of emergent and isolated vernal pools bordered by emergent marsh plants such as cattails and rushes. The calm waters provide excellent habitat for ducks such as cinnamon teal (*Anas cyanoptera*), American wigeon (*Anas Americana*), and mallard (*Anas platyrhynchos*).

The wetlands of the Delta represent habitat for a number of shorebirds and waterfowl species including killdeer (*Charadrius vociferous*), California black rail (*Laterallus jamaicensis coturniculus*), western sandpiper (*Calidris mauri*), long-billed curlew (*Numenius americanus*), greater yellow-legs (*Tringa melanoleuca*), American coot (*Fulica americana*), American wigeon, gadwall (*Anas strepera*), mallard, canvasback (*Aythya valisineria*), and common moorhen (*Gallinula chloropus*). These areas also support a number of mammals such as coyote, gray fox (*Urocyon cinereoargenteus*), muskrat (*Ondarta zibethicus*), river otter (*Lontra Canadensis*), and beaver (*Aplodontia rufa*). Several species of reptiles and amphibians also occur in this region.

The complex interface between land and water in the Delta has led to a rich and varied plant life that provides habitat for a diversity of wildlife species, especially birds. Wildlife habitats include agricultural land, riparian forest, riparian scrub-shrub, emergent freshwater marsh, heavily shaded riverine aquatic, and grassland/rangeland. Many species that either are listed or are candidates for listing as rare, threatened, and endangered inhabit the Delta, but none are endemic to that area.

4.3.1.7 San Luis Reservoir

Habitat types found at San Luis Reservoir include lacustrine, riparian, and scattered blue oak woodlands. Riparian habitat is limited to scattered patches of mule fat and occasional willows. Blue oak woodlands occur on the western shore of the reservoir.

4.3.1.8 South-of-Delta Groundwater Banks

Groundwater recharge basins associated with groundwater banks provide habitat for waterfowl, wading birds, and shorebirds.

4.3.2 Impact Assessment Methodology

The analysis of potential impacts on wildlife and vegetation associated with the proposed water transfer within the affected waterbodies was based on the following criteria:

- Changes in river flow, relative to the basis of comparison, of sufficient magnitude and duration for any given month to result in unreasonable impacts upon river corridor riparian habitat or other sensitive natural communities and associated species.
- Changes in reservoir water surface elevation, relative to the basis of comparison, of sufficient magnitude and duration, to result in unreasonable impacts upon reservoir near-shore habitat and associated species.

Potential changes in reservoir water surface elevation and river flows were evaluated to determine if changes in reservoir water surface elevations of sufficient magnitude and duration would occur and result in unreasonable impacts to reservoir near-shore, riparian, and river corridor riparian habitats, or other sensitive natural communities and associated special-status wildlife species.

4.3.3 Impact Assessment

4.3.3.1 Yuba River

Under the proposed project, flows in the lower Yuba River below New Bullards Bar Reservoir are expected to be similar to the basis of comparison (RD-1644 long-term), and remain with normal operational ranges. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to the basis of comparison) are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during November, December and March; (2) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (3) lower at low and intermediate flow levels, and equivalent at high flow levels during May; (4) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June; (5) higher at low flow levels, lower at low flow levels, and higher at high flow levels during July; and (6) higher over the range of flows expected during August, September and October.

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-61 and 10-62) analysis determined that, "*Flows would increase at most by 1,005 cfs in July through September, approximately 60 percent above the Baseline Condition. While this increase would be a noticeable change, releases would be operated to maintain relatively constant flows during this time period in accordance with existing Yuba County WA operations to protect fish and the environment. This increase in flow would have the potential to increase non-volitional movement of aquatic wildlife that cannot find quieter water to remain in during periods of increase. However, species such as the California red-legged frog and foothill yellow-legged frog are not known to inhabit this reach of the Yuba River. These effects cannot be quantified, but may be considered significant adverse effects if the EWA-related water releases are maintained at significantly higher flows for long periods of time. EWA agencies would monitor the releases to ensure that adverse effects do not occur, and institute changes to quantities of water released through adaptive management processes to avoid or minimize any adverse effect*." Conversely, the EWA analysis also concluded that, "*Yuba River flows would decrease at most by 239 cfs in late spring as farmers use groundwater for irrigation instead of surface water from New Bullards Bar Reservoir. (A total of 12 to 19 percent reduction in April through June compared to the median flow under the Baseline Condition.) EWA agencies would monitor the releases to ensure that adverse effects do not occur, and institute changes to quantities of water released through adaptive management processes to avoid or minimize any adverse effect* (Reclamation *et al.* 2003) (p. 10-61)."

Based on the model output (Appendix B), average increases in monthly mean Yuba River flow under the proposed project, relative to the basis of comparison, would be expected to be less than those identified in the EWA EIS/EIR. Because the proportion of EWA acquisitions associated with the proposed project (i.e., 62,000 acre-feet to 125,000 acre-feet) is less than that which was previously evaluated by the EWA Program, and the proposed project would be implemented for a period of less than one year, potential effects on river corridor riparian habitat or other sensitive natural communities and associated species would be expected to be less than those identified for the entire EWA Program. Therefore, flow changes expected under the proposed project, relative to the basis of comparison, are not anticipated to result in unreasonable impacts to river corridor riparian habitat or other sensitive natural communities and associated species.

4.3.3.2 New Bullards Bar Reservoir

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-66) analysis determined that, "*By the end of June, the surface water elevation in the reservoir would be, at most, 5 feet higher than under the Baseline Condition… An increase in the surface water elevation would only inundate the existing drawdown zone and would not affect vegetation and wildlife*." Shoreline vegetation would not be impacted by reductions in reservoir water surface elevations because this vegetation is not dependent upon reservoir levels for water (the shoreline vegetation is not riparian, it is associated with upland scrub that is not dependent on saturated soil for water). In addition, the EWA EIS/EIR analysis determined that, "*New Bullards Bar Reservoir water levels fluctuate seasonally and annually; therefore, the drawdown zone is vegetated primarily with non-native herbaceous plants and scattered willow shrubs that do not form contiguous riparian communities and would not be affected by decreases in water levels caused by EWA actions (CALFED 1998). Therefore, the EWA agency acquisition of Yuba County Water Agency water would have less-than-significant effects on the lacustrine habitat of New Bullards Bar Reservoir used by special-status species or other wildlife, particularly as wildlife movement corridors or nurseries along the shoreline*" (Reclamation *et al.* 2003) (p. 10-66).

Changes in New Bullards Bar Reservoir levels associated with the proposed project, relative to the basis of comparison, are not expected to substantially impact aquatic and littoral habitat near New Bullards Bar Reservoir that may be used by the California red-legged frog. In April, which is the reported end of the breeding period, average end-of-month water surface elevation would be approximately 4 feet lower under the proposed project, relative to the basis of comparison. In September 2007, average end-of-month water surface elevation would be approximately 14 feet lower under the proposed project, relative to the basis of comparison. Although the California red-legged frog is rarely found far from water during dry periods, the USFWS Draft Recovery Plan (2002) reports that the species will disperse to upland areas in response to receding water, which often occurs during the driest time of the year (e.g., September). However, because adult frog movements of up to 3 miles have been reported (USFWS 2002), a water surface elevation change of 14 feet would not be of a magnitude that would result in a significant impact to the species' ability to access or utilize aquatic habitat in New Bullards Bar Reservoir. Therefore, potential changes in reservoir levels associated with the proposed project, relative to the basis of comparison, would not result in any unreasonable impacts to the California red-legged frog.

Although New Bullards Bar Reservoir supports a pair of nesting southern bald eagles, the proposed project is not expected to have a substantial impact on bald eagles. The reservoir drawdown associated with the proposed project is expected to generally be similar to the drawdown under the basis of comparison, and is expected to be within historical and recent operation levels. Reservoir level reductions resulting from the proposed project are not anticipated to be large enough to either substantially affect prey fish populations or substantially increase the distance from the nest to the reservoir surface. The change in reservoir levels associated with the proposed project is not expected to adversely or unreasonably impact foraging success of bald eagles inhabiting New Bullards Bar Reservoir.

Additionally, although water surface elevation reductions are anticipated with the proposed project, these decreases would not adversely impact the vegetation and wildlife at New Bullards Bar Reservoir. However, the anticipated lower surface water elevations at New Bullards Bar Reservoir would be within historical operational limits, and would not go below the minimum drawdown zone and, therefore, would not be expected to unreasonably affect any moderate to high value vegetation or wildlife habitat.

Surface Streams and Wetlands

In the past, CDFG has expressed concern regarding the potential impacts of the groundwater substitution component of YCWA water transfers to potentially affect surface streams and wetlands due to surface-groundwater interactions. This topic is addressed in the Groundwater Resources section of this Environmental Analysis.

4.3.3.3 Feather River

Flows within the Feather River may be higher under the proposed project during most schedules (Table 4-1), but are anticipated to remain within the range of normal instream flows and fluctuations resulting from Oroville Reservoir operations. Specific operations of the Feather River system as a result of the proposed project presently are uncertain. However, the potential slight change in flows is not expected to unreasonably impact the vegetation and wildlife communities along the Feather River, relative to the RD-1644 long-term instream flow requirements.

4.3.3.4 Oroville Reservoir

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-65) analysis determined that, "*Increased releases in July and August as the stored EWA water is released for cross-Delta transfer would cause the lake level to decline faster compared to Baseline Conditions; however, reduced releases in September would allow end of month elevation in September to be the same as Baseline Conditions. The increase water surface elevation would result in increased flooding of shoreline habitat. The increased level would come slowly (less than an inch per day) so that wildlife would not be affected and riparian vegetation are accustomed to flooding and will not be adversely affected. Therefore, the change in Lake Oroville water surface elevation would have less-than-significant effects on the lacustrine habitat used by special-status species or other wildlife, particularly as wildlife movement corridors or nurseries along the shoreline*."

Oroville Reservoir water levels would not be unreasonably affected by the proposed project, relative to the basis of comparison, would not result in unreasonable impacts to the wildlife or vegetation at Oroville Reservoir. The operation of Oroville Reservoir would remain within normal operational parameters. The proposed project, relative to RD-1644 long-term instream flow requirements, would not unreasonably impact the vegetation or wildlife communities of Oroville Reservoir.

4.3.3.5 Sacramento River

Flows within the lower Sacramento River change under the proposed project relative to the basis of comparison (Table 4-2), but are anticipated to remain within the normal flow ranges and fluctuations resulting from SWP and CVP operations. The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-60) analysis determined that although EWA acquisitions could reduce Sacramento River flows by 1,160 cfs during June and could increase flows between 1 to 11 percent during other months, these changes were not considered significant to cause adverse effects.

Specific operations of the Sacramento River system as a result of the proposed project are uncertain at this time. However, the potential change in flows is not expected to unreasonably impact the vegetation and wildlife communities along the lower Sacramento River, relative to the basis of comparison.

4.3.3.6 Sacramento-San Joaquin Delta

Flows within the Delta under the proposed project may change relative to the basis of comparison (Table 4-3), but are anticipated to remain within the range of normal flow ranges and fluctuations resulting from SWP and CVP operations. The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-85) analysis determined that EWA acquisitions "*would result in changes in the Delta, but these changes would remain within the same general range of flows that the Delta experiences. The vegetation in the region has adapted to these flow ranges; therefore, these changes would likely not substantially affect the growth, maintenance, or reproductive capacity of this community.*"

Specific operations of the Delta system as a result of the proposed project are presently uncertain, but would remain within authorized operational constraints. Therefore, the potential changes to Delta inflows are not expected to unreasonably impact the vegetation and wildlife communities within the Delta, relative to the basis of comparison.

The EWA Project agencies coordinate EWA water acquisition and transfer actions with federal (Reclamation, USFWS and NMFS), state (DWR and CDFG), other CALFED agencies, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, the Senate Bill [SB] 1086 program, the Corps' Sacramento and San Joaquin

Basin Comprehensive Study, the Riparian Habitat Joint Venture, the CVPIA, the Central Valley Habitat Joint Venture, and the Grassland Bird Conservation Plan) that could affect management of evaluated species. Coordination would avoid conflicts among management objectives. Therefore, the potential changes to Delta inflows are not expected to unreasonably impact the vegetation and wildlife communities within the Delta, relative to the basis of comparison.

4.3.3.7 San Luis Reservoir

DWR may store a portion of water transferred under the proposed project in San Luis Reservoir. The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 10-88) analysis determined that, "*EWA actions would be managed to prevent contributing to or aggravating the low point problem… Therefore, the effect of borrowing project water on lacustrine habitat would be less than significant*." It is unknown how DWR may operate San Luis Reservoir, however, if water from the proposed project is stored in the reservoir, there is potential for a slight beneficial effect upon near-shore habitat areas through increased water surface elevations.

Drawdown of San Luis Reservoir for the purpose of delivering water from the proposed project would be expected to occur within normal SWP and CVP operational practices for the reservoir, and according to existing regulatory requirements or limitations. Therefore, the proposed project is not expected to result in unreasonable impacts to wildlife or vegetation associations of San Luis Reservoir.

South of Delta Groundwater Banks – Groundwater Recharge Basins

DWR may store proposed project transfer water in groundwater banks south of the Delta. This operation includes spreading water in recharge basins for recharge and storage into the groundwater banks. This practice temporarily could increase habitat for waterfowl, wading birds, and shorebirds.

No additional areas would be flooded or inundated as a result of the proposed project. The proposed project also would not develop or cultivate any native untilled land. Overall, there would not be any unreasonable impacts on any wildlife or vegetation in the areas affected by the proposed project. There would be no unreasonable impacts on any state or federal special status animal or plant species.

4.4 Recreation

Recreational activities at reservoirs or rivers within the study area could be affected by changes in water operations associated with the proposed project, relative to the basis of comparison. Changes in reservoir storage or water surface elevation levels at New Bullards Bar Reservoir, Oroville Reservoir, or San Luis Reservoir could affect swimming, boating, water-skiing, or other water-based activities. Surface water storage at these reservoirs normally varies throughout the year due to water releases made for agricultural, urban, and environmental needs and the necessity to have a designated volume available to store runoff during winter and spring (flood control). Recreational activities along or within the Yuba, Feather, and Sacramento river corridors and the Delta that could be affected by the proposed project include swimming, boating, fishing, camping, and picnicking

4.4.1 Environmental Setting

4.4.1.1 Yuba River

Numerous rivers, creeks, tributaries, and reservoirs along the Yuba River offer recreational opportunities. Where access to the river is available, fishing, picnicking, rafting, kayaking, tubing, and swimming are the dominant recreational uses. The Yuba River offers excellent American shad, Chinook salmon, and steelhead fishing (Reclamation *et al.* 2003).

4.4.1.2 New Bullards Bar Reservoir

New Bullards Bar Reservoir recreation facilities are managed by the U.S. Forest Service (USFS). Popular recreation activities include boating, fishing, and camping. Over 20 miles of hiking and mountain biking trails exist in the area, including Bullards Bar Trail, which runs along the perimeter of the reservoir. Several campgrounds, including Schoolhouse and Dark Day, are in the vicinity. Some campgrounds around the reservoir, such as Madrone Cove and Garden Point, are accessible only by boat. Emerald Cove Resort and Marina is a floating marina that is operable at all surface water elevations. The marina offers a variety of services to recreationists including, a general store, fuel pumping station, boat launch, boat rentals, moorage, and annual slips. Boat access to the reservoir is provided by the Cottage Creek boat ramp (at Emerald Cove Marina) and Dark Day boat ramp. Cottage Creek boat ramp is unusable when surface water elevations are below 1,822 feet-msl, and Dark Day boat ramp becomes inoperable when surface water elevation are below 1,798 feet-msl *(*Reclamation *et al. 2003)*. Low reservoir levels affect day swimming areas and boat-in campgrounds before boat ramps are affected. Some boat launchings occur year-round; however, the typical boating season extends from about early May through mid-October. The heaviest use of the ramps occurs on weekends and holidays from Memorial Day to Labor Day (USFS 1999). Fishing also is a popular recreational activity; some species found in the reservoir include rainbow trout, brown trout, kokanee salmon, smallmouth bass, largemouth bass, bluegill, crappie, and bullhead catfish.

4.4.1.3 Feather River

Feather River recreational activities include swimming, fishing, camping, bird-watching, picnicking, and bicycling. Rafting on the North and Middle forks of the Feather River runs from January to April or May, depending on flow. Summer rafting and kayaking occurs on the North Fork depending on upstream PG&E reservoir operations. Recreational activities along the Low Flow Channel reach of the Feather River include fishing, sightseeing, hiking, bicycling, and wildlife and bird watching. The Oroville Wildlife Area, downstream of the Thermalito Afterbay Outlet, provides opportunities for bird-watching, in-season hunting, fishing, swimming, and camping.

4.4.1.4 Oroville Reservoir

The California Department of Parks and Recreation (CDPR) manages the recreation facilities of the Oroville Reservoir complex. Oroville Reservoir has a surface area of approximately 15,800 acres and a shoreline of 167 miles when full (SWRCB 1997). The peak recreation season is from late spring through summer.

Oroville Reservoir has two full-service marinas, nine parks provide facilities for baseball, tennis, swimming, and picnicking within the vicinity of the reservoir. There are major boat launch ramps at Bidwell Canyon, Loafer Creek, and Lime Saddle (DWR 2001c). The spillway has an 8-

lane and 12-lane boat ramp in two stages. Construction of extensions on boat ramps at Bidwell Canyon, the Spillway, and Lime Saddle allow the ramps to remain open when lake elevations remain at or greater than 700 feet above msl (Reclamation *et al.* 2003). Average water surface elevation in Oroville Reservoir historically has been between 817 and 787 feet above msl between July and September, respectively. Although boat ramps remain usable, lower lake elevations can adversely affect swimming beaches and boat-in campgrounds *(*Reclamation *et al. 2003)*. The Oroville Reservoir State Recreation Area (SRA) provides camping, picnicking, boating, fishing, hunting, horseback riding, hiking, bicycling, sightseeing, and a variety of other activities. Major facilities in the SRA include Loafer Creek, Bidwell Canyon, Spillway, Lime Saddle, Oroville Reservoir Visitor Center, and North and South Thermalito Forebay. The SRA also provides several less-developed car-top launching areas, boat-in campsites, and floating campsites on Oroville Reservoir. DWR maintains three launch ramps and a day-use area at the Oroville Wildlife Area, which includes Thermalito Afterbay.

4.4.1.5 Sacramento River

On the upper Sacramento River, water-dependent activities (e.g., swimming, boating, and fishing) account for approximately 52 percent of the recreation uses (Reclamation and Sacramento County Water Agency 1997). Fishing, rafting, canoeing, kayaking, swimming, and power boating are available along most of the upper Sacramento River. While fishing is a year-round activity, boating, rafting, and swimming use take place primarily in summer months when air temperatures are high. Between Colusa and Sacramento, major recreation facilities are located at Colusa-Sacramento River Recreation Area, Colusa Weir access, Tisdale Weir access, River Bend Boating Facility, Knights Landing, Sacramento Bypass, and Elkhorn Boating Facility.

Recreational use of the lower Sacramento River, between the American River confluence and the Delta, is closely associated with recreational use of Delta waterways. This section of the river, influenced by tidal action similar to the Delta, is an important boating and fishing area with several private marinas located on the river.

4.4.1.6 Sacramento-San Joaquin Delta

As a complex of waterways affected by both freshwater inflows and tidal action, the Delta is a very important recreation resource that provides a variety of water-dependent and water-enhanced recreation opportunities. Boating is the most popular activity in the Delta region, accounting for approximately 17 percent of visitation, with other popular uses including fishing, relaxing, sightseeing, and camping (DWR and Reclamation 1996). Boating and related facilities are located throughout the Delta and include launch ramps, marinas, boat rentals, swimming areas, camping sites, dining and lodging facilities, and marine supply stores. Most recreation facilities are privately owned and operated commercially.

Located near several metropolitan areas, the Delta supports about 12 million user days of recreation a year (DWR 1993). Parks along the mainstem of the Sacramento River and Delta sloughs provide access for water-oriented recreation as well as picnic sites and camping areas. Brannan Island State Park and Delta Meadows River Park are major water-oriented recreational areas. Use of these parks typically peaks in July.

4.4.1.7 San Luis Reservoir

San Luis Reservoir SRA is open year-round. Recreational activities include boating, waterskiing, fishing, camping, and picnicking. Boat access is available via one boat ramp at the

Basalt area at the southeastern portion of the reservoir and at Dinosaur Point at the northwestern portion of the reservoir. The boat ramp at Basalt becomes difficult to use because of low reservoir levels at elevation 340 feet above msl; the boat ramp at Dinosaur Point is difficult to access at elevation 360 feet above msl (San Joaquin River Group 1999). There are no designated swimming areas or beaches at San Luis Reservoir.

4.4.2 Impact Assessment Methodology

The potential for impacts to recreation opportunities at reservoirs was analyzed based on a comparison of the percent probability that that a dewatering event would occur during the recreation use season (i.e., May through September) such that the reservoir surface water elevations would drop below the level to sustain boat ramp use under the basis of comparison and the proposed project. The potential impact to recreation along the river was analyzed based on a comparison of changes in river flows and water temperatures during the recreation use season under the proposed project and basis of comparison.

The analysis of the potential impacts on recreation opportunities associated with the proposed project was based on the following criteria:

- Reduction in river flows, relative to the basis of comparison, of sufficient magnitude during the recreation season, such that boating opportunities are decreased.
- Changes of river water temperature, relative to the basis of comparison, of sufficient magnitude and duration during the recreation season, to unreasonably impact recreational swimming, tubing, canoeing, kayaking, and rafting.
- Reduction in reservoir water levels, relative to the basis of comparison, of sufficient magnitude during the recreation season, such that boat ramps become unusable.
- Changes in reservoir water levels or river flows, relative to the basis of comparison, of sufficient magnitude and duration for a given month of the recreation use season to unreasonably impact (substantially reduce) recreational opportunities.

4.4.3 Impact Assessment

4.4.3.1 Yuba River

Under the proposed project, flows in the lower Yuba River are expected to remain within normal operational ranges. Flow exceedance plots indicate that simulated monthly mean flows at the Smartville and Marysville under the proposed project (relative to RD-1644 long-term) generally are expected to be: (1) equivalent or slightly higher at low flow levels, lower at intermediate levels, and equivalent at high flow levels during November, December and March; (2) higher at low and intermediate flow levels, and equivalent at high flow levels during April; (3) lower at low and intermediate flow levels, and equivalent at high flow levels during May; (4) lower at low flow levels, higher at intermediate levels, and equivalent at high flow levels during June; (5) higher at low flow levels, lower at low flow levels, and higher at high flow levels during July; and (6) higher over the range of flows expected during August, September and October. Any impacts on river recreation activities would be minimal, or beneficial. The increased flows could benefit rafting and other boating opportunities. The greater water volumes under the proposed project could enhance angling opportunities on the Yuba River. In addition, the slight increase in flows would not significantly impact water temperatures in the Yuba River. During the recreation use season, the water temperatures simulated at Daguerre

Point Dam under the proposed project and the basis of comparison are similar (always within 0.1°F of each other), and water temperatures simulated at Marysville did not increase or decrease by more than 2.5°F under the proposed project, relative to the basis of comparison.

Because of limited river access, recreation is not common along the Yuba River, although angling occurs year-round (Reclamation *et al.* 2003). Thus, the EWA EIS/EIR focused on two primary recreational activities, which were fishing and swimming, to a limited extent. The analysis of recreation resources in the EWA EIS/EIR determined that flow reductions of up to 239 cfs (the maximum identified in the analysis) "*would not affect fish population or decrease the quality of fishing*" (Reclamation *et al.* 2003) (p. 14-23). Further, the decrease in flows under the EWA Program "*would not create a substantial loss of recreational opportunity; therefore, the effect would be less than significant*" (Reclamation *et al.* 2003) (p. 14-23). Comparatively, the change in flow as a result of EWA actions "*would not increase flows beyond fishable levels. In fact, increased flow is beneficial to fish, which could lead to more favorable fishing conditions* (Reclamation *et al.* 2003) (p. 14-23)." The EWA analysis also concluded that although water temperatures would be substantially colder, recreational opportunities would not be substantially affected because while water temperatures may not be as desirable as without the EWA, recreational users could partake in water dependent activities at lower river water temperatures, as demonstrated by use of the American and Sacramento rivers.

Potential flow- and water temperature-related changes in the Yuba River under the proposed project are within the range of potential impacts previously evaluated in the EWA EIS/EIR, and would not be of sufficient magnitude to reduce the recreational opportunities on the Yuba River. Additionally, the ramping rates identified as part of the Yuba Project operations for Yuba River have been developed with consideration for the overall safety of anglers and other recreationists. Because the proposed project would only occur for a period of approximately one-year and potential impacts are less than those identified for the EWA Program, no unreasonable impacts on recreation, including angling, are expected to occur as a result of the proposed project.

4.4.3.2 New Bullards Bar Reservoir

Cottage Creek boat ramp is unusable when the lake level is below 1,822 feet above msl, and Dark Day boat ramp is unusable when the reservoir level is below 1,798 feet above msl. Emerald Cove Marina is operable at all reservoir levels. During the recreation use season there would be an additional 0.2 percent probability under the proposed project that surface water elevations would decrease below the 1,798 feet msl threshold over the 83-year simulation period (Appendix B). During the recreation use season there would be an additional 1.0 percent probability under the proposed project that surface water elevations would decrease below the 1,822 feet msl threshold over the 83-year simulation period (Appendix B). These minor increases in probability of exceeding a threshold are most likely to occur at the end of the recreation season and during dry or critical water year types. Therefore, based on the low probability of occurrence and the timing of the occurrence, the proposed project will not result in unreasonable impacts to boat ramp use at New Bullards Bar Reservoir. Lower reservoir levels would generally affect boat ramps prior to affecting other recreational activities (e.g., swimming or fishing). If boat ramps remain usable, it is assumed that there are sufficient water levels in the reservoir to sustain other recreational activities.

The EWA EIS/EIR (Reclamation *et al.* 2003) analysis of recreation resources determined that although water surface elevation in New Bullards Bar Reservoir would decline below the Dark Day boat ramp, this would occur late in the recreational season (i.e., mid-October) (Reclamation *et al.* 2003). Additionally, the number of boaters would be fewer than during the peak recreational season (Memorial Day through Labor Day) (Reclamation *et al.* 2003). The EWA EIS/EIR (2003) (p. 14-25) also includes provisions that, "*The EWA agencies and YCWA could agree to transfer water under a multi-year contract. If full refill occurred, which it has for 85 percent of the past transfers, effects on recreation for subsequent years would be the same as described above. If full refill did not occur, Yuba County WA would consider selling less water the following year. The EWA agencies would not purchase water if the transfer would cause a significant effect on recreation.*" Because the proposed project is designed to provide water to the EWA Program, it is assumed that the refill provisions also would be met as part of the 2007 Pilot Program.

Therefore, because the analysis presented above indicates that the range of potential variation in New Bullards Bar Reservoir water surface elevations under the proposed project, relative to the basis of comparison, would be relatively minor, and have previously been evaluated for the entire EWA Program, there would be no unreasonable impacts to recreation opportunities at New Bullards Bar Reservoir under the proposed project, relative to the basis of comparison.

4.4.3.3 Feather River

Flows in the Feather River potentially would be higher under proposed project, relative to the basis of comparison. Increased flows potentially would improve recreational opportunities during most months and flow schedules. Overall, the range of flows anticipated under the proposed project in the Feather River would be within normal operating ranges and would not be expected to result in unreasonable impacts to recreational opportunities on the Feather River. Because the volume of flow under the proposed project generally would result in only a slight increase, relative to the total volume of flow in the Feather River (Table 4-1), it also would not significantly impact water temperatures in the Feather River.

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 14-18) analysis of recreation resources determined that, "*In July through September, the Feather River would increase below the point of diversion by 2,105 cfs, 850 cfs, and 149 cfs in July, August, and September, respectively. This is an increase above the median monthly flow under the Baseline Condition of 36 percent, 19 percent, and 9 percent in July through September. The increase in flow because of increased releases is not associated with any reduction in recreational opportunities. The increases would not preclude any recreational activity (e.g., fishing, boating, or swimming) that occurred under the Baseline Condition. The flow increase would therefore have a less-than-significant effect on recreation along the Feather River*."

Changes in Feather River flows under the proposed project, relative to the basis of comparison, are expected to be less than those identified for the entire EWA Program and, thus, would not result in unreasonable impacts to recreational opportunities on the Feather River.

4.4.3.4 Oroville Reservoir

The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 14-22) analysis of Oroville Reservoir recreation resources determined that, "*The small change in elevation would not affect the boat ramps, which are usable until the lake level falls below 700 msl… The changes in surface water elevation would not affect fishing, swimming, and boating opportunities; therefore, the effects would be less than significant*." Water levels in Oroville Reservoir during the primary recreation season (May through September) would remain within normal operational parameters under the proposed project, relative to the basis of comparison. Therefore, the proposed project would not result in unreasonable impacts upon recreation activities at Oroville Reservoir.

4.4.3.5 Sacramento River

Flows within the lower Sacramento River may change during the proposed project relative to the basis of comparison, but are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations, which were previously evaluated in the EWA EIS/EIR (Reclamation *et al.* 2003). Although specific operations of the Sacramento River system as a result of the proposed project are uncertain, the potential changes in flow are not expected to unreasonably impact recreation, relative to the basis of comparison, and may be slightly beneficial. Because the volume of flow under the proposed project generally would result in only a slight increase, relative to the total volume of flow in the Sacramento River (Table 4-2), it also would not be anticipated to significantly impact water temperatures in the Sacramento River. Therefore, the proposed project would not be expected to reduce the recreational opportunities on the Sacramento River.

4.4.3.6 Sacramento-San Joaquin Delta

Flows within the Delta could be slightly higher or lower during the proposed project (Table 4-3), but are anticipated to remain within normal flow ranges and fluctuations resulting from SWP and CVP operations, which were previously evaluated in the EWA EIS/EIR. The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 14-31) analysis of recreation resources determined that, "*There would be no decreases in Delta inflows from the Sacramento or San Joaquin Rivers under the Flexible Purchase Alternative. Because river water temperatures are not significantly affected in the Upstream from the Delta Region, there would be no adverse effect on recreation from changes in water temperature in the Delta. Therefore, no effects on recreation in the Delta would be anticipated*."

Although specific operations of the Delta system are uncertain as a result of the proposed project, the potential slight increases in flow are not expected to adversely or unreasonably impact recreation, relative to basis of comparison.

4.4.3.7 San Luis Reservoir

DWR potentially would store some portion of water from the proposed project in San Luis Reservoir. The EWA EIS/EIR (Reclamation *et al.* 2003) (p. 14-32) analysis of recreation resources determined that, "*there would be no significant change to recreational opportunities, including water-enhanced and water-based activities*" in San Luis Reservoir.

The proposed project would not be anticipated to lower reservoir water surface elevations and, thus, would not be expected to affect boat ramp accessibility. Because DWR could use a portion of the proposed project to store water in San Luis Reservoir, storage levels could increase during the primary recreational months (May through September), and may provide a beneficial effect upon recreational opportunities at the reservoir. Therefore, the proposed project would not be expected to result in unreasonable impacts upon recreation activities at San Luis Reservoir.

4.4.3.8 Groundwater Recharge Basins

The groundwater recharge basins located south of the Delta provide habitat for waterfowl and water birds and provide recreational opportunities for bird watching. The potential increase in water stored in south-of-Delta groundwater banks possibly could increase habitat for waterfowl and water birds at the recharge basins and would not be expected to result in unreasonable impacts upon bird watching opportunities at the groundwater recharge basins.

4.5 Other Environmental Resource Issues

4.5.1 Air Quality

The proposed groundwater substitution component of the proposed project (i.e., 30,000 acre-feet of groundwater substitution pumping that could occur in a Schedule 6 year) has the potential to result in air quality impacts related to the generation of criteria pollutants from fossil-fueled pumps. The EWA EIS/EIR (Reclamation *et al.* 2003) presents a detailed analysis of potential air quality impacts associated with groundwater substitution practices, and includes mitigation measures to ensure avoidance of significant air quality impacts.

Additionally, YCWA and its Member Units have developed and are implementing a mitigation plan with the goal of no net increase in air quality emissions associated with groundwater pumping operations in the Yuba County area. The air quality mitigation plan is consistent with the EWA Final EIS/EIR Mitigation Monitoring and Reporting Plan (Mitigation Plan) (Reclamation *et al.* 2004), and the proposed project would be conducted in compliance with these mitigation requirements. In particular, YCWA groundwater substitution water would be delivered only from wells approved by DWR for use in water transfers for EWA purposes (i.e., wells fitted with electric or other non-diesel fueled pumps). Implementation of applicable air quality mitigation plan elements would result in avoidance of any air quality standard violation and would ensure the proposed project would not contribute a net increase of any criteria pollutant, including those for which the region is in non-attainment under state regulations.

4.5.2 Cultural Resources

Drawdown of water from New Bullards Bar Reservoir for the purposes of providing transfer water to the EWA Program is subject to consideration under Section 106 of the National Historic Preservation Act as discussed in the EWA EIS/EIR (Reclamation *et al.* 2003). The proposed project is not anticipated to result in water elevations in New Bullards Bar Reservoir lower than historic normal operations and, therefore, would not result in creation of a new drawdown zone. Potential impacts upon cultural resources due to potential exposure of formerly unexposed resources beneath the water would be avoided during the proposed project.

4.6 Carryover Storage

The proposed project would result in a reduction in storage of at least 62,000 acre-feet in New Bullards Bar Reservoir by December 2007, and could affect the probability, or at least the timing and duration, of spilling in the following year (or subsequent years). Spills would not occur as early, or may be smaller, under the proposed project compared to the basis of comparison.

During a subsequent dry or critically dry year, after December 2007, it is possible that no spilling would take place regardless of whether the proposed project occurs; thus, potential impacts of the proposed project (including proposed water transfer) on storage refill could be delayed into subsequent water years. If a below-normal water year occurs after implementation of the proposed project, the potential storage refill effects of the proposed project (including a water transfer) would be largest because some spilling (a marginal amount) would be likely under the basis of comparison conditions. Potential storage refill effects likely would be minor if an above-normal or wet water year occurs, because of the large quantity of spilling that probably would occur, regardless of whether the proposed project is implemented. However, it is difficult to predict storage refill effects even with respect to water year types because substantial spilling could occur even in a dry water year (Appendix B).

Storage refill effects for the proposed project are not considered to be unreasonable given the speculative nature of the potential impacts, and the maintenance of minimum instream flow requirements at all times regardless of when storage refill effects may occur. Additionally, Yuba River instream flow requirements specified in RD-1644 long-term would require reservoir releases greater than the volume of the proposed project, and the potential effects of proposed project would be smaller than those of the releases that would be made to satisfy the RD-1644 long-term flow requirements. Overall, the effects of operations under the proposed project would not be considered unreasonable.

Chapter 5
Cumulative Impacts

5.1 Introduction

Cumulative effects are considered for the incremental effects of the proposed water transfer when added to other past, present, and reasonably foreseeable future actions, regardless of which agency or entity undertakes them. Cumulative effects can result from individually minor, but collectively significant, actions taking place over time. CALFED Program actions, CVPIA actions, and ongoing SWP and CVP operations and actions, in particular, are all highly adaptable programs subject to great change as hydrologic, environmental, regulatory, and water supply conditions change. Because the proposed water transfer would increase operational flexibility of DWR's EWA Program, the analysis of cumulative effects is necessarily general. However, it must be recognized that this flexibility provides an operational buffer for avoidance of adverse cumulative impacts.

Ongoing operations of YCWA, SWP, CVP, CALFED's Operations Group, and water contractors are complex and part of the affected environment. Both the SWP and CVP consist of a complex network of reservoirs and delivery systems. SWP and CVP management decisions to provide water for water contractors require the balancing of water for irrigation and domestic water supplies, fish and wildlife protection, restoration and mitigation and hydropower generation. In developing operations decisions, YCWA, DWR, and Reclamation collectively use criteria related to reservoir operations and storage, downstream conditions and needs, prevailing water rights, environmental requirements, flood control requirements, carryover storage objectives, reservoir recreation, hydropower production capabilities, cold water reserves, pumping costs, contract requirements, and other factors. The possibility of using multiple water sources for some requirements and environmental opportunities adds flexibility to project operations and complexity to operations decisions.

DWR and Reclamation are participants in several statewide programs that currently involve or will involve water transfers from stored surface water, groundwater substitution, or farmland fallowing practices. These include CALFED programs, such as EWA and the Environmental Water Program, DWR's Dry Year Water Purchase Program, and the state-proposed Critical Water Shortage Reduction Marketing Program. Programs such as the EWA and the proposed Critical Water Shortage Reduction Marketing Program are intended to benefit water supply and environmental conditions, including increased instream flows in source areas and increased water levels in SWP/CVP reservoirs.

5.2 Other Related Projects

The EWA Program for 2007 likely will include upstream acquisitions, stored water, and 2006 carryover surface supply. In addition to the EWA Program, DWR's Dry Year Water Purchase Program and the Critical Water Shortage Contingency Plan (if needed), the Environmental Water Program, and Reclamation's CVPIA Level 4 Wildlife Refuge Water Purchase Program may need to acquire north of the Delta water supply options during 2007. These programs will need to be coordinated between DWR and Reclamation. Some of the information presented below is based on the DWR and Reclamation water purchase agreement for the EWA (DWR and Reclamation 2002).

5.2.1 CALFED EWA – Other Acquisitions

5.2.1.1 Environmental Water Account Water Transfers

Under the EWA, assets acquired are used to manage water for environmental purposes while decreasing conflicts in use of water in the Bay-Delta estuary. The more flexible means of managing water operations, existing fish protection measures and the implementation of the EWA achieve fish recovery opportunities while providing improvements in water supply reliability and water quality in the Delta. DWR has been successful in creating water assets of over 150,000 to more than 200,000 acre-feet annually in 2001 through 2004.

5.2.2 DWR Dry Year Water Purchase Program Acquisitions

In 2001 and 2002, the Dry Year Water Purchase Program acquired approximately 138,800 acre-feet and 22,000 acre-feet of water, respectively (YCWA 2004). DWR initiated the Dry Year Water Purchase Program for 2003 and 2004, but the amounts of water purchased were lower (11,355 and 487 acre-feet, respectively) (DWR Website 2005a; DWR Website 2005b). In August 2004, DWR announced its plans to implement the Dry Year Water Purchase Program beginning in 2005. The Dry Year Water Purchase Program is open to all agencies and is intended to reduce the possibility of adverse economic impacts and hardship associated with water supply shortages. The quantity of water to be acquired in any year is unknown and depends on requests made by the participants, if any, in the Dry Year Water Purchase Program, what options are exercised in their contracts, available SWP pumping capacity and environmental conditions in the Delta. Much of this water is purchased from north of the Delta during dry years. Currently, it is unknown whether DWR would implement the Dry Year Water Purchase Program in 2007. However, if 2007 were to be a dry water year, then the program could be implemented, and YCWA water could be acquired if it was available.

Because there is a low probability that the hydrological conditions in late 2006 and early 2007 will be such that any YCWA transfer water can be transferred to the DWR Dry Year Program in 2007, this EA does not analyze such a transfer. If, because of the hydrological conditions that occur in late 2006 and early 2007, YCWA and DWR decide to pursue such a transfer, then YCWA will prepare a supplement to this EA and file a supplemental petition or request the SWRCB for approval of the transfer.

5.2.3 CALFED Environmental Water Program

The Environmental Water Program will continue to acquire water to assist in carrying out the goals of CALFED's Ecosystem Restoration Program Plan in 2007.

5.2.4 Reclamation CVPIA Level 4 Wildlife Refuge Water Purchase Program

CVPIA requires the U.S. Department of Interior (Interior) to acquire additional water supplies to meet optimal waterfowl habitat management needs at national wildlife refuges in California's Central Valley, certain state wildlife management areas, and the Grassland

Resource Conservation District (collectively know as refuges). The optimum water supply levels are referred to as Level 4. The annual water acquisition goal is 163,000 acre-feet to meet full Level 4 requirements at the refuges. Typical annual water acquisition needs are lower because refuge water supplies are partially met in most years by rainfall, runoff, and/or local supplies (Reclamation 2005). For the 2005 contract year (March 2004 through February 2005), 73,024 acre-feet were acquired (pers. comm., Meier 2005).

5.2.5 Sacramento Valley Water Management Program Short-term Agreement

Phase 8 of the SWRCB's Bay-Delta water rights proceedings has evolved to a settlement between DWR, Reclamation, export interests, and certain water rights holders in the Sacramento Valley, including YCWA. This settlement has resulted in a short-term agreement between the parties. As part of the short-term agreement, YCWA has agreed to provide 15,000 acre-feet of water for the program in dry years. The water would be made available through groundwater substitution.

5.2.6 Other Water Transfers

Other water transfers between currently unknown and unidentified parties also may be proposed and undertaken in 2007. YCWA currently is not considering any other water transfers for 2006. There is a high likelihood that other local or regional transfers may occur in the Sacramento Valley and Delta in 2007 that cannot be identified at this time.

5.3 Potential Cumulative Impacts

5.3.1 Yuba River

YCWA in prior years has undertaken transfers similar to the proposed project water transfer and has prepared environmental documentation for each transfer (Reclamation 1997; Reclamation 1999; YCWA 2004; YCWA and SWRCB 2001; YCWA and SWRCB 2002; YCWA and SWRCB 2003). These past evaluations and subsequent reviews of the water transfer effects (YCWA 2002; YCWA 2003; YCWA 2005), have not identified any significant adverse or unreasonable environmental impacts upon legal users of the water or upon fish, wildlife, vegetation, recreation, or other beneficial uses of the water. Yuba River adult Chinook salmon population trends have remained stable or increased over time, including during periods of water transfers. For example, the 2001-2003 Yuba River salmon spawning escapements were approximately 23,000 to 29,000 salmon in each year, well above the average annual escapement levels over the past 45 years. The most recent 8-year period of escapement records (1996 through 2003) is higher than any other 8-year period of Chinook salmon escapement on the Yuba River since data have been collected (over the past 50 years).

Fisheries monitoring programs instituted in 2001, 2002 and 2004 to collect data regarding YCWA's water transfer effects on fisheries found no conclusive evidence of adverse impacts (YCWA 2002; YCWA 2003; YCWA 2005). While much of the existing information is inconclusive, protections such as minimizing fluctuations during spawning periods and implementing ramping rates at the ends of transfers have reduced the potential for unreasonable adverse effects on Yuba River fisheries.

5.3.2 Sacramento-San Joaquin Delta and Environmental Water Account

The EWA will allow further curtailment of Delta pumping to reduce the entrainment of fish at the SWP Banks Pumping Plant to achieve benefits beyond the existing environmental baseline. Pumping could be increased to move water controlled by the EWA when substantial impacts on sensitive fish are not likely to occur. However, the ultimate/final pumping pattern will remain within the possible patterns that the SWP is allowed under the existing SWRCB Delta Water Quality Control Plan.

Most water transfers likely will be exported through the Delta during summer and fall months to maximize benefits to migrating winter-run Chinook salmon and minimize adverse effects on delta smelt. The EWA is expected to make relatively small changes in the overall operations of the SWP and CVP facilities. Operational changes to the SWP and CVP in 2007 generally can be characterized as shifts in pumping rates at the SWP and CVP Delta diversion pumps, shifts in storage and release patterns at SWP/CVP reservoirs, shifts in groundwater pumping in local areas, and shifts in surface water storage release patterns in local areas. Overall, programs such as the EWA, the Dry Year Water Purchase Program, and the Critical Water Shortage Reduction Marketing Program will benefit instream resources by reducing Delta pumping and the entrainment of fish at the Delta pumping plants. Programs such as the EWA will rely primarily on surface water in wet years and shift to reliance on groundwater in dry years.

The EWA transfer from YCWA may affect Oroville Reservoir storage levels if releases have to be made to prevent water quality impacts in the Delta during the period when New Bullards Bar Reservoir is being refilled. Changes in storage levels and release patterns at Oroville Reservoir also may result from changes in operations at the Banks Pumping Plant in the Delta as a result of other EWA projects. In most instances, changes in operations would lead to temporary increases in reservoir storage levels. In some instances, the EWA could borrow water from upstream reservoirs, (i.e., Shasta Reservoir on the Sacramento River) thereby lowering reservoir storage levels.

The nature of the EWA Program, specifically the acquisition of up to approximately 200,000 acre-feet of water annually from various sources, along with the regulatory framework currently in place, makes the potential for significant and/or unreasonable adverse cumulative impacts during 2007 implementation highly unlikely. The EWA Program is being implemented and will be adaptively managed to actually maintain and/or benefit both Delta fisheries and contractor water supplies.

Early in 2001, DWR prepared an environmental document addressing the specific impacts from implementing the Year 2001 Water Transfer Agreement between YCWA and DWR for support of CALFED's EWA (DWR 2001a). This document provides additional background information on the larger program of establishing numerous other individual assets to create the EWA, as specified in the CALFED ROD, dated August 28, 2000. Additional environmental documents were prepared annually for additional assets, as appropriate. In 2004, the EWA Final EIS/EIR was released, which evaluated numerous transfer scenarios including transfers from YCWA to Delta users. The conclusion in the Final EIS/EIR and by the USFWS and NMFS was that the EWA transfers would not likely adversely affect delta smelt, Sacramento River winter-run Chinook salmon and critical habitat, Central Valley spring-run Chinook salmon, and Central Valley steelhead (NMFS 2004; Reclamation *et al.* 2004a; USFWS 2004).

5.4 Conclusion

For the proposed project water transfer in 2007, cumulative effects are not likely to be unreasonable. Environmental considerations have been strongly integrated into the design of the related projects described above. Salmon populations in the lower Yuba River remain healthy since transfers were first initiated in the late 1980s. Less information is available for steelhead, but there is no conclusive information demonstrating any unreasonable impacts to this species. The regulatory framework currently in place and the use of most of this transfer water for environmental purposes in the EWA Program also lead to the conclusion that there would be no unreasonable cumulative effects.

Chapter 6
Summary of Unreasonable Impacts, Mitigation Measures, and Water Transfer Benefits

Potential impacts that could occur within and downstream of the Yuba River watershed were evaluated to determine whether the proposed project would adversely affect surface water and groundwater supply and quality, fisheries resources, wildlife and vegetation, recreation, air quality and cultural resources in the potentially affected waterbodies. The proposed project would not result in any adverse effects on the beneficial uses of the Yuba River, Yuba Project, Yuba groundwater subbasins, Feather River, Oroville Reservoir, Sacramento River, or Delta. The following sections summarize the determination regarding the potential for unreasonable impacts, describe mitigation measures to be implemented during the proposed project, and discuss the anticipated benefits.

6.1 Unreasonable Impacts

The proposed project would not have any unreasonable impacts on instream beneficial uses of the waterbodies associated with the proposed project. Similar YCWA water transfers in recent years also have not resulted in any known significant, substantial, or unreasonable impacts to any beneficial uses. These transfers have provided additional water for various uses, including environmental uses and thereby have provided multiple benefits.

6.2 Mitigation

The environmental assessment determined that there would be no unreasonable impacts associated with the proposed project. Although no specific mitigation actions are required, this section summarizes the measures incorporated into the proposed project to ensure protection of water supply, groundwater, fisheries, and air quality.

- DWR will comply with SWRCB Decision 1641 (D-1641) Tables 1, 2 and 3 to ensure that no unreasonable effects on fish, wildlife or other instream beneficial uses are caused by the addition of the Clifton Court Forebay and the Tracy Pumping Plant as points of rediversion.
- YCWA and its Member Units have voluntarily agreed to cooperate with DWR to investigate any claim of adverse impact on residents or groundwater users and to adjust operations as necessary to address any such impact. Additionally, YCWA and DWR will implement a Groundwater Monitoring and Reporting Program.
- YCWA will continue to consult and coordinate with fishery resources agencies regarding the appropriate level of monitoring and reporting for the proposed project.
- YCWA will provide water obtained only from DWR-approved wells for the groundwater substitution component of the proposed project.

6.3 Benefits

Benefits that may result from the proposed project would include:

- DWR would be provided with increased flexibility to meet its water supply and environmental protection obligations.
- YCWA would receive funds that it would use to meet its multi-objective mission of providing flood control, hydroelectric generation, water supply, and fisheries enhancement and related recreation for Yuba County residents.
- Yuba River water temperatures may be reduced, which may provide slight benefits to anadromous species in the river.
- September and October flows below Daguerre Point Dam would be stabilized, which would maintain migration of adult spring-run and fall-run Chinook salmon in the Yuba River, as well as any spawning by adult spring-run and fall-run Chinook salmon.
- The higher river flows would allow for increased rafting and other boating opportunities and, therefore, could increase recreational opportunities.
- The increases in reservoir storage and river flows would increase the potential dilution of contaminants and, therefore, improve the water quality at these locations.

Chapter 7
Consistency With Plans and Policies

The proposed project would be implemented and consistent with existing plans and policies, as described below.

Coordinated Operations Agreement (DWR/Reclamation)

DWR and Reclamation shall continue to adhere to the general sharing principles contained in the 1986 Coordinated Operations Agreement (COA) as modified by interim operating agreements to reflect changes in regulatory standards, facilities, and operating conditions, including the EWA.

Yuba County Water Agency

- California Water Code §1732
- SWRCB Orders
- FERC License Agreements
- PG&E Power Purchase Agreement
- 2005 NMFS Final Biological Opinion for the Yuba River Development Project License Amendment

DWR/State Water Project

- South Delta Improvements Program
- Kern Water Bank Operating Plan
- California Department of Health Services Drinking Water Standards
- Article 19 Water Quality Objectives for Long-term SWP Contracts
- 2004 NMFS Biological Opinion on OCAP
- 2005 USFWS Biological Opinion on OCAP
- 2004 USFWS Programmatic Biological Opinion on the Proposed Environmental Water Account
- 1995 Bay-Delta Water Quality Control Plan

Chapter 8
Consultation and Coordination

YCWA and legal counsel, and environmental consultants preparing this Water Code Environmental Analysis, contacted and coordinated with resource agency personnel regarding the potential impacts of the proposed project. This section summarizes the consultations and coordination activities.

8.1 Fisheries Resources Agencies

YCWA and technical resource consultants met with resource agency representatives from CDFG, USFWS, and NMFS during June, August and September 2006 to discuss the 2007 Pilot Program. These discussions primarily addressed issues that had previously been resolved during last years Pilot Program fisheries agreement. Discussions clarified the manor in which the Yuba Project would be operated in 2007. YCWA and the resource agency representatives discussed the Pilot Program RMF accounting and monitoring activities. During the September 13, 2006 meeting, YCWA and resource agency representatives discussed a brief overview of the proposed assessment methodology, which was described as being very similar to the previous 2006 Pilot Program analytical approach.

Agency and consultant representatives at the three meetings were as follows:

June 19, 2006	August 2, 2006	September 13, 2006
Mike Tucker (NMFS)	Mike Tucker (NMFS)	Cesar Blanco (USFWS)
Cesar Blanco (USFWS)	Cesar Blanco (USFWS)	John Nelson (CDFG)
John Nelson (CDFG)	John Nelson (CDFG)	Ian Drury (CDFG)
Duane Massa (CDFG)	Duane Massa (CDFG)	Gary Reedy (SYRCL)
Tom Johnson (YCWA	Tom Johnson (YCWA	Curt Aikens (YCWA) – by telephone
Ben Ransom (SWRI)	Ben Ransom (SWRI)	Tom Johnson (YCWA)
		Paul Bratovich (SWRI)
		Ben Ransom (SWRI)

8.2 Central Valley Regional Water Quality Control Board

Richard McHenry, Senior Water Quality Control Engineer for the RWQCB, has indicated that the RWQCB identified the potential for shifts in hardness levels related to water transfers to be of concern and indicated that the analyses of water transfers should provide a description of hardness levels in the potentially affected waterbodies. The potential water quality concern is related to the potential for metals to become more readily bioavailable if the hardness level of the receiving water is substantially reduced by introduction of the transfer source water. Therefore, transfer of a high volume of low hardness waters into waters of higher hardness levels potentially could be of concern. Mr. McHenry and his staff previously provided data for the Yuba, Feather, and Sacramento rivers for use in the discussion of shifts in hardness levels associated with water transfers. Mr. McHenry indicated for the proposed 2006 YCWA water transfer that due to the anticipated volume of water released from New Bullards Bar Reservoir, the available dilution potential as the water flows downstream from the Yuba River to the Feather River, Sacramento River and to the Delta, and the relatively low or "clean" hardness levels of these waterbodies, that there likely would not be a water quality concern related to the proposed 2006 water transfer. Because the proposed 2007 Pilot Program water transfer volume is the same as that considered in 2006, there also likely would not be a water quality concern related to the proposed project. A discussion of this topic is provided in the water quality assessment.

Chapter 9
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Chapter 10
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10.2 Personal Communications

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Brown, D., Division of Environmental Services, California Department of Water Resources, Sacramento, California; Email communication with Phil Leapley, Senior Environmental Scientist, Surface Water Resources, Inc., Sacramento, California; Temporary Portable Pumps in the South Delta, October 27, 2005b.

McHenry, R., Senior Water Quality Engineer, Central Valley Regional Water Quality Control Board; Telephone conversation with T. Mihm, Senior Planner, Surface Water Resources, Inc.; Discussion Regarding Water Quality Concerns Related to Potential Effects Upon Hardness Levels Related to the Proposed YCWA Water Transfer From the Lower Yuba River Flows to the Feather River, Sacramento River, and into the Delta, 2005a.

McHenry, R., Senior Water Quality Control Engineer, Regional Water Quality Control Board; Telephone conversation with P. Leapley, Senior Environmental Scientist, Surface Water Resources, Inc.; Telephone Discussion Regarding Water Hardness in Relation to the 2005 Water Transfer, 2005b.

Meier, D., Fish and Wildlife Program Manager, Bureau of Reclamation, Sacramento, California; Telephone conversation with Phil Leapley, Senior Environmental Scientist, Surface Water Resources, Inc., Sacramento, California; Reclamation CVPIA Level 4 Wildlife Refuge Water Purchase Program, October 27, 2005.

Niiya, K., Central Valley Regional Water Quality Control Board; Telephone conversation with T. Mihm, Senior Planner, Surface Water Resources, Inc.; Discussion of Hardness Level Data for the Yuba and Feather Rivers for Use in the Evaluation of Potential Effects Upon Water Quality Associated With the Proposed Water Transfer, 2005.

Appendix A

Fisheries Agreement for 2007 Lower Yuba River Pilot Program

Fisheries Agreement For
2007 Lower Yuba River Pilot Program

1. <u>INTRODUCTION</u>

1.1 *Parties*

The Parties to this Agreement are: Yuba County Water Agency; California Department of Fish & Game; and the following non-governmental organizations: South Yuba River Citizens League; Friends of the River; Trout Unlimited; and The Bay Institute.

1.2 *Purpose of Agreement*

This Fisheries Agreement for the 2007 Lower Yuba River Pilot Program applies to the Yuba Project as it affects the Lower Yuba River during the term of this Agreement.

1.2.1. <u>Scope and Purpose of Agreement</u>. This Agreement specifies the minimum instream flows that will occur in the Lower Yuba River between March 1, 2007 and March 31, 2008, and the temporary amendment to the State Water Resources Control Board's Revised Water-Right Decision 1644 (RD-1644) that the parties will ask the SWRCB to make for the period between March 1, 2007 and March 31, 2008. The Parties agree that this Agreement fairly, reasonably and appropriately specifies instream flows and temporary amendments to RD-1644 for this period, while the parties are working to complete the Yuba Accord.

1.2.2. <u>Issues Outside Scope of Agreement</u>. This Agreement does not address or resolve the issues that are contemplated to be addressed by the Yuba Accord after March 31, 2008, the requirements in paragraph 8 on pages 180-181 of RD-1644 regarding fish losses at the North Canal or the South Canal, the requirements in RD-1644 regarding local districts' water rights, or any litigation concerning such requirements. These issues will be resolved through separate agreements and, if necessary, separate proceedings.

This Agreement does not address or resolve any issues that may arise during the FERC proceeding regarding the relicensing of YCWA's FERC License for the Yuba Project. This Agreement does not address or resolve any issues that may arise in FERC proceedings concerning projects in the Upper Yuba River basin, specifically, the Yuba Bear-NID, Drum-Spaulding, and South Feather Power Project relicensings.

This Agreement does not address or resolve any issues that may arise during or in separate proceedings, forums, or venues involving the Lower Yuba River, for example, the Upper Yuba River Studies Program (fish passage at Englebright Dam) or the Daguerre Dam Fish Passage Improvement Project. This Agreement does resolve the issues regarding the temporary amendments to RD-1644 that are described in Section 4.1 and the issues covered in Section 5.

1.3 *Yuba Accord*

YCWA has developed the Yuba Accord, which consists of the Proposed Lower Yuba River Fisheries Agreement and several other elements. The other elements of the Yuba Accord are: (a) the Conjunctive Use Agreements, under which YCWA and Member Units will implement programs to conjunctively use available surface water and groundwater supplies to ensure that local water supplies are not reduced to implement the Yuba Accord; (b) the Water Purchase Agreement among YCWA, DWR and Reclamation, under which YCWA will transfer water, including water made available by the instream-flow schedules in the Fisheries Agreement, to DWR and Reclamation, and DWR and Reclamation will make payments to YCWA that YCWA will use to make payments to the River Management Fund, to Member Units under the Conjunctive Use Agreements, and to fund flood-control and water-supply projects in Yuba County; and (c) an agreement, memorandum of understanding or similar document with PG&E amending or regarding the PG&E/YCWA Power Purchase Contract so that YCWA can implement the Fisheries Agreement, the Water Purchase Agreement and the Conjunctive Use Agreements. All of these elements of the Yuba Accord must be in place for any of the elements of the Yuba Accord to go into effect. The Parties to the Yuba Accord are pursuing regulatory approvals of the various elements of the Yuba Accord in appropriate venues, with the goal and intention of implementing the Yuba Accord in late 2007.

1.4 *NEPA/CEQA Compliance*

The Parties' agree that the 2007 Water Purchase Agreement is exempt from CEQA under Water Code section 1729 because the transfer and purchase of water under that Agreement will be made pursuant to Water Code sections 1725-1732 and will be for a period of one year or less. However, this 2007 Pilot Program Fisheries Agreement and the associated temporary change to RD-1644 that is described in Section 4.1.1 will not be exempt from CEQA. YCWA will be the Lead Agency for this Agreement and the temporary change to RD-1644. This Agreement is exempt from NEPA because it does not involve any federal actions.

2. DEFINITIONS

"2007 Water Purchase Agreement" means the 2007 water purchase agreement between YCWA and DWR that is described in Section 4.2.

"ADR" means alternative dispute resolution.

"Agreement" means this Fisheries Agreement for the 2007 Lower Yuba River Pilot Program.

"CDFG" means the Department of Fish and Game of the State of California.

"CEQA" means the California Environmental Quality Act.

"Conjunctive Use Agreements" mean the agreements described in section 4.3.

"CVP" means the Central Valley Project, which is operated by Reclamation.

"DWR" means the Department of Water Resources of the State of California

"Exhibit" and "exhibit" refer to exhibits to this Agreement, unless the context clearly indicates otherwise.

"FERC" means the Federal Energy Regulatory Commission.

"FERC License" means the license that was issued to YCWA by FERC for the operation of the Yuba Project and any amendments to that license that FERC has made or makes during the term of this license. The term of this license expires on April 30, 2016.

"FERC Annual License" means one or more annual licenses issued by FERC to YCWA for the operation of the Yuba Project following the expiration of the term of the FERC License.

"FERC Long-Term License" means the long-term license that FERC will issue to YCWA for the operation of the Yuba Project following the expiration of the term of the FERC License and the last FERC Annual License.

"Fisheries Agreement" means the Proposed Lower Yuba River Fisheries Agreement.

"Flow Schedule" and "Flow Schedules" mean the flow schedules in Exhibit 1.

"FOR" means Friends of the River.

"Force Majeure Event" mean any of the *force majeure* events described in section 6.4.1.

"Groundwater Substitution Program" means a program in which water users in Yuba County will pump groundwater, in lieu of receiving surface water from YCWA, and an equivalent amount of surface water then will be released from Englebright Dam to flow down the Lower Yuba River to the Feather River for a water transfer for uses outside of Yuba County. "Groundwater Substitution Program" does not include groundwater pumping made for other purposes, including, but not limited to, pumping made to reduce deficiencies in deliveries of surface water to water users in Yuba County that is not made in connection with a water transfer for use outside of Yuba County.

"Lower Yuba River" means the Yuba River from Englebright Dam to the Yuba River-Feather River confluence.

"Material Violation of Agreement Flow Schedules" is defined in section 6.1.1.

"Member Unit" means "Member Unit" as defined in section 2(g) of the Yuba Act.

"Narrows II Powerhouse Full Flow Bypass" means the proposed action described in the Preliminary Biological Opinion for Yuba Project (FERC No. 2246) dated January 26, 2005.

"NEPA" means the National Environmental Policy Act.

"NGOs" means SYRCL, FOR, TU and TBI.

"NOAA Fisheries" means the United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service

"Non-Material Violation of Agreement Flow Schedules" is defined in section 6.2.1.

"North Yuba Index" is defined in Exhibit 4.

"Operations Group" means the River Management Team Operations Group described in section 5.2.

"Parties" mean YCWA, CDFG, SYRCL, FOR, TU and TBI. Parties sometimes are referred to in this Agreement as the "Parties to this Agreement."

"PG&E" means the Pacific Gas and Electric Company.

"PG&E/YCWA Power Purchase Contract" means the contract dated May 13, 1966 between PG&E and YCWA regarding the operation of the Yuba Project for hydroelectric power generation.

"Planning Group" means the River Management Team Planning Group described in section 5.2.

"RD-1644" means Revised Water Right Decision 1644, adopted by the SWRCB on July 16, 2003.

"Reclamation" means the United States Department of the Interior, Bureau of Reclamation.

"Regulatory Change Event" means any of the regulatory change events described in section 6.4.2.

"River Management Fund" or "RMF" means the fund described in section 5.3.

"River Management Team" or "RMT" means the team described in section 5.2.

"RMT Participants In RMF Issues" means the Parties to this Agreement, NOAA Fisheries and USFWS.

"Schedule" and "Schedules" mean the flow schedules in Exhibit 1.

"Section" and "section" refer to sections of this Agreement, unless the context clearly indicates otherwise.

"Short-Term Phase 8 Bay-Delta Settlement Agreement" means the "Short-Term Agreement to Guide Implementation of Short-Term Water Management Actions to Meet Local Water Supply Needs and to Make Water Available to the SWP and CVP to Assist in Meeting the Requirements of the 1995 Water Quality Control Plan and to Resolve Phase 8 Issues," effective March 24, 2003.

"Significant Change" in the assumed operating assumptions for the Yuba Project is defined in Exhibit 10.

"Surface Water Supplemental Transfer" means a transfer to surface water from storage in New Bullards Bar Reservoir for use outside of Yuba County, where: (a) the transferred water is not part of a Lower Yuba River flow that is reasonably needed to meet the requirements in Section 5.1.1 (or an operational buffer for such a requirement); (b) the release of water from storage in New Bullards Bar Reservoir is in addition to releases reasonably needed to reach the applicable September 30 storage target and instead causes the September 30 New Bullards Bar Reservoir storage to be less than the applicable storage target; and (c) the transfer is not part of a Groundwater Substitution Program.

"SWRCB" means the California State Water Resources Control Board.

"SWP" means the State Water Project, which is operated by DWR. The SWP also is known as the "State Water Facilities," as defined in Water Code section 12934, subdivision (d).

"SYRCL" means the South Yuba River Citizens League.

"TAF" means thousand acre-feet.

"TBI" means The Bay Institute.

"Technical Variation of Agreement Flow Schedules" is defined in section 6.2.5.

"Technical Working Group" means the River Management Team Technical Working Group described in section 5.2.

"TU" means Trout Unlimited.

"USFWS" means the United States Department of the Interior, Fish and Wildlife Service.

"Water Year" means a 12-month period from an October 1 through the following September 30.

"YCWA" means the Yuba County Water Agency.

"YFA" means this Lower Yuba River Fisheries Agreement.

"Yuba Act" means the Yuba County Water Agency Act, California Statutes 1959, Chapter 788, as amended.

"Yuba Project" means FERC Project No. 2246, which sometimes is called the "Yuba River Development Project" or the "Yuba River Project."

"Yuba Accord" means the Lower Yuba River Accord described in section 1.3.

3. TERM OF FISHERIES AGREEMENT

3.1 *Term of Lower Yuba River Fisheries Agreement*

This Agreement will become effective once the conditions precedent, described in Section 4, have been satisfied. The term of this Agreement then will be from the effective date until March 31, 2008 unless it is superseded before then by the Yuba Accord or some other agreement.

4. CONDITIONS PRECEDENT

This Agreement will become effective when all of the following conditions have been met.

4.1 *State Water Resources Control Board Actions*

This Agreement will not become effective unless and until the SWRCB adopts, without any substantial modifications, YCWA's petitions to change to YCWA's water rights permits and RD-1644 that are described in this Section 4.1.

The Parties understand that the SWRCB may reject or modify some or all of the proposed changes in these petitions. If the SWRCB rejects or substantially modifies any of these proposed changes, then the Parties will make a good faith effort to try to reach agreement on appropriate revisions to this Agreement to accommodate the rejections or modifications made by the SWRCB. However, if the Parties do not reach such agreement, then this Agreement will not go into effect.

4.1.1. Revisions To RD-1644 Instream Flow Requirements. This Agreement will not become effective unless and until the SWRCB adopts an order granting, without any substantial modifications, YCWA's petition to the SWRCB to change the effective date of RD-1644's Long Term instream-flow requirements from February 28, 2007 to March 31, 2008.

While the SWRCB will maintain its lawful authority over YCWA's water rights, nothing in this Agreement will be construed as limiting or expanding that authority, and all Parties will retain their rights to disagree, object to or challenge any attempted exercise of that authority.

4.1.2. This Section left blank.

4.1.3. This Section left blank.

4.1.4. Changes To Implement 2007 Water Purchase Agreement. This Agreement will not become effective unless and until the SWRCB adopts an order granting, without any substantial modifications, YCWA's petition to the SWRCB to amend YCWA's water-right Permits 15026, 15027 and 15030 to add, during the term of the 2007 Water Purchase Agreement, the SWP and CVP points of diversion/rediversion and places of use that are necessary to implement the 2007 Water Purchase Agreement.

4.2 *2007 Water Purchase Agreement for the 2007 Lower Yuba River Pilot Program*

This Agreement also will not become effective unless and until: (i) YCWA and DWR execute the 2007 Water Purchase Agreement; and (ii) the 2007 Water Purchase Agreement goes into effect. YCWA will advise the other Parties to this Agreement in writing when these events have occurred.

4.3 *Conjunctive Use Agreements*

This Agreement also will not become effective unless and until YCWA executes Conjunctive Use Agreements with a sufficient number of YCWA's Member Units so that YCWA can meet its obligations under this Agreement and the 2007 Water Purchase Agreement. YCWA will advise the other parties to this Agreement in writing when these agreements have been executed.

4.4 This section left blank.

4.5 This section left blank.

5. OBLIGATIONS OF PARTIES

5.1 *Lower Yuba River Instream Flows*

5.1.1. Specific Flow Schedule. Except as otherwise provided in this Agreement, YCWA will comply with the Schedule 1-6 and A-B instream flow requirements in Exhibit 1 (plus the 30,000 acre-feet of additional water in Schedule 6 Water Years that is described in section 5.1.3) during March 1, 2007 to March 31, 2008. The instream flow requirements in these schedules will be maintained as measured by a five-day running average of the mean daily stream flows with instantaneous flows never less than 90 percent of the applicable flow requirements specified in the schedules. In addition, instantaneous flows will not be less than the applicable flow requirements specified in the schedules for more than 48 consecutive hours unless CDFG concurs to a longer period of time, which may not exceed 5 days. During the parts of September through December of Schedule A Water Years when the Narrows 2 Powerhouse is shut down for maintenance or construction activities, the Smartville Gage requirements will be 700 cfs or the full release capacity of the Narrows 1 Powerhouse at the Englebright Reservoir level that occurs at that time, whichever is less. During such periods in 2007 or 2008 in which the Narrows II powerhouse is shut down for construction of the Narrows II Full Flow Bypass Project, minimum flows at the Marysville gauge will be 350 cfs. YCWA, in consultation with Parties to this Agreement, will make reasonable efforts to make flows greater than 350 cfs available at the Marysville gauge during such periods in 2007 or 2008 in which the Narrows II powerhouse is shut down for construction of the Narrows II Full Flow Bypass Project. YCWA will consult with the Parties to this Agreement regarding the timing of such additional flows.

The specific flow schedule that will be implemented at any time will be determined by the value of the North Yuba Index and the rules in Exhibit 2, with the adjustments described in Exhibit 3 (if applicable). The North Yuba Index is defined in Exhibit 4. The procedure for calculating the North Yuba Index is described in Exhibit 5.

5.1.2. Right To Request Specific Performance Of Flow Schedules. Each Party to this Agreement will have the right to ask a court of competent jurisdiction to order YCWA to specifically perform its obligations under this Agreement. This right will include the rights to ask the court to issue a temporary restraining order, a preliminary injunction or a final injunction after entry of judgment. YCWA will not oppose such a request on the grounds that any other Party lacks standing, failed to join necessary parties or has adequate remedies at law.

Consistent with the portion of section 7.8 regarding the location of execution of this Agreement, each Party agrees that any action requesting specific performance of this Agreement may be filed in Yuba County or Sacramento County. In any such action, any Party may file a motion under California Code Civil Procedure section 394, provided that: (a) such motion is filed within 30 days of the filing of the initial action; and (b) in lieu of requesting a transfer of the action to another county, such motion instead requests that the action remain in the original county but that the chairperson of the Judicial Council assign a disinterested judge from a neutral county to hear the action. For the purposes of any such motion under Code of Civil Procedure section 394, the Parties further agree that Alameda, Marin, Nevada, Sacramento and Yuba Counties are not neutral counties from which a disinterested judge may be assigned.

5.1.3. Groundwater-Substitution Program. YCWA will operate a groundwater-substitution program if Schedule 6 is in effect during the term of this Agreement which will result in an additional 30,000 acre-feet of water not shown in Schedule 6 flowing in the Lower Yuba River at the Marysville Gage during the portions of this period when this water is transferable to the 2007 Water Purchase Agreement transferees. Subject to the preceding requirement of transferability, the River Management Team, through a decision by its Planning Group, will determine the flow schedule for the 30,000 acre-feet if a Schedule 6 Water Year is in effect . This flow schedule will be set to achieve maximum fish benefit during the transfer period.

5.1.4. Temporary Alteration of Flow Schedule. The River Management Team (through a decision by its Planning Group) may decide to temporarily alter the applicable instream flow requirements in Schedules 1 through 6 at any time during the term of this Agreement, so long as the agreed-to instream flows comply with the applicable requirements of YCWA's FERC license and YCWA's water-right permits.

Any agreed upon alterations to the instream flows must: (a) occur only during March through October; (b) not cause decreases from the flows specified in Schedules 1 through 6 of more than 20%; (c) not shift water from the amounts specified in Schedules 1 through 6 by more than 6 weeks; (d) not reduce the amount of stored water remaining in New Bullards Bar Reservoir at the end of the calendar year during which the temporary alteration occurs below the amount that would occur without the temporary alteration; and (e) not result in a net decrease in the total amount of water released for the applicable schedule of instream flow requirements for the calendar year. The process in section 6.6.3 will apply to any RMT decision to temporarily alter schedules. Absent River Management Team consensus, no changes to applicable instream flow requirements in Schedules 1 through 6 will occur while this Agreement is in effect.

5.1.5. This section left blank.

5.1.6. Operations Assumptions and Parameters for Defining Future Significant Changes. YCWA's commitment to provide the instream flows in Exhibit 1 is based on the assumption that the Yuba Project will be operated consistent with Exhibit 10. The Parties acknowledge that a Significant Change in YCWA operations under this Agreement may be required because of a Force Majeure Event or a Regulatory Change Event. Absent such a Significant Change, YCWA will operate the Yuba River Project according to this Agreement and the terms of its water rights permits.

If YCWA must make any Significant Change in the assumed operations parameters described in Exhibit 10 because of a Force Majeure Event or a Regulatory Change Event, then the River Management Team will work to try to develop an alternative consensus flow schedule. In such circumstances, Section 6.4 will apply.

("Significant Changes" in assumed operations parameters are defined in Exhibit 10.)

5.1.7. Surface Water Supplemental Transfers Between March 1, 2007 and December 31, 2007. Hydrologic conditions prevented completion of a surface water transfer by YCWA during the summer and fall of 2006. As a result, the North Yuba Index will be approximately 55,000 acre-feet higher on October 1, 2006 than it would have been if a Surface Water Supplemental Transfer had taken place in 2006. If hydrologic conditions permit, then YCWA intends to make a Surface Water Supplemental Transfer of up to 60,000 acre-feet in addition to any transferable water that is needed to implement the applicable Flow Schedule in Exhibit 1 between March 1, 2007 and December 31, 2007. If YCWA makes any Surface Water Supplemental Transfer between March 1, 2007 and December 31, 2007, then the following conditions will apply to the transfer: (a) The flow schedule for the water involved in the Surface Water Supplemental Transfer will be set to achieve maximum fish benefit during the transfer period, as determined by the RMT, or, if the RMT does not agree on this issue, by the SWRCB; (b) the minimum flow at the Marysville gauge after May 31, 2007 and before any increase of Lower Yuba River flows above the flows specified in the applicable Flow Schedule as a result of the Surface Water Supplemental Transfer will remain within 300 cfs (or greater than 300 cfs upon consent of the RMT) of the maximum flow above the Flow Schedule that will occur as a result of the Surface Water Supplemental Transfer; (c) any change in flows will (within YCWA's operational ability) be in a gradual manner, will not exceed 300 cfs per day total, and will be as close as possible to 100 cfs in any four-hour period as is operationally feasible, although a buffer of 50 cfs (resulting in a potential flow change of up to 150 cfs per four-hour period) will be allowable provided that all reasonable efforts are made to adhere to a limit of 100 cfs per four-hour period; (d) any ramp-down of flows will be gradual and not exceed 400 cfs per day, and will be as close as possible to 100 cfs in any four-hour period as is operationally feasible, but may include the 50 cfs operational buffer described in this Section; (e) ramp down from any transfer flow level to the applicable flow schedule shall be completed by the end of August; and (f) the flow at the Marysville Gauge on September 1 should not be less than the minimum instream flow required on October 15, unless the Narrows II Bypass is under construction, during which time the flow schedules and operations described in Section 5.1.1 shall be in effect.

If the Flow Schedules in Exhibit 1 are used to determine minimum instream flows after December 31, 2007, then the Flow Schedule in Exhibit 1 that will be used after October 1, 2007 will be based on the New Bullards Bar Reservoir September 30 actual Active Storage (as defined in Exhibit 4) on September 30, 2007, without any adjustment for any Surface Water Supplemental Transfer that may have occurred before that date.

If it appears that hydrologic conditions will allow YCWA to make a Surface Water Supplemental Transfer between March 1, 2007 and December 31, 2007, then on April 10, 2007 YCWA will provide a preliminary indication of the supplemental transfer amount. On May 1, 2007, YCWA will provide a refinement of the preliminary transfer indication. This May 1 refinement will include a draft implementation schedule, after consultation with the River Management Team, for the Surface Water Supplemental Transfer. Unless otherwise indicated by YCWA, the implementation schedule for the transfer will become final no later than May 15, 2007.

5.1.8. Supplemental Flows For Groundwater Substitution Programs: If YCWA operates any Groundwater Substitution Program between March 1, 2007 and December 31, 2007, then the following criteria will apply to such program:

- Schedule 1 years: All supplemental transfer flows that occur as part of the Groundwater Substitution Program will be scheduled to occur on or after July 1. The total of such supplemental transfer flows plus the Exhibit 1 flows (700 cfs in July) will not exceed the June Exhibit 1 flows (1,500 cfs) or the actual flow at the Marysville Gage on June 30, whichever is greater.

- Schedule 2, 3, 4 and 5 years: Up to 10 percent of the Groundwater Substitution Program's total transfer volume may be scheduled by the River Management Team to flow between the end of the higher spring flows (which end on May 31 in Schedule 2 and 3 years, and on May 15 in Schedule 4 and 5 years) and the latest day on which the transfer may be allowed to start (based on Delta and other conditions), even though such water may not be transferable under the 2007 Water Purchase Agreement. No more than 10 percent of the Groundwater Substitution Program's total transfer volume will be at risk of not being transferable. The remainder of the total transfer volume will be scheduled during the period when the water will be transferable.

- Schedule 6 years: The entire Groundwater Substitution Program transfer volume will be scheduled to flow during the transferable period under the 2007 Water Purchase Agreement. The schedule for such flows will be developed in consultation with the River Management Team. The flow schedule will be set to achieve maximum fish benefit during the transfer period.

YCWA also will make additional water available for supplemental flows during Schedule 4 and 5 years according to the following criteria:

- Schedule 4 years: 10 percent of the Groundwater Substitution Program total transfer volume (if any), or 9,000 acre-feet, whichever is less, will be provided for supplemental fisheries flows, to be scheduled for any time after May 1 by the River Management Team. Some or all of this water may not be transferable under the 2007 Water Purchase Agreement. At the discretion of the RMT, some or all of this water for supplemental fisheries flows may be scheduled to flow before May 1.

- Schedule 5 years: 10 percent of the Groundwater Substitution Program total transfer volume (if any), or 6,000 acre-feet, whichever is less, will be provided for supplemental fisheries flows, to be scheduled for any time after May 1 by the River Management Team. Some or all of this water may not be transferable under the 2007 Water Purchase Agreement. At the discretion of the RMT, some or all of this water for supplemental fisheries flows may be scheduled to flow before May 1.

If YCWA intends to implement a Groundwater Substitution Program between March 1, 2007 and December 31, 2007, then on or before April 10, 2007 YCWA will provide a preliminary indication of the amount of water that will be transferred as part of the program, and it will prepare a preliminary schedule of the supplemental Lower Yuba River flows that will be used to implement the program after consultation with the River Management Team. On May 1, 2007, YCWA will provide a refinement of the preliminary transfer indication and prepare an update to the flow schedule. If the applicable flow schedule is Schedule 4 or Schedule 5, and if the River Management Team elects to allocate some or all of the 10 percent of the Groundwater Substitution Program total transfer volume described in the immediately preceding paragraph, then that water will be included in the updated flow schedule and will be provided by YCWA. If the final Groundwater Substitution Program amount is less than the amount planned for in the May 1 update and the some or all of the additional water that is required by this section already has been released, then that additional water will not be counted for as part of the Groundwater Substitution Program amount.

Unless otherwise agreed to by the River Management Team, the implementation schedule for the Groundwater Substitution Program will become final no later than May 15, 2007, unless the applicable flow schedule, as determined by Exhibits 2-5, changes after May 15, 2007 because of a change in the North Yuba Index.

For all flow schedule years, any Groundwater Substitution Program or surface-water transfer made by YCWA under the Short-Term Phase 8 Bay-Delta Settlement Agreement will be scheduled pursuant to the rules for transfers under that agreement, and any such transfers by Member Units will be subject to the rules for those transfers. Such transfers by YCWA or Member Units will not be subject to the above rules in this Agreement for Surface Water Supplemental Transfers or Groundwater Substitution Programs. YCWA will notify the RMT of any planned transfer under the Short-Term Phase 8 Bay-Delta Settlement Agreement as far in advance of the transfer as possible.

5.2 *River Management Team*

The River Management Team will consist of a Planning Group and an Operations Group. The Planning Group will include representatives of each Party to this Agreement and the 2007 Water Purchase Agreement, NOAA Fisheries, USFWS and PG&E. The Operations Group will include one representative each of: (a) YCWA; (b) PG&E; (c) CDFG, NOAA Fisheries and USFWS, where the one representative will rotate between these three agencies; (d) the NGO's; and (e) DWR and Reclamation, where one representative will rotate between these two agencies.

The Planning Group will hold regularly scheduled meetings with prior notification of agenda items, and it may hold special meetings as needed. The Planning Group's authority will be limited to the actions described in section 5.2.1.

The Operations Group will meet and hold conference calls as necessary to carry out the actions listed in section 5.2.2. The Operations Group's authority will be limited to the actions described in section 5.2.2.

If necessary to carry out its functions, the Planning Group may convene a Technical Working Group, which will include such members as the Planning Group may appoint. Each Planning Group principal representative may designate one or more secondary representative or representatives who may participate in the Planning Group discussion of a given issue. Each Operations Group member may designate at their discretion additional technical experts to participate in the Operations Group's discussions of issues.

5.2.1. Planning Group Actions

The Planning Group may take any of the following actions:

1. set the flow schedule for the 30,000 acre-feet of Groundwater Substitution Program water that will occur if 2007 is a Schedule 6 year;
2. decide to temporarily alter the applicable instream flow requirements in Schedules 1-6, subject to the conditions described in Section 5.1.4, if necessary or appropriate for the aquatic resources, Yuba Project operations or maintenance, or SWP or CVP operations or maintenance;
3. decide, if 2007 is a Schedule 5 year, to adjust the Marysville Gage instream-flow requirements to 400 cfs during all or part of the period from October 1 until the February Bulletin 120 forecasts are available, when it is authorized to do so under Exhibit 3.
4. schedule any water made available for supplemental instream flows in connection with a Groundwater Substitution Program (as specified in section 5.1.8);
5. determine the planned operations of the upper and lower outlets from New Bullards Bar Dam into the New Colgate Penstock and any temperature adjustment device that is constructed at Englebright Dam;
6. develop and implement studies of Lower Yuba River fish or fish habitat, monitoring of flows or water temperatures, or fry studies.
7. make decisions to spend money in the River Management Fund for any authorized purpose;
8. comment on YCWA's plans for Narrows I and II Powerhouse maintenance outages.

Only the Parties to this Agreement, NOAA Fisheries and the USFWS will participate in making formal decisions on Planning Group actions 1 through 7 above. Decisions on these actions will be made by unanimous consent of the parties and entities named in the preceding sentence, and section 6.6 of this Agreement, which details a specific alternative dispute resolution process, will apply as necessary. Parties to this Agreement, NOAA Fisheries and the USFWS will consult with DWR, Reclamation and PG&E on these actions as necessary and appropriate through the RMT Planning Group process.

The RMT Participants In RMF Issues will select five mutually agreeable fisheries experts and five mutually agreeable mediators for the purposes of dispute resolution, as described in Section 6.6. For both selection processes, the RMT Participants In RMF Issues will take into account candidates' cost, skill, and demonstrated record of success in resolving similar disputes. Either list of five experts may be modified as necessary, but only upon unanimous written consent of the RMT Participants In RMF Issues.

Any agreement on Planning Group action 2 or 3 (temporary flow alterations) will be presented to the Chief of the Division of Water Rights of the SWRCB. If the Chief of the Division of Water Rights does not object to the alterations within 10 calendar days, the alterations will remain in effect.

Subject to the preceding provisions, any Party may take any action that it is authorized to take that does not violate this Agreement or any applicable regulatory requirement.

5.2.2. Operations Group Actions

The Operations Group will provide specific guidance to YCWA for YCWA's implementation of:

1. the flow schedule set by the Planning Group for the 30,000 acre-feet of Groundwater Substitution Program water if 2007 is a Schedule 6 year;
2. any temporary alterations in the applicable instream flow requirements in Schedules 1-6 that have been agreed to by the Planning Group;
3. any supplemental instream flows that have been scheduled by the Planning Group in connection with a Groundwater Substitution Program;
4. any Planning Group decisions regarding the operations of the upper and lower outlets from New Bullards Bar Dam into the New Colgate Penstock or any temperature adjustment device that is constructed at Englebright Dam; and
5. any other recommendations or directions from the Planning Group to the Operations Group.

The Operations Group will act only upon unanimous consent of all of its members and in the absence of such unanimous consent will act pursuant to section 6.7, which details a specific dispute resolution process. Any agreement on Operations Group action 2 (temporary flow alterations) will be presented to the Chief of the Division of Water Rights of the SWRCB. If the Chief of the Division of Water Rights does not object to the alterations within 10 calendar days, the alterations will remain in effect.

Subject to the preceding provisions, any Party may take any action that it is authorized to take that does not violate this Agreement or any applicable regulatory requirement.

Parties to this Agreement acknowledge that the Operations Group's actions and efforts are time sensitive and will often be made in real-time or close to real-time situations.

5.3 *River Management Fund*

5.3.1. YCWA Funding of Ongoing Studies and Data Collection. YCWA will continue to directly fund certain data collection activities and studies on the Lower Yuba River. Specifically, YCWA will continue to fund the collection of flow and water temperature data required by paragraph 5 on page 179 of RD-1644. Additionally, YCWA will continue to fund and conduct the redd dewatering and fry stranding studies required by paragraph 7 on page 180 of RD-1644, through the completion of the study plan that has been submitted to the SWRCB.

5.3.2. YCWA Funding of RMF. In 2007, YCWA will provide funding to the River Management Fund (RMF). The RMF will consist of a "General Account." Money from the General Account may be used for any of the purposes described in section 5.3.4.

YCWA will contribute $550,000 for 2007 to the RMF, General Account. This contribution amount and the following in-kind contributions together make a total estimated budget of $628,500 per year for core monitoring and focused studies during the projected entire period of this Agreement and the Fisheries Agreement, reduced by: (a) in-kind contributions of $50,000 per year or more (average) from CDFG; (b) in-kind contributions of $15,000 per year or more (average) from YCWA; and (c) average savings of $15,000 per year over the term of the Yuba Accord from discontinuing the Chinook salmon carcass surveys in the Lower Yuba River upstream of Daguerre Point Dam after 2010. In-kind contributions from YCWA and CDFG may be in the form of labor, materials, or equipment, and must be documented as costs that otherwise would be paid from the RMF, General Account.

The contribution to the RMF for 2007 will be subject to YCWA's transfer of water and receipt of funds pursuant to the 2007 Water Purchase Agreement. If less than the full C1 payment amount (as defined in the 2007 Water Purchase Agreement) is paid to YCWA, then the amount of payment to the RMF by YCWA shall be pro-rated by the following formula: the amount contributed by YCWA will be directly pro-rata to the amount received by YCWA in revenues above the first $500,000 (which amount is for YCWA's expenses related to the transfer). For example, if the C1 component payment to YCWA for 2007 is supposed to be $3.0 M, but YCWA actually receives only $2.0 M in payment, then the YCWA contribution to the RMF will be $330,000 ($2.0 M - $500,000 = 1.5 M, $3.0 M - $500,000 = 2.5 M, $1.5M/$2.5M is 60% of $3.0 M, so the contribution is 60% x $550,000 = $330,000). All in-kind contributions (by CDFG & YCWA) also will be subject to this same pro-ration formula.

5.3.3. Participants in RMF Decisions. Only the Parties to this Agreement, NOAA Fisheries and the USFWS will participate in making RMF decisions. Such decisions will be made by unanimous consent of all such parties and entities, or will be made pursuant to section 6.6, which details a specific alternative dispute resolution process.

5.3.4. Purpose of RMF. To ensure reasonable and prudent disbursement of funds, the RMT will adopt a structure for fund allocation based on specific prioritized goals for monitoring, studies, actions and activities. Money from the RMF may be spent for any of the following actions:

1. monitoring and evaluating the effectiveness of the implementation of the Lower Yuba River Accord, including flow schedules, and the Water Purchase Agreement;
2. evaluating the condition of fish resources in the Lower Yuba River;
3. evaluating the viability of Lower Yuba River fall-run Chinook salmon and any subpopulations of the Central Valley steelhead and spring-run Chinook salmon Evolutionarily Significant Units (ESUs) that may exist in the Lower Yuba River;
4. implementing habitat improvement and non-flow enhancement actions and activities;
5. purchasing water for instream flows in the Lower Yuba River above the flows specified in Exhibit 1;
6. retaining expert advice for specific technical questions;
7. retaining an expert or experts for dispute resolution processes; and
8. paying local shares of grant-funded projects for fish or fish habitat in the Lower Yuba River, specifically to facilitate unique grant matching opportunities.

Some of these actions are described in more detail in Appendix A.

5.3.5. Geographic Scope of RMF. Funds from the RMF will only be used for projects in the Lower Yuba River (i.e., downstream of Englebright Dam), unless the RMT Participants In RMF Issues unanimously approve using funds from the RMF in another area.

5.3.6. Activities Excluded from RMF. Funds from the RMF will not be used towards studies pertaining to groundwater basin dynamics, groundwater/surface water interactions or any other study related to the sustainability of groundwater transfers, unless the RMT Participants In RMF Issues unanimously approve using funds from the RMF for such studies. Funds from the RMF will not be used to comply with section 5.3.1.

5.3.7. Recording Responsibilities for RMF Supported Studies. The RMT Participants In RMF Issues will maintain a record, which states: (1) each study conducted; (2) year or years conducted; (3) purpose of study; (4) the data collected, and (5) whether any dispute between members existed regarding study protocol or data. Section 6.8 details a specific dispute resolution process for possible study protocol and data protocol disputes. These ongoing records will be submitted to FERC at appropriate times (e.g., concurrent with YCWA's Notice of Intent to file a new license application and at the expiration of this

Agreement, and at other agreed upon times) in report format prepared collectively by the RMT Participants In RMF Issues. These reports will only contain data and the additional information described in this paragraph and not interpretations or conclusions. To the extent permitted by applicable law, RMT Participants In RMF Issues will support these submissions in the future FERC relicensing.

5.3.8. RMF Fiscal Agent and Reporting. YCWA shall act as fiscal agent for all expenditures from the RMF during the term of this Agreement. At the RMT Planning Group's budget and allocation meeting, the fiscal agent will make a reporting of accounts, including actual expenditures, anticipated expenditures, and unspent allocations. This reporting will include accountings of YCWA's and CDFG's in-kind contributions under Section 5.3.2.

5.3.9. This Section left blank.

5.3.10. This Section left blank.

5.3.11. RMF Remainder Balance. If a remainder balance exists in the RMF General Account at the termination or expiration of this Agreement, and if the Yuba Accord or subsequent Pilot Program agreement is in effect, then any remainder balance will be transferred into the RMF General Account that is established in the Yuba Accord or subsequent Pilot Program agreement. If a remainder balance exists in the RMF General Account at the termination or expiration of this Agreement, and if no Yuba Accord or subsequent Pilot Program agreement is in effect, then any remainder balance of the River Management Fund General Account will be returned to YCWA. This section will survive the termination or expiration of this Agreement.

5.3.12. RMF Ongoing Studies at Termination or Expiration. At the termination or expiration of this Agreement, the RMT Participants In RMF Issues will seek to ensure that ongoing studies that are being funded by the RMF are completed.

5.3.13. Additional CEQA/NEPA Compliance. Any projects that are funded by the RMF will be subject to all applicable requirements of CEQA and NEPA.

5.4 *Miscellaneous*

5.4.1. Duty to Cooperate. The Parties will cooperate in the implementation of this Agreement. The Parties and members of the River Management Team will cooperate in conducting studies, performing monitoring, and conducting all other activities within their control and statutory or regulatory authorities related to implementation of this Agreement and River Management Team tasks.

5.4.2. Duty to Support YCWA Petitions To SWRCB. All of the Parties to this Agreement will actively support before the SWRCB YCWA's petition to change its water-right permits and RD-1644 that is described in section 4.1.

5.4.3. Ramping Rate Commitments. YCWA will comply with the flow ramping requirements that are specified in its FERC License for the Yuba Project as amended by FERC on November 22, 2005..

5.4.4. Grant Funding Commitments. YCWA will continue to diligently pursue grant funding for the Narrows II Powerhouse Intake Extension Project at Englebright Dam. The other Parties to this Agreement will make best reasonable efforts to support and assist YCWA in its pursuit of grant funding for this project, for example, with letters of support regarding submitted grant applications. YCWA will provide a progress report on these efforts in its annual report to the SWRCB.

5.4.5. Monitoring Commitments. YCWA will install and operate automated water temperature recorders in the Lower Yuba River and collect the water-temperature data required by paragraph 5 on page 179 of RD-1644. YCWA will include this data in the reports that it prepares and submits to the SWRCB, as required by paragraph 6 on page 180 of RD-1644. The costs to install and operate such recorders will not be paid from the River Management Fund.

5.4.6. Studies of Fish and Fish Habitat in Lower Yuba River. All Parties to this Agreement will disclose, and coordinate the development and scoping of, any studies regarding or related to fish or fish habitat in the Lower Yuba River with the River Management Team's Planning Group, and will provide the results of these studies (including all raw data) to all of the other Parties, NOAA Fisheries and USFWS. In the spirit of collaboration, as non-parties to this Agreement but participants in the River Management Team, NOAA Fisheries and USFWS agree to disclose and coordinate the development and scoping of any studies regarding or related to fish or fish habitat in the Lower Yuba River with the RMT's Planning Group, and to provide the results of these studies (including all raw data) to all of the Parties to this Agreement.

5.4.7. Redd Dewatering and Fry Stranding Study. YCWA will disclose and coordinate its present redd dewatering and fry stranding studies (which are required by paragraph 7 on page 180 of RD-1644) with the River Management Team's Planning Group, and will provide the results of these studies (including all raw data) to DFG, the NGO's, NOAA Fisheries and USFWS. After YCWA provides these results to these parties, a Technical Working Group of the RMT will develop any appropriate additional data collection procedures, work for additional studies, analysis, conclusions and recommendations.

5.4.8. Temperature Device Operations. The Planning Group of the River Management Team will determine the planned operations of the existing upper and lower outlets from New Bullards Bar Dam into the New Colgate Penstock, and of any new temperature adjustment device that is constructed at the Narrows II Powerhouse. The Operations Group of the River Management Team will provide specific guidance to YCWA for YCWA's implementation of the Planning Group's final decisions regarding the operations of the existing upper and lower outlets from New Bullards Bar Dam into the New Colgate Penstock and any new temperature adjustment device that is constructed at the Narrows II Powerhouse.

5.4.9. This Section left blank.

5.4.10. Annual Report On Implementation Of YFA. YCWA will include reports on implementation of this Agreement in its annual reports to the SWRCB.

5.4.11. Plans For Narrows I and II Powerhouse Maintenance Outages. YCWA will advise the River Management Team regarding any planned maintenance outages of the Narrows I and II Powerhouses and consider any RMT comments regarding these planned outages.

5.4.12 This Section left blank.

6. TERMINATION AND WITHDRAWAL, FORCE MAJEURE EVENTS AND REGULATORY CHANGES AND DISPUTE RESOLUTION

6.1 *Termination and Withdrawal*

6.1.1. Material Violation Of Agreement Flow Schedules. A "Material Violation of Agreement Flow Schedules" is defined as any failure of YCWA to meet any applicable instream-flow requirements described in sections 5.1.1 and 5.1.3 between March 1, 2007 and March 31, 2008 for a period of 10 consecutive calendar days, except for any of the following:

a. a failure to meet these requirements because of a Force Majeure Event or a Regulatory Change Event;
b. a failure to meet these requirements because of an action taken by, or implemented at the request of, the RMT Planning Group or Operations Group;
c. a failure to meet these requirements because of a gauge re-rating or other action taken by the U.S. Geological Survey after the time at which the failure to meet these requirements occurred;
d. before the Narrows II Powerhouse Full Flow Bypass is completed, a failure to meet these requirements because of the limits of the Narrows I Powerhouse flow capacity when the Narrows II Powerhouse is shut down for maintenance or repairs;
e. a failure to meet these requirements because of planned maintenance or construction activities, when the deviation from these requirements has been approved in advance in writing by the Chief of the Division of Water Rights of the SWRCB;
f. a failure to meet these requirements because of an action that was, or actions that were, beyond YCWA's control; and
g. a failure to meet these requirements on any day on which there is a Technical Variation of Agreement Flow Schedules.

(Paragraph f. above does not include actions taken by PG&E to operate the Yuba Project during times when YCWA has authorized PG&E to operate the Yuba Project.)

6.1.2. Notice Of Material Violation Of Agreement Flow Schedules. If any Party to this Agreement besides YCWA believes that there has been a Material Violation of Agreement Flow Schedules, then that Party will so notify all other Parties to this Agreement in writing. Such notice will include all of the Party's reasons for believing that there has been a Material Violation Of Agreement Flow Schedules. YCWA then will have 15 days to respond to the notice. If YCWA disagrees with the notifying Party, then YCWA's response will state all of the reasons for YCWA's disagreement. Within 20 days after such response, the disputing Parties and any other interested Parties will meet at least once to use their best efforts to try to resolve the dispute. If, after such notice and response and any subsequent meetings or discussions among the Parties to this Agreement, the dispute remains unresolved, then any Party to this Agreement may exercise any remedies that it has under section 6.1.3.

6.1.3. Determinations Of A Material Violation Of Agreement Flow Schedules. If the procedures described in section 6.1.2 have been followed for an alleged Material Violation of Agreement Flow Schedules and a dispute remains regarding whether or not such a Material Violation of Agreement Flow Schedules occurred, then any Party to this Agreement may notify the Chief of the Division of Water Rights of the SWRCB that such Party believes that a Material Violation of Agreement Flow Schedules has occurred and ask the Chief of the Division of Water Rights to determine whether a Material Violation of Agreement Flow Schedules actually has occurred. The Party or Parties submitting such a request will include with the request copies of all of the notices and responses that were prepared under section 6.1.2 and any other relevant material.

6.1.4. Remedy For Material Violation of Agreement Flow Schedules. If the Parties to this Agreement agree, or the Chief of the Division of Water Rights of the SWRCB determines, that a Material Violation of Agreement Flow Schedules has occurred, then YCWA will make a one-time payment of $100,000 to the RMF, General Account, in addition to the payments to the RMF that YCWA is required to make under section 5.3.2, and in addition to the payments required by section 6.2.4. YCWA's obligation to make payments under this section will be reduced by the amount of any payment that YCWA must make under Water Code section 1052 for the same day. (If YCWA already has made a payment to the RMF under this section when it makes a payment under Water Code section 1052 for the same day, then YCWA's obligation to make future payments to the RMF will be reduced by the amount of such payment under section 1052.)

For any Material Violation of Agreement Flow Schedules that occurs any time during the May through October control period, in addition to making the payment described in this section, YCWA also will provide an amount of water for supplemental instream flows in the Lower Yuba River equal to the difference in volume between the amount of water required to flow in the Lower Yuba River under any applicable instream-flow requirements described in sections 5.1.1, 5.1.3 and 5.1.5 and the amount of water that actually flowed in the Lower Yuba River on the days on which the Material Violation of

Agreement Flow Schedules occurred. The RMT Participants In RMF Issues will determine the schedule for such supplemental instream flows.

6.1.5. Withdrawal or Termination Because Of CDFG Obligations. When required to fulfill a statutory or regulatory responsibility, CDFG may suspend participation or, if necessary, withdraw from this Agreement, without first using the ADR procedures of this Agreement. However, before suspending participation or withdrawing, CDFG will provide timely notice to all Parties of the need for such suspension or withdrawal, and will make good-faith efforts to work with the other Parties to reach agreement on modifications to this Agreement that would allow the Agreement to remain in effect. If CDFG withdraws from this Agreement under this section, then YCWA may, but is not required to, terminate this Agreement among the remaining Parties. YCWA may make such termination by notifying the other Parties in writing that YCWA has taken such action. However, YCWA may take such action only after first providing the other Parties to this Agreement with notice of its intent to terminate this Agreement and allowing a 30-day period to meet and confer. If this Agreement terminates, then each Party to this Agreement will have full and adequate opportunity to challenge or defend in court any change that the SWRCB makes to YCWA's permits after or as a result of such termination, and no Party will assert that any such challenge or defense is barred or limited by any statute of limitation (including, but not limited to Water Code section 1126), laches, res judicata or collateral estoppel.

6.1.6. No Other Early Terminations. In no circumstance other than under section 6.1.5 or section 6.1.7 will this Agreement terminate early.

6.1.7 Option Of Withdrawal. Any Party to this Agreement may exercise an option to withdraw at its discretion from this Agreement if a second Material Violation of Agreement Flow Schedules has occurred. However, if such withdrawal occurs, then this Agreement will remain in effect among the remaining Parties. If all Parties to this Agreement besides YCWA and CDFG withdraw under this section, and if CDFG withdraws under this section or section 6.1.5, then this Agreement will terminate. If such termination occurs, then the last sentence of section 6.1.5 will apply.

6.1.8. Option Of Withdrawal Relating To Resolution of South Screen Issue. Any signatory to this Agreement may exercise an option to withdraw from this Agreement because resolution of the South Screen issue has not occurred, has been substantially delayed, or is reasonably expected to not occur or be substantially delayed. However, if such withdrawal occurs, then this Agreement will remain in effect among the remaining Parties.

6.2 *Remedies For Material and Non-Material Violations and Technical Variations Of Agreement Flow Schedules*

6.2.1. Non-Material Violation Of Agreement Flow Schedules. A "Non-Material Violation of Agreement Flow Schedules" is defined as any failure of YCWA to meet any applicable instream-flow requirements described in sections 5.1.1 and 5.1.3 between

March 1, 2007 and March 31, 2008 for any period less than 10 consecutive calendar days, except for any of the following:

a. a failure to meet these requirements because of a Force Majeure Event or a Regulatory Change Event;
b. a failure to meet these requirements because of an action taken by the RMT Planning Group or Operations Group;
c. a failure to meet these requirements because of a gauge re-rating or other action taken by the U.S. Geological Survey after the time at which the failure to meet these requirements occurred;
d. before the Narrows II Powerhouse Full Flow Bypass is completed, a failure to meet these requirements because of the limits of the Narrows I Powerhouse flow capacity when the Narrows II Powerhouse is shut down for maintenance or repairs;
e. a failure to meet these requirements because of planned maintenance or construction activities, when the deviation from these requirements has been approved in advance in writing by the Chief of the Division of Water Rights of the SWRCB;
f. a failure to meet these requirements because of an action that was, or actions that were, beyond YCWA's control; and
g. a failure to meet these requirements on any day on which there is a Technical Variation of Agreement Flow Schedules.

(Paragraph f. above does not include actions taken by PG&E to operate the Yuba Project during times when YCWA has authorized PG&E to operate the Yuba Project.)

6.2.2. <u>Remedies For Material and Non-Material Violations Of Agreement Flow Schedules.</u> In the event of a Material or Non-Material Violation of Agreement Flow Schedules, YCWA will make a monetary payment to the River Management Fund, General Account (in addition to all payments required by section 5.3.2), in an amount agreed to by the Parties to this Agreement or determined using the process described in section 6.2.3. If YCWA does not make any payment into the River Management Fund that is required by this section 6.2.2 and the following section 6.2.3 within 30 days after the amount of such payment is agreed to or determined, then interest on that amount will begin to accrue at the rate of interest that YCWA receives on funds in the Local Agency Investment Fund plus the rate of 2 percent per annum (but no higher than any maximum interest rate that YCWA by law may pay) until the payment is made.

6.2.3. <u>Determination Of Non-Material Violation of Agreement Flow Schedules.</u> If any Party believes that there has been a Non-Material Violation of Agreement Flow Schedules, then that Party will notify all of the other Parties to this Agreement in writing. Such notice will include all of the Party's reasons for believing that a violation has occurred. YCWA will have 15 calendar days to respond to the notice. If YCWA disagrees with the notifying Party, then YCWA's response will state all of the reasons for YCWA's disagreement. If, after such notice and response and any subsequent discussions and meetings among the Parties to this Agreement, a dispute remains as to whether or not there has been a Non-Material Violation of Agreement Flow Schedules, then the Parties will randomly select one individual from a previously and mutually agreed upon list of five mediators (described in section 5.2.1). The selected mediator will hold at least one meeting with the disputing Parties (any other interested Party to this Agreement may attend) and attempt to resolve the dispute. If the dispute is not resolved by the end of the meeting or meetings, then the selected mediator will issue a binding opinion resolving the dispute within 15 days after the last meeting.

6.2.4. Payments For Material or Non-Material Violation of Agreement Flow Schedules. For any Material or Non-Material Violation of Agreement Flow Schedules of Agreement Flow Schedules, YCWA will make a payment into the River Management Fund, General Account, in addition to the payments described in section 5.3.2. For each day during which such a violation occurs, the amount of the payment will be $100 times the number of percentage points by which the actual flow was less than the required flow, up to a maximum of $1,000. For example, if the applicable five-day running average requirement on a particular day was 1,000 cfs and the actual five-day running average on that particular day was 970 cfs, then the payment for that day would be $300. (970 cfs is 30 cfs, or 3 percentage points of 1,000, less than 1,000.) As a second example, if the applicable requirement on a particular day was 400 cfs and the actual lowest instantaneous flow on that day was 336 cfs, then the payment for that day would be $600. (90% of 400 = 360; 336 is 24 cfs, or 6 percentage points of 400, less than 360.) In no case will the payment for any one day exceed $1,000. For any Material Violation of Agreement Flow Schedules, YCWA will make both the payment required by this section and the payment required by section 6.1.4. YCWA's obligation to make payments under this section will be reduced by the amount of any payment that YCWA must make under Water Code section 1052 for the same day. (If YCWA already has made a payment to the RMF under this section when it makes a payment under Water Code section 1052 for the same day, then YCWA's obligation to make future payments to the RMF will be reduced by the amount of such payment under section 1052.)

6.2.5. Technical Variations of Agreement Flow Schedules. A "Technical Variation of Agreement Flow Schedules" is defined as any failure of YCWA to meet any applicable instream-flow requirements described in sections 5.1.1 and 5.1.3 between April 1, 2007 and February 28, 2007 during the part of September of any Schedule 1, 2 or 3 Water Year before the Narrows II Powerhouse Full Flow Bypass is in operation when the Narrows II Powerhouse is shut down for normal maintenance, except for any of the following:

a. a failure to meet these requirements because of a Force Majeure Event or a Regulatory Change Event;
b. a failure to meet these requirements because of an action taken by the RMT Planning Group or Operations Group;
c. a failure to meet these requirements because of a gauge re-rating or other action taken by the U.S. Geological Survey after the time at which the failure to meet these requirements occurred;
d. a failure to meet these requirements because of planned maintenance or construction activities; and

e. a failure to meet these requirements because of an action that was, or actions that were, beyond YCWA's control.

(Paragraph e. above does not include actions taken by PG&E to operate the Yuba Project during times when YCWA has authorized PG&E to operate the Yuba Project.) "Technical Variation of Agreement Flow Schedules" does not include any day where the difference between the applicable Marysville Gage requirement and the actual flow at the Marysville Gage is greater than 50 cfs.

6.2.6. <u>Remedies For Technical Variations Of Agreement Flow Schedules.</u> In the event of a Technical Variation of Agreement Flow Schedules, YCWA will make a monetary payment to the River Management Fund, General Account (in addition to all payments required by section 5.3.2), in an amount agreed to by the Parties to this Agreement or determined using the process described in section 6.2.8. If YCWA does not make any payment into the River Management Fund that is required by this section 6.2.6 and the following section 6.2.7 within 30 days after the amount of such payment is agreed to or determined, then interest on that amount will begin to accrue at the rate of interest that YCWA receives on funds in the Local Agency Investment Fund plus the rate of 2 percent per annum (but no higher than any maximum interest rate that YCWA by law may pay) until the payment is made.

6.2.7. <u>Determination Of Technical Variation of Agreement Flow Schedules.</u> If any Party believes that there has been a Technical Variation of Agreement Flow Schedules, then that Party will notify all of the other Parties to this Agreement in writing. Such notice will include all of the Party's reasons for believing that a violation has occurred. YCWA will have 15 calendar days to respond to the notice. If YCWA disagrees with the notifying Party, then YCWA's response will state all of the reasons for YCWA's disagreement. If, after such notice and response and any subsequent discussions and meetings among the Parties to this Agreement, a dispute remains as to whether or not there has been a Technical Variation of Agreement Flow Schedules, then the Parties will randomly select one individual from a previously and mutually agreed upon list of five mediators (described in section 5.2.1). The selected mediator will hold at least one meeting with the disputing Parties (any other interested Party to this Agreement may attend) and attempt to resolve the dispute. If the dispute is not resolved by the end of the meeting or meetings, then the selected mediator will issue a binding opinion resolving the dispute within 15 days after the last meeting.

6.2.8. <u>Payments For Technical Variation of Agreement Flow Schedules.</u> For any Technical Variation of Agreement Flow Schedules of Agreement Flow Schedules, YCWA will make a payment into the River Management Fund, General Account, in addition to the payments described in section 5.3.2. For each day during which such a violation occurs, the amount of the payment will be $100 times the number of percentage points by which the actual flow was less than the required flow, up to a maximum of $1,000. For example, if the applicable five-day running average requirement on a particular day was 500 cfs and the actual five-day running average on that particular day was 460 cfs, then the payment for that day would be $800. (460 cfs is 40 cfs, or 8 percentage points of 500, less than 500.) As a second example, if the applicable requirement on a particular day was 500 cfs and the actual lowest instantaneous flow on that day was 430 cfs, then the payment for that day would be $400. (90% of 500 = 450; 430 is 20 cfs, or 4 percentage points of 500, less than 450.) In no case will the payment for any one day under the preceding sentences of this section exceed $1,000. However, if Technical Variations of Agreement Flow Schedules occur for 10 consecutive days, then, in addition to making the payments described in the preceding sentences of this section, YCWA also will make a one-time payment of $20,000. YCWA's obligation to make payments under this section will be reduced by the amount of any payment that YCWA must make under Water Code section 1052 for the same day. (If YCWA already has made a payment to the RMF under this section when it makes a payment under Water Code section 1052 for the same day, then YCWA's obligation to make future payments to the RMF will be reduced by the amount of such payment under section 1052.)

6.2.9 <u>Provision Of Make-up Water For Non-Material Violation or Technical Variation of Agreement Flow Schedules</u>. For any Non-Material Violation of Agreement Flow Schedules that occurs any time during the May through October control period, in addition to making the payments described in section 6.2.4, and for any Technical Variation of Agreement Flow Schedules, in addition to making the payments described in section 6.2.8,YCWA also will provide an amount of water for supplemental instream flows in the Lower Yuba River equal to the difference in volume between the amount of water required to flow in the Lower Yuba River under any applicable instream-flow requirements described in sections 5.1.1, 5.1.3 and 5.1.5 and the amount of water that actually flowed in the Lower Yuba River on the days on which Non-Material Violations of Agreement Flow Schedules or Technical Variations of Agreement Flow Schedules occurred. The RMT Participants In RMF Issues will determine the schedule for such supplemental instream flows.

6.2.10. <u>No Effect On CDFG's Remedies Under California Endangered Species Act.</u> Nothing in this Agreement will affect CDFG's remedies under the California Endangered Species Act (California Fish and Game Code §§ 2050-2115.5).

6.3 *Non-payment by Water Purchase Agreement Transferees*

In the event of non-payment by the Water Purchase Agreement transferees to YCWA of any amount of money due to YCWA under the Water Purchase Agreement, the Parties to this Agreement may use the process described in section 6.5 to consider modifications to YFA flow schedules. However, the SWRCB must approve any proposed modifications to YFA flow schedules before they will go into effect and YCWA may not unilaterally request relief from, amend or terminate this Agreement because of such non-payment.

6.4 *Force Majeure or Regulatory Change Events*

6.4.1. <u>Force Majeure Event</u>. A Force Majeure Event is defined as an event, including but not limited to, a natural event, a labor or civil disruption, or a breakdown or failure of a Yuba Project, PG&E, Corps of Engineers or U.S. Geological Survey component or facility, where the event: (a) is in the Yuba River watershed or directly affects a component of PG&E's electricity transmission system, (b) is reasonably beyond YCWA's control, and (c) significantly affects YCWA's ability to comply with any provision of this Agreement. No party will be liable to any other Party for breach of this Agreement due to such a Force Majeure Event. For the purposes of this Agreement, Force Majeure Events do not include events that just affect the operations of SWP or CVP facilities and do not also directly affect Yuba Project operations.

6.4.2. <u>Regulatory Change Event</u>. A Regulatory Change Event is defined as a new court order or regulatory action (including, but not limited to, a regulatory action under the federal Endangered Species Act or the California Endangered Species Act) that requires YCWA to make a Significant Change in YCWA's operations of the Yuba Project. A regulatory change in or regarding the Delta that is not specifically directed to YCWA, or that does not specifically require YCWA to make any Significant Change in YCWA's operations of the Yuba Project, is not a Regulatory Change Event for the purposes of this Agreement.

6.4.3. <u>Force Majeure Event or Regulatory Change Event</u>. In the event of a Force Majeure Event or a Regulatory Change Event that affects YCWA's operations of the Yuba Project or YCWA's ability to comply with section 5.1.1 or 5.1.3, the RMT will work to try to reach consensus, as needed, on an alternative flow schedule for the relevant time period. If the RMT cannot reach a consensus solution, then it will adhere to the ADR procedure in Section 6.4.5 to attempt to resolve the dispute and find a consensus solution.

If the Parties still have not reached consensus after using the ADR procedures in section 6.4.5, then any Party to this Agreement may ask a court of competent jurisdiction (subject to the rules in the second paragraph of section 5.1.2) to determine whether the underlying event is a Force Majeure Event or Regulatory Change Event that triggers the need for an alternative flow schedule. If the court determines the underlying event is not such a triggering event, then the relevant instream-flow requirements specified in section 5.1.1 or 5.1.3 will continue to be implemented. If the court determines that the underlying event is such a triggering event, then it will determine the appropriate relief. In this case, this Agreement will remain in effect, but subject to the court's order.

6.4.4. <u>This Section left blank</u>

6.4.5. <u>Dispute Resolution—ADR For Sections 6.4.3</u>. If YCWA's performance under this Agreement is affected by a Force Majeure Event or Regulatory Change Event, then YCWA will notify the other Parties to this Agreement in writing within 5 days after becoming aware of any such event. Such notice will: (a) identify the event; (b) estimate the anticipated period that the event will affect YCWA's performance under this Agreement; (c) state the measures that YCWA has taken or proposes to take to address the event; and (d) state the estimated timetable for implementation of such measures. The Parties to this Agreement then will meet and confer within 5 days of receipt of such notice. If any Party makes a request for mediation under this section 6.4.5 to assist in resolving the problem presented because of the change in condition, parameter, assumption, knowledge, or circumstance, then the Parties will use their best efforts to negotiate a temporary or permanent change to this Agreement as needed, undertake these ADR provisions, and try to resolve the problem presented without electing to invoke section 6.4.3.

The costs to engage a mediator or fishery expert under these disputes, who will be randomly selected from the previously mutually agreed upon list or lists, will be divided on a pro rata sharing of costs. Each Party will bear their own costs to participate in this ADR procedure for these disputes. If mediation is not successful and the Parties cannot agree on how to resolve the problem within 10 days of the notice, then the relevant provisions of section 6.4.3 will apply.

6.5 *Dispute Resolution—General ADR for River Management Team*

For all disputes involving the RMT, regardless of category, Parties and members of the River Management Team (Planning and Operations Groups) will adhere to the following process. Each Party or member with authority to participate in making the applicable decision will make reasonable efforts to reach consensus on every matter relevant to the decision. Consensus is defined as unanimous consent of all such Parties and members. If such a Party or member does not agree with a decision proposed by another such Party or member, then the disagreeing Party or member will propose an alternative to resolve the matter. If such Parties or members still are unable to agree on one or more matters, then any non-agreeing Party or member will provide notice to the entire group (Planning Group and/or Operations Group, as relevant) as soon as possible, and not later than 5 days after attempting to resolve the matter, that a dispute exists and specifying in reasonable detail the nature of such dispute and steps taken to date to resolve the dispute.

Within 20 days after the notice of a dispute, the disputing Parties and members (and any other interested Parties) will meet at least once to use their best efforts to try to resolve the dispute. At the end of the meeting or meetings, if the dispute remains unresolved, the Parties and members will submit the dispute to non-binding mediation. However, this provision does not apply to Operations Group disputes (see section 6.7) and River Management Team disputes solely regarding study protocol or data collection (see section 6.8), as discussed below. All Parties and members will make all reasonable good faith and best efforts to promptly schedule and attend such meetings and devote the needed time and resources to resolve any dispute in lieu of mediation.

6.6 *Dispute Resolution—Planning Group*

6.6.1. <u>Disputes Regarding Planning Group Action 4</u>. For disputes regarding Planning Group action 4, if the RMT Participants In RMF Issues cannot resolve the dispute, then they will ask the SWRCB to resolve the dispute.

6.6.2. <u>Disputes Regarding Planning Group Actions 5-7</u>. If after 20 days to meet and confer, the RMT Participants In RMF Issues have not reached consensus on a disputed matter related to a decision on any action described in Planning Group actions 5-7, then the parties will submit the dispute to non-binding mediation, within 25 days after the initial notice of dispute.

Within 30 days after the initial notice of dispute, the RMT Participants In RMF Issues will randomly select one individual from the previously and mutually agreed upon list of five fishery biology experts. The selected expert will hold at least one meeting with the disputing parties (other interested parties may attend) and attempt to resolve the dispute. If the dispute is not resolved at the end of the meeting or meetings, then the selected expert will issue a non-binding opinion to try to resolve the dispute, within 60 days of the initial notice of dispute, unless additional time is requested by the expert and the RMT Participants In RMF Issues unanimously agree to the additional time. Unless otherwise agreed, the RMT Participants In RMF Issues will implement promptly any final agreement reached after consideration of the opinion issued, subject to applicable law. If 90 days after the initial dispute is noticed (plus any additional time requested and approved) the RMT Participants In RMF Issues have not resolved the dispute, then the dispute will be resolved as follows.

(1) For disputes regarding Planning Group actions 5 and 6, the expert opinion that sought to resolve the dispute and any minority opinion that captures the disagreement with the expert opinion and a narrative explaining the two opinions and the process used to reach them will be submitted to the SWRCB along with a request that the Chief of the Division of Water Rights resolve the matter by selecting between the expert and minority opinion.

(2) For disputes regarding Planning Group action 7, the expert opinion will be implemented

In no circumstance will a dispute under this section result in termination of, or any Party's withdrawal from, this Agreement. Fees and costs of such fishery expert or mediator under this section will be paid from the River Management Fund. Each RMT Participant In RMF Issues will bear its own costs for participation in these ADR procedures.

6.6.3. Disputes Regarding Planning Group Actions 1-3. If after 20 days to meet and confer the RMT Participants In RMF Issues have not reached consensus on a disputed matter related to a decision on any action described in Planning Group actions 1-3, then the RMT Participants In RMF Issues will submit the dispute to non-binding mediation, within 25 days after the initial notice of dispute.

Within 30 days after the initial notice of dispute, the RMT Participants In RMF Issues will randomly select one individual from the previously and mutually agreed upon list of five mediators. The selected mediator will hold at least one meeting with the disputing parties (other interested parties may attend) and attempt to resolve the dispute. If the dispute is not resolved at the end of the meeting or meetings, then the selected mediator will issue a non-binding opinion to try to resolve the dispute, within 60 days of the initial notice of dispute. For such disputes, no extensions for the opinion will be allowed.

Unless otherwise agreed, the RMT Participants In RMF Issues will implement promptly any final agreement reached after consideration of the opinion issued, subject to applicable law.

If 65 days after the initial dispute is noticed the RMT Participants In RMF Issues have failed to resolve the dispute, then the matter will be resolved as follows.

(1) For Planning Group action 1: the 30,000 acre-feet of Groundwater Substitution Program water will be allocated to flow during the portions of June through August in which such water is transferable, with the allocation of the 30,000 acre-feet being made in proportion to the applicable Schedule 6 flows;

(2) For Planning Group action 2 or 3: the action will not occur.

In no circumstance will a dispute under this section 6.6.3 result in termination of, or any Party's withdrawal from, this Agreement. Fees and costs of such mediation in this category will be paid from the River Management Fund. Each Party will bear its own costs for participation in the ADR procedures. For any matter in Section 6.6 for which the parties are to randomly select a fisheries expert, the relevant parties instead may unanimously agree to randomly select a mediator, and for any matter for which the parties are to randomly select a mediator, they instead may unanimously agree to randomly select a fisheries expert.

6.7 *Dispute Resolution—Operations Group*

The Operations Group will not have the authority to refuse to recommend implementation of Planning Group directions, unless implementation will occur during the "delivery season" from June 1 to November 1. The Operations Group will strive for consensus during the winter season. During the "delivery season," the Operations Groups will determine how to recommend implementation of Planning Group directions based on consensus.

However, Parties to this Agreement and other River Management Team members acknowledge that the Operations Group has discretion to determine how to recommend implementation of Planning Group directions. Parties and RMT members further acknowledge that the Operations Group will be exercising this discretion often on a real-time or close to real-time basis. Moreover, because of YCWA's ultimate responsibility for Yuba Project operations, the ultimate decision for implementation of Operation Group actions rests with YCWA's discretion. In the absence of consensus among participants, YCWA will take the appropriate actions to implement the applicable Planning Group decision to the fullest extent possible. Whenever possible (and the Parties expect that it will be possible most of the time), YCWA will provide notice of the proposed appropriate action and allow a 24-hour window for other members to reply or object before it acts. In the event that consensus does not exist on a given matter and YCWA unilaterally takes action as a last resort, the Operations Group will subsequently prepare an annual report for the Planning Group summarizing: (a) the dispute, (b) the final action taken, (c) any minority opinions, and (d) proposals for avoiding the dispute in the next planning and operations decision-making cycle. Best efforts will be made to implement a proposal to avoid future disputes.

In no circumstance will a dispute under this section result in termination of, or any Party's withdrawal from, this Agreement, unless section 6.1.5 or section 6.1.7 applies.

6.8 *Dispute Resolution—River Management Team Study Protocols or Data Protocols*

The Parties to this Agreement intend that their monitoring and data-collection actions will produce a useful database for the FERC relicensing and to evaluate the biological provisions of this Agreement. If the dispute-resolution provisions in sections 6.5 and 6.6.2 do not resolve disputes regarding study protocols or data-collection protocols or data collection, then any RMT participant may request that its disagreement with, or dispute regarding, a study or data-collection protocol or data collection for a study or data collection that is being funded or is going to be funded by the RMT be recorded.

During the future FERC relicensing, a RMT participant's disagreement with or dispute regarding the study protocol or data-collection protocol or a particular study or monitoring effort conducted under the RMT's responsibility during the term of this Agreement will be limited to the disagreements or disputes that the member previously raised, unless a participant makes a reasonable showing that the accepted scientific approach regarding the relevant protocol has materially changed in the time between when the original disagreement or dispute was raised and the FERC relicensing. This paragraph applies only to study protocols and data collection protocols, and not to issues regarding the interpretation or significance of data collected under those protocols, or to data collection, or to any other issue a RMT participant may wish to comment on in the FERC relicensing.

7. GENERAL PROVISIONS

7.1. Representation By Counsel. This Agreement is entered into freely and voluntarily. The Parties acknowledge that they have been represented by counsel of their own choice, or that they have had the opportunity to consult with counsel of their own choosing, in the negotiations that preceded the execution of this Agreement and in connection with its preparation and execution. Each of the Parties executes this Agreement with full knowledge of its significance and with the express intent of effecting its legal consequences.

7.2. Entire Agreement. This Agreement constitutes the entire agreement between the Parties pertaining to the settlement of disputes and obligations between them. This Agreement supersedes all prior and contemporaneous agreements, representations and/or obligations concerning those obligations, which are merged into this Agreement. This

Agreement is made on the understanding that each term is in consideration and support of every other term, and each term is a necessary part of the entire agreement.

7.3. Applicable Law. This Agreement will be construed under and will be deemed to be governed by the laws of the State of California and of the United States, without giving effect to any principles of conflicts of law if such principles would operate to construe this Agreement under the laws of any other jurisdiction.

7.4. Construction of Agreement. This Agreement is the product of negotiation and preparation by and among the Parties and their attorneys. Therefore, the Parties acknowledge and agree that this Agreement will not be deemed to have been prepared or drafted by any one Party or another. Accordingly, the normal rule of construction to the effect that any ambiguities are to be resolved against the drafting party will not be employed in the interpretation of this Agreement.

7.5. Modification of Agreement. No supplement, modification, waiver, or amendment of this Agreement will be binding unless executed in writing by the Party against whom enforcement of such supplement, modification, waiver or amendment is sought.

7.6. Counterparts of Agreement. This Agreement may be signed in any number of counterparts by the Parties hereto, each of which will be deemed to be an original, and all of which together will be deemed one and the same instrument. This Agreement, if executed in counterparts, will be valid and binding on a party as if fully executed all on one copy. Counterpart executions may be made by facsimile.

7.7. Signatories' Authority. The signatories to this Agreement on behalf of all of the Parties hereto warrant and represent that they have authority to execute this Agreement and to bind the Parties on whose behalf they execute this Agreement.

7.8. Effective Date and Location of Execution of Agreement. The Parties hereto deem this Agreement to be signed and of binding legal effect as of the date on which the conditions precedent requirements in Section 4 have been satisfied and last signatory hereto has signed this Agreement. CDFG and the NGOs will execute and enter into this Agreement by signing it in Sacramento County, and this Agreement will be deemed to have been executed in Sacramento County.

7.9. Notices to Parties. Except as otherwise provided, all notices required under or regarding this Agreement will be made in writing addressed as provided in the Party address list attached hereto as Exhibit 11. Such notices will be sent to all Parties still in existence by first-class mail or comparable method of distribution. For purposes of this Agreement, a notice will be effective 7 days after the date on which it is mailed or otherwise distributed. When this Agreement requires notice in less than 7 days, notice will be provided by personal service, telephone, facsimile or electronic mail and will be effective when provided. The Parties will provide notice of any change in the authorized representatives designated in Exhibit 11, and YCWA will maintain the current distribution list of such representations, including addresses, telephone numbers, facsimile numbers and email addresses.

7.10. Federal and State Agency Obligations. Nothing in this Agreement is intended to limit the authority of the federal participants in any provision of this Agreement or the California Resource Agency Parties to fulfill their responsibilities under federal or state law. Moreover, nothing in this Agreement is intended to limit or diminish the legal obligations and responsibilities of the federal participants or the California Resource Agency Parties in any provision of this Agreement. Nothing in this Agreement is intended or will be construed to require the obligation, appropriation or expenditure of any money from the Treasury of the State of California. The Parties acknowledge that CDFG is a state agency and will not be required under this Agreement to expend any appropriated funds unless and until an authorized officer of CDFG affirmatively acts to commit such expenditures as evidenced in writing.

7.11. Successors and Assigns. This Agreement will apply to, and be binding on, the Parties and their successors and assigns. Upon completion of a succession or assignment, the initial Party no longer will be a party to this Agreement. A transferring or assigning Party will provide notice to the other Parties at least 30 days prior to completing such transfer or assignment.

7.12. No Partnership. Except as otherwise expressly set forth herein, this Agreement does not and will not be deemed to make any Party the agent for or partner of any other Party.

7.13. No Precedent. This Agreement is made upon the express understanding that it constitutes a negotiated resolution of the resolved issues stated in Section 1.2. Nothing in this Agreement is intended or will be construed as a precedent with regard to any other proceeding.

7.14. No Effect on YCWA's Water Rights. The only rights granted to the Parties to this Agreement by this Agreement are those expressly set forth in this Agreement. YCWA's maintenance of the instream flows under this Agreement will not confer any appropriative, public trust or other right on any person or entity. Nothing in this Agreement is intended or will be construed to act as a forfeiture, diminution or impairment of any water right of YCWA. The use of water to maintain instream flows under this Agreement will not be evidence of, or be used to try to demonstrate, either the existence of surplus water or the lack of beneficial use of water during the term of this Agreement.

7.15. No Admission. No Party will be deemed to have approved, admitted, accepted, or other otherwise consented to any operation, management, valuation, or other principle underlying or supposed to underlie any of this Agreement's resolved issues, except as expressly provided herein. Nothing in this Agreement will be construed as an admission by any Party that such Party has obligations relative to the protection of fishery or other resources or the maintenance of water quality standards. Similarly, nothing in this

Agreement will be construed to, or used in an effort to attempt to, demonstrate that any of the Parties has surplus water or water which is not being beneficially used by such Party.

7.16. No Waiver. Except as to the matters addressed in this Agreement, no Party will be deemed to have waived or compromised any of its rights that may be available under state or federal law, and no Party will be deemed to have waived or compromised any legal arguments regarding the SWRCB's authority over YCWA's water rights permits. The waiver at any time by any Party of any of its rights under this Agreement with respect to any default or breach will not be deemed to be a waiver with respect to any other default or breach.

Date:____________________ YUBA COUNTY WATER AGENCY

By:______________________________

Date:__________________ CALIFORNIA DEPARTMENT OF FISH AND GAME

By:______________________________

Date:______________________ SOUTH YUBA RIVER CITIZENS LEAGUE

By:_____________________________

Date:_________________ FRIENDS OF THE RIVER

By:_____________________________

Date:____________________ TROUT UNLIMITED

By:_____________________________

Date:_______________________ THE BAY INSTITUTE

By:______________________________

Appendix A

Actions That May Be Funded From River Management Fund

Exhibits

1. Instream Flow Requirements

2. Flow Schedule Year Types

3. Dry Year Storage Adjustment To Instream-Flow Requirements

4. Definition of the North Yuba Index

5. Procedure for Calculating the Forecasted Total Annual Inflow Into New Bullards Bar Reservoir To Calculate North Yuba Index

6. Exhibit not used

7. Exhibit not used

8. Exhibit not used

9. Exhibit not used

10. Yuba River Development Project, Operating Assumptions for Yuba River Fisheries Agreement

11. Addresses of Representatives of Lower Yuba River Fisheries Agreement Parties

12. Exhibit not used

Appendix A

ACTIONS THAT MAY BE FUNDED FROM RIVER MANAGEMENT FUND

The RMF will be used to fund actions in two broad categories: (1) monitoring and evaluation actions; and (2) habitat improvement actions and activities. Monitoring and evaluation may be categorized as either core monitoring or focused studies. The Technical Working Group of the RMT has developed a document titled "*Lower Yuba River Accords, River Management Fund, Monitoring and Evaluation Guidelines*" that outlines the framework for the Yuba Accord monitoring and evaluation program. Habitat improvement may be further segregated into non-flow and flow augmentation actions or activities. The River Management Fund also may be used to: (1) retain expert advice for specific technical questions; and (2) retain an expert or experts for dispute resolution process.

MONITORING AND EVALUATION ACTIONS

Core Monitoring

Core monitoring should achieve at least one of the following objectives: (1) evaluate the effectiveness of implementation of the Yuba Accord, including the Fisheries Agreement flow schedules and the Water Purchase Agreement; (2) obtain data required to evaluate the condition of lower Yuba River fish resources; and (3) evaluate the viability of Lower Yuba River fall-run Chinook salmon and any subpopulations of the Central Valley steelhead and spring-run Chinook salmon ESUs that may exist in the Lower Yuba River.

Core monitoring activities could include, but are not necessarily limited to, estimation of: anadromous salmonid annual escapement (e.g., VAKI, carcass surveys); spawning distribution (redd surveys); abundance and timing of juvenile downstream movement (rotary screw trapping); or juvenile salmonid growth (individual tagging).

The core monitoring program will be developed to assess the condition of individual fish, fish populations and the fish community and the viability of anadromous salmonid populations, and to evaluate the effectiveness of implementation of the Yuba Accord in benefiting the fish resources of the Lower Yuba River. The Technical Team is currently developing draft guidelines to provide a framework for identifying and prioritizing monitoring and evaluation actions to be funded by the RMF. The guidelines being developed are intended to encompass the suite of potential attributes identified for assessing the condition and viability of Lower Yuba River fish resources, and evaluating the effectiveness of implementation of the Yuba Accord in benefiting these resources. The monitoring and evaluation program is anticipated to assess and evaluate a subset of the attributes under development, reflecting a selection process that eliminates those components that are not appropriate or cannot be readily measured through monitoring and evaluation. The attributes presented in the monitoring and evaluation program are intended to provide an initial framework and guidelines for developing the Yuba Accord monitoring and evaluation program.

Core monitoring studies and evaluation activities also will be designed to be relevant to future regulatory processes, including FERC relicensing. The specific core monitoring objectives and studies initially will be identified and developed by the Technical Working Group of the RMT.

Focused Studies

Focused studies may be conducted to provide additional insights into specific issues or areas of concern, to provide guidance or feedback for specific habitat improvement actions, or to provide guidance or feedback for specific adaptive management actions.

Examples of focused studies include, but are not necessarily limited to, juvenile salmonid habitat use, age-specific survival rates, in-river harvest or salmonid genetic analyses.

Focused studies also may be designed to provide baseline information or additional insights for future regulatory processes, including FERC relicensing. Specific objectives for focused studies initially will be identified and developed by the Technical Working Group, and ultimately by the RMT Planning Group.

HABITAT IMPROVEMENT ACTIONS

Habitat improvement actions potentially include a multitude of activities that address ecosystem functions needed to support healthy habitats which, in turn, support Lower Yuba River fish resources. Water quality, water quantity, channel/instream complexity, presence of off-channel habitat and riparian vegetation all contribute to fish resource health. Specific habitat improvement actions will be directed towards improving one, or several, of these or other features in the Lower Yuba River.

Habitat improvement actions will be prioritized based on factors such as their anticipated benefits to instream fisheries production (i.e., their effect on ameliorating previously identified and prioritized anadromous salmonid stressors) and permanence of the improvement action. Each habitat improvement action will have well-defined goals and objectives and will incorporate a monitoring and evaluation plan, as appropriate, developed to determine the effectiveness of the habitat improvement action in attaining specified goals and objectives. Specific habitat improvement actions, and their goals and objectives, initially will be identified and developed by the Technical Working Group, and ultimately by the RMT Planning Group. Habitat improvement actions will be categorized in two areas: (1) non-flow actions; and (2) flow augmentation.

Non-Flow Actions

The non-flow actions category is intended to encompass habitat improvement activities that physically alter Lower Yuba River in-channel or riparian habitats without augmenting streamflows. Non-flow actions may include, but are not necessarily limited to, instream habitat improvements (e.g., spawning gravel augmentation, large woody debris placement), riparian vegetation restoration, and off-channel (e.g., floodplain and side-channel) habitat creation.

Flow Augmentation

Flow augmentation includes purchases of water for flow augmentation in the Lower Yuba River. The total volume of any water that is purchased and the allocation of such water will be specified by the RMT, and will have pre-specified goals and objectives (e.g., increase juvenile transport flows, increase spring-run Chinook salmon spawning flows).

Exhibit 1. Instream Flow Requirements.

Marysville Gage (cfs)

Schedule	OCT		NOV	DEC	JAN	FEB	MAR	APR		MAY		JUN		JUL	AUG	SEP	Total Annual Volume (AF)
	1-15	16-31	1-30	1-31	1-31	1-29	1-31	1-15	16-30	1-15	16-31	1-15	16-30	1-31	1-31	1-30	
1	500	500	500	500	500	500	700	1000	1000	2000	2000	1500	1500	700	600	500	574200
2	500	500	500	500	500	500	700	700	800	1000	1000	800	500	500	500	500	429066
3	500	500	500	500	500	500	500	700	700	900	900	500	500	500	500	500	398722
4	400	400	500	500	500	500	500	600	900	900	600	400	400	400	400	400	361944
5	400	400	500	500	500	500	500	500	600	600	400	400	400	400	400	400	334818
6	350	350	350	350	350	350	350	350	500	500	400	300	150	150	150	350	232155

* Indicated flows represent average volumes for the specified time period. Actual flows may vary from the indicated flows according to established criteria.

* Indicated Schedule 6 flows do not include an additional 30 TAF available from groundwater substitution to be allocated according to established criteria.

Smartville Gage (cfs)

Schedule	OCT		NOV	DEC	JAN	FEB	MAR	APR		MAY		JUN		JUL	AUG	SEP	Total Annual Volume (AF)
	1-15	16-31	1-30	1-31	1-31	1-29	1-31	1-15	16-30	1-15	16-31	1-15	16-30	1-31	1-31	1-30	
A	700	700	700	700	700	700	700	700	-	-	-	-	-	-	-	700	-
B	600	600	600	550	550	550	550	600	-	-	-	-	-	-	-	500	-

* Schedule A used with Schedules 1, 2, 3 and 4 at Marysville.

* Schedule B used with Schedules 5 and 6 at Marysville.

Exhibit 2

Flow Schedule Year Types
Based on the North Yuba Index
For Establishing Required Flows in the Lower Yuba River Fisheries Agreement

The water year hydrologic classification for the Yuba River to determine the flow requirements of Yuba County Water Agency's water right permits shall be based on the North Yuba Index. Determinations of a year's flow schedule year type shall be made in February, March, April, and May and for any subsequent updates.

Flow Schedule Year Type	North Yuba Index Thousand Acre-Feet (TAF)
Schedule 1	Equal to or greater than 1400
Schedule 2	Equal to or greater than 1040 and less than 1400
Schedule 3	Equal to or greater than 920 and less than 1040
Schedule 4	Equal to or greater than 820 and less than 920
Schedule 5	Equal to or greater than 693 and less than 820
Schedule 6	Equal to or greater than 500 and less than 693
Conference Year	Less than 500

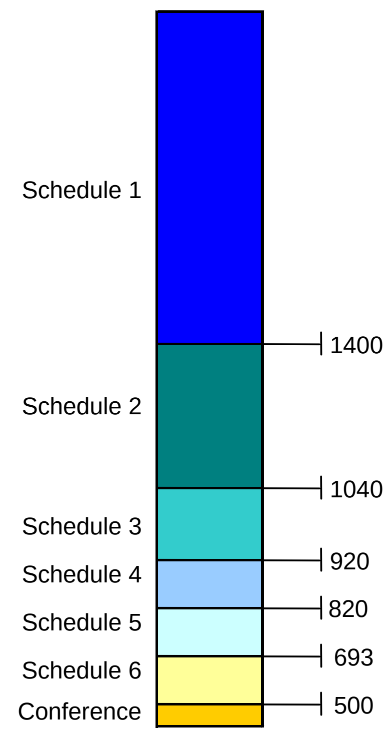

Exhibit 3. Dry Year Storage Adjustments To Instream-Flow Requirements

- In some dry years with Schedule 5 instream-flow requirements, the September 30 New Bullards Bar Reservoir storage may be very low.

- To ensure sufficient carryover storage in the event of a subsequent very dry year, a dry-year storage adjustment will be made.

- The dry-year storage adjustment will be made as follows:

  - If the September 30 New Bullards Bar Reservoir storage is less than 400,000 acre-feet, then the Marysville Gage instream-flow requirement will be 400 cfs from October 1 until the next February Bulletin 120 forecasts are available.

  - If the September 30 New Bullards Bar Reservoir storage is less than 450,000 acre-feet but greater than or equal to 400,000 acre-feet, then, the River Management Team may decide to adjust the Marysville Gage instream-flow requirement to 400 cfs from October 1 until the next February Bulletin 120 forecasts are available.

  - When the next February Bulletin 120 forecasts are available, the instream-flow requirements will be based on those forecasts.

EXHIBIT 4

DEFINITION OF THE
NORTH YUBA INDEX

The North Yuba Index is an indicator of the amount of water available in the North Yuba River at New Bullards Bar Reservoir that can be utilized to achieve flows on the Lower Yuba River through operations of New Bullards Bar Reservoir. The index is comprised of two components: (1) active storage in New Bullards Bar Reservoir at the commencement of the current water year and; (2) total inflow to New Bullards Bar Reservoir for the current water year, including diversions from the Middle Yuba River and Oregon Creek to New Bullards Bar Reservoir. The following is the definition of the index and the procedure for determining the index for each water year.

$$\textbf{North Yuba Index} = Sa^{NBB} + I^{NBB}$$

Where:

Sa^{NBB} = New Bullards Bar Reservoir Active Storage

The New Bullards Bar Reservoir Active Storage for determining the current year North Yuba Index equals the actual recorded amount of water in storage in New Bullards Bar Reservoir on September 30th of the previous water year minus the Federal Energy Regulatory Commission Project License minimum pool amount of 234,000 acre-ft.

and:

I^{NBB} = Forecasted Total Annual Inflow To New Bullards Bar Reservoir

The Forecasted Total Annual Inflow To New Bullards Bar Reservoir shall be based on actual inflow to date to New Bullards Bar Reservoir, including the diversions from the Middle Yuba River and Oregon Creek plus forecasted inflow for the remainder of the water year, where such forecast is based on the Department of Water Resources 50%-exceedance forecast of unimpaired flow contained in Bulletin-120 at the beginning of each month from February until May or June, with periodic updates. The procedure for determining the Forecasted Total Annual Inflow To New Bullards Bar Reservoir is described in Exhibit 5, which is entitled "*Procedure for Calculating the Forecasted Total Annual Inflow Into New Bullards Bar Reservoir*".

Determination of the North Yuba Index for a water year shall be made based on 50%-exceedance estimates of unimpaired runoff as published in California Department of Water Resources Bulletin 120 beginning in February and updated in March, April and May, and any subsequent updates. The year type for the preceding water year shall remain in effect until the initial forecast of unimpaired runoff for the current year is available.

Exhibit 5
Procedure for Calculating the Forecasted Total Annual Inflow Into New Bullards Bar Reservoir To Calculate North Yuba Index

The forecasted total inflow into New Bullards Bar Reservoir shall be calculated starting in February and updated periodically, but no less than monthly, until May. If a June updated Bulletin 120 forecast or any post May 1 update is published by the Department of Water Resources, then an updated forecast of total inflow to New Bullards Bar Reservoir shall be calculated as described below.

The forecasted total inflow into New Bullards Bar Reservoir is based on two main components: (1) the actual measured inflow into New Bullards Bar Reservoir to date; plus (2) the Bulletin 120 based calculation of forecasted inflow for the remainder of the water year. The following formula shall be used to calculate the forecasted total inflow to New Bullards Bar Reservoir (NBBR):

I^{NBB} (TAF) = Total Actual Inflow to NBBR from October 1 to the end of Month^{i-1} + Forecasted Inflow from the beginning of Month^{i} to September 30

(Month^{i-1} is the previous month and Month^{i} is the current month)

Where:

Total actual inflow to NBBR is the calculated inflow based on a daily summation of inflow for the month as follows:

Total Actual Inflow to NBBR (TAF) = Monthly change in stored water (TAF) + Monthly outflow (TAF)

and where:

The forecasted inflow from the beginning of Month^{i} to September 30 is calculated using statistically derived linear coefficients applied to the measured inflow into New Bullards Bar reservoir and the Bulletin 120 published 50%-exceedance forecasts of unimpaired flow of the Yuba River at Goodyears Bar and at Smartville, and for the time periods identified in the following table:

Table 1. Coefficients For the Calculation of Forecasted New Bullards Bar Inflow (AF)

Forecast Month	Forecasted For:	Constant (C)	Total Actual Inflow to NBBR (C1)	Bulletin 120 Forecasted Smartville (C2)	Bulletin 120 Forecasted Goodyear's Bar (C3)
February	February	-2,146	0.01424	0.52533	
	March	-3,221	0.02458	0.54787	
	April-July	-30,416	0.01413	0.62473	-0.24081
	August-September	-	0.01593	0.64037	
March	March	-23,495	0.00596	0.55386	
	April-July	-31,134	0.01237	0.62162	-0.23266
	August-September	-	0.01473	0.59396	
April	April-July	-30,665	0.00547	0.61332	-0.19623
	August-September	-	0.01409	0.53241	
May	April-July	-31,652	0.01033	0.61645	-0.22353
	August-September	-	0.01298	0.50071	

For all subsequent forecast updates the May coefficients shall be used, with the forecasted Goodyears Bar runoff equaling 0.273 times the current forecasted Yuba River unimpaired flow at Smartville.

The following procedure shall be used to calculate the Forecasted New Bullards Bar Inflow:

The general formula for Forecasted New Bullards Bar Inflow is:

Forecasted NBB Inflow[i] = February NBB Inflow + March Inflow + April-July Inflow + August-September Inflow

Formula terms are only applicable as shown in Table 1. As an example, the March forecast does not include a term for forecasted February NBB Inflow. The following formulas shall be used to calculate the terms of the formula above using the corresponding coefficients from Table 1 *(Note terms are calculated in AF and the result is converted to TAF for use in the calculation of the Forecasted Total Inflow to New Bullards Bar (I^{NBB} (TAF))*:

February NBB Inflow = C + C1 x Total Actual Inflow to NBB + C2 x Forecasted Smartville$^{(\text{February})}$

March NBB Inflow = C + C1 x Total Actual Inflow to NBB + C2 x Forecasted Smartville$^{(\text{March})}$

April – July Inflow = C + C1 x Total Actual Inflow to NBB + C2 x Forecasted Smartville$^{(\text{April - July})}$ + C3 x Forecasted Goodyears Bar$^{(\text{April - July})}$

August - September Inflow = C1 x Total Actual Inflow to NBB + C2 x Forecasted Smartville$^{(\text{August - September})}$

("Forecasted Smartville" is the DWR forecast for "Yuba River at Smartville Plus Deer Creek")

The May calculation of Forecasted NBB Inflow and subsequent updated calculations shall be reduced by the actual NBB inflow between April 1 and the calculation date.

Example calculation of the North Yuba Index for February 1, 2003:

Excerpt from February 2003 DWR Bulletin -120:

FEBRUARY 1, 2003 FORECASTS
APRIL-JULY UNIMPAIRED RUNOFF

HYDROLOGIC REGION and Watershed	Unimpaired Runoff in 1,000 Acre-Feet					
	HISTORICAL			FORECAST		
	50 Yr Avg	Max of Record	Min of Record	Apr-Jul Forecasts	Pct of Avg	80 % Probability Range
Yuba River						
North Yuba below Goodyears Bar	286	647	51	240	84%	
Yuba River at Smartville Plus Deer Creek	1,044	2,424	200	900	86%	510-1,560

FEBRUARY 1, 2003 FORECASTS (CONT'D)
WATER YEAR UNIMPAIRED RUNOFF

Unimpaired Runoff in 1,000 Acre-Feet													
HISTORICAL			DISTRIBUTION								FORECAST		
50 Yr Avg	Max of Record	Min of Record	Oct Thru Jan*	Feb	Mar	Apr	May	Jun	Jul	Aug & Sep	Water Year Forecasts	Pct of Avg	80% Probability Range
564	1,056	102											
2,459	4,926	369	675	255	300	360	380	130	30	30	2,160	88%	1,510-3260

*Unimpaired runoff in prior months based on measured flows

From the published Bulletin-120 information, and from historical gaged date for New Bullards Bar Reservoir, the North Yuba Index can be calculated as follows:

1) The end-of-September 2002 New Bullards Bar Reservoir Storage (from USGS gage number 11413515) is 532,088 acre-feet.

2) From end-of-October, November, December, and January New Bullards Bar storage figures and monthly reservoir releases (from USGS gages 11413510 and 11413520), the total inflow to New Bullards Bar between October 1, 2002 and January 31, 2003 is 387,302 acre-feet.

3) Using the B-120 information and the inflow to date, the forecasted February inflow is calculated as follows:

   Inflow = C + C1*(Oct-Jan Inflow) + C2*(B120 Forecasted Flow at Smartville for February)

   Forecasted February Inflow = -2,146 + 0.01424 (387,302) + 0.52533 (255,000) = 137,328 acre-feet

4) The forecasted March inflow is calculated as follows:

   Inflow = C + C1*(Oct-Jan inflow) + C2*(B120 Forecasted Flow at Smartville for March)

   Forecasted March Inflow = -3,221 + 0.02458 * (387,302) + 0.54787 * 300,000 = 170,660 acre-feet

5) The forecasted April-July inflow is calculated as follows:

   Inflow = C + C1*(Oct-Jan Inflow) + C2*(B120 Forecasted Flow at Smartville for April-July) + C3*(Forecasted Flow at Goodyear's Bar for April-July)

   Forecasted April-July Inflow = -30,416 + 0.01413 * (387,302) + 0.62473 * (900,000) + -0.24081 * (240,000) = 479,519 acre-feet

6) The August and September inflows are calculated as follows:

   Inflow = C1*(Oct-Jan Inflow) + C2*(Forecasted flow at Smartville for August and September)

   Forecasted August and September Inflow = 0.01593 * (387,302) + 0.64037 * (30,000) = 25,381 acre-feet

7) The North Yuba Index for 2003, as calculated for February 1, 2003, is:

Active NBB Storage + Actual Inflow (Oct – Jan) +forecasted Feb Inflow + forecasted Mar Inflow + forecasted Apr-Jul Inflow + forecasted Aug-Sept Inflow =

(532,088-234,000) + 387,302 + 137,328 + 170,660 + 479,519 + 25,381 = 1,498,278 acre-feet = **Index Number of 1498 which is a Schedule 1 year**

Example calculation of the North Yuba Index for May 1, 1999:

Excerpt from May 1999 DWR Bulletin -120:

May 1, 1999 FORECASTS
APRIL-JULY UNIMPAIRED RUNOFF

HYDROLOGIC REGION and Watershed	Unimpaired Runoff in 1,000 Acre-Feet					
	HISTORICAL			FORECAST		
	50 Yr Avg	Max of Record	Min of Record	Apr-Jul Forecasts	Pct of Avg	80 % Probability Range
Yuba River						
North Yuba below Goodyears Bar	286	647	51	330	115%	
Yuba River at Smartville Plus Deer Creek	1,029	2,424	200	1,200	117%	1,090-1,360

May 1, 1999 FORECASTS (CONT'D)
WATER YEAR UNIMPAIRED RUNOFF

Unimpaired Runoff in 1,000 Acre-Feet													
HISTORICAL			DISTRIBUTION								FORECAST		
50 Yr Avg	Max of Record	Min of Record	Oct Thru Jan*	Feb *	Mar *	Apr *	May	Jun	Jul	Aug & Sep	Water Year Forecasts	Pct of Avg	80% Probability Range
564	1,056	102											
2,337	4,926	369	720	520	350	305	510	310	75	55	2,845	122%	2,720-3,030

*Unimpaired runoff in prior months based on measured flows

From this information and historic information, the North Yuba Index can be calculated as follows:

1) The end-of-September 1998 New Bullards Bar Reservoir Storage (from USGS gage number 11413515) is 708,904 acre-feet.

2) From end-of-October, November, December, January, February, March and April New Bullards Bar storage and monthly reservoir releases (from USGS gages 11413510 and 11413520), the total inflow to New Bullards Bar between October 1, 1998 and April 30 1999 is 1,098,591 acre-feet.

3) Using the B-120 information and the inflow to date the forecasted April - July inflow is calculated as follows:

Inflow = C + C1*(Oct-April Inflow) + C2*(B120 Forecasted Flow at Smartville for April-July) + C3*(Forecasted Flow at Goodyear's Bar for April-July)

Forecasted April-July Inflow = -31,652 + 0.01033 * (1,098,591) + 0.61645 * (1,200,000) + -0.22353 * (55,000) = 707,142 acre-feet.

4) The August and September inflows are calculated as follows:

Inflow = C1*(Oct-April Inflow) + C2*(Forecasted flow at Smartville for August and September)

Forecasted August and September Inflow = 0.01298 * (1,098,591) + 0.50071 * (55,000) = 41,799 acre-feet

5) The North Yuba Index for May 1, 1999, is calculated as follows:

Active NBB Storage + Actual Inflow (Oct – April) + forecasted Apr-Jul Inflow + forecasted Aug-Sept Inflow – Actual April Inflow =

(708,904-234,000) + 1,098,591 + 707,142 + 41,799 – 182,647 = 2,139,789 acre-feet = **Index Number of 2140 which is a Schedule 1 year**

Exhibit 10
Yuba River Development Project
Operating Assumptions for Yuba River Fisheries Agreement

Introduction

The flow schedules and operations parameters described in Exhibits 1-5 of the Yuba River Fisheries Agreement (YFA) are based on a set of assumed Operating Assumptions for the Yuba River Development Project (YRDP) during: (a) water-management or base-flow operations; (b) storm-runoff operations; and (c) flood-control operations.

These Operating Assumptions, and Significant Changes to these Operating Assumptions, are described in this Exhibit 10.

Definitions

- Base Flow/Water Management Operations
- Storm Runoff Operations
- Flood Control Operations
- Operations for PG&E Power Purchase Contract (PPC) Obligations
- Significant Changes to Operating Assumptions

Definitions of Base Flow/Water Management Operations, Storm Runoff Operations and Flood Control Operations utilize the language in YCWA's pending application for FERC license amendment. The pertinent language states:

> **"With the exception of emergencies, releases required by U.S. Army Corps of Engineers flood control criteria, releases required to maintain a flood control buffer or for other flood control purposes, bypasses of uncontrolled flows into Englebright Reservoir, uncontrolled spilling, or uncontrolled flows of tributary streams downstream of Englebright Dam, Licensee shall make reasonable efforts to operate New Bullards Bar Reservoir and Englebright Reservoir to avoid fluctuations in the flow of the lower Yuba River downstream of Englebright Dam, and daily changes in project operations affecting releases or bypasses of flow from Englebright Dam shall be continuously measured at the USGS gage at Smartville, and shall be made in accordance with the following conditions: [list of conditions follow]"**

<u>Base Flow/Water Management Operations:</u>

Base Flow/Water Management Operations include all operations except operations: (a) during emergencies, (b) when releases are required by U.S. Army Corps of Engineers flood control criteria or to maintain a flood control buffer in New Bullards Bar Reservoir or for other flood control purposes, or (c) when bypasses of uncontrolled flows into Englebright Reservoir, uncontrolled spilling, or uncontrolled flows of tributary streams downstream of Englebright Dam are occurring.

Storm Runoff Operations:

Storm Runoff Operations include all operations while bypasses of uncontrolled flows into Englebright Reservoir, uncontrolled spilling, uncontrolled flows of tributary streams downstream of Englebright Dam are occurring.

Flood Control Operations:

Flood Control Operations include all operations when: (a) releases are required by U.S. Army Corps of Engineers flood control criteria; (b) releases or other actions are required or requested by the U.S. Army Corps of Engineers under its flood-control authority or by the the Department of Water Resources (DWR)/ U.S. Army Corps of Engineers Flood Control Joint Operations Center; (c) releases are required to maintain a flood-control buffer, or for other flood-control purposes, between September 15 and June 1; and (d) emergencies requiring substantial changes in project operations are occurring.

Operations Guidelines

Base Flow/Water Management Operations

Base Flow Operations shall be conducted under the following guidelines:

1. Starting approximately September 1, releases will be set at the rates necessary to meet the controlling instream-flow requirement, which is at either the Marysville Gage or the Smartville Gage, plus any additional amount that is required for diversions.
    a. These diversions include fall base irrigation diversions and diversions for fall rice decomposition/duck water field flooding. Fall rice decomposition/duck field flooding typically starts in late September to early October and goes through mid November, and includes a ramp up to a maximum diversion rate of between 450 to 550 cfs. Diversions then ramp down during November and December as field flooding requirements decrease. When Wheatland Water District comes on line, this maximum diversion rate is not expected to exceed the historic range of 450 cfs to 550 cfs.
    b. After the completion of fall field flooding, releases under Base Flow/Water Management Operations drop down to the amounts necessary to meet the controlling minimum instream flow requirement or the requirements in the PPC as amended and pursuant to recent historical practice.

2. During approximately January through March, there normally are minimal diversions at Daguerre Point Dam, and Base Flow/Water Management Operations are set to maintain the releases necessary to meet the controlling instream flow requirement or the requirements in the PPC as amended and pursuant to recent historical practice.

3. Starting about April 1, Base Flow/Water Management Operations are conducted to:
    a. Meet the controlling minimum instream flow requirements.
    b. Supply sufficient water for the diversions necessary to meet water-supply contract requirements.
    c. Meet the requirements of the PPC as amended and pursuant to recent historical practice.
    d. Meet a September 30 New Bullards Bar Reservoir storage target of 650,000 acre-feet.

4. Base Flow/Water Management Operations will be subject to the flow-fluctuation and ramping criteria in YCWA's pending application for FERC license amendment.

<u>Storm Runoff Operations</u>

Storm Runoff Operations shall be conducted under the following guidelines:

1. Storm Runoff Operations occur during the storm season, which typically occurs between October and May, but can extend into other periods during the year if there are any unusual storm events. Storm Runoff Operations target Englebright Reservoir operations, because Englebright Reservoir is the control point for releasing water into the lower Yuba River.

2. Specific Storm Runoff Operations decisions are highly dependent on the following factors:
    a. Amount and elevations of snowpack.
    b. Storm forecasted precipitation and snow level.
    c. Future storm forecasts.
    d. PG&E generation schedule.
    e. Time of year, amount of water in New Bullards Bar Reservoir and relation of New Bullards Bar Reservoir water storage to flood-control requirements.

3. Storm Runoff Operations guidelines for Englebright Reservoir are:
    a. Maintain an Englebright target base reservoir elevation of about 517 feet (above sea level).
    b. Maintain Englebright Reservoir storage elevation above 514 feet.
    c. Maintain Englebright outflow at a generally constant rate until Englebright Reservoir water-surface elevation reaches 523 feet, unless a large storm is forecasted.
    d. If Englebright Reservoir water-surface elevation reaches 523 feet and still is increasing, or if a major storm is forecasted, then increase Englebright outflow, through Narrows 1 Powerhouse or Narrows 2 Powerhouse or a combination of

both powerhouses, at a ramping rate target of 200 cfs per hour, until Englebright elevation stops increasing.

e. When a storm event ends, and runoff starts to subside, decrease Englebright outflow at a target rate of 100 cfs per hour when the reservoir level drops to elevation 520 feet, with a target of returning to base releases when elevation reaches 517 feet.
f. If Englebright reservoir elevation increases at a rate greater than 0.5 foot per hour, then higher ramp-up and ramp-down rates, up to the maximum allowable rate of 500 cfs per hour, and up to the maximum capacities of the Narrows 1 and Narrows 2 Powerhouses, may be utilized to attempt to stabilize the reservoir and prevent or reduce spills.

4. Storm Runoff Operations will not be subject to the flow-fluctuation and ramping criteria in YCWA's pending application for FERC license amendment.

Flood Control Operations

Flood Control Operations shall be conducted under the following guidelines:

Flood Control Operations are generally dictated by the Corps flood operations criteria or the Flood Control Joint Operations Center operated by DWR and the Corps. Flood operations are designed to protect life, property and the dams from actual and anticipated major flood events. Flood flow releases from Englebright and New Bullards Bar Reservoirs are controlled by the following requirements and criteria:

1. Corps flood control operations requirements as defined by the flood operations manual or direction from the Corps and include:
   a. encroachment into the New Bullards Bar Reservoir flood pool or anticipated encroachment into the flood pool from a forecasted storm; and
   b. ramping rates and spill gate operations criteria from the Corps flood operations manual or direction from the Corps.

2. Department of Water Resources (DWR), Department of Flood Management or Joint Flood Control Center directives.

3. Prereleases from New Bullards Bar Reservoir in advance of a forecasted major flood storm to reduce peak flood flows or to avoid or reduce encroachment into the flood pool during the storm.

4. Creating a flood pool buffer in New Bullards Bar Reservoir to avoid unnecessary flood-control releases operations during a typical storm for that time of the year.

5. At the end of Flood Control Operations, flows shall be returned to Storm Runoff Operations or Base Flow/Water Management Operations as soon as practicable.

6. Flood Control Operations will not be subject to the flow-fluctuation and ramping criteria in YCWA's pending application for FERC license amendment.

<u>Operations for PPC Obligations</u>

Current practice of releases to meet requirements in the 1966 YCWA/PG&E Power Purchase Contract as amended for the Accord include the following:

- Reservoir elevation target maximum of 705 TAF in January, providing that sufficient water is available;
- Reservoir elevation target of maximum 720 TAF in February, providing that sufficient water is available;
- Reservoir elevation target of maximum 790 TAF in March, providing that sufficient water is available;
- Reservoir elevation target of maximum 890 TAF in April, providing that sufficient water is available;
- No minimum monthly generation targets.

<u>Significant Changes to Operating Assumptions</u>

A Significant Change in the assumed Operating Assumptions is defined as one of the following occurrences:

1. Any releases from storage in the New Bullards Bar reservoir required by a regulatory mandate that was not in place on October 1, 2004, that would result in a reduction in the North Yuba Index of 10,000 AF or more in any water year, in comparison to the index value that would occur in the absence of those required releases.
2. Changes in the flow reduction and fluctuation criteria that are included in YCWA's pending license amendment application to FERC that would require the release of additional water from storage in excess of 10,000 AF in any water year.
3. A requirement to release water from storage solely to meet the terms of the Power Purchase Contract between YCWA and PG&E that would prevent YCWA from operating to achieve the following target levels:
    a. 705 TAF in January;
    b. 720 TAF in February;
    c. 790 TAF in March, or
    d. 890 TAF in April.
4. An increase of 5,000 AF or more in YCWA's total obligation to contribute to the implementation of Bay/Delta water quality objectives, if such increase is caused by a judicial or regulatory action.

5. An ESA, CESA, or other regulatory action that would result in a change in flow Schedules 1 – 6 and that would result in either: a) decrease in total Transfer Agreement payment amounts for Components 2-4 water of 5% per year or more in any water year, or b) decrease in the amount of flow that can be delivered to YCWA's consumptive users of 5% or more in any water year.

The following are not considered Significant Changes in Operating Assumptions:

1. Any decrease in YCWA's Phase 8 Bay/Delta obligations.
2. Any supplemental surface water transfer or supplemental groundwater transfer.
3. An ESA, CESA, or other regulatory action that would result in a change in flow Schedules 1 – 6 and that would result in: a) an increase in Transfer Agreement payment amounts, and b) an increase in the amount of flow that can be delivered to YCWA's consumptive users.

Exhibit 11
Addresses of Representatives of Lower Yuba River Fisheries Agreement Parties

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Conservation Director
Friends of the River
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Appendix B

Hydrologic Analysis of the Proposed Yuba County Water Agency One-Year Water Transfer to the California Department of Water Resources

Appendix B

Hydrologic Analysis of the Proposed Yuba County Water Agency One-Year Water Transfer to the California Department of Water Resources

Introduction

The Yuba County Water Agency (YCWA) plans to transfer up to a total of 125,000 acre-feet of water in 2007 to the California Department of Water Resources (DWR) for the CALFED Environmental Water Account (EWA). The transfer is planned to occur between March 1, 2007 and December 31, 2007. For 2007, the water transfer will be from storage in New Bullards Bar Reservoir. Although groundwater substitution is not currently planned for the 2007 transfer, there is a slight chance that 30,000 of transfer water will be provided through groundwater substitution. The 30,000 acre-feet of groundwater substitution is a commitment by YCWA to the parties to the Fisheries Agreement for the 2007 Lower Yuba River Accord Pilot Program (2007 Pilot Program Fisheries Agreement) when conditions are extremely dry on the Yuba River. This 30,000 acre-feet of groundwater substitution is required under the 2007 Pilot Program Fisheries Agreement if a Schedule 6 year (North Yuba Index basis) were to occur. The probability of a Schedule 6 year occurring for the 2007 water year is less than 3 percent.

The planned transfer will change flows in the Yuba River below Englebright Dam. Because of the widely varying hydrology of the Yuba River from year to year, and because the 2007 water year is unknown at this time, the water year could result in any of a wide range of hydrologic conditions. This analysis has been conducted to examine the range of hydrologic conditions that could occur in the absence of the transfer, and then transfer operations have been included in the set of operational conditions and analyzed to determine the effects of the transfer when compared to the without-transfer conditions. Although the transfer period is from March 1, 2007 to December 31, 2007, the analysis and results for this report includes the time period of March 1, 2007 to March 31, 2008. This time period is analyzed because YCWA is petitioning the State Water Resources Control Board (SWRCB) for an extension of the Revised Decision 1644 (RD-1644) Interim flow schedules to remain in effect through March 31, 2008.

The YCWA 2007 transfer will be accomplished by operating the Yuba River Development Project (Yuba Project) facilities to comply with one of 6 flow schedules that have been developed by YCWA and other entities in a collaborative process called the Proposed Lower Yuba River Accord (Yuba Accord). The 2007 water transfer will be a pilot program to test various elements of the Yuba Accord, including operational changes for New Bullards Bar Reservoir to meet the Yuba Accord flow schedule that is applicable for the 2007 water year. A pilot program also was implemented for the 2006 water year. The specific flow schedule to be followed will be determined using an index that is a combination of the volume of active storage in New Bullards Bar Reservoir on September 30, 2006, plus the total inflow volume to New Bullards Bar Reservoir in 2007. The combined volume of water is indexed to the 6 flows schedules and is called the North Yuba Index (NYI). The amount of active storage in New Bullards Bar Reservoir on September 30, 2006 is estimated to be 461,000 acre-feet (total storage of 695,000 acre-feet – 234,000 acre-feet minimum Federal Energy Regulatory Commission [FERC] license storage). New Bullards Bar Reservoir total inflow for 2007 is calculated by adding the measured inflow to date plus the forecasted inflow volume for the remainder of the 2007 water year. Complete descriptions of the North Yuba Index, and the Yuba Accord flow schedules were provided as exhibits to the transfer petition filed with the SWRCB. An additional part of the Yuba Accord Pilot Program operations for 2007 is an end of September target storage in New Bullards Bar Reservoir of 650,000 acre-feet, which is 55,000 acre-feet lower than the operationally target previously used by YCWA. The previous end-of-September target storage was 705,000 acre-feet, which is part of the operational conditions agreed to with Pacific Gas and Electric Company (PG&E) in the 1966 YCWA-PG&E Power Purchase Agreement. The lower storage target for the end of September results in increased releases from storage during the summer months of wetter years when storage operations govern the releases from New Bullards Bar Reservoir.

The transfer water will be provided to the Delta for export by DWR because YCWA will be releasing water that would have otherwise been stored without the operations to meet the Yuba Accord flow schedules or to meet the end of September storage target. Additional transfer flows could also be released to the Delta if YCWA and Member Units must implement a groundwater substitution program in 2007 to meet the commitments of the 2007 Pilot Program Fisheries Agreement for a Schedule 6 year.

This hydrologic analysis addresses the following parameters and assumptions;

- Determination of the range and probability of occurrence of flows and temperatures in the lower Yuba River that would occur without a transfer and with YCWA operations to comply with the SWRCB RD-1644 Long-term flow requirements. This is the without-transfer condition assuming the SWRCB RD-1644 Long-term flows requirements would be implemented.

- Determination of the range and probability of occurrence of flows and temperatures in the lower Yuba River that would occur without a transfer, with YCWA operations to comply with the SWRCB RD-1644 Interim flow requirements. This is the without-transfer condition assuming the SWRCB RD-1644 Interim flows requirements would be continued.

- Determination of the range and probability of occurrence of flows and temperatures in the lower Yuba River that would occur with the proposed transfer, with YCWA operations to comply with the SWRCB RD-1644 Interim flow requirements and the flow schedules of the Yuba Accord, with each day's requirement being whichever is the higher requirement.

- Determination of the amount and timing of transfer water storage and releases that would occur with YCWA operations to comply with the SWRCB RD-1644 Long-term flow requirements and the flow schedules of the Yuba Accord, when these resulting flows are compared to the storage and release of water that would result from YCWA operations to comply with the SWRCB RD-1644 Long-term flow requirements.

- Determination of the additional amount and timing of transfer water storage and releases that would result from using as the without-transfer condition the storage and releases resulting from YCWA operations to comply with SWRCB RD-1644 Interim flow requirements versus using the storage and releases resulting from YCWA operations to comply with the flow schedules of the Yuba Accord and the SWRCB RD-1644 Interim flow requirements.

- Assessment of the potential increased diversion delivery shortages that would occur in 2008 if YCWA were to operate to the flow schedules of the Yuba Accord, and an extension of the RD-1644 Interim flow requirements until March 31, 2008 were not granted by the SWRCB, thereby requiring operation to the RD-1644 Long-term requirements in addition to the Yuba Accord flow schedules.

Surface Water Modeling Description

The YCWA Yuba Project facilities were simulated using the Lower Yuba River Basin Model (LYRBM) developed by MWH for modeling the lower Yuba River. The model operates on a monthly time-step, and uses inflows that are a result of modeling historical hydrology routed through the Yuba River upper basin facilities which have been simulated to operate under current operational constraints. This upper basin simulation was completed using an HEC-5 model developed by Bookman-Edmonston Engineering, Inc. for the 2001 SWRCB Lower Yuba River hearings.

The HEC-5 model results are used as inputs to the LYRBM which define the monthly inflows to New Bullards Bar Reservoir and Englebright Reservoir, and flows from Deer Creek for 1922 through 2004. The primary operational objectives for reservoir operations in the LYRBM are flood control, agricultural water supply, power generation and instream flows. The features modeled by the LYRBM include New Bullards Bar Reservoir, Englebright Reservoir, the lower Yuba River between Englebright Dam and Daguerre Point Dam, diversions at Daguerre Point Dam, and the lower Yuba River from Daguerre Point Dam to Marysville. The LYRBM has been verified by comparing results from this model against the results of the HEC-5 Yuba Basin model, which was reviewed by DWR for the 2001 SWRCB hearings.

The LYRBM simulation includes operations for several sets of requirements for the lower Yuba River and New Bullards Bar Reservoir. These sets of requirements include the following:

- FERC License for Yuba River Development Project
- 1966 Pacific Gas and Electric Power Purchase Contract (when implemented in the model)
- Flood Control Agreement Between YCWA and the U.S. Army Corps of Engineers (Corps)
- 1993 Narrows I FERC License
- YCWA Water Right Permits and Member Unit Contracts
- Proposed Yuba Accord (when implemented in the model)
- RD-1644 flow requirements (Interim or Long-term flow schedules as selected)
- Minimum monthly power generation (set at 18,500 megawatthours (MWh) for all scenarios)
- Target storage operating line (varies by scenario)

New Bullards Bar Reservoir is the major storage facility of the Yuba Project and the primary operational feature of the LYRBM. The reservoir has a total storage capacity of 966,000 acre-feet with a minimum pool of 234,000 acre-feet, leaving 732,000 acre-feet of operable storage. A portion of the storage, 170,000 acre-feet, is reserved from September through April for flood control. Releases from New Bullards Bar Reservoir are made through either the New Colgate Powerhouse, with a release capacity of 3,700 cubic feet per second (cfs), the dam's bottom outlet, or a gated spillway.

Englebright Reservoir has a total storage capacity of 70,000 acre-feet, but this capacity normally is used only for day-to-day regulation of flows. Englebright Reservoir receives flows from New Bullards Bar Reservoir and flows from the Middle and South

Yuba rivers. Releases are made through the Narrows I and II powerhouses, with a combined capacity of 4,170 cfs and over an uncontrolled spillway. Since the LYRBM operates on a monthly time-step, Englebright Reservoir storage is not simulated and all inflows to the reservoir are released within the same time step. New Bullards Bar Reservoir operations take into consideration Englebright Reservoir inflows from the Middle and South Yuba rivers and the Narrows I and II powerhouses' capacities to obtain release amounts to meet downstream demands for each time-step.

The lower Yuba River refers to the 24-mile section of the river between Englebright Dam and the confluence with the Feather River south of Marysville. Instream flow requirements are specified on the lower Yuba River at the Smartville Gage immediately below Englebright Dam, and at the Marysville Gage near the confluence of the Yuba and Feather Rivers.

Daguerre Point Dam controls water elevations for irrigation diversions into the Hallwood-Cordua Canal (North Canal) and South Yuba Canal (South Canal). Browns Valley Irrigation District diverts water at its Pumpline Diversion Facility, approximately one mile upstream from Daguerre Point Dam. Cordua Irrigation District, Hallwood Irrigation Company, and Ramirez Water District receive water via North Canal from the north side of the Yuba River just upstream from the north abutment of Daguerre Point Dam. Brophy Water District, South Yuba Water District, and Dry Creek Mutual Water Company receive water *via* the South Canal from the south side of the Yuba River just upstream from the south abutment of Daguerre Point Dam. For the LYRBM, all diversions are assumed to occur at Daguerre Point Dam.

Modeling the Lower Yuba River for 2007

For the 2007 transfer, the LYRBM simulates water year 2007 (October 2006 through September 2007) and the 2008 water year (October 2007 through September 2008) using a Monte Carlo simulation. Because the sequence of hydrologic conditions in 2007 or 2008 cannot be predicted at this time, the Monte Carlo simulation uses historical conditions of each 2 water year pair from 1922 to 2004 to represent a range of historical hydrology with the starting reservoir conditions for water year 2007 and current operational constraints as listed above. Therefore, 83 two-year series of monthly hydrologic conditions are modeled and results are calculated. In other words, 1922 and 1923 hydrology are used for 2007 and 2008, then 1923 and 1924 hydrology are used for 2007 and 2008, then 1924 and 1925 and so on.

The 2007 YCWA/EWA transfer is the second Yuba Accord Pilot Program to include a transfer. In 2006, YCWA also implemented a Yuba Accord Pilot Program. In 2006, the hydrologic analysis was done and model simulations were run to examine the range of hydrologic conditions that could occur for that year. In 2006 the starting storage in New Bullards Bar Reservoir was known, and was 708,000 acre-feet. For the 2007 water year, the starting storage condition (end-of-September New Bullards Bar Reservoir storage) is estimated to be about 695,000 acre-feet. Other than this slight difference in starting storage, the conditions for analysis of the range of potential hydrology are identical to the 2006 water year. For this reason, the 2006 model results are used for the analysis of the 2007 transfer. The only difference between 2006 and 2007--the difference in starting storage of 695,000 acre-feet versus 708,000 acre-feet--has no discernable effects on the modeling results. This difference in starting storage would also result in no changes to operations in New Bullards Bar Reservoir during the fall of 2007. The only potential effect this slight difference in starting storage may have on actual operations of New Bullards Bar Reservoir will be to delay by a few days the onset of spills if conditions during the winter of 2007 are very wet.

Using the same starting condition for each simulation period, the Monte Carlo LYRBM simulates lower Yuba River flows for 24 months, using the 24 months of historical inflows for each of the 83 time periods of 1922 through 2004 as described above, generating a range of hydrologic conditions for the 2007 and 2008 water years. When the resulting range of storage and flows for each month of the simulation period are ranked, the range of possible outcomes can be used to statistically identify the potential occurrence of reservoir and river conditions for 2007 and 2008.

Modeling results from the Monte Carlo simulations provide information about lower Yuba River operations, including reservoir storage, power generation, flows at Smartville, diversions from Daguerre Point Dam, and flows at Marysville. The flow results for the lower Yuba River are, in turn, used with a temperature model to predict the ranges of temperatures expected on the lower Yuba River, as discussed below.

Surface water modeling for the 2007 transfer involved four alternative flow and operational scenarios:

- RD-1644 Interim flow requirements
- RD-1644 Long-term flow requirements
- Lower Yuba River Accord Flow and related requirements, where the RD-1644 Interim flow requirements are also complied with
- Lower Yuba River Accord Flow and related requirements, where the RD-1644 Long-term flow requirements are also complied with (this scenario is used for determination of transfer amounts under the Yuba Accord combined with RD-1644 Long-term versus transfer amounts under the Yuba Accord combined with RD-1644 Interim)

All four alternatives include the present level of demands for diversions from Daguerre Point Dam. One of the operational constraints of the Yuba Project that is modeled is to attempt to protect against drought conditions and the potential for diversion delivery shortage. This is accomplished by maintaining a storage amount (carry-over storage) on September 30 in New Bullards Bar Reservoir that would ensure being able to provide at least 50 percent of local diversion demands in the following year, if the following year were to have 1-in-100-year drought conditions. This carry-over storage amount is used to determine when and how much shortage in diversion deliveries would be imposed in the current year to maintain storage at the required carry-over storage amount.

For the 2007 water transfer, the starting storage amount, used for the North Yuba Index, can be accurately estimated because only one month remains until the start of the 2007 water year. The only remaining variable for the North Yuba Index is the amount of inflow to new Bullards Bar reservoir for the 2007 water year. Therefore, the probability of occurrence of the various flow schedules for 2007 is based on the probability of inflow volume to New Bullards Bar Reservoir. The 2006 water year was very wet, and the 2006 YCWA/DWR transfer operations did not take place because of Delta conditions. Therefore, YCWA operated New Bullards Bar Reservoir to meet the end of September target of 705,000 acre-feet, and actual storage is estimated to be 695,000 acre-feet on September 30, 2006. Therefore, the amount of active storage in New Bullards Bar Reservoir will be 461,000 acre-feet. This amount of storage is well above the maximum amount of September 30th storage that would typically be reached under long term Yuba Accord implementation, and is well above the storages used to formulate the North Yuba River Index values and resulting planned probability of occurrence for the six flow schedules. Because of the high storage amount for calculating the North Yuba Index, the probability of occurrence of the various schedules for 2007 is skewed heavily to the wetter schedules. As example, the Yuba Accord flow schedules and North Yuba Index were designed so that either a schedule 4, 5, 6, or a Conference Year would occur with a 15 percent probability. For the 2007 water year the probability of one of these schedule years occurring is 8.9 percent. Additionally, although it is statistically possible to have a conference year in 2006, the inflow into New Bullards Bar Reservoir would have to be less than 39,000 acre-feet for this to occur so a Conference Year in 2007 is extremely unlikely, even though a slight statistical probability exists. **Table B-1** shows the statistical probability of occurrence for the Yuba Accord schedules for 2007.

Table B-1. Probability of Occurrence of Lower Yuba River Accord Schedules for 2007

North Yuba Index	Percent Probability (%)	Schedule	Percent Exceedance (%)
500	0.4	Conference	
693	2.0	6	99.6
820	3.0	5	97.7
920	3.5	4	94.7
1,040	5.5	3	91.1
1,400	21.8	2	85.7
>1,400	63.9	1	63.9
Total	**100**		

Simulation Results

The results of the Monte Carlo simulation are 83 separate series of monthly New Bullards Bar Reservoir storage values, and flows in the lower Yuba River. For each month (March 2007 through March 2008) the 83 values from the Monte Carlo simulation are ranked in order from highest to lowest and plotted against exceedance probability. Plotting position (rank/(1+ n), where n = 83) is used to determine exceedance probability. Figure 1 is an example of the results of flows for a single month (June) simulated for the 83 years of hydrologic conditions, for the three flow requirement scenarios. Results for the months March 2007 through March 2008 are attached to this report as Attachment A. The three scenarios are labeled in the plots as "Interim", representing the results of the flow analysis for simulated operations to RD-1644 Interim flow requirements; "Long-term", representing the results of the flow analysis for simulated operations to RD-1644 Long-term flow requirements; and the Proposed Project, representing the results of the flow analysis for simulated operations for the combination of the Yuba Accord and the RD-1644 Interim flow requirements, with each day's requirement being the greater of the Yuba Accord requirement and the RD-1644 Interim requirement for that day.

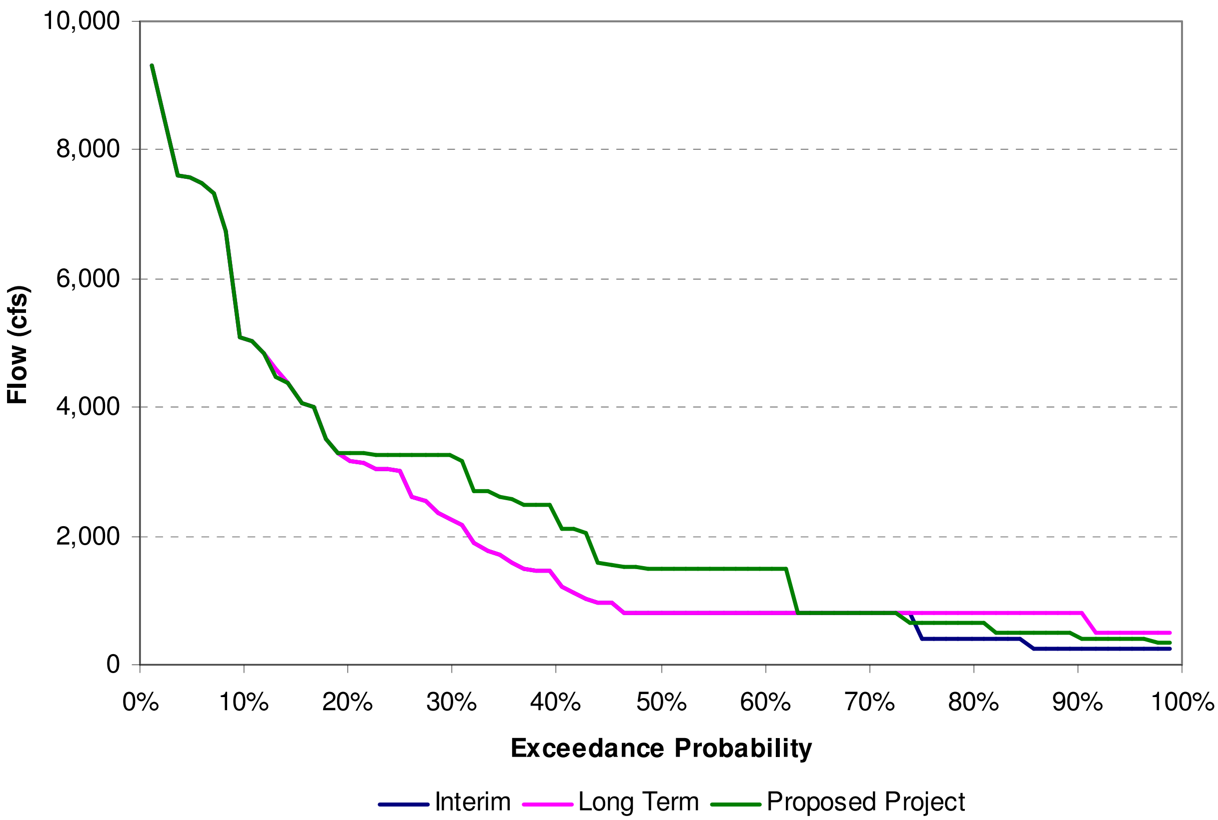


Figure B-1. Exceedance Probability of Yuba River Flow at Marysville for June 2007

Groundwater Substitution to Comply with Schedule 6 Commitments

Member Units of the YCWA may pump groundwater as a substitution for surface water deliveries and the forgone surface water diversions will be made available by YCWA releasing this water to the Delta during July and August of 2007. Groundwater substitution operations would occur if conditions are very dry and a Schedule 6 year were to occur. As shown in Table B-1, there is only a 2 percent chance that this will occur. The amount of groundwater substitution for a schedule 6 year would be 30,000 acre-feet. Because this is a firm commitment for groundwater substitution, the flows that would result in addition to the base Schedule 6 flows of the Yuba Accord have been included in the modeling simulations.

Lower Yuba River Temperature Modeling

Temperature modeling of the lower Yuba River focuses on predicting temperatures at two locations on the lower Yuba River: at Daguerre Point Dam and at the Marysville Gage. The purpose of the analysis is to determine the relative effect of flow on water temperature for the two locations of interest. This analysis provides a relative comparison of the changes in water temperature that would occur with the 2007 YCWA transfer and operation to the Yuba Accord flow schedules versus without-transfer conditions. For the temperature model, water temperatures at Daguerre Point Dam and the Marysville gage are simulated on a monthly basis.

Temperature modeling analysis for the SWRCB 2001 hearings showed that the main variables for prediction of water temperature in the lower Yuba River are the release temperature at Narrows II Powerhouse, located below Englebright Reservoir, the Marysville air temperature, and the flow of the lower Yuba River.

Temperatures for the analysis are calculated using flow output results from the LYRBM. These flows are used in a multivariate linear statistical model to calculate temperatures. The multivariate linear statistical model was determined through regression analysis on available historical flow and temperature data. A significant amount of temperature data has been collected since 1999 on the lower Yuba River. Prior to 1999 very little temperature data was available for the Daguerre Dam location. The new Daguerre Dam temperature data has allowed for regression analysis of this information to develop a statistical model for predicting temperatures at Daguerre Dam, which previously was done in an indirect manner which was a less accurate analytical approach. The new data also has provided greater insight into the relative influence of flow, air temperature and other influences, such as Yuba Goldfield flow returns to the Yuba River, on water temperature at the Marysville Gage.

Development of the statistical temperature model was accomplished using daily data. Because of the strong influence of release temperature on water temperature at Daguerre Dam and Marysville Gage, the regressions use the Narrows II release temperature as an upstream condition. Both regressions were determined using historical daily data for 1999 through 2005. The flow results from the LYRBM are for the period of 1922 to 2004 were then used as inputs to obtain temperature predictions for the entire 83-year period of simulation. Available temperature data for the two variables besides flow that are used in the statistical model are the Narrows II temperature release and the Marysville air temperature. Because of a lack of available historical daily data (or monthly data for Narrows II releases) for the full period of record, the Narrows II release temperature and Marysville air temperatures used in the temperature prediction are defined as a single series of 12 monthly values. These values are the historical average monthly Narrows II release temperature and Marysville daily mean air temperatures. These 12 month series of values are used for all scenarios modeled. As a result, all variations in water temperatures from one scenario to another are a result of the flow driven variations.

Daguerre Point Dam Water Temperature

As previously described, Daguerre Point Dam is approximately 12 miles downstream of Englebright Dam. The terrain for this reach of the river varies significantly, changing from a steep, narrow gorge near Englebright Dam, to a wide, flat, open area near Daguerre Point. Also, multiple accretions and depletions exist between Englebright and Daguerre Point, including Deer Creek, Dry Creek, and the Yuba River Goldfields. While a flow gage is present at the mouth of Deer Creek, there are very limited temperature data below Smartville and no flow gages below Deer Creek except for the Marysville gage.

Historical data used for developing a statistical model of water temperatures at Daguerre Point Dam include the Yuba River flow at the Smartville gage, Narrows II release temperature, Daguerre Point Dam water temperature, and Marysville air temperature. Daily data for these variables are available from 1999 through 2005. Regression equations are used to relate Daguerre Point Dam water temperature to flow at the Smartville gage, Narrows II release temperature, and air temperature at Marysville.

The statistical temperature model resulting from regression analysis use a single set of coefficients for all months. The independent variables for the model are: Narrows II release temperature, flow at Smartville, and average monthly air temperature at Marysville. The representative equation has the form:

DGP = 0.83 * (N2) + 0.16*(Air) -7.79E-5*(YRS)

Where:
DGP = Water temperature at Daguerre Point Dam (degrees Fahrenheit)
N2 = Release temperature of Narrows II Powerhouse (degrees Fahrenheit)
Air = Air temperature at Marysville (degrees Fahrenheit)
YRS = Flow at Smartville (cfs)

As shown in the equation, the Narrows II release temperature has the strongest influence on water temperatures at Daguerre Dam, with a .83 coefficient. This relationship has an R-squared value of .95. **Figure B-2** is a scatter plot of the calculated daily water temperature at Daguerre Point Dam versus the measured daily water temperature.

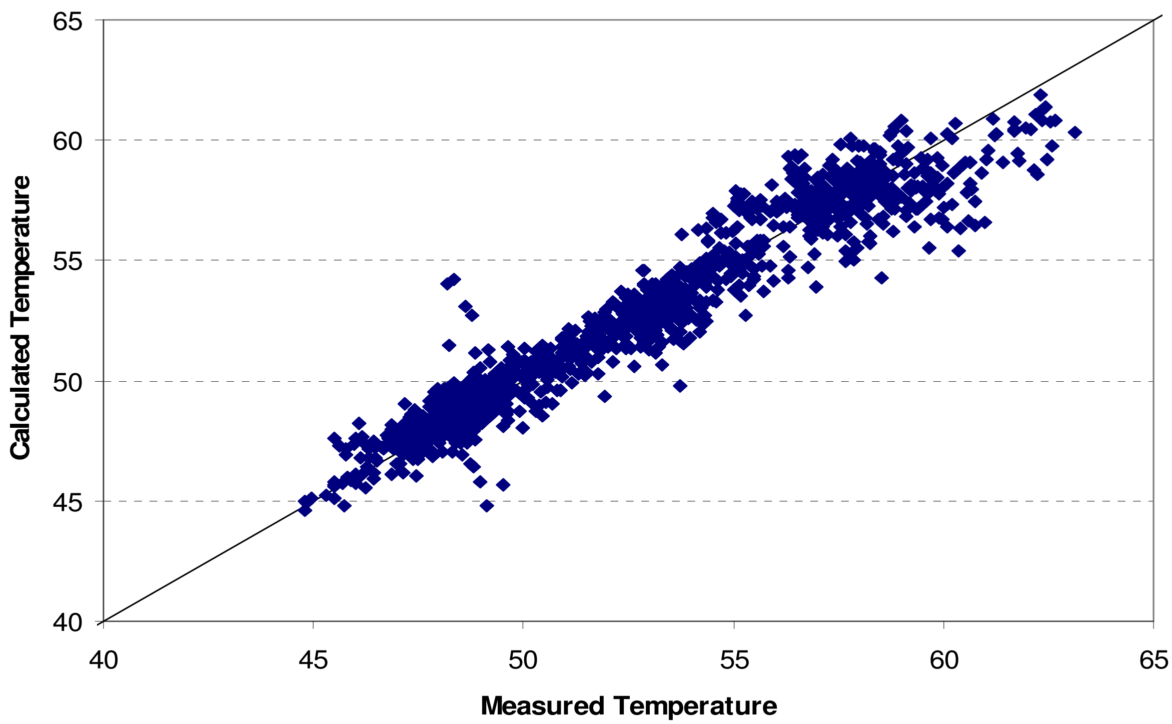


Figure B-2. Measure Daguerre Point Dam Daily Water Temperature Versus Calculated Daily Water Temperature

Marysville Gage Water Temperature

The Marysville Gage is approximately six miles downstream from Daguerre Point Dam. The river in this reach is relatively wide and flat, with very little cover or shade. Few accretions or depletions are present in this reach. While the Yuba Goldfields have an influence on temperatures, they are relatively high in the reach, and the flow attains equilibrium with the Yuba Goldfields return flow temperature when it reaches the Marysville Gage. Due to diversions at Daguerre Point Dam, the flow below Daguerre Point Dam to the confluence with the Feather River is lower than the flow above the dam. For predicting the temperature at Marysville gage, a two-segmented approach is required to obtain the simulated water temperature at the Marysville gage. First, the temperature at Daguerre is calculated for each month in the time series as described above. Then these temperatures are used as the upstream release temperature for calculating the Marysville Gage flow temperature for the corresponding month. For simplification, and to reduce error in the analysis, the variables for predicting the Daguerre temperature are used directly in the regression analysis for determining the statistical model for the Marysville temperature and a single equation is used to calculate the Marysville Gage flow temperature.

Available historical data for developing a statistical model of water temperature at the Marysville gage included Daguerre Point Dam water temperature, Marysville air temperature, Yuba River flow at the Marysville gage, and Marysville water temperature. Daily historical data are available from 1999 to 2005. Analysis is similar to that described for Daguerre Point Dam water temperature. The general representative equation has the form:

MRY = A * (N2) + B*(Air) + C*(YRS)+D*(MRYF)

Where:
MRY = Water temperature at Marysville gage (degrees Fahrenheit)
N2 = Release temperature of Narrows II Powerhouse (degrees Fahrenheit)
Air = Air temperature at Marysville (degrees Fahrenheit)
YRS = Yuba River flow at Smartville gage (cfs)
MRYF = Yuba River flow at Marysville gage (cfs)

As seen in the equation the variables for the Daguerre Point Dam water temperature prediction (Narrows II release temperature, flow at Smartville and Marysville air temperature) are included in the variables for the Marysville Gage water temperature prediction.

Observation of the relationship between flows and temperatures shows a reduction in influence on water temperature as flows increase. Therefore, a linear regression providing a singular linear relationship between flow and temperature will tend to overestimate predicted water temperature at high flows and underestimate water temperatures at low flows. To capture this nonlinear effect in a simplified quasi-linear relationship, different sets of coefficients are used for Marysville Gage flows above and below a transition flow, where the flow-temperature relationship weakens. Analysis showed that the most accurate use of a transition point for Marysville Gage flow varied by month in order to maintain continuity as different Narrows II temperatures and Marysville air temperatures are used for each month. Transition flow points were determined through iteration of 50 cfs intervals to ensure no sudden changes in temperature prediction occur for a small increase or decrease in flow at the transition point. **Figure B-3** is an example of the relationship between Marysville Gage flow and Marysville Gage temperature for a given release temperature and a given Marysville air temperature. **Table B-2** shows the two sets of coefficients for prediction of the Marysville Gage water temperature and **Table B-3** shows the monthly Marysville Gage transition flow rate used to determine which equation is applied to each time step.

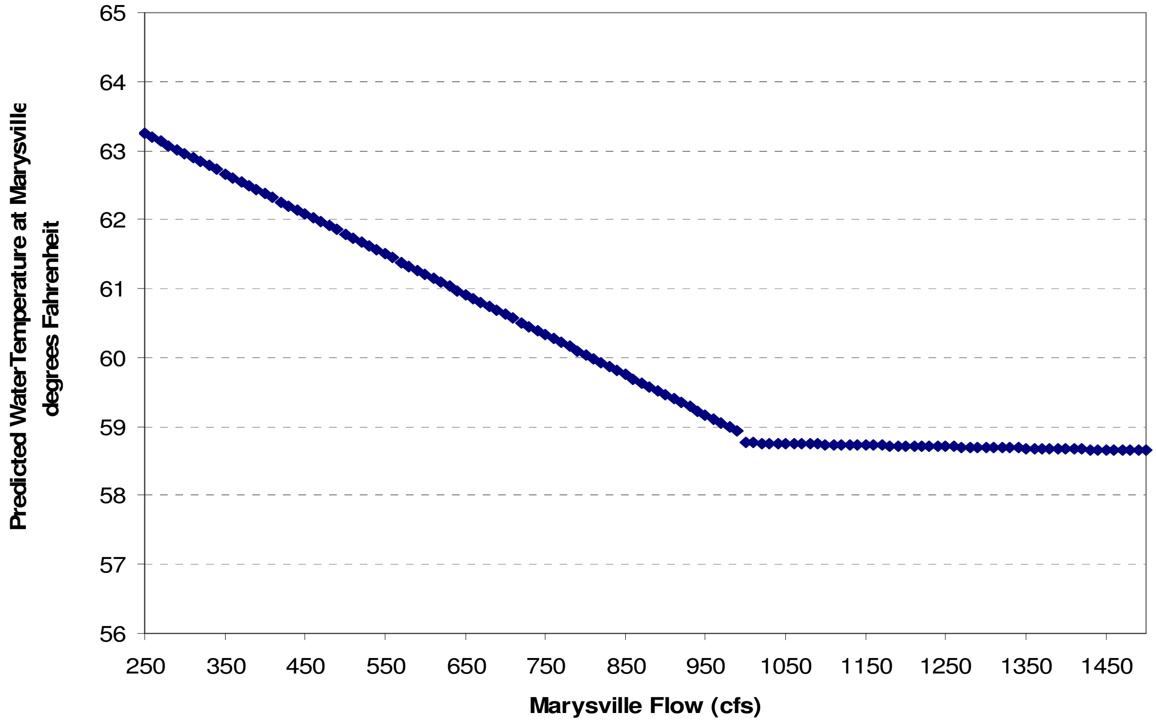


Figure B-3. Relationship of Flow versus Temperature at the Marysville Gage for August

Table B-2. Coefficients for Water Temperatures at Marysville Gage

	A	B	C	D
Flow < Q	0.76	0.30	2.73E-4	-6.11E-3
Flow > Q	0.81	0.20	-3.23E-4	9.30E-5

Table B-3. Transition Flow Rates for Calculating Water Temperatures at Marysville Gage

Month	Flow (Q) (cfs)
January	450
February	550
March	550
April	650
May	900
June	950
July	1,050
August	1,000
September	950
October	750
November	550
December	450

The resulting temperature predictions, when compared to measured temperatures for the Marysville Gage flow have an R-squared value of .95. **Figure B-4** is a scatter plot of the calculated daily water temperature at Marysville Gage versus the measured daily water temperature using the equation and two sets of coefficients and transition flows listed above.

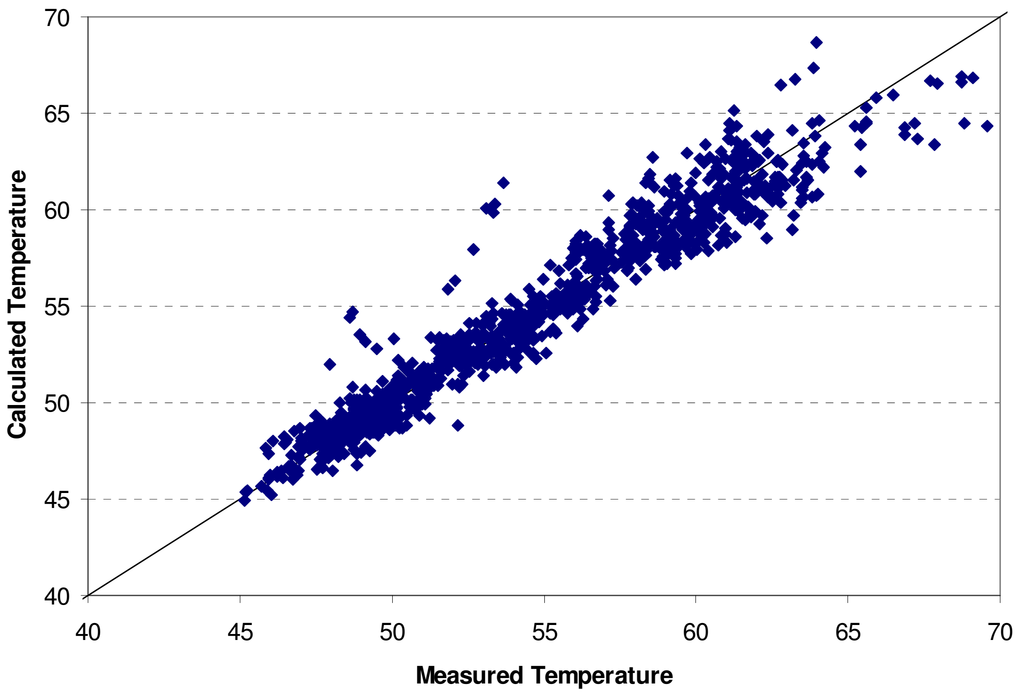


Figure B-4. Measured Marysville Gage Daily Water Temperature Versus Calculated Daily Water Temperature

The results of the temperature modeling are shown in Attachment B as exceedance probability plots each month of March 2007 through March 2008 for the three flow scenarios. The three scenarios are labeled in the plots as "Interim", representing the results of the temperature analysis for simulated operations to RD-1644 Interim flow requirements; "Long-term", representing the results of the temperature analysis for simulated operations to RD-1644 Long-term flow requirements; and the Proposed Project, representing the results of the temperature analysis for simulated operations for the combination of the Yuba Accord and the RD-1644 Interim flow requirements, with each day's requirement being the greater of the Yuba Accord requirement and the RD-1644 Interim requirement for that day.

Transfer Water Storage and Release

The analysis of transfer flow for the 2007 transfer differs from past YCWA transfers because the operations by YCWA for the 2007 transfer will differ from past transfers. In recent transfers, YCWA has made operational decisions regarding the timing and amount of transfer releases only after the hydrology for the water year is known or can be accurately predicted. The transfer releases are planned as releases of water from storage above the releases that must be made for other purposes such as instream flows, power generation, and diversion deliveries. In contrast, for the 2007 transfer, the YCWA operations for the water year are predetermined based on the Yuba Accord flow schedules, the North Yuba River Index, and a new maximum target storage for September 30, 2007 that is 55,000 acre-feet below the normal September 30 storage target for new Bullards Bar Reservoir. The Yuba Accord flow schedules are generally higher than the required flow schedules of RD-1644, and the target storage is lower than the normal target storage for New Bullards Bar Reservoir for the end of the water year on September 30. Therefore, although the baseline, without transfer condition is the same under both types of transfers, the amount of transfer under operation to the Yuba Accord is determined by the amount of additional water released from storage because of YCWA operating to the Yuba Accord flow schedules and September 30 target storage. As stated above, this operation is pre-determined by the Yuba Accord requirements. Because of these differences, for the Yuba Accord operations, the amount and timing of transfer releases is calculated by subtracting the without-transfer flows from the with-transfer flows and accounting for transfer flows when the water is released during balanced conditions[1].

The amounts and timing of transfer water storage and releases were calculated using the flow scenarios described under the surface water modeling portion of this report. A calculation of the total amount of transfer water for each of the 73 Monte Carlo simulation flow series was made to determine the transfer amounts that would be generated under the range of historical hydrology for 1922 to 1994. The years 1995 to 2004 are not used in the calculation because Delta model simulations do not extend through these more recent years.

As described in the introduction of this report, the transfer amount calculation has been completed by comparing the release of water that would result from YCWA operations to comply with the SWRCB RD-1644 Interim flows requirements and the flow schedules of the Yuba Accord, with the release of water that would result from YCWA operations to comply with the SWRCB RD-1644 Long-term flow requirements.

[1] This is a simplification of the complete terms and conditions of the accounting of the 2007 transfer as described in the agreement between YCWA and DWR

Although the transfer period is from March 2007 through December 2007, the majority of transfer water, that is the additional releases from storage above the without-transfer scenario, will be made during the summer of 2007. Some additional transfer water will likely be released in the fall of 2007. Because the majority of transfer water is released prior to the end of September 2007 for all of the 73-year series, comparison of end-of-September storage for the with-transfer and without-transfer conditions provides a reasonable assessment of the storage impacts of the transfer operations and can be compared to the transfer amounts.

Another complex relationship of the transfer is that the increased flows from the Yuba River resulting from operation to the Yuba Accord do not always occur when the water can be exported by DWR at the State Water Project (SWP) facilities in the Delta. The fact that the Delta is sometimes in excess conditions and that the changes in flow on the Yuba River do not affect Delta operations or SWP or Central Valley Project (CVP) storage is a fundamental part of how transfers provide water supply benefits downstream, without impacting these projects at times when the storage evacuated from New Bullards Bar Reservoir for the transfer is refilled. Under past YCWA water transfers, YCWA would make transfer releases only when the Delta was in balanced conditions and the water could be exported. This timing of releases will not be as flexible during 2007 because the releases of water to meet the Yuba Accord flow schedules are predetermined. Therefore, during some time periods, the increased flows will occur when they cannot be exported and therefore will not be accounted for as transfer water. This is also true for time periods when flows under the Yuba Accord operations are less than the baseline conditions. This can occur when the flow requirements of the without-transfer condition are higher than the with-transfer condition. This is the case for some time periods when comparing the flows under RD-1644 Long-term to the flows resulting from operation to the Yuba Accord. Because the determination of when water can be exported at the Delta is quite complex and dependent upon many variables, a simplified approach has been used for this analysis to determine transfer periods. In this analysis, results from a DWR CALSIM II simulation that provides the monthly amount of surplus Delta outflow, if any, has been used to determine time periods when transfer flows occur. The assumption for this analysis is that if there is surplus Delta outflow, then no transfer may occur during that month.

Figure B-5 is a chart of the total transfer water amounts (shown as purple bars) for each of the 73 years of simulation of the 10 months of March 2007 through December 2007 of Yuba Accord operations with the RD-1644 Long-term flow requirements in effect and using a baseline of YCWA operations to comply only with the RD-1644 Long-term requirements. (Although this scenario does not represent the proposed project, it is discussed here to show the portion of the proposed project transfer that would result solely from storage releases that are in addition to releases to meet RD-1644 Long-term flows) The average transfer amount for the 73 years of simulation is 58,000 acre-feet.

Also shown on the figure (shown as red dots) are the differences in end-of-September storage between the two scenarios (RD-1644 Long-term storage - Yuba Accord storage) for each year of simulation. Although the storage amounts are not directly related to the transfer amounts, for the reasons described above, the figure shows that storage would be reduced substantially due to the Yuba Accord. The average storage reduction for the end of September between these two scenarios is 67,000 acre-feet.

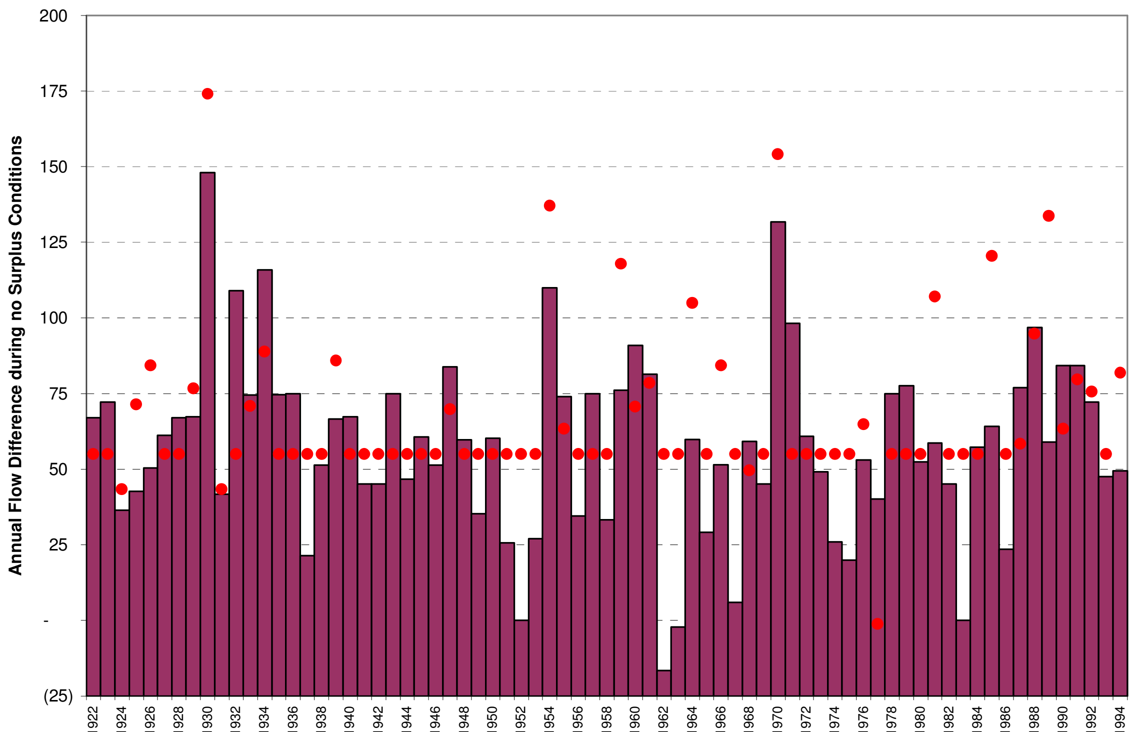


Figure B-5. Sum of Monthly Flow Differences During Months with no Surplus Delta Outflow.

Simulation of March 2007 through December 2007 Using 73 years of Historical Hydrology for the Yuba Accord Under D-1644 Long-term Requirements Compared to a Baseline Flow of D-1644 Long-term (purple bars). Storage Difference (RD-1644 Long-term - Yuba Accord) is also shown (red dots).

Figure B-6 is a chart of the total transfer water amounts (shown as blue bars) for each of the 73 years of simulation for the 10 months of March 2007 through December 2007 of Yuba Accord operations with the RD-1644 Interim flow requirements and using a baseline of operations to comply only with RD-1644 Interim. The average transfer amount for the 73 years of simulation for the operation is 66,000 acre-feet. Also shown on the figure (shown as red dots) are the differences in end-of-September storage between the two scenarios (RD-1644 Interim storage - Yuba Accord storage). Although the storage amounts are not directly related to the transfer amounts, as described above, the figure shows that storage would be reduced substantially due to the Yuba Accord. The average storage reduction for the end of September between these two scenarios is

76,000 acre-feet. These figures show that the effect of the requested extension of the RD-1644 Interim requirements would be to increase the average transfer amount by 8,000 acre-feet (66,000 – 58,000 = 8,000.) These figures also show that, regardless of which RD-1644 requirements are in effect, the average reduction in storage because of the transfer would exceed the average transfer amount.

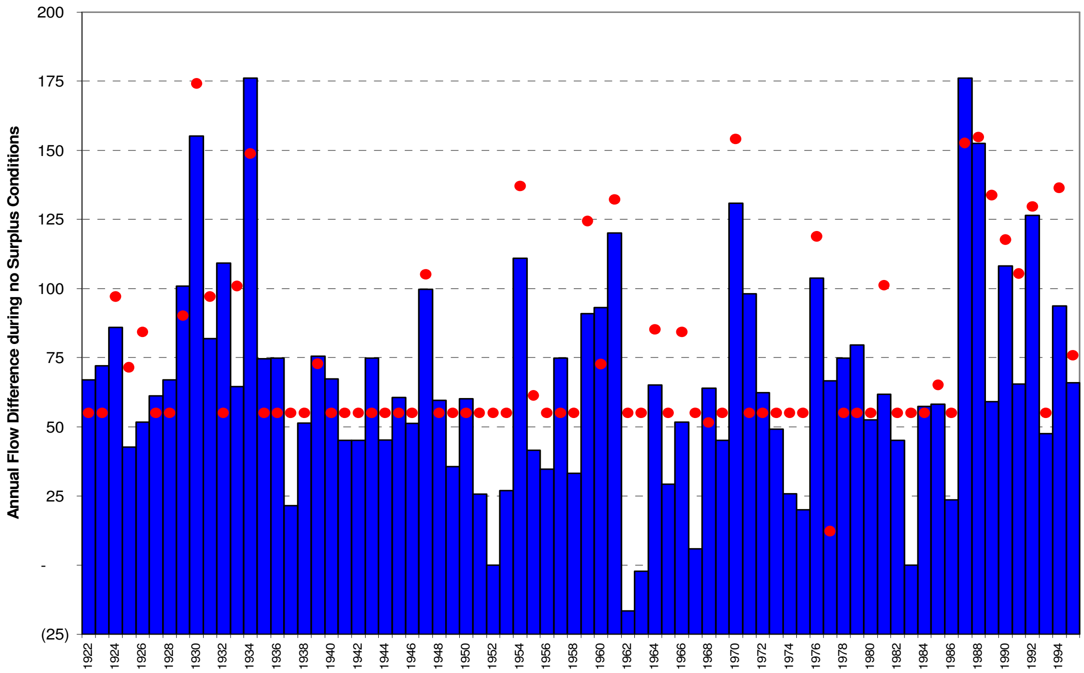


Figure B-6. Sum of Monthly Flow Differences During Months with no Surplus Delta Outflow

Simulation of March 2007 through December 2007 Using 73 Years of Historical Hydrology for the Yuba Accord Under D-1644 Interim Requirements Compared to a Baseline Flow of D-1644 Interim (blue bars). Storage difference (RD-1644 Interim - Yuba Accord) is also shown (red dots).

Impacts of Operating to RD-1644 Long-term in 2007 with the Yuba Accord

The Yuba Accord flow schedules were developed to maximize the use of the hydrology of the Yuba River and the capacity of Yuba Project facilities to provide fishery benefits and to provide water for transfer while maintaining a reliable level of water supply for local irrigation needs. If the RD-1644 Long-term flow requirements, which were postponed by the SWRCB until March 1 2007, are not delayed further, then YCWA will be required to meet the RD-1644 Long-term flow requirements starting on March 1, 2007, which would require more water in the drier year types than is required with the RD-1644 Interim flow requirements. The effect of these additional required releases would be to reduce storage in New Bullards Bar Reservoir in Dry, Critical and Extreme Critical years (as defined in RD-1644), if they were to occur, below the levels that would occur with the RD-1644 Interim flow requirements and the Yuba Accord. The end-of-

September storage reduction with the Yuba Accord and RD-1644 Long-term flow requirements below the levels reached with the Yuba Accord and RD-1644 Interim flow requirements averages 33,000 acre-feet in Dry, Critical, and Extreme Critical years, which would be about 20 percent of all years. In about 10 percent of all years, the reduction would range from 40,000 acre-feet to 70,000 acre-feet. With the Yuba Accord and operations to comply with the RD-1644 Long-term flow requirements, the average storage amount at the end of September 2007 in the 10 percent driest years would be 410,000 acre-feet.

Using a starting storage amount of 410,000 acre-feet, the LYRBM was used to simulate conditions in the 2008 water year, with operations to comply with RD-1644 Long-term flow requirements, and no Yuba Accord operations. The results of simulation of the historical hydrology of 1922 through 2004 for these starting conditions indicate about a 30 percent chance of shortages greater than 40,000 acre-feet in deliveries to YCWA's Member Units during 2008. The average shortage amount, when a shortage occurs, is estimated to be 173,000 acre-feet, or about 50 percent of the diversion demand for YCWA's deliveries to its Member Units.

YCWA, in cooperation with its Member Units has been developing a conjunctive use program that would be used to support the Yuba Accord during drought conditions. Although this analysis has assumed that the Yuba Accord would not be implemented in 2008 and that YCWA would operate only to the RD-1644 Long-term flow requirements, the pumping capacity of the conjunctive use program nevertheless would be available to attempt to meet water supply shortages by Member Units pumping groundwater (f funding could be obtained for the pumping). However, the total estimated pumping capacity for irrigation for the Member Units is about 100,000 acre-feet to 120,000 acre-feet. Therefore, any shortage amount above 100,000 acre-feet would not be able to be replaced with groundwater. For the simulation described above, the diversion delivery shortage would be greater than 100,000 acre-feet in about 20 percent of all years when the 2008 starting storage was 410,000 acre-feet. Based on the simulation results, the additional storage reduction resulting from operations to comply with RD-1644 Long-term flow requirements in 2007 with Yuba Accord operations, which range from 40,000 acre-feet to 70,000 acre-feet in the 10 percent driest years, could not be made up through groundwater pumping in 2008 if shortages of more than 100,000 acre-feet were to occur.

Attachment A

Exceedance Probability Plots for Flow at Marysville Gage and Smartville for March 2007 through March 2008

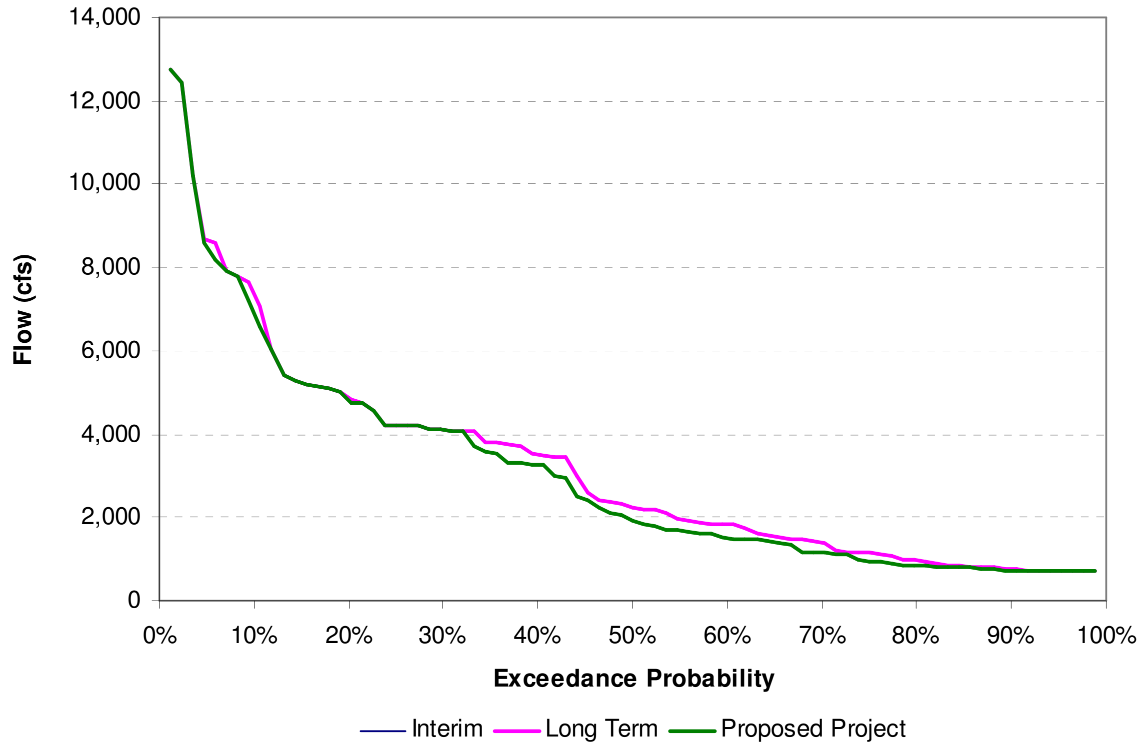


Figure A-1. Exceedance Probability of Yuba River Flow at Smartville for March 2007

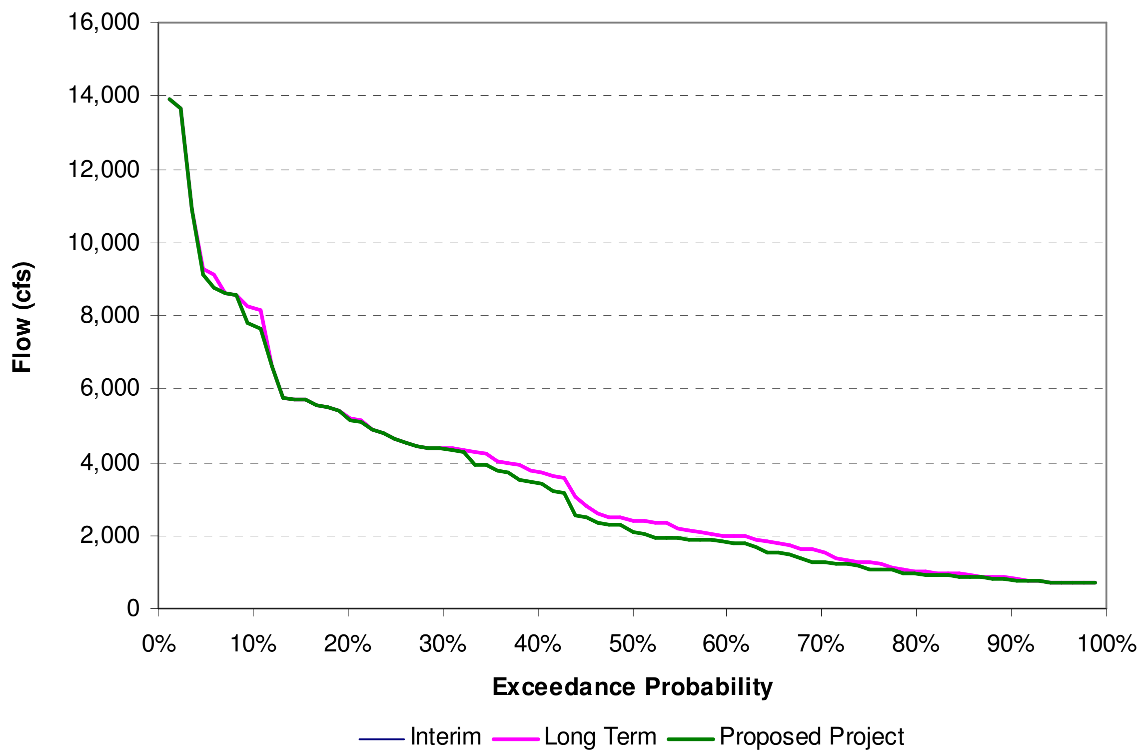


Figure A-2. Exceedance Probability of Yuba River Flow at Marysville for March 2007

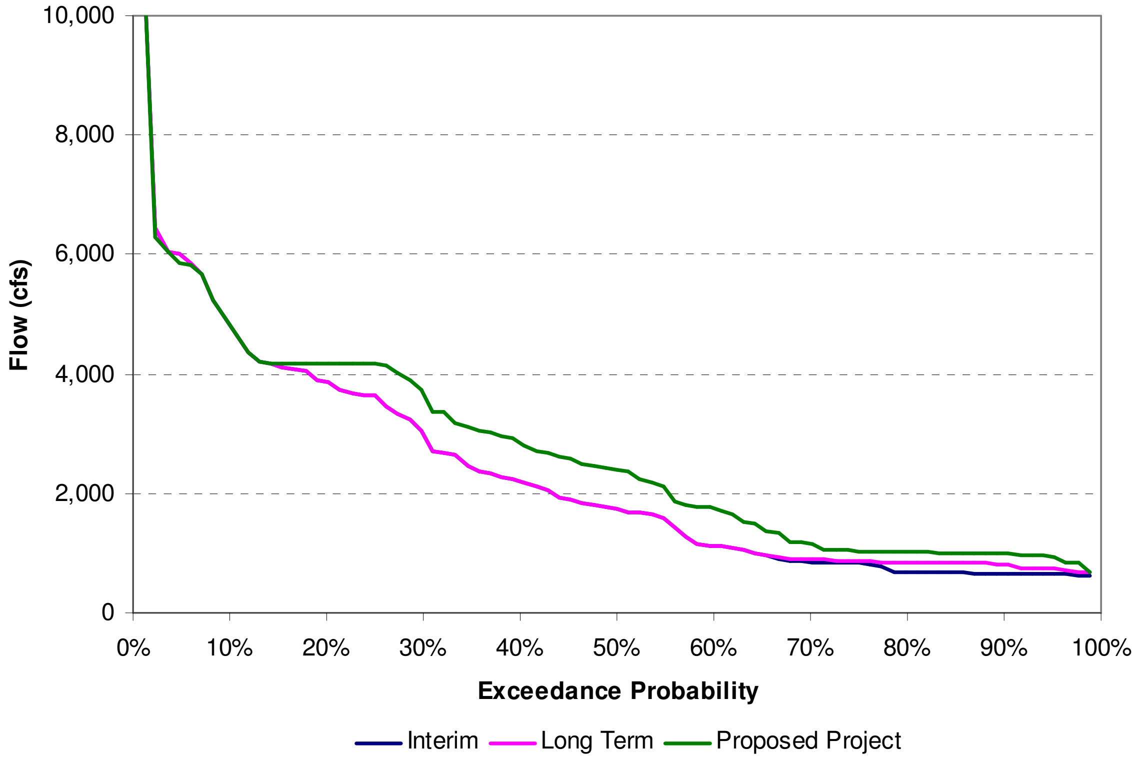


Figure A-3. Exceedance Probability of Yuba River Flow at Smartville for April 2007

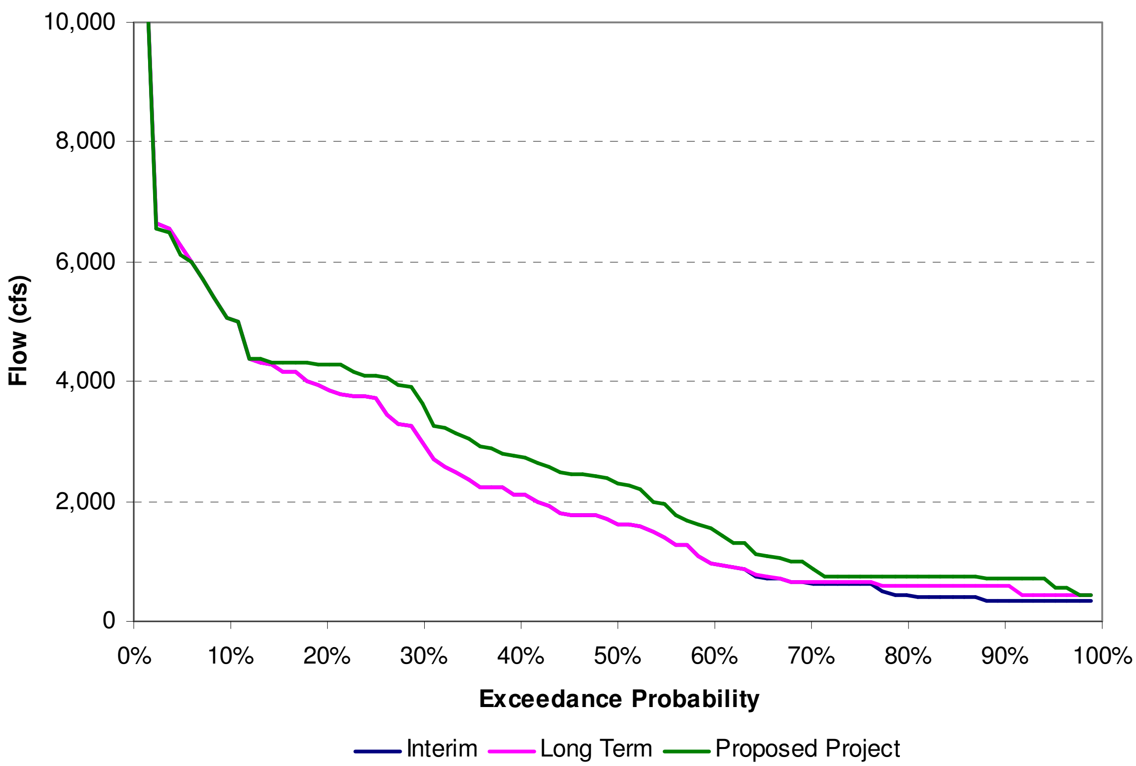


Figure A-4. Exceedance Probability of Yuba River Flow at Marysville for April 2007

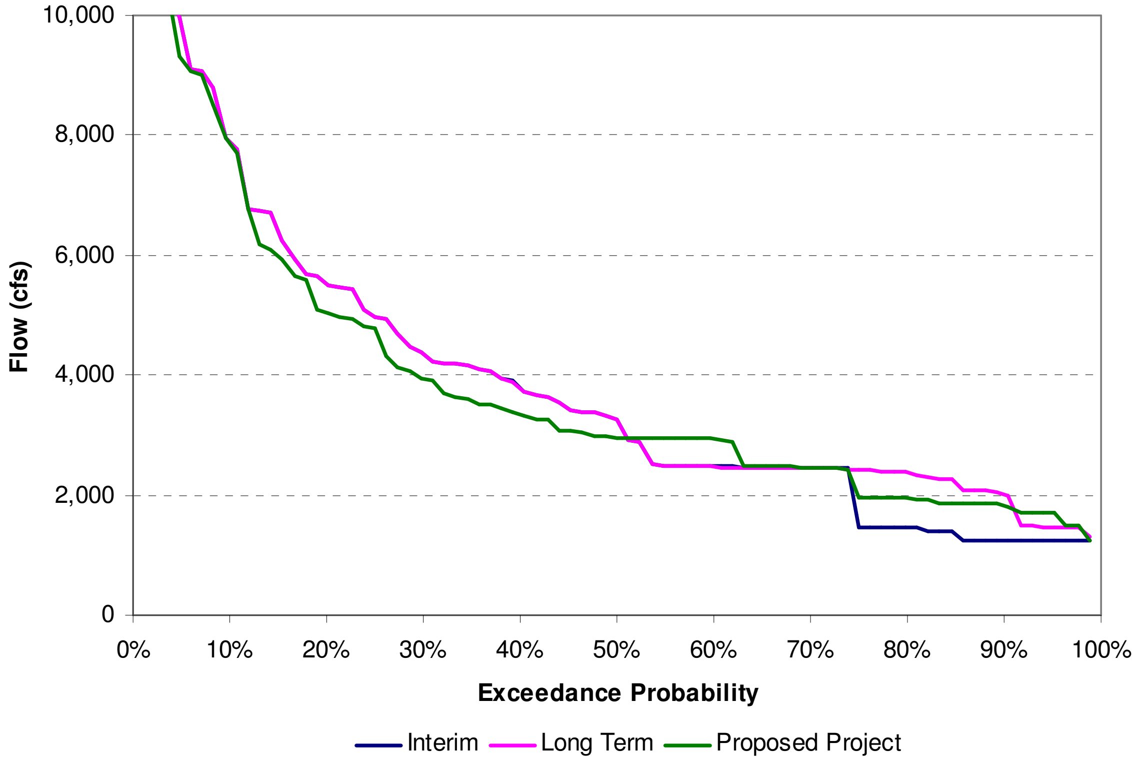


Figure A-5. Exceedance Probability of Yuba River Flow at Smartville for May 2007

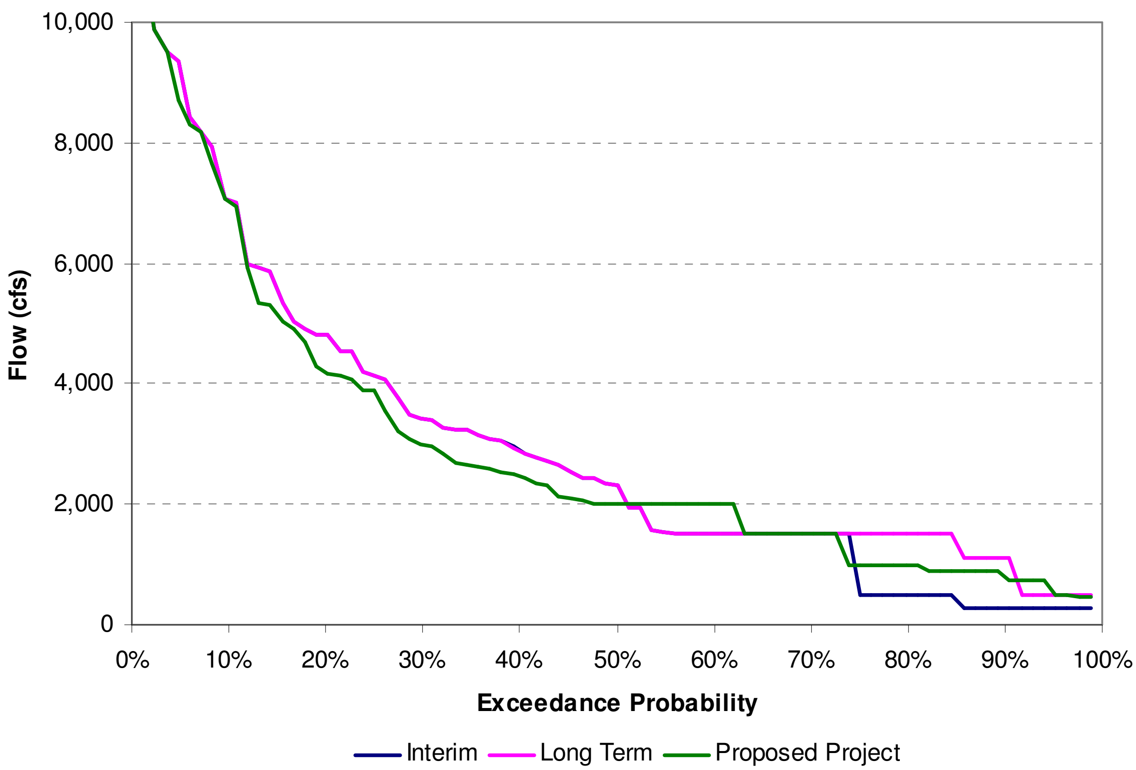


Figure A-6. Exceedance Probability of Yuba River Flow at Marysville for May 2007

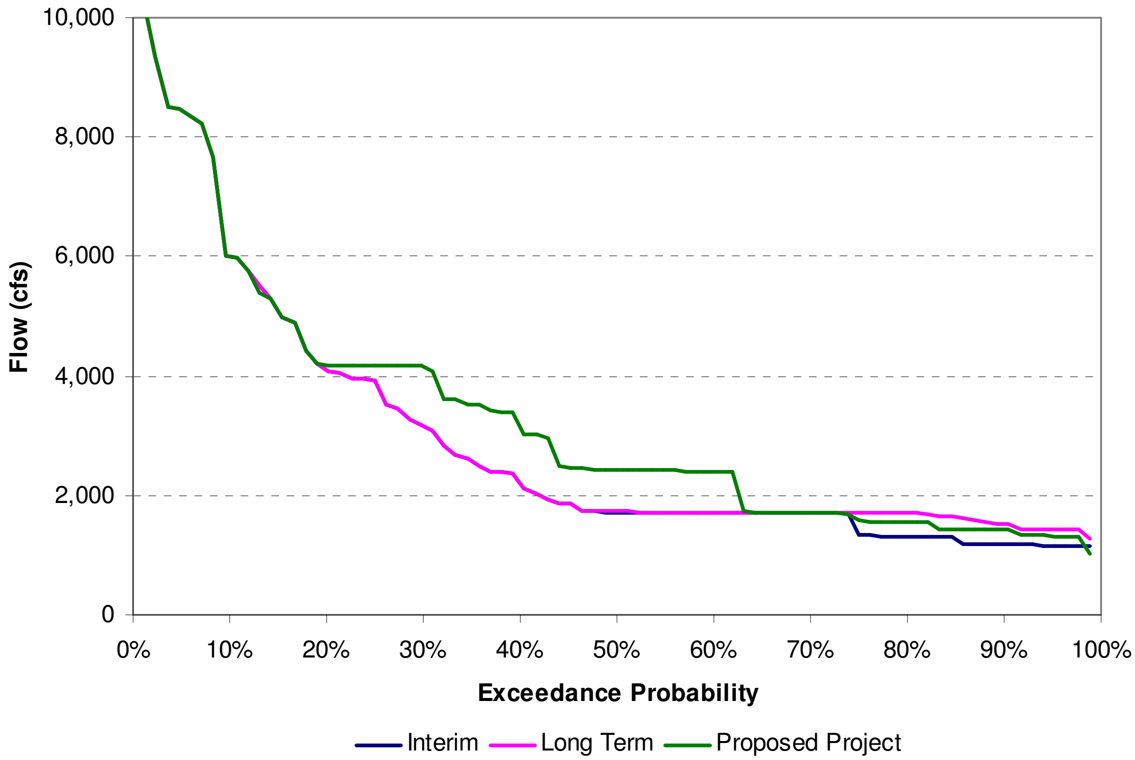


Figure A-7. Exceedance Probability of Yuba River Flow at Smartville for June 2007

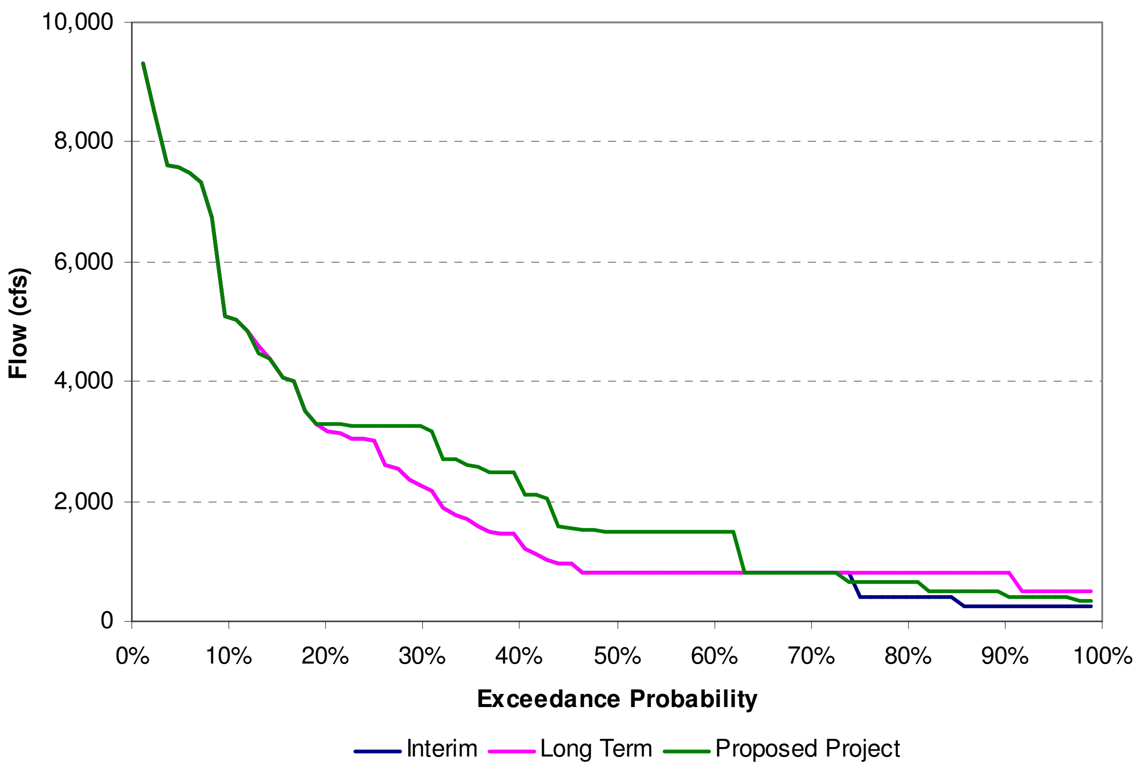


Figure A-8. Exceedance Probability of Yuba River Flow at Marysville for June 2007

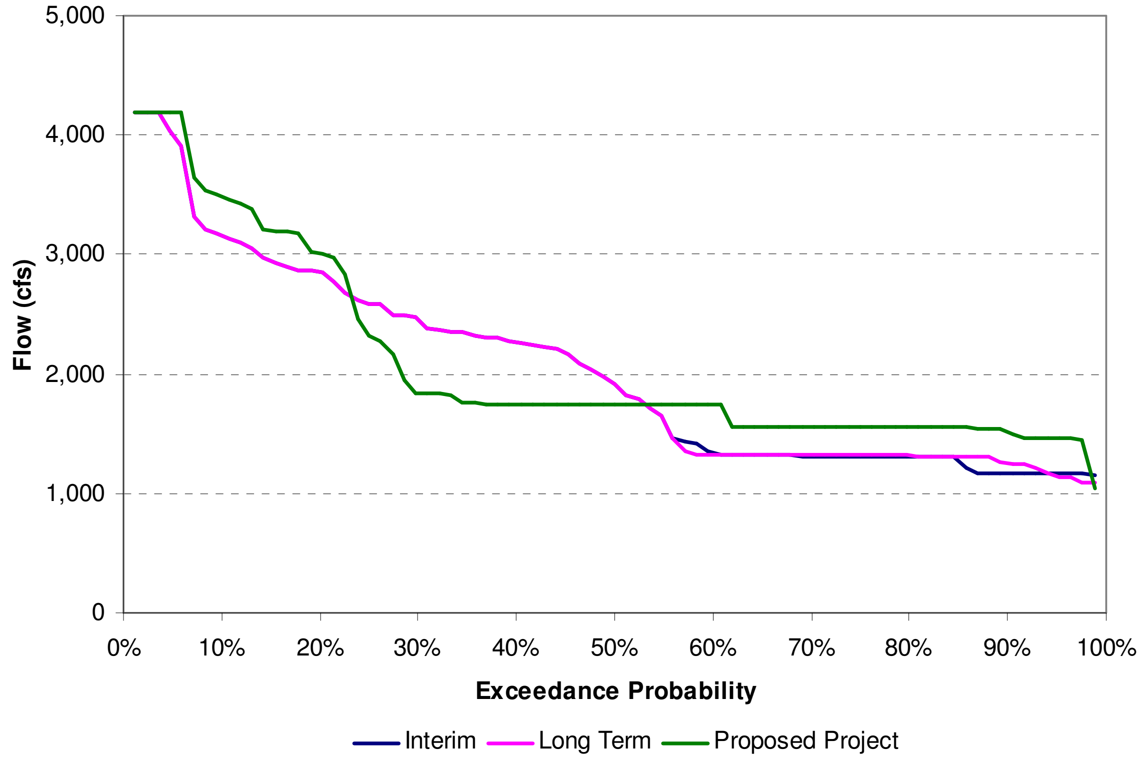


Figure A-9. Exceedance Probability of Yuba River Flow at Smartville for July 2007

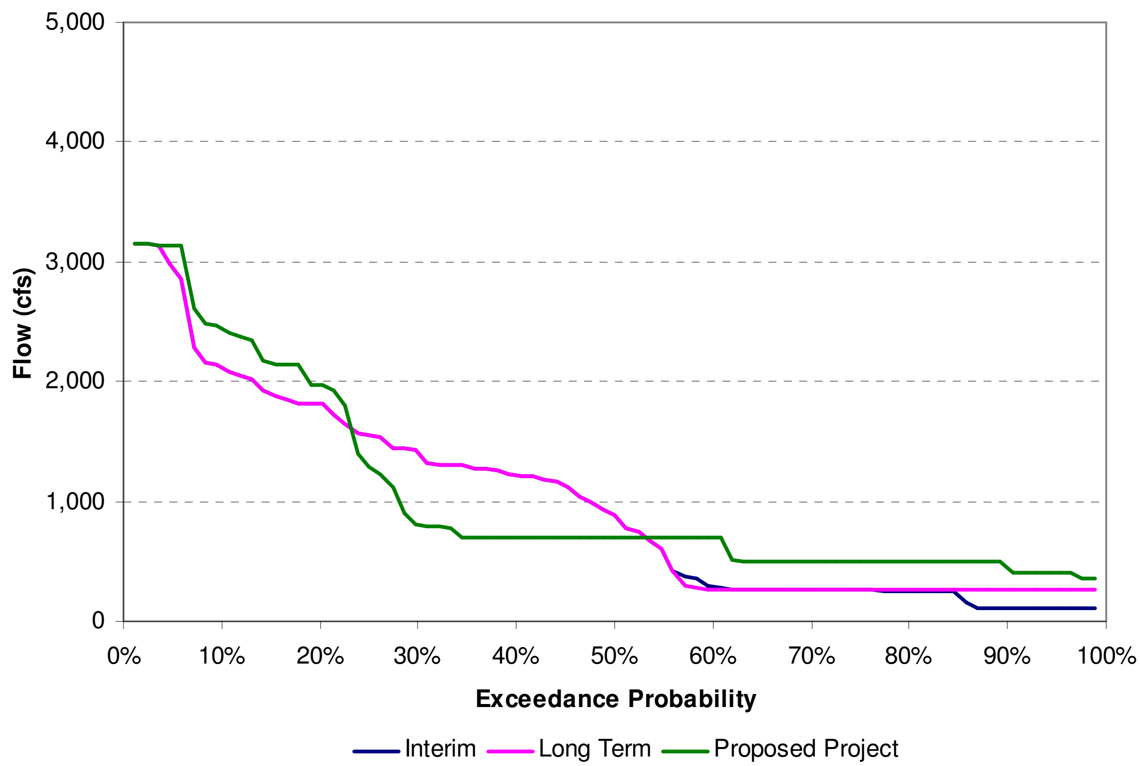
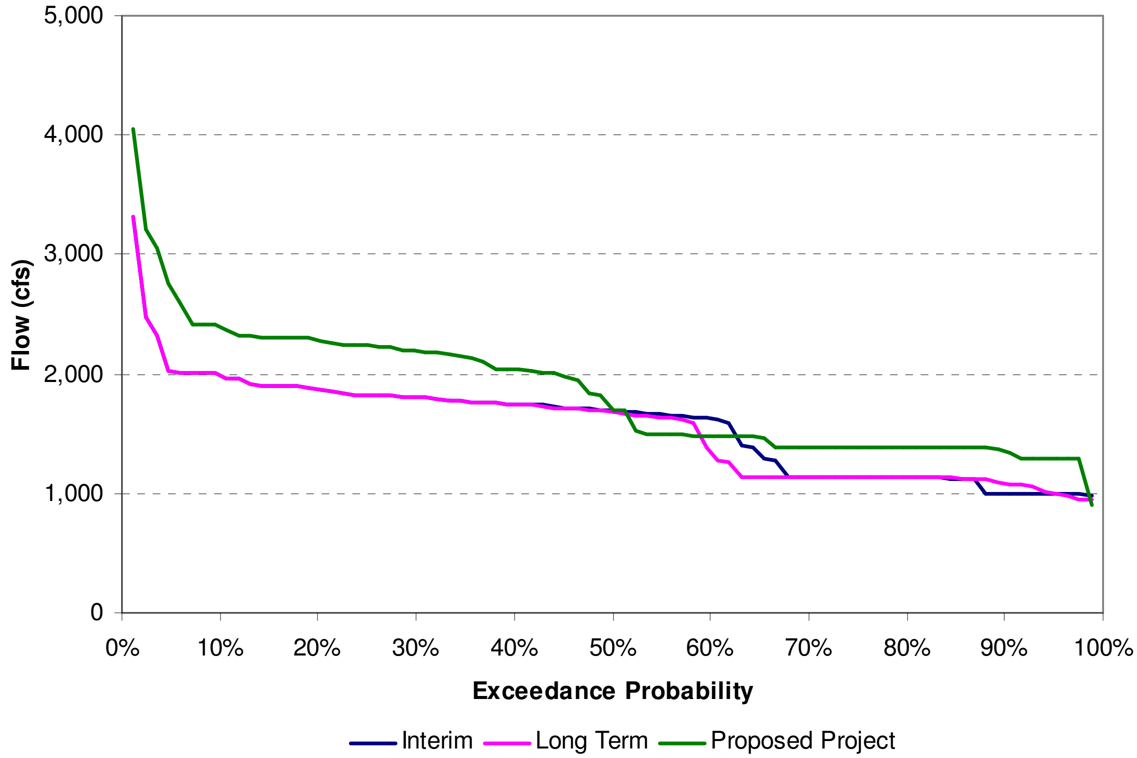


Figure A-10. Exceedance Probability of Yuba River Flow at Marysville for July 2007



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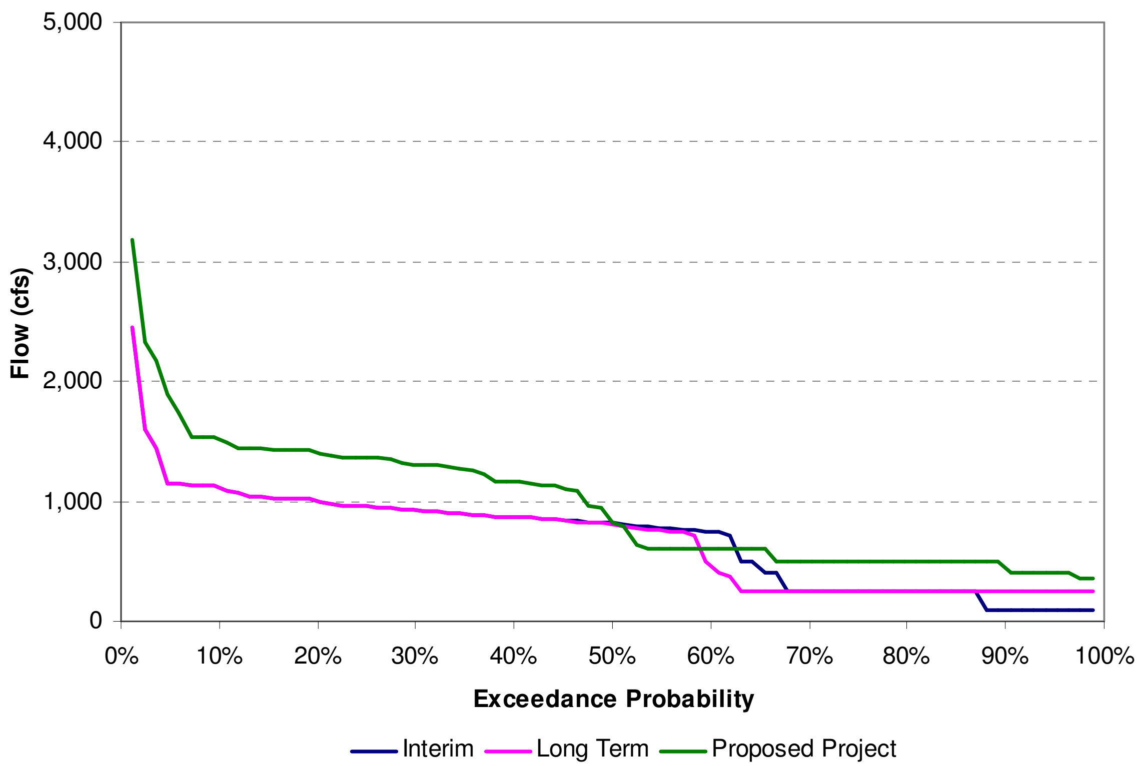

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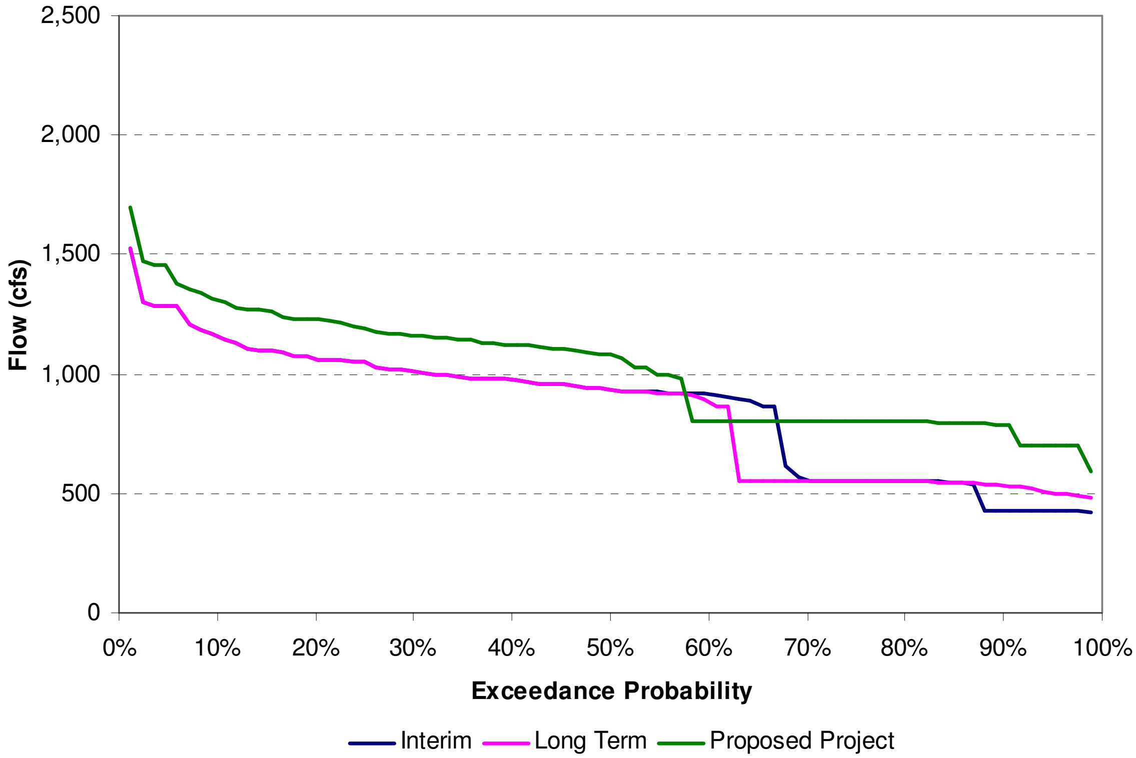

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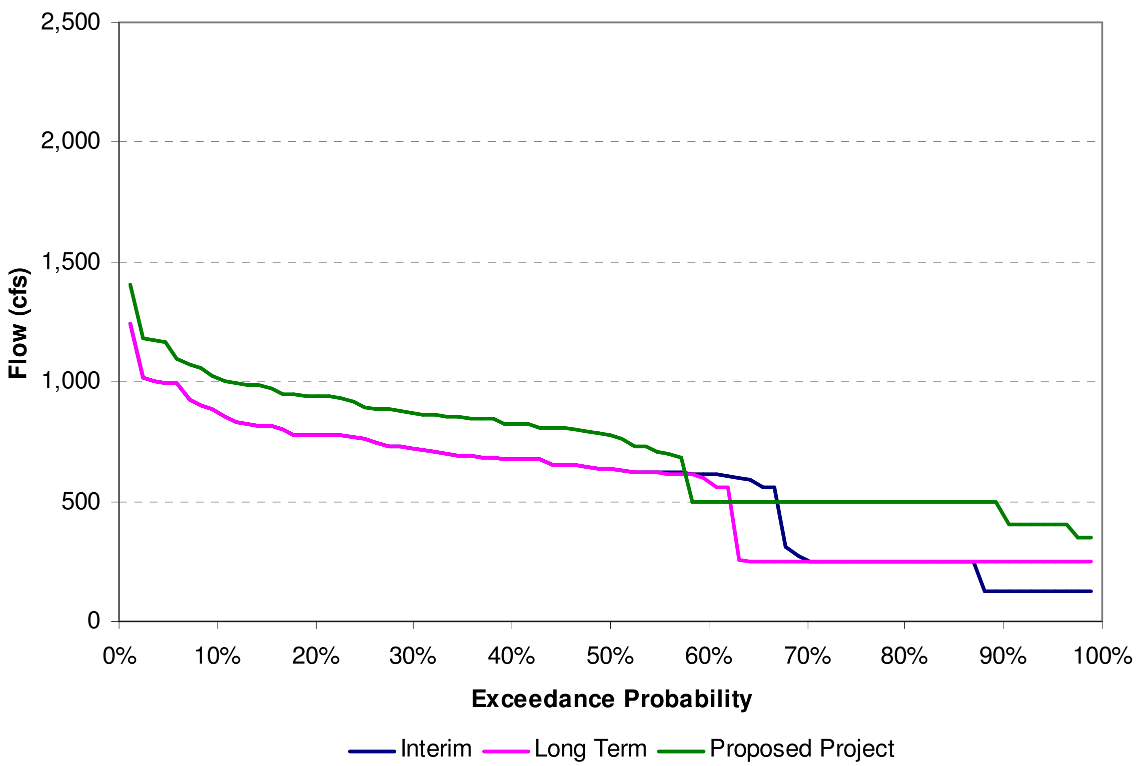

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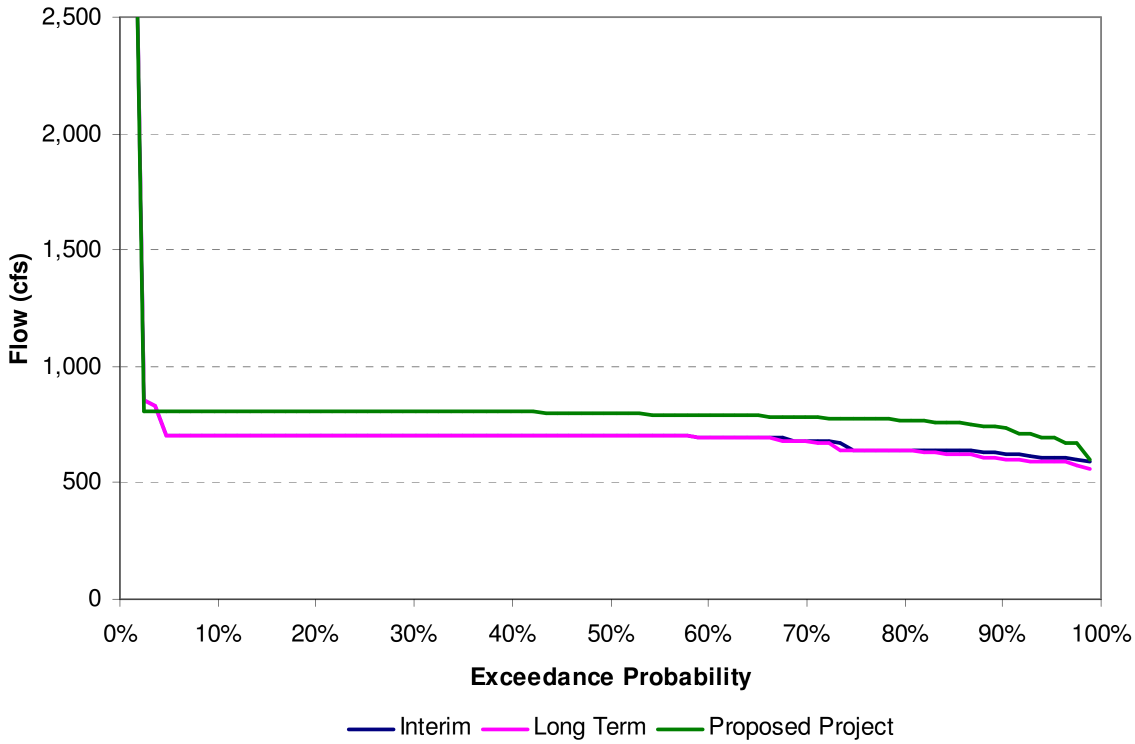
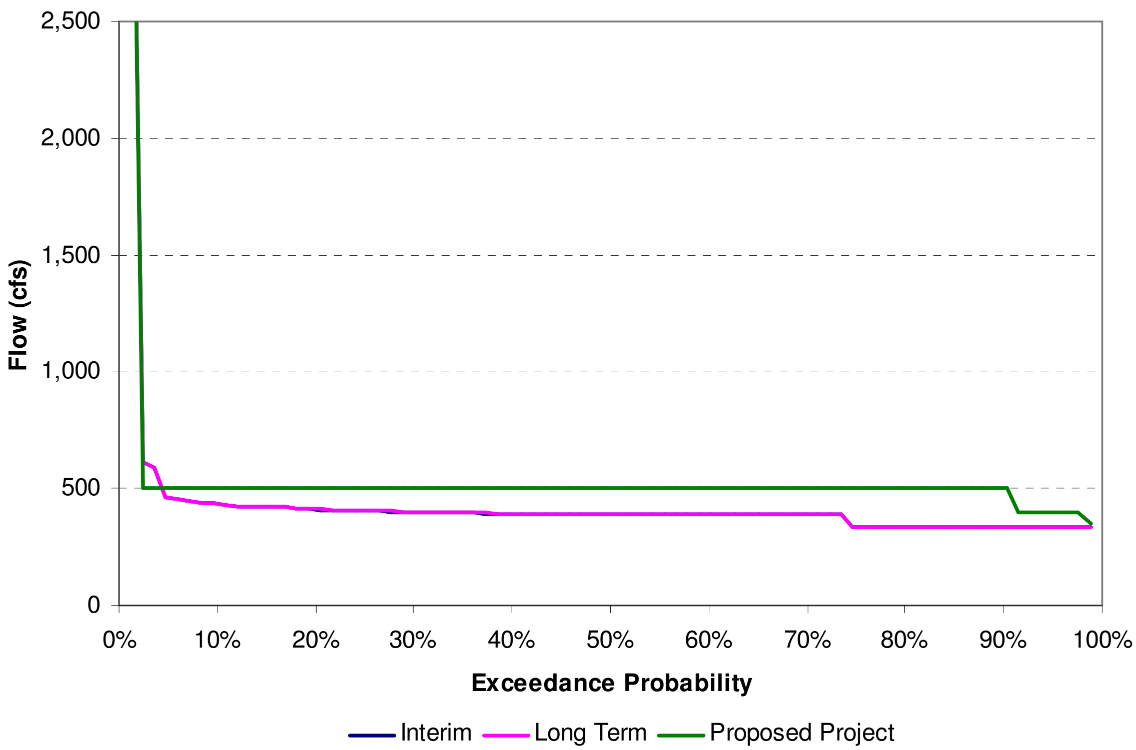


Figure A-15. Exceedance Probability of Yuba River Flow at Smartville for October 2007



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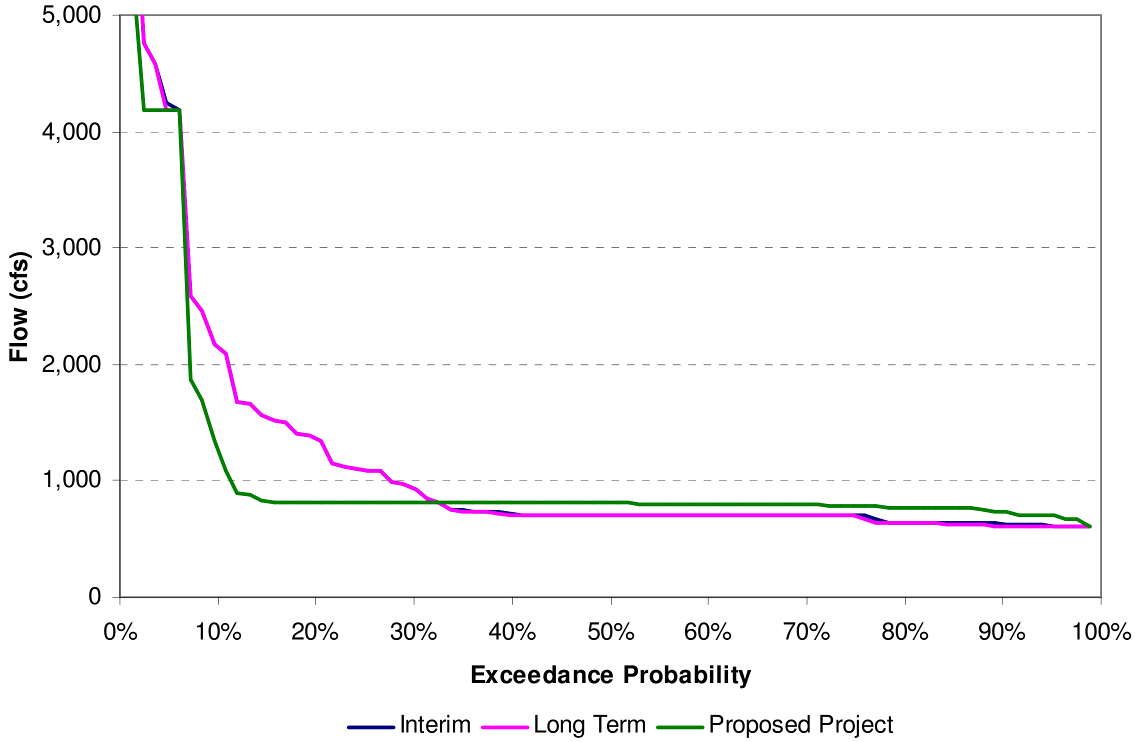
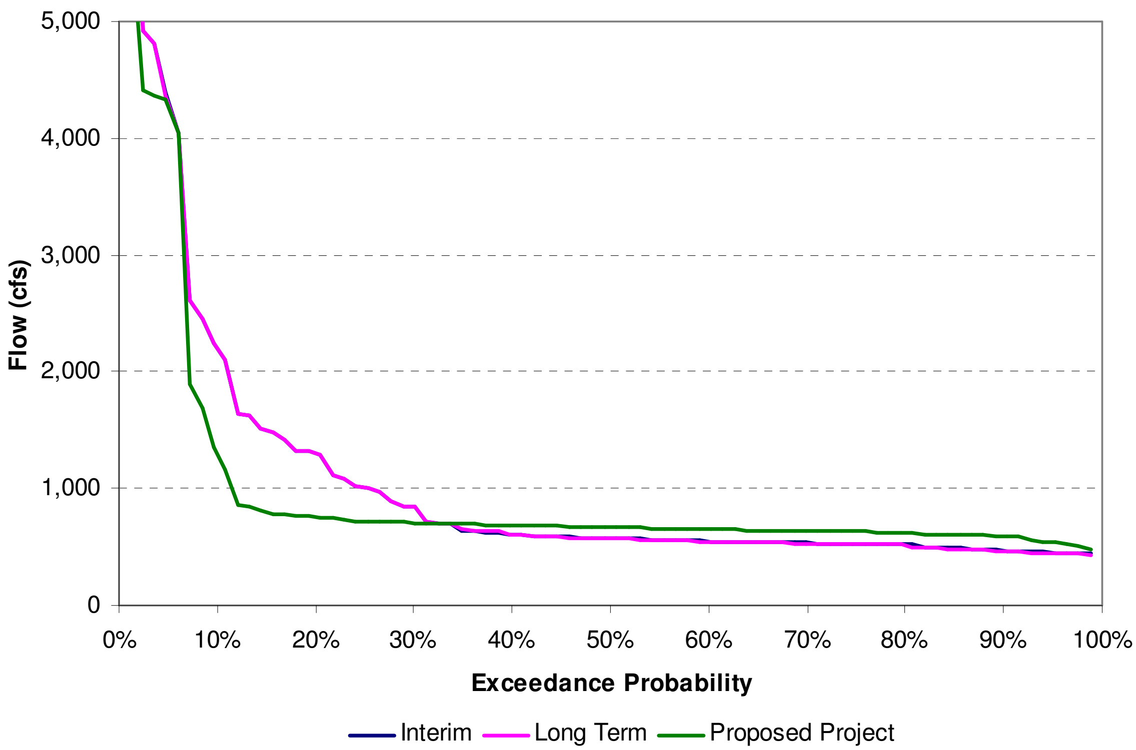


Figure A-17. Exceedance Probability of Yuba River Flow at Smartville for November 2007



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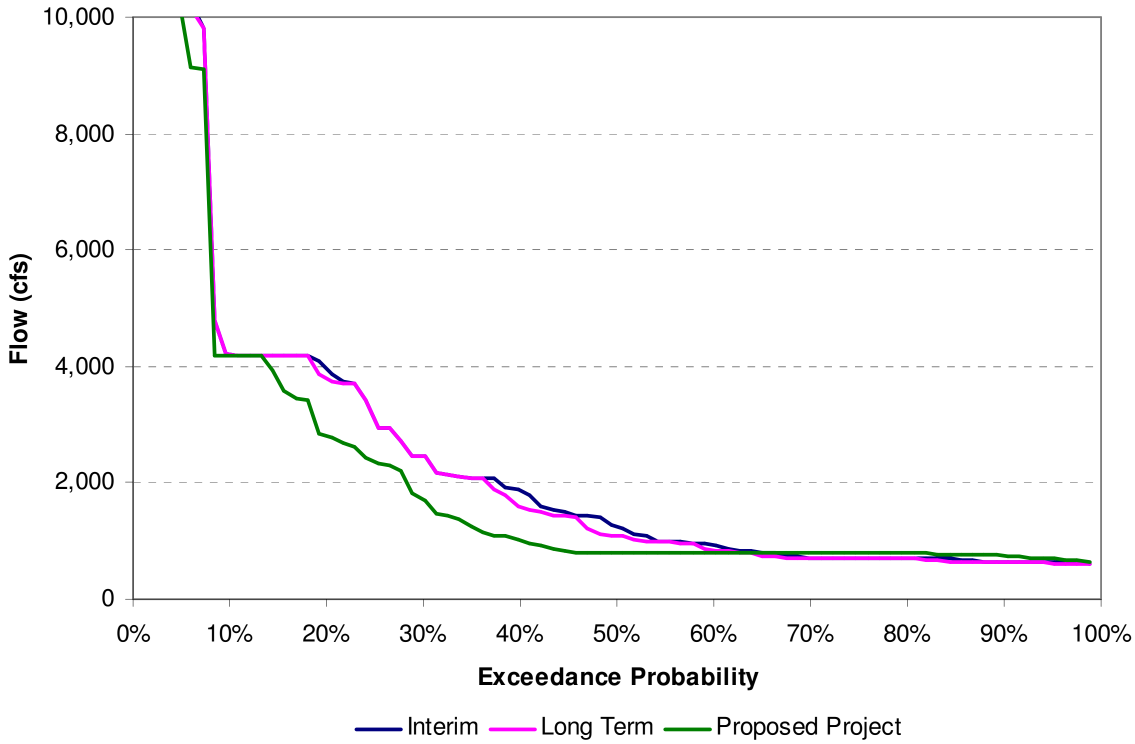


Figure A-19. Exceedance Probability of Yuba River Flow at Smartville for December 2007

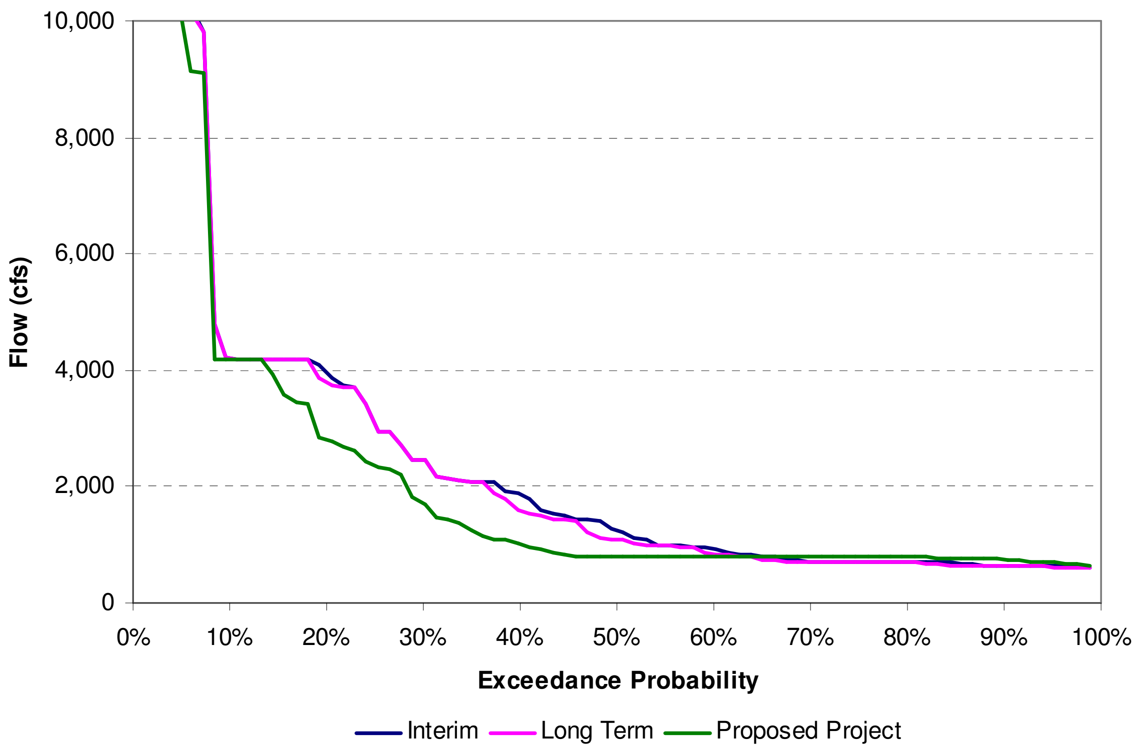


Figure A-20. Exceedance Probability of Yuba River Flow at Marysville for December 2007

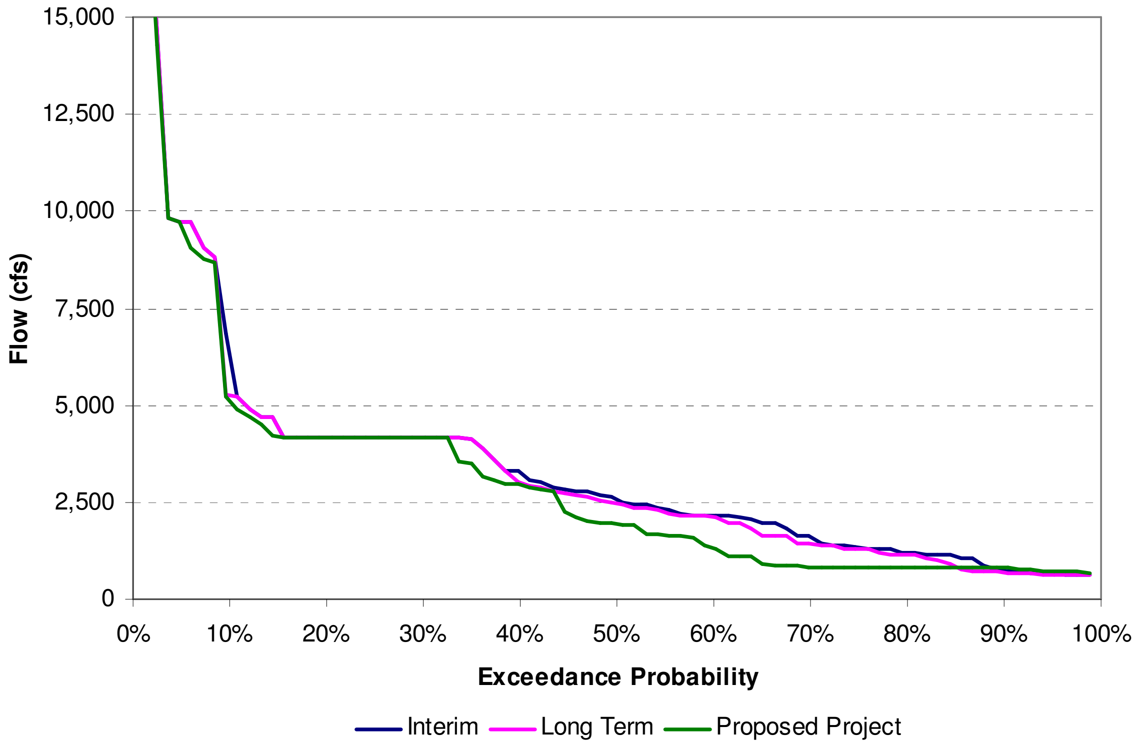


Figure A-21. Exceedance Probability of Yuba River Flow at Smartville for January 2008

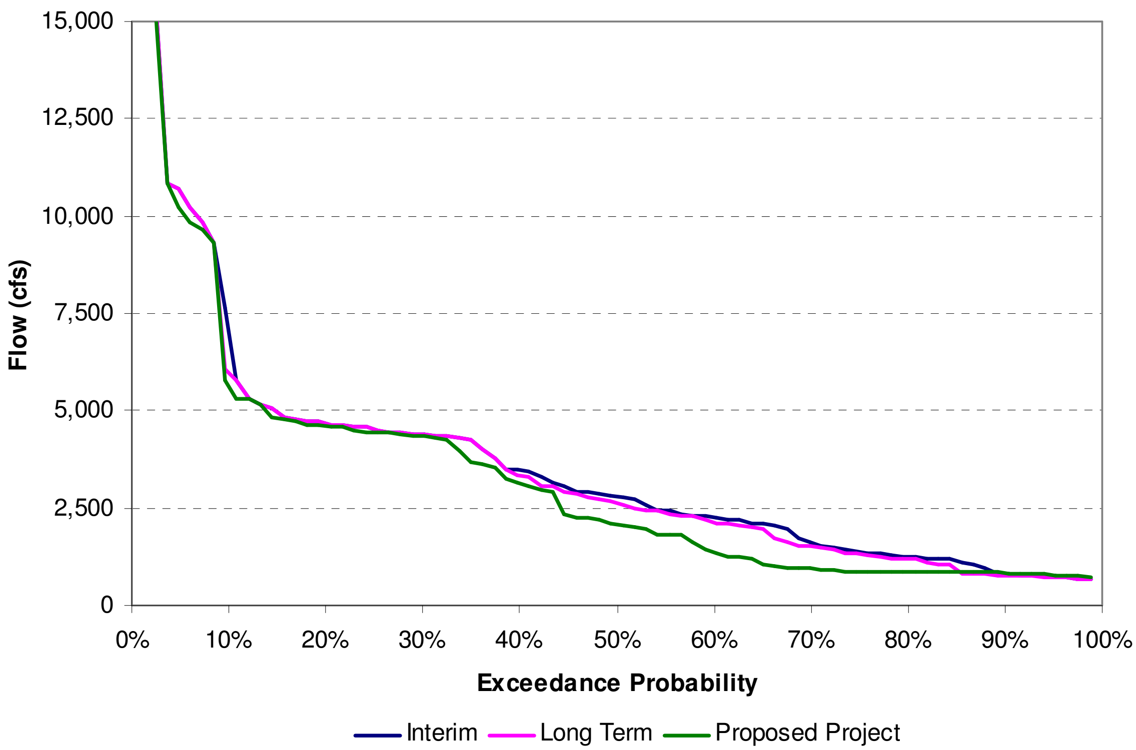


Figure A-22. Exceedance Probability of Yuba River Flow at Marysville for January 2008

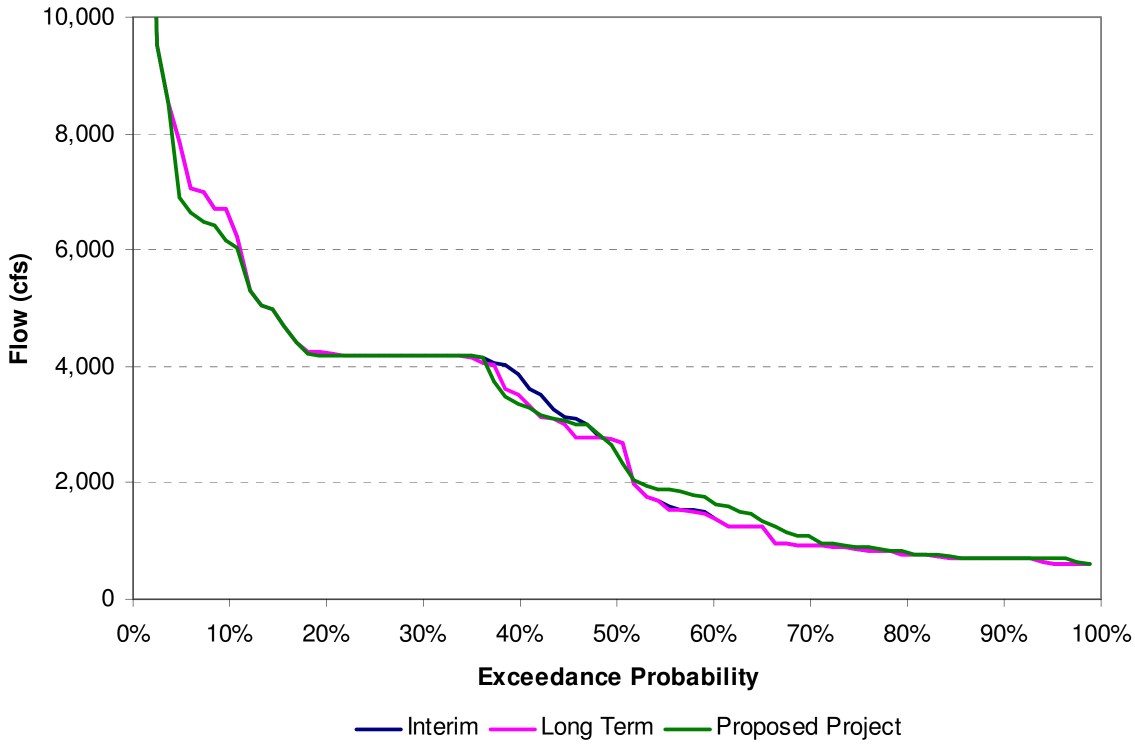


Figure A-23. Exceedance Probability of Yuba River Flow at Smartville for February 2008

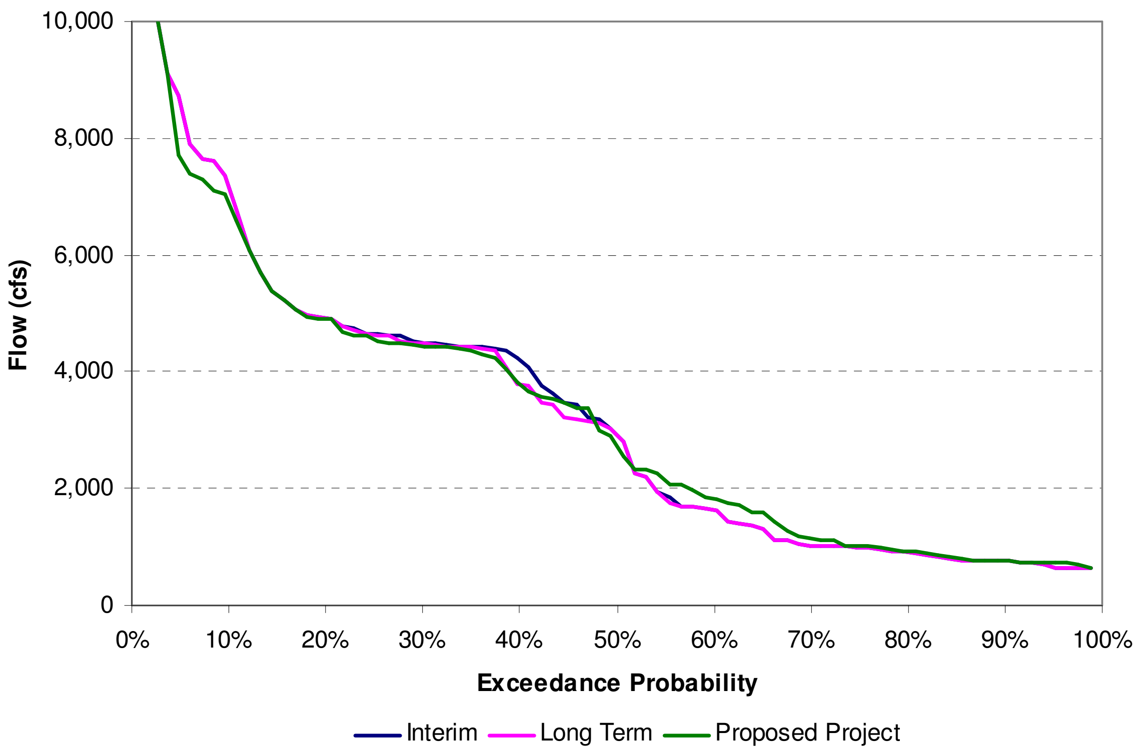


Figure A-24. Exceedance Probability of Yuba River Flow at Marysville for February 2008

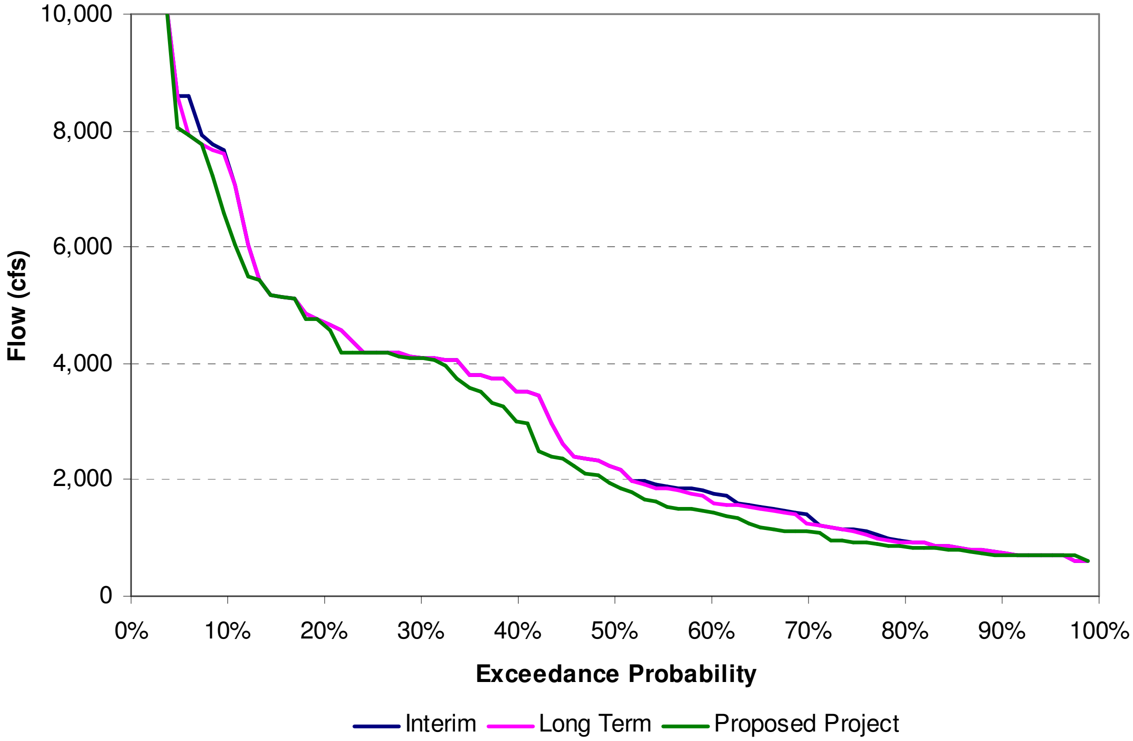


Figure A-25. Exceedance Probability of Yuba River Flow at Smartville for March 2008

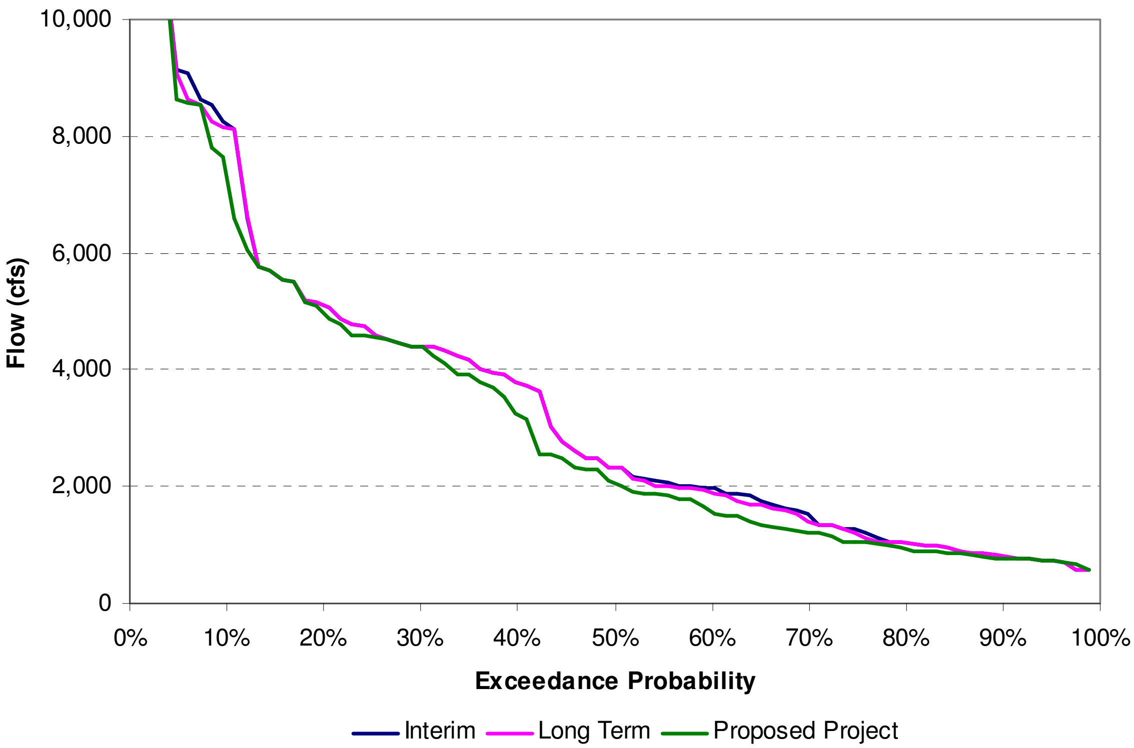


Figure A-26. Exceedance Probability of Yuba River Flow at Marysville for March 2008

Attachment B

Exceedance Probability Plots for Water Temperature at Marysville Gage and Daguerre Dam for March 2007 through March 2008

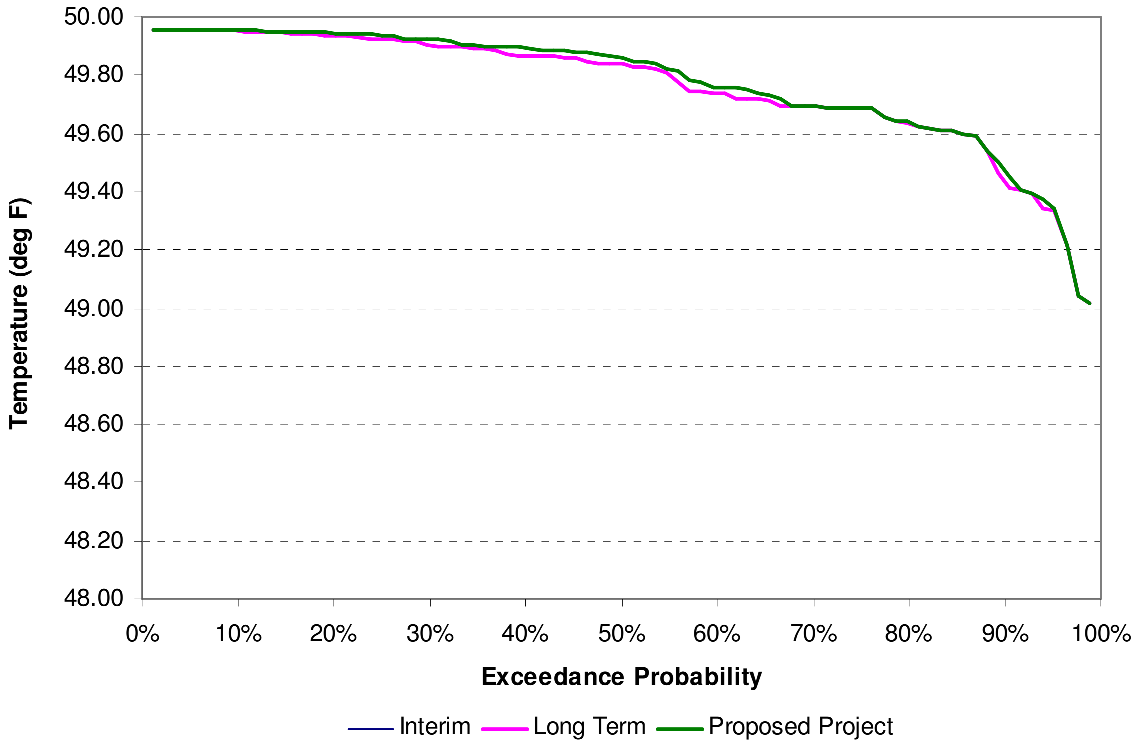


Figure B-1. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for March 2007

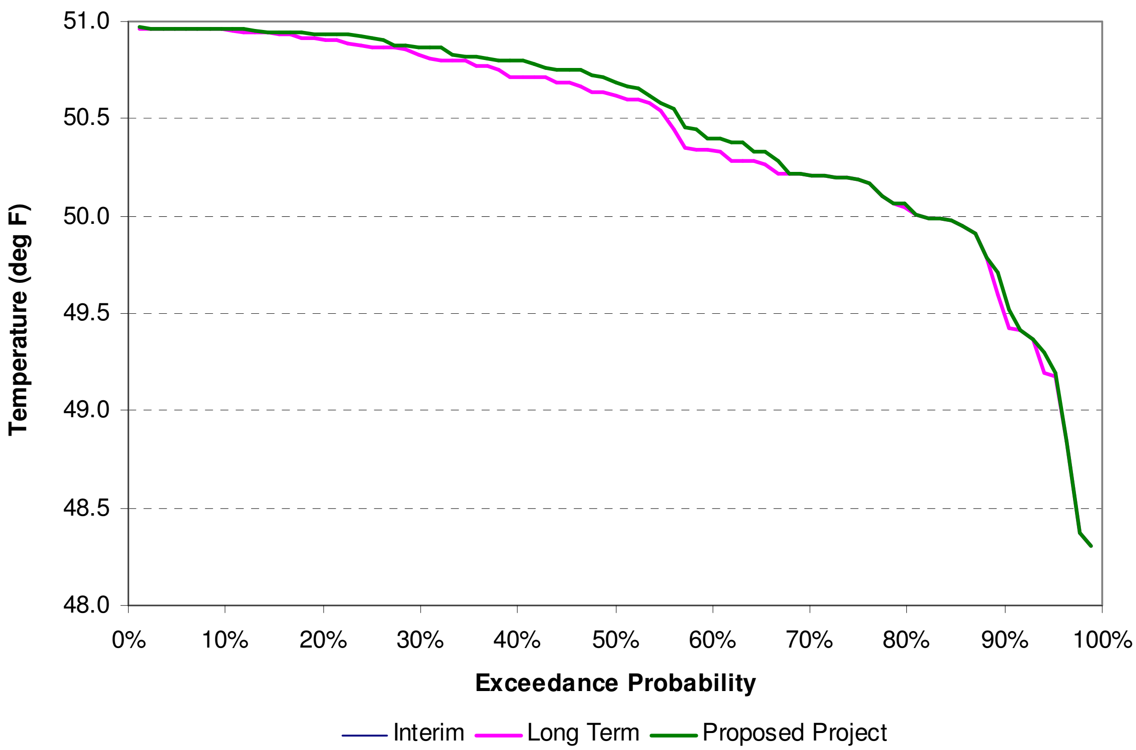


Figure B-2. Exceedance Probability of Yuba River Water Temperature at Marysville for March 2007

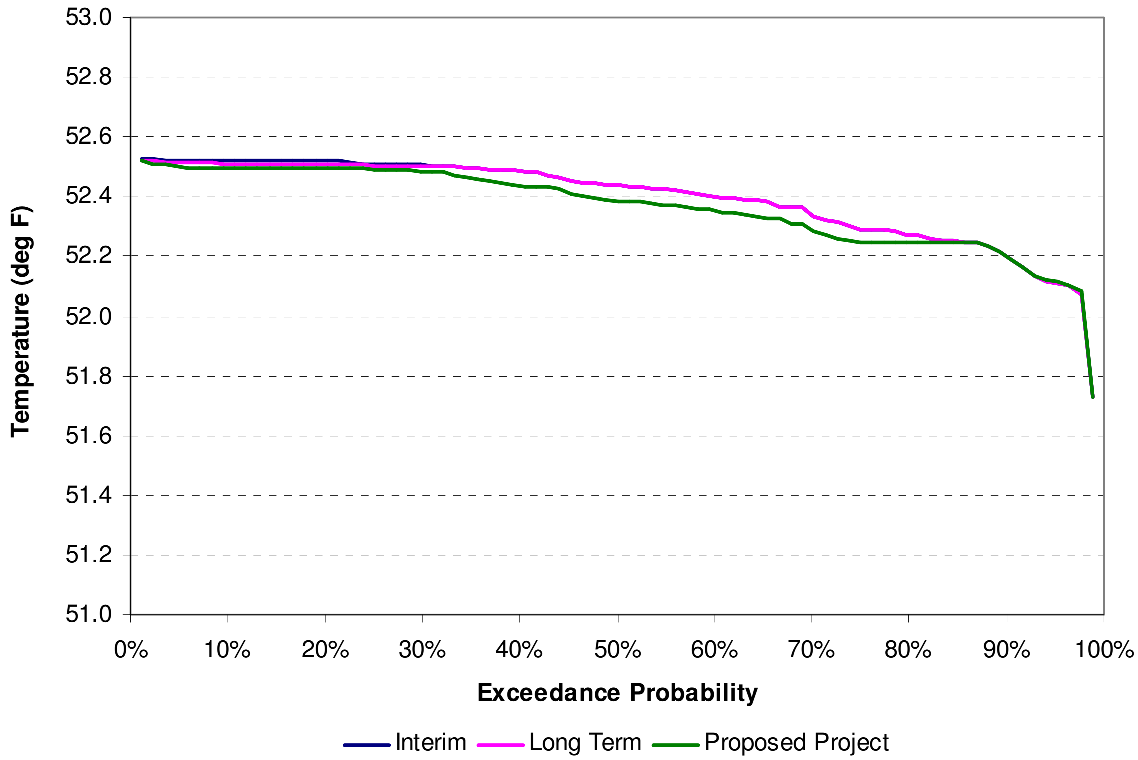


Figure B-3. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for April 2007

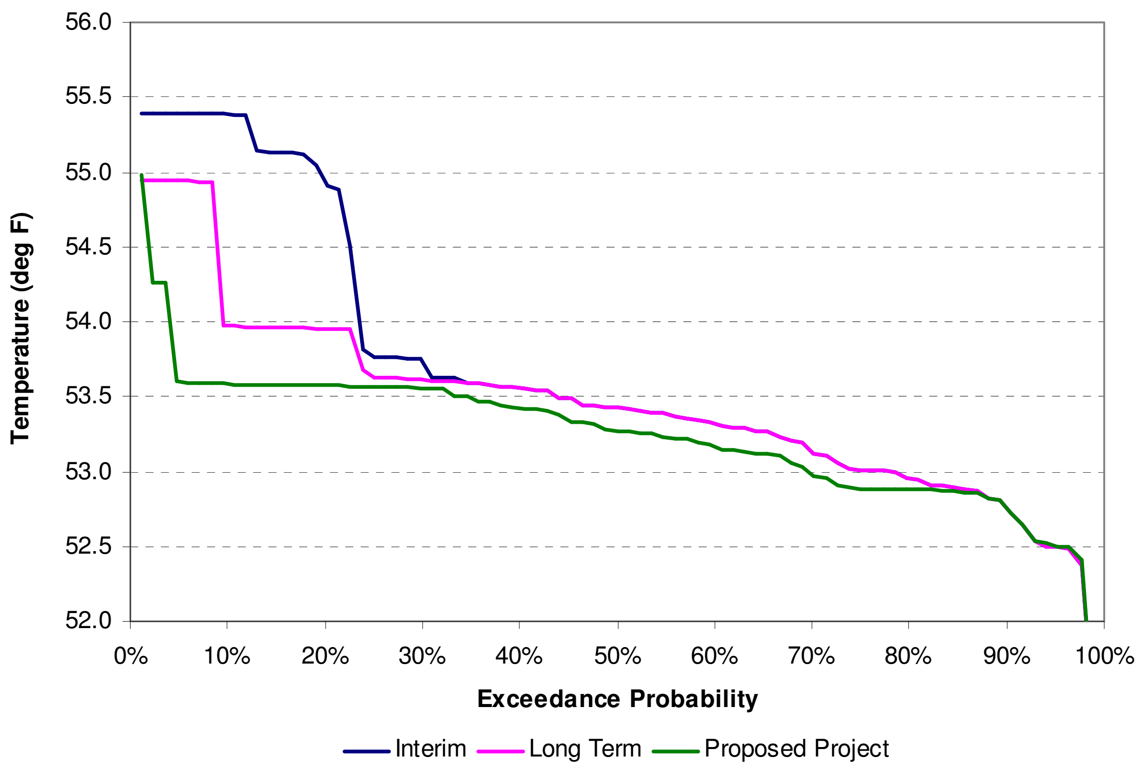


Figure B-4. Exceedance Probability of Yuba River Water Temperature at Marysville for April 2007

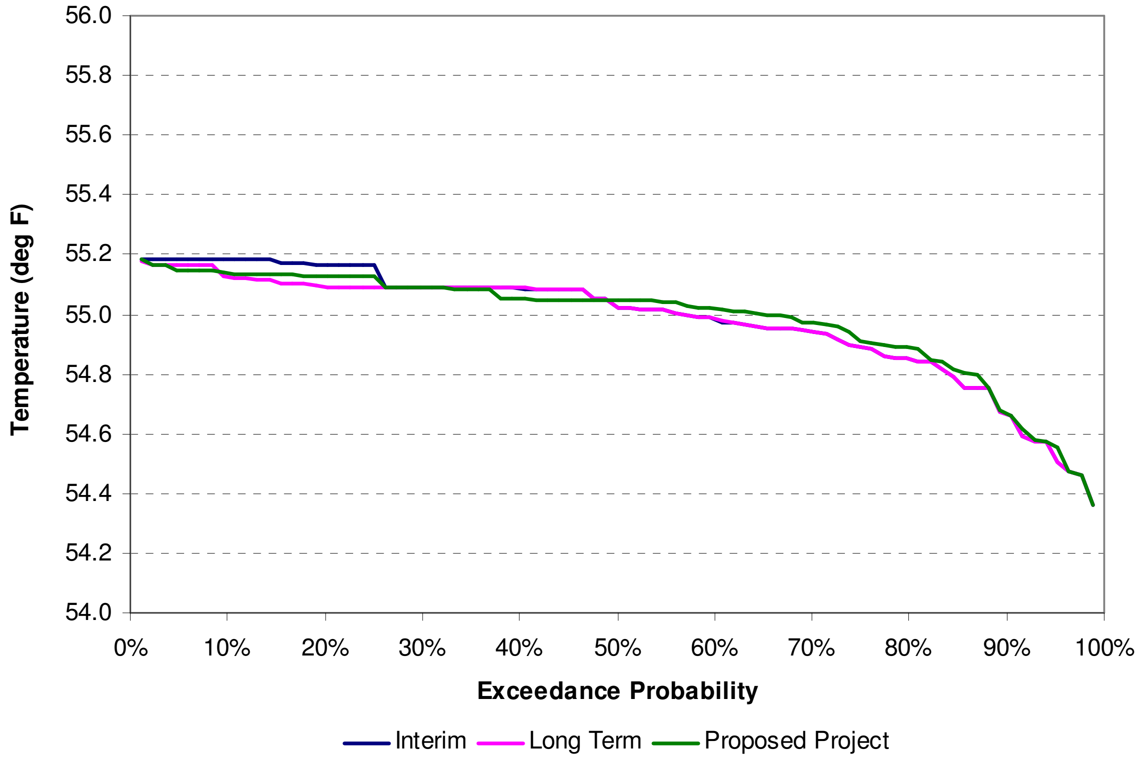


Figure B-5. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for May 2007

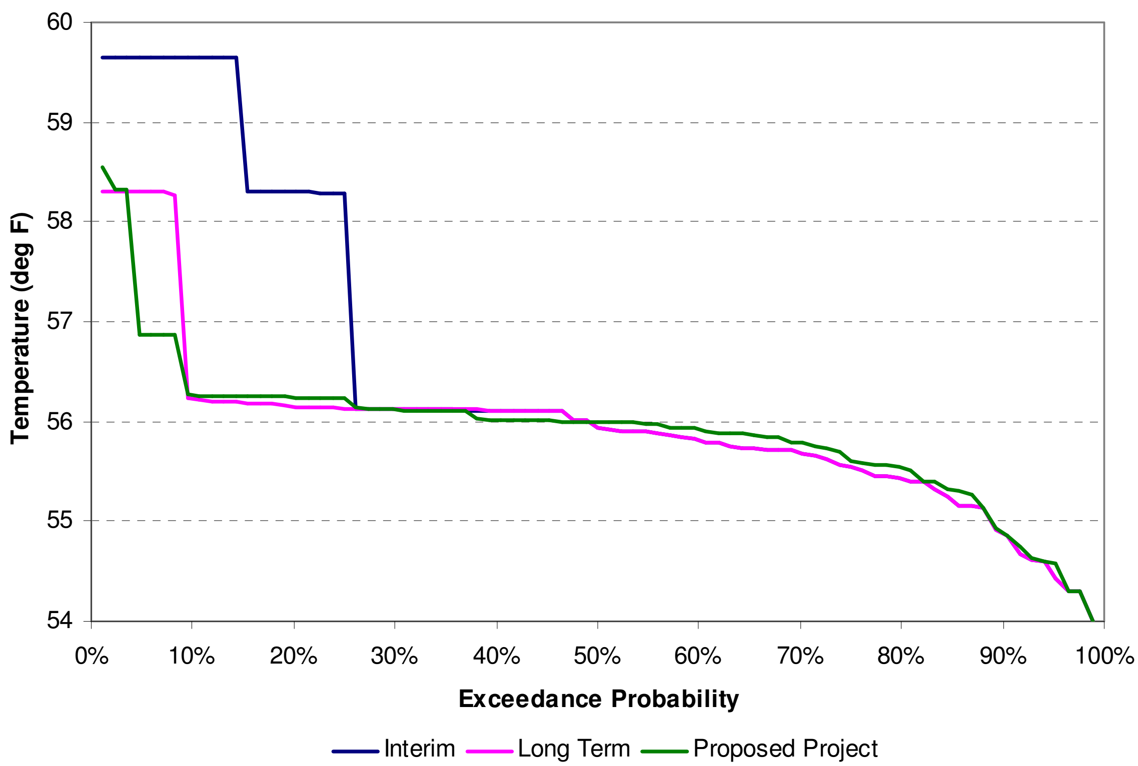


Figure B-6. Exceedance Probability of Yuba River Water Temperature at Marysville for May 2007

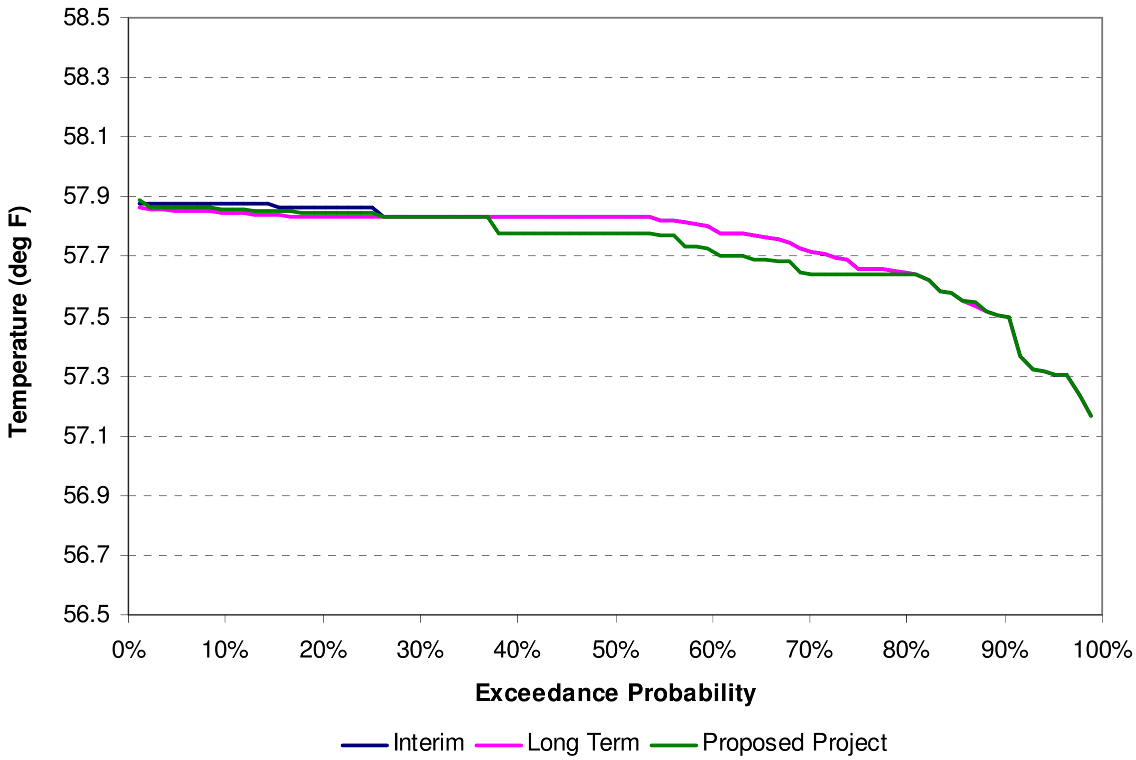


Figure B-7. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for June 2007

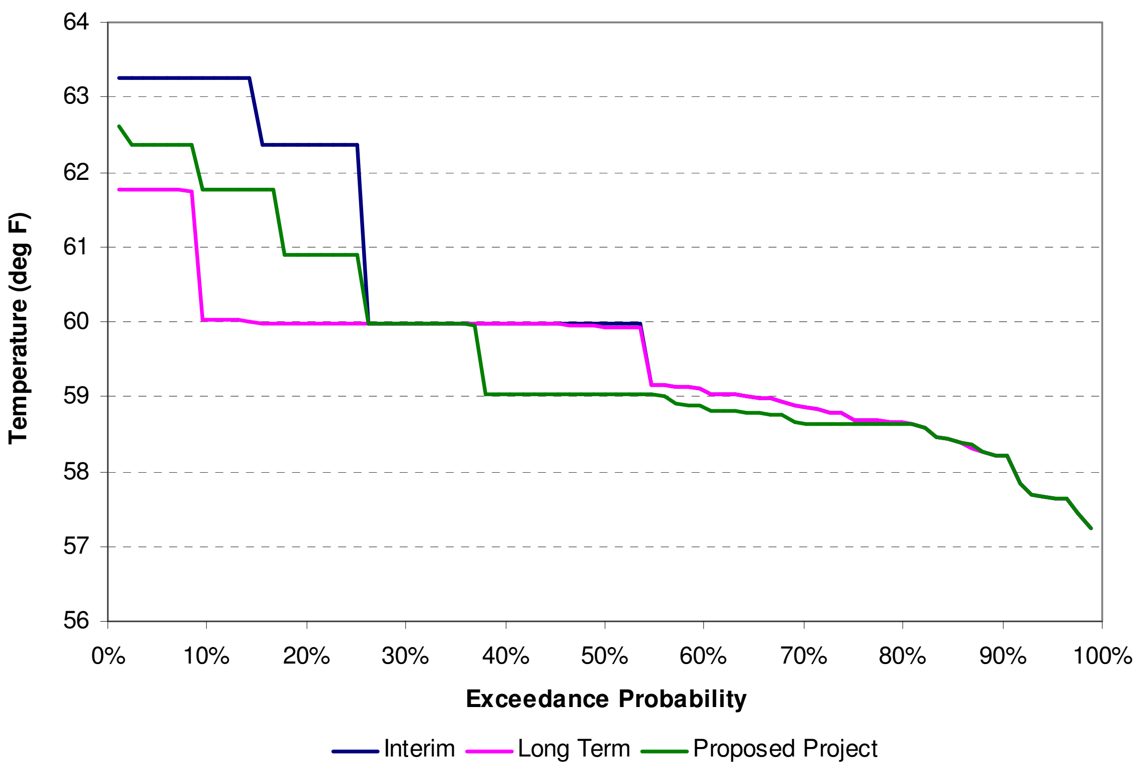


Figure B-8. Exceedance Probability of Yuba River Water Temperature at Marysville for June 2007

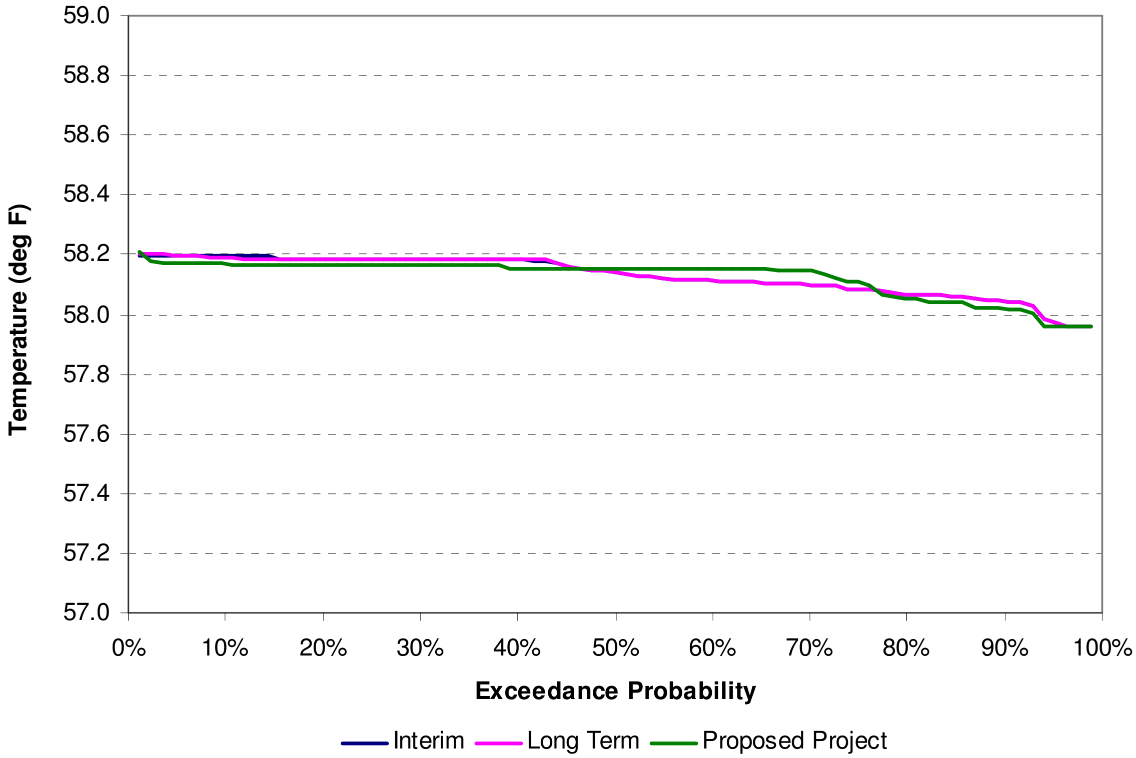


Figure B-9. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for July 2007

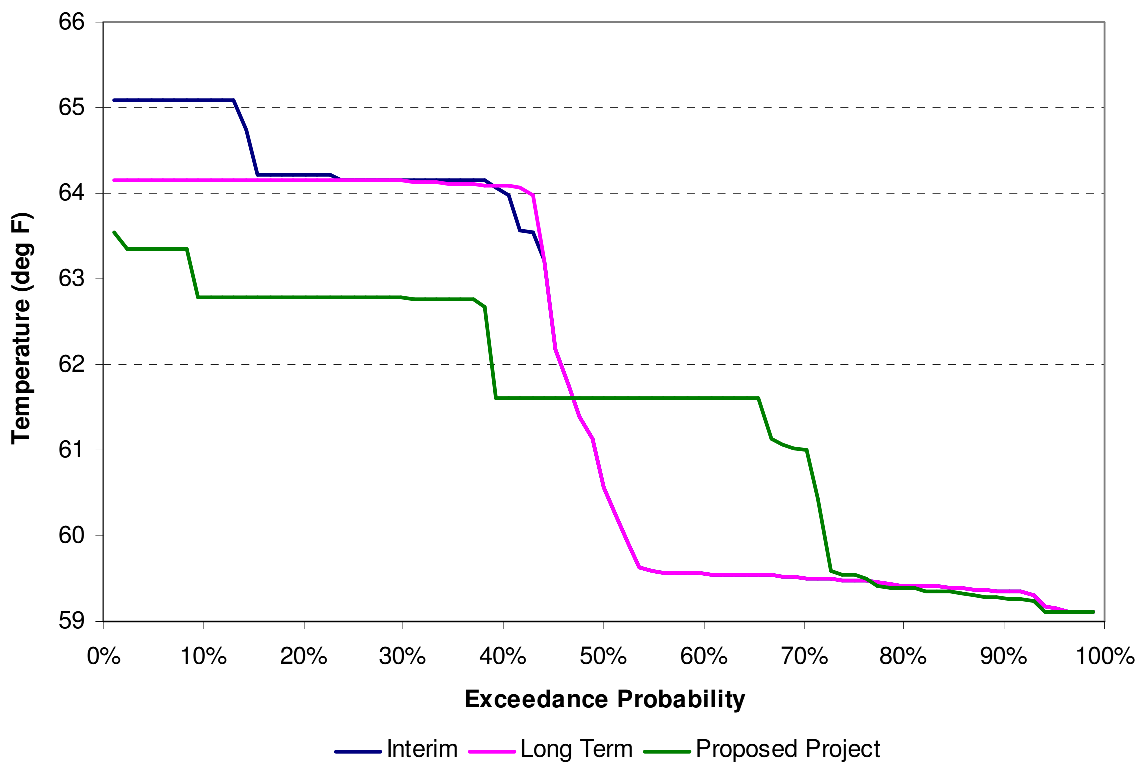


Figure B-10. Exceedance Probability of Yuba River Water Temperature at Marysville for July 2007

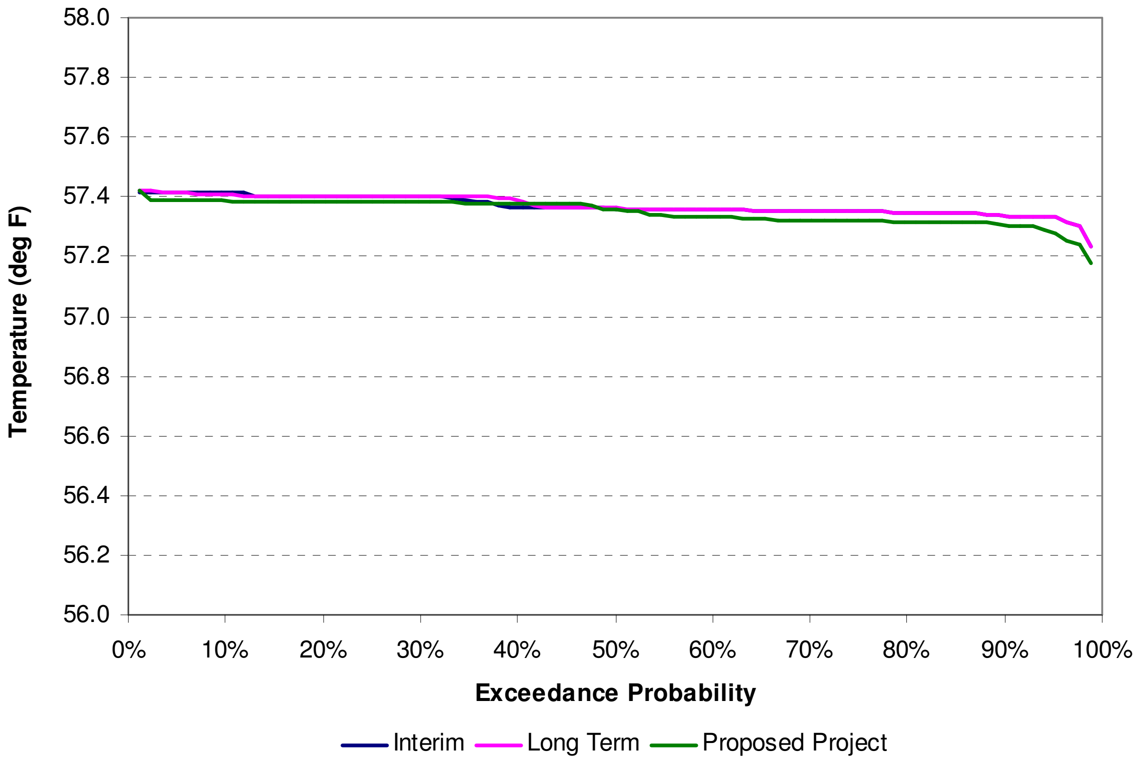


Figure B-11. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for August 2007

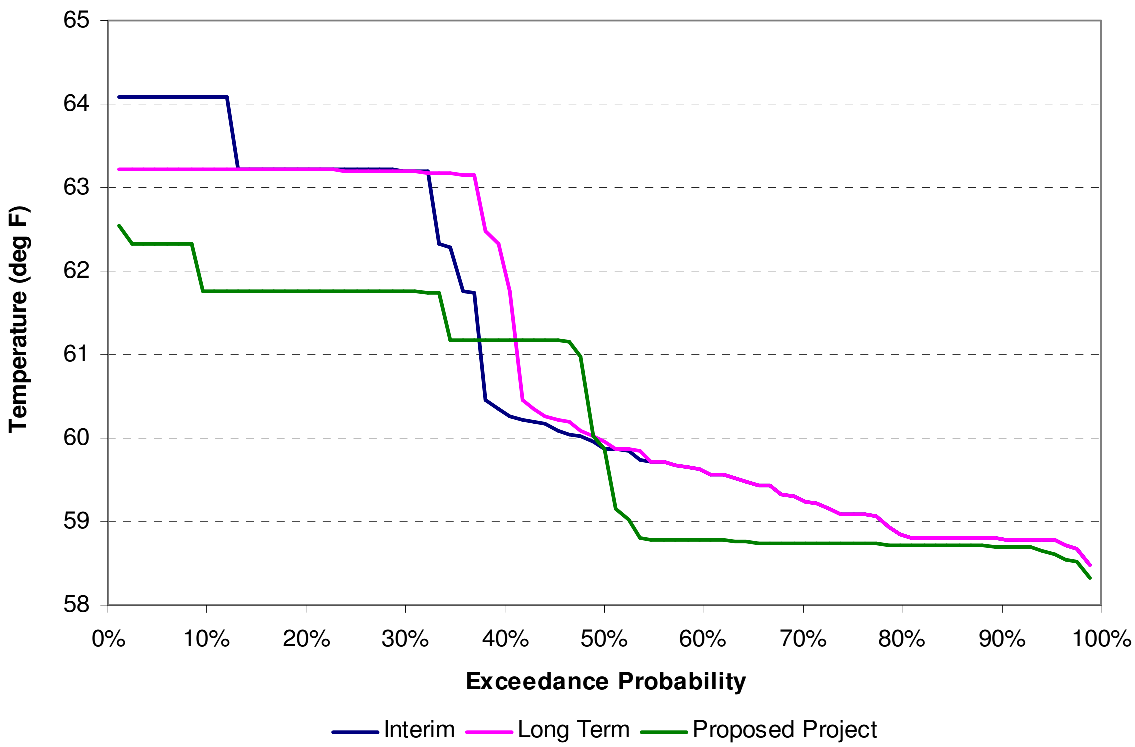


Figure B-12. Exceedance Probability of Yuba River Water Temperature at Marysville for August 2007

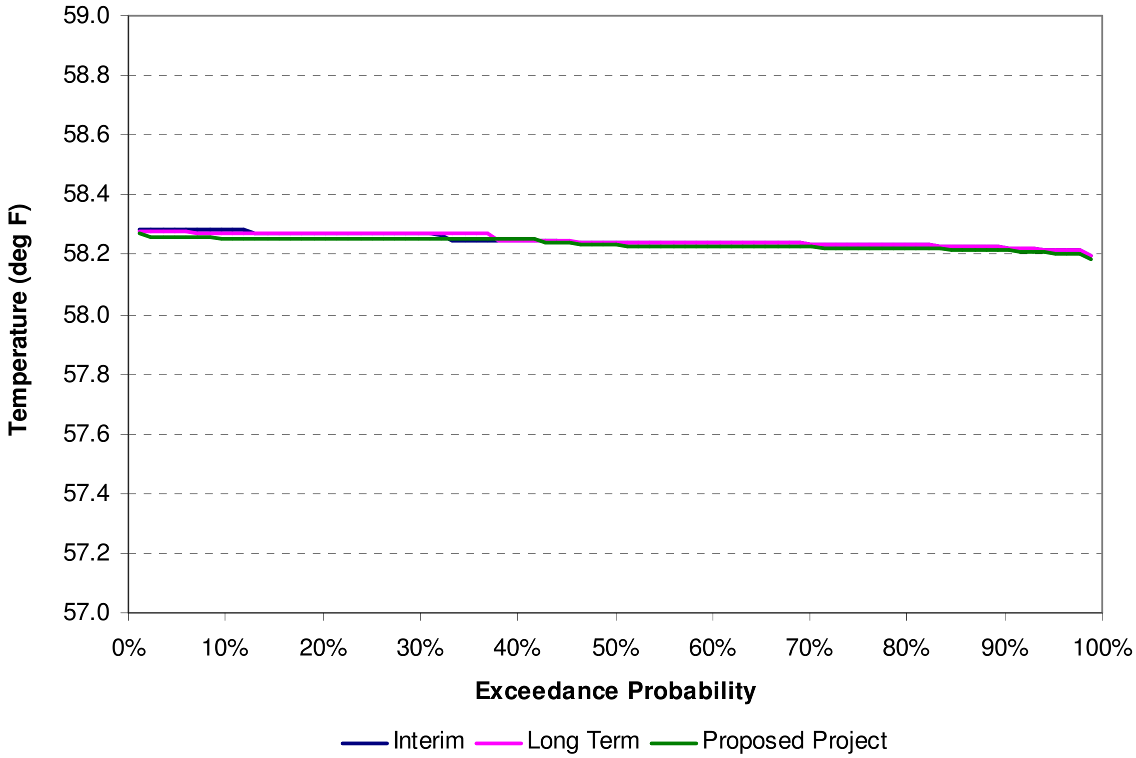


Figure B-13. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for September 2007

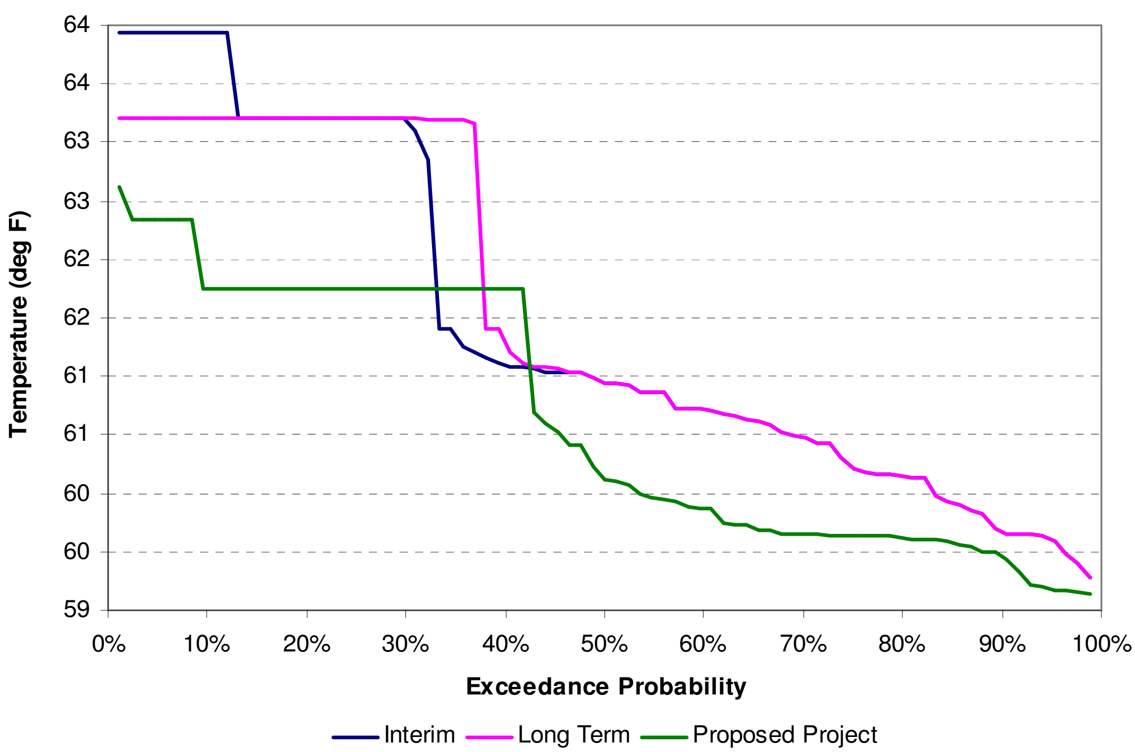


Figure B-14. Exceedance Probability of Yuba River Water Temperature at Marysville for September 2007

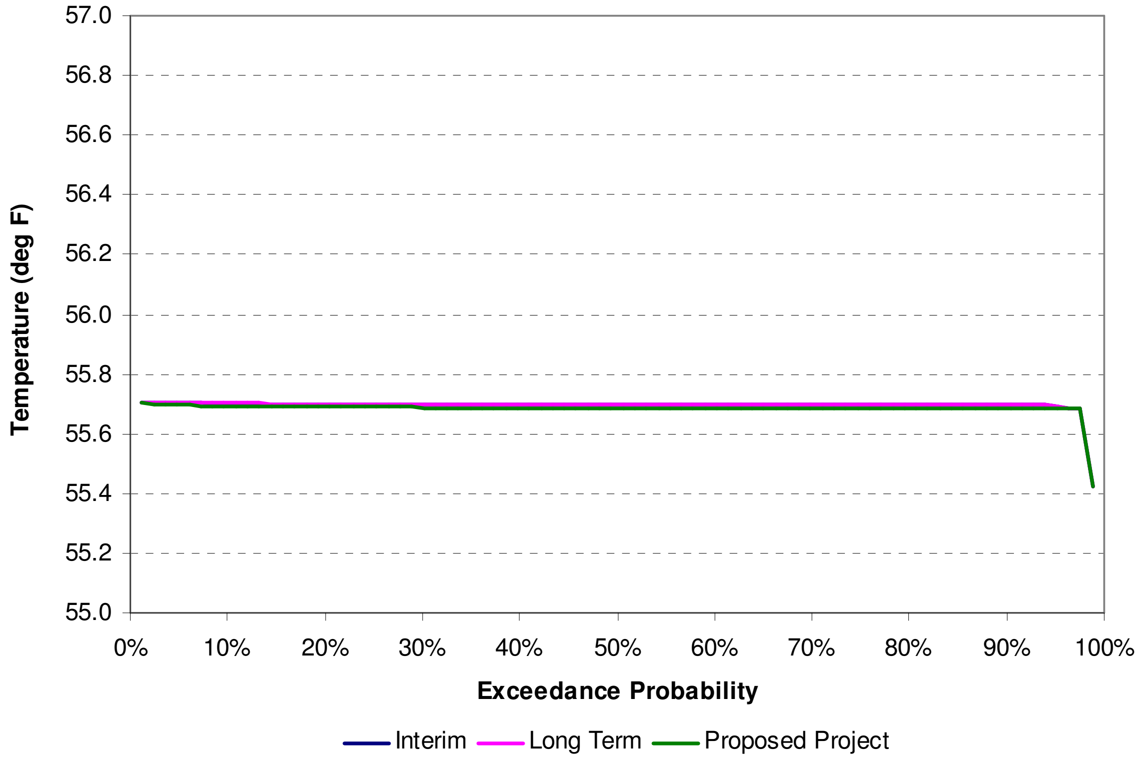


Figure B-15. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for October 2007

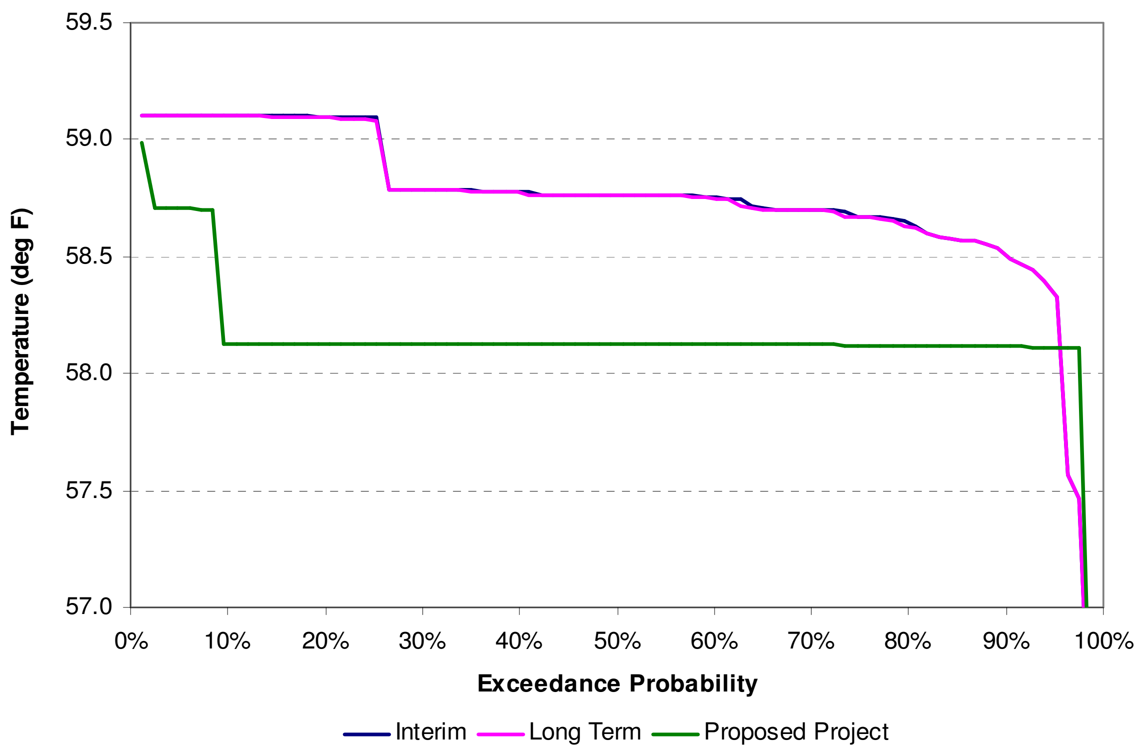
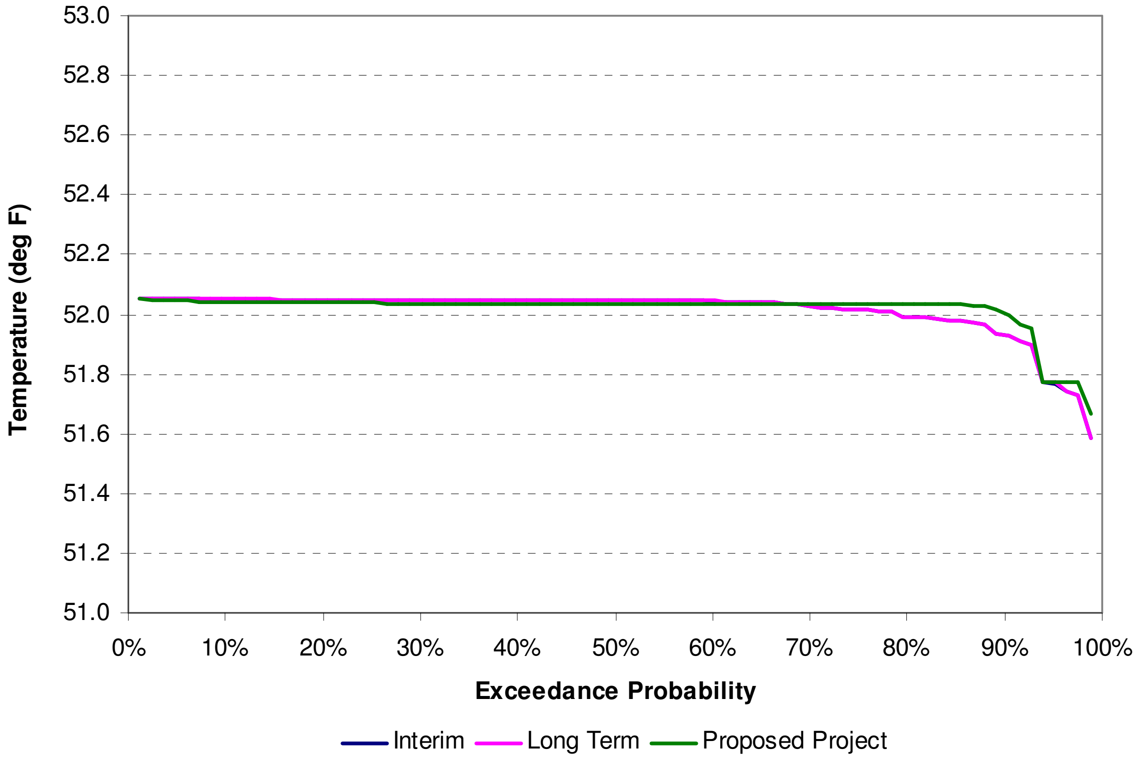


Figure B-16. Exceedance Probability of Yuba River Water Temperature at Marysville for October 2007



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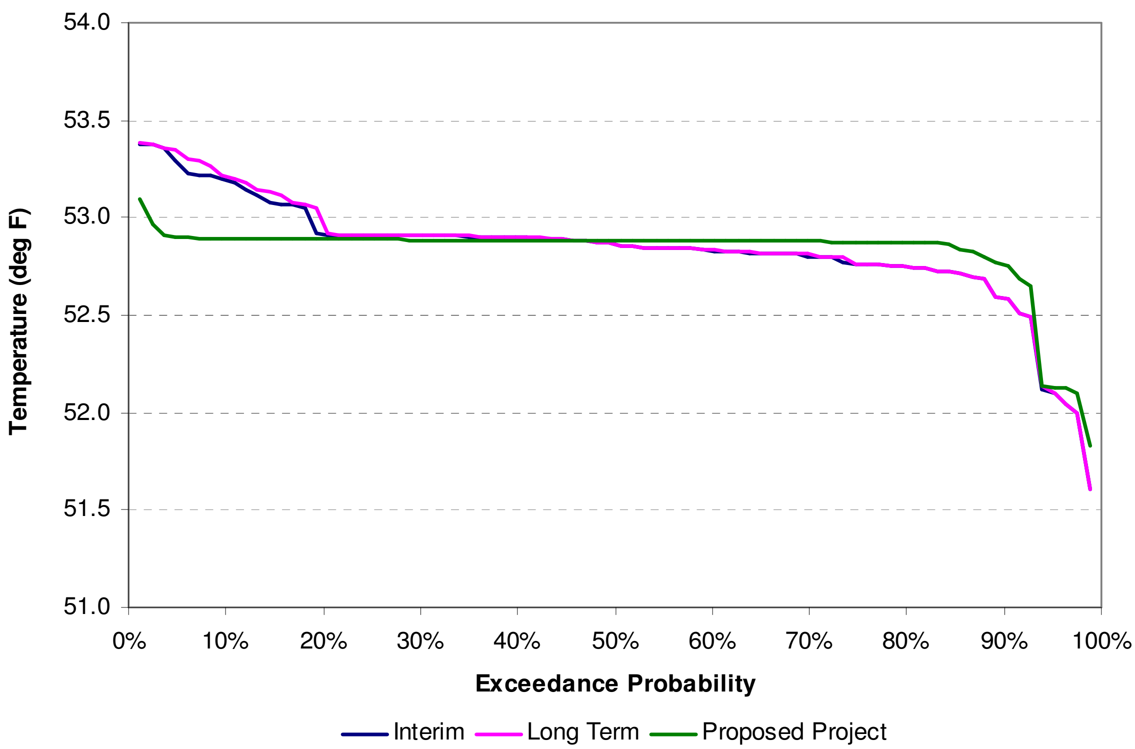


Figure B-18. Exceedance Probability of Yuba River Water Temperature at Marysville for November 2007

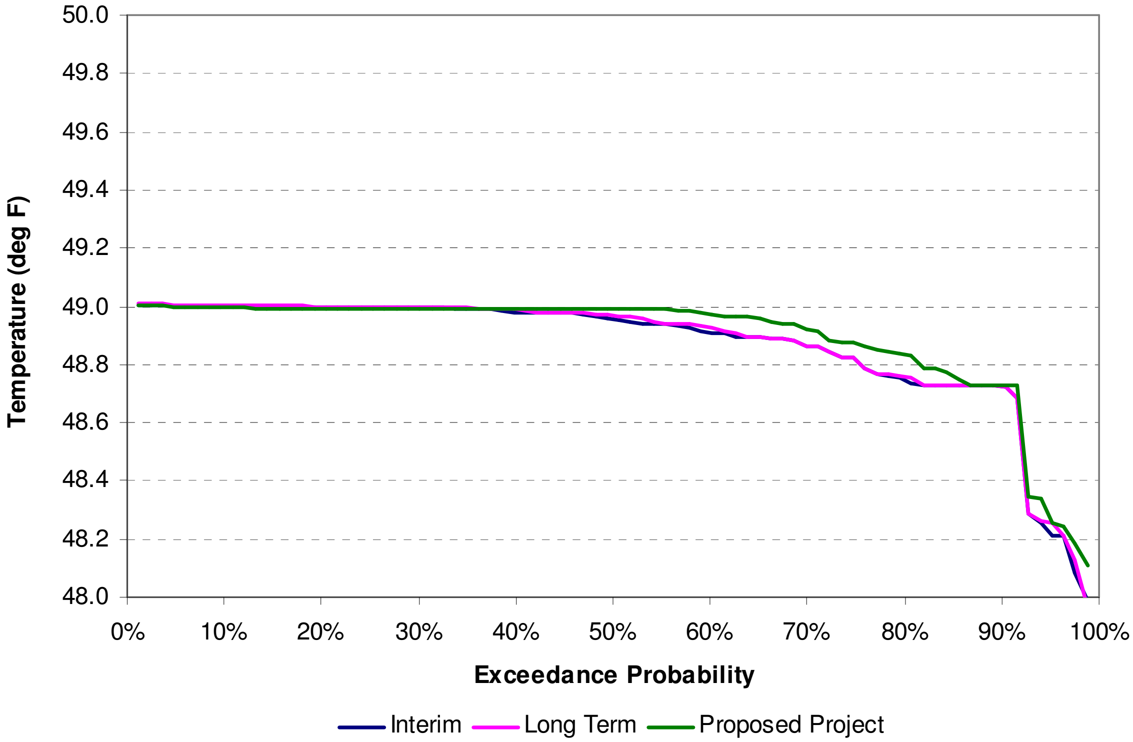


Figure B-19. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for December 2007

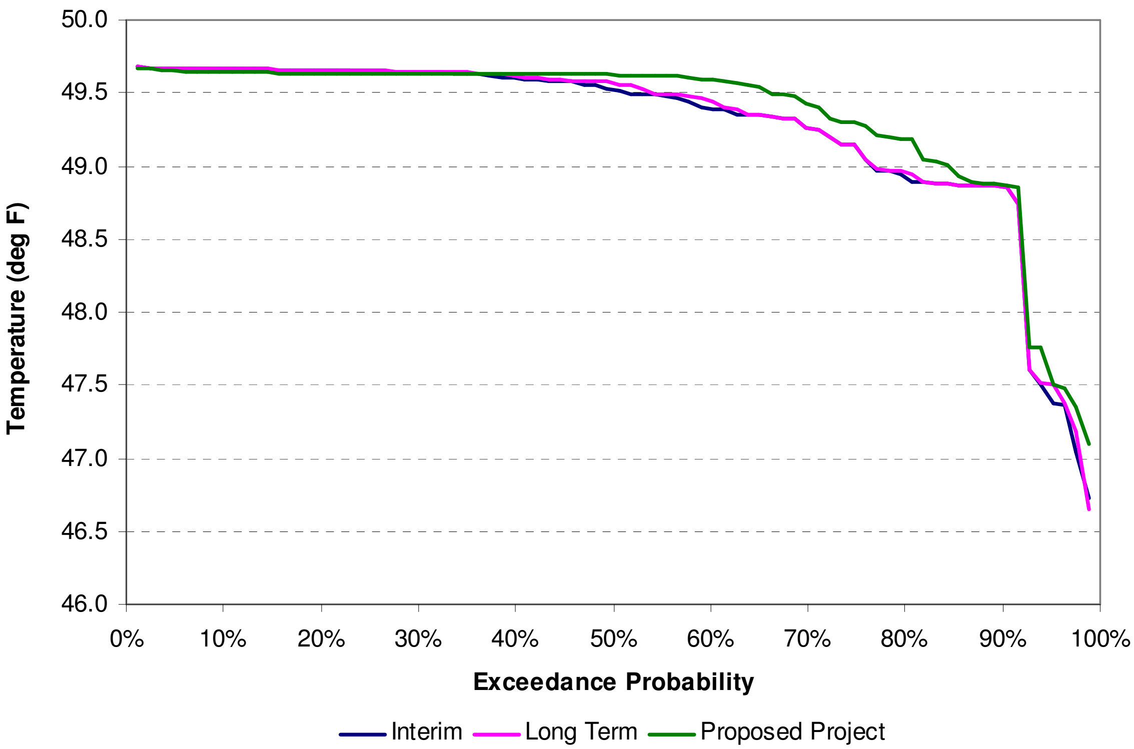


Figure B-20. Exceedance Probability of Yuba River Water Temperature at Marysville for December 2007

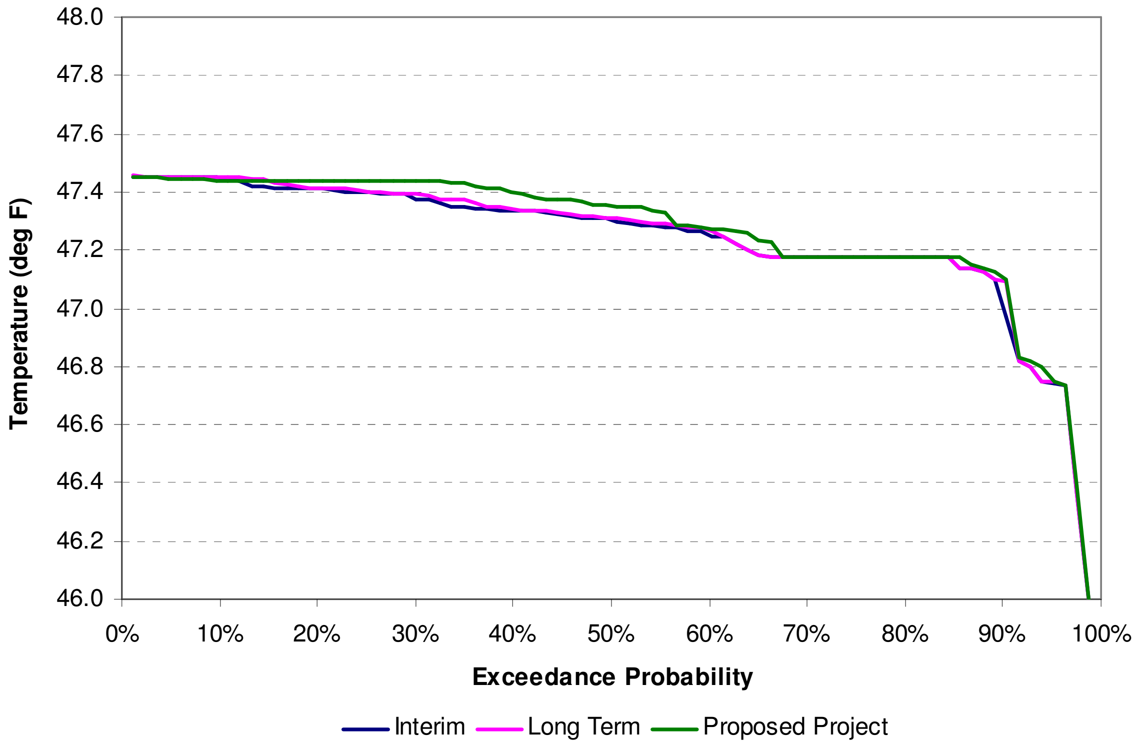


Figure B-21. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for January 2008

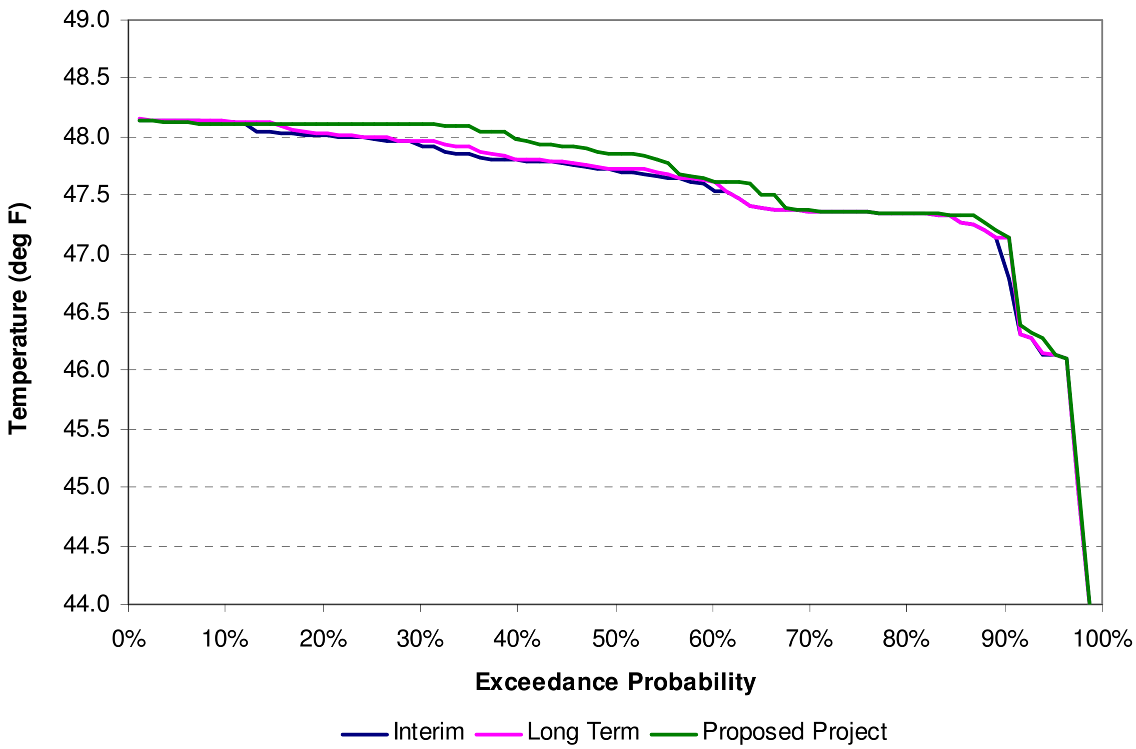


Figure B-22. Exceedance Probability of Yuba River Water Temperature at Marysville for January 2008

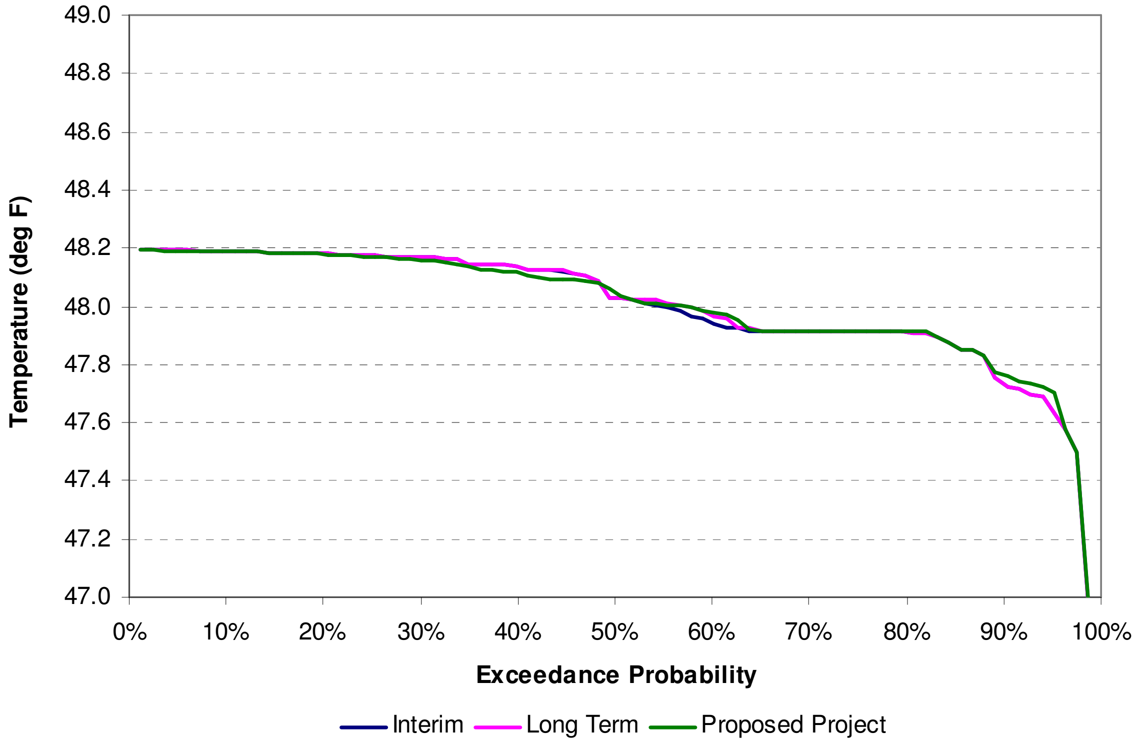
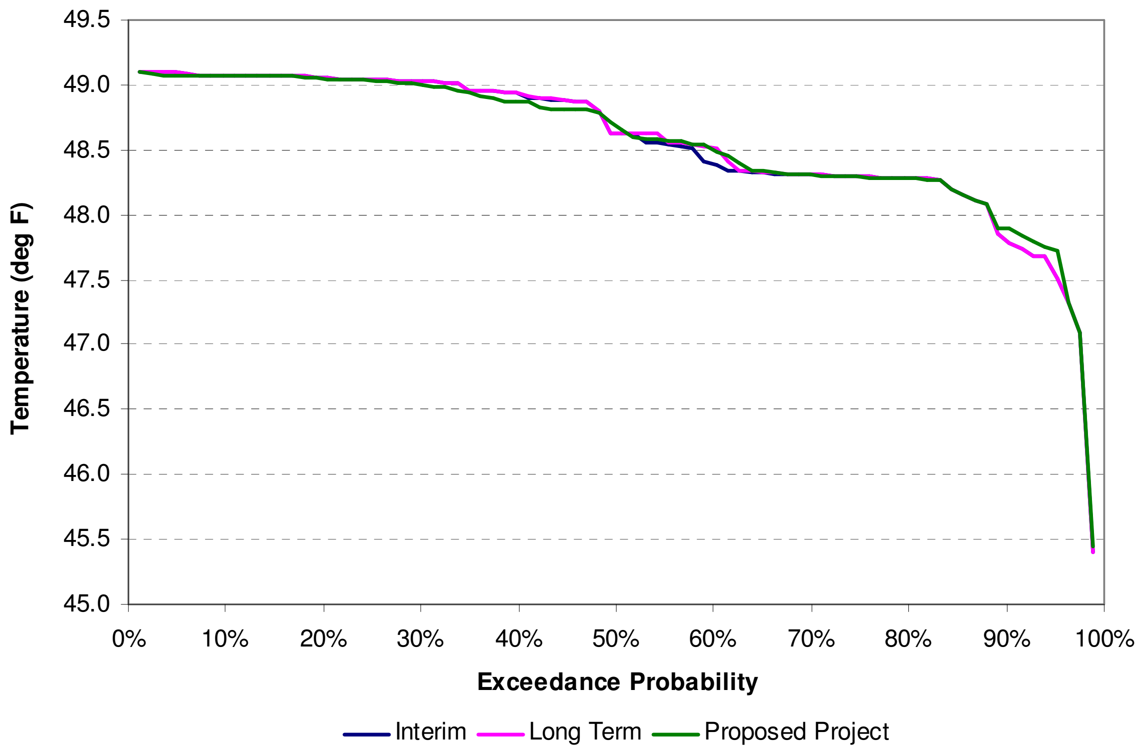


Figure B-23. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for February 2008



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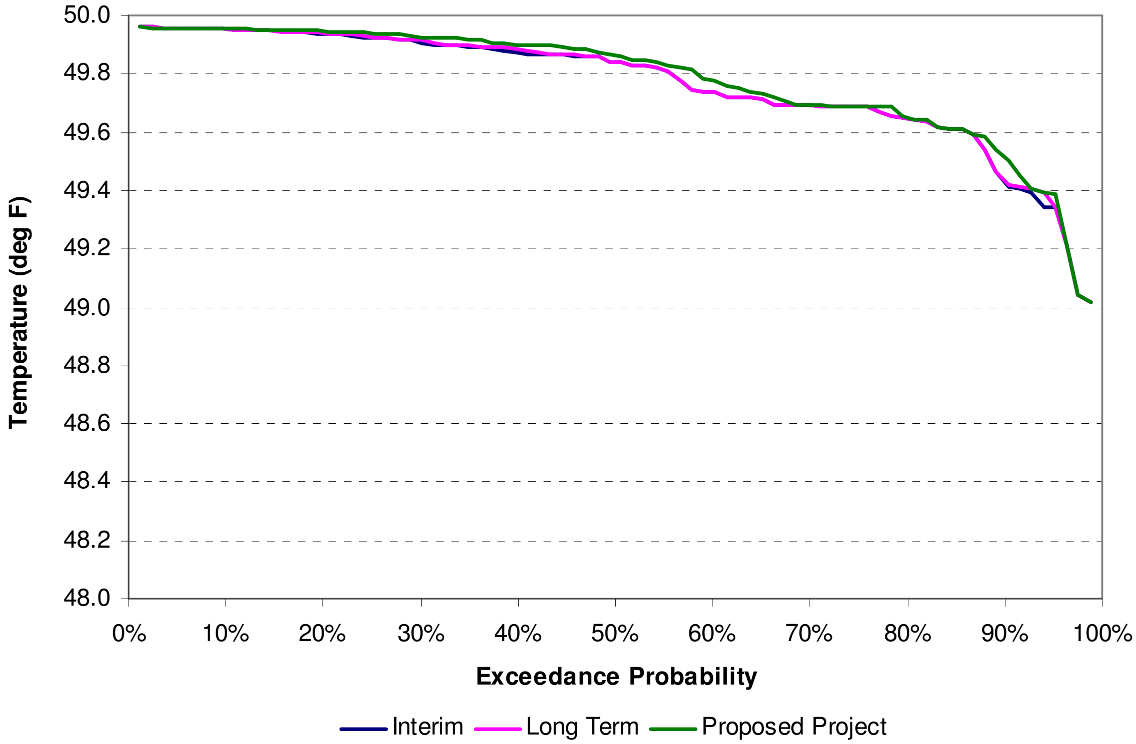

Figure B-25. Exceedance Probability of Yuba River Water Temperature at Daguerre Point Dam for March 2008

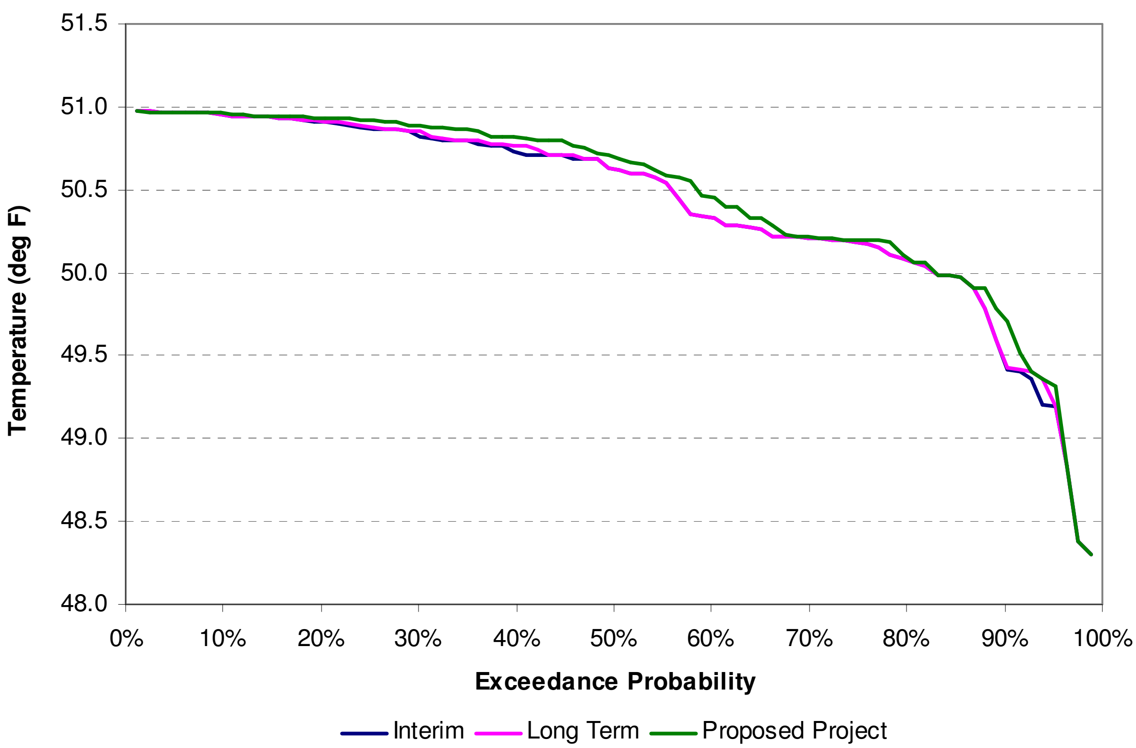

Figure B-26. Exceedance Probability of Yuba River Water Temperature at Marysville for March 2008

Appendix C

Groundwater Analysis Report

Appendix C
Analysis of the Groundwater Substitution Portion of the Yuba County Water Agency-CALFED Environmental Water Account/ Department of Water Resources 2007 Transfer

The Yuba County Water Agency (YCWA) plans to transfer up to a total of 125,000 acre-feet of water in 2007, between April 1 and December 31, 2007. A portion of the water transfer will be from storage in New Bullards Bar Reservoir and a portion may be from substitution of groundwater for surface water deliveries by several Member Units of YCWA.

The maximum amount of water for the transfer that would be derived from groundwater substitution is 30,000 acre-feet. 30,000 acre-feet of groundwater substitution would occur if the 2007 water year is critically dry and a Schedule 6 year occurs. A Schedule 6 year occurrence is defined in the 2007 Pilot Program Fisheries Agreement between the Yuba County Water Agency and the California Department of Fish and Game and other parties to the Yuba River Accord. The probability of a Schedule 6 year occurring in 2007 is about 1 in 50.

Based on the analysis described herein, no significant negative impacts are expected from the transfer of 30,000 acre-feet of water through groundwater substitution. The extraction of this amount of groundwater would result in conditions that would be within an acceptable range for the groundwater basin. Operations of the 2007 groundwater substitution transfer, if it were to occur, and the projected post-transfer basin conditions would not cause significant or unreasonable impacts to the environment. These expected conditions along with the basin management procedures implemented by YCWA and member districts would result in no significant unmitigated third party impacts to other groundwater users within the basin.

YUBA COUNTY GROUNDWATER SUBBASIN

The 2007 YCWA groundwater substitution transfer would take place with pumping from the Yuba County groundwater subbasin. The subbasin lies entirely within the Sacramento Valley groundwater basin, within the overlying political boundary of Yuba County. The subbasin extends from the Sierra Nevada foothills on the east to the Feather River on the west. The southern boundary is the Bear River and the northern boundary is Honcut Creek. The Yuba County groundwater subbasin encompasses an area of approximately 270 square miles. Information provided herein has been excerpted from the report titled *Groundwater Resources and Management in Yuba County* (Bookman-Edmonston, 1992) and other studies conducted over the past decade.

Geologic Setting

The subbasin area is bounded on the east by the relatively impermeable rocks of the Sierra Nevada Mountain Range. These same rocks and younger consolidated rocks extend beneath the subbasin at a gradually increasing depth toward the Feather River and beyond to the trough of the Sacramento Valley. Fresh groundwater is stored in this wedge-shaped body of alluvial material to depths of 1,000 feet. Beneath these alluvial deposits are consolidated rocks that may contain saline water and are effectively nonwater-bearing.

Physical Structure of Freshwater-Bearing Formation

The subbasin water-bearing units are thinnest to the east and thicken to the west. The structure is thickest along the Feather River and thinnest along the Sierra Nevada boundary. The thickness varies from 1,000 feet in the southwest corner near the Bear River to less than 300 feet at the base of the Sierra foothills. All of the stratified alluvial deposits slope gently to the west. No faults or folding of strata are known to occur within the freshwater-bearing area.

Description of Geologic Formations

All alluvial deposits and adjacent nonwater-bearing rocks are subdivided into geologic units called formations, which are described below in sequence of age from oldest to youngest. They range in age from the very old Paleozoic Sierran bedrock to the overlying alluvial materials that are still being deposited. Between these are the nonwater-bearing Eocene and Cretaceous Age rocks and the two principal water-bearing formations, the Laguna Formation and the Older Alluvium Formation, that together comprise over 95 percent of the subbasin water storage volume. The remaining volume includes the superficial stream channel and floodplain deposits.

Sierra Nevada Bedrock Formation

The Sierra Nevada Bedrock Formation does not store or yield significant amounts of groundwater. Shallow domestic wells can obtain small quantities of water from the weathered zone in these rocks, but the supply is not usually dependable. These rocks form the eastern boundary of the Yuba County groundwater subbasin and extend beneath the subbasin and Sacramento Valley to a considerable depth. At the west end of the dredger tailings, these rocks were found at a depth of 1,222 feet. Along the eastern boundary, north of the Yuba River, they occur within the subbasin as "islands" of bedrock surrounded by alluvial materials. These rocks are found beneath dredger tailings at a shallow depth upstream from Daguerre Point Dam.

Volcanic rocks are included with the Sierran bedrock formations within the property of Beale Air Force Base. They may be an important source of groundwater, but very little is known about their occurrence because well drillers tend not to recognize or record their volcanic origin.

Cretaceous Age Formations

Rocks from Cretaceous Age formations are common to the entire Sacramento Valley and occur at a depth of about 600 feet in the Goldfields area, although they are typically found at much greater depth. Marine in origin, they originally contained saline water; however, it is believed that, through most of the subbasin, the salt water in these formations has been mostly flushed out toward the valley trough.

Eocene Age Formations

Underlying nearly all the Yuba County groundwater basin and overlying Cretaceous Age formations are rocks of Eocene Age. These rocks are probably nonmarine in origin. Although well drillers have given the Eocene rock various names depending upon their location in the valley, the Ione Formation is considered the most commonly occurring formation name. Typically a clay, samples of this formation have been found at depths of 255 to 483 feet in the easterly thinner area of the groundwater subbasin.

Laguna Formation

The Laguna Formation is the thickest and most extensive water-bearing unit in the Sacramento Valley groundwater basin. The formation is exposed intermittently along the east side of the valley from Oroville south to Stockton. In Yuba County, the Laguna Formation is well exposed all along the foothills adjacent to the eastern boundary of the groundwater basin. It is also exposed in isolated hills between Beale Air Force Base and Wheatland, where the thin surrounding younger sediments allow the Laguna Formation to be exposed in "windows." Farther west, the formation is only found in deep wells.

The overall composition of the formation is silts to sandy silts with abundant clay. Gravel or sand deposits are uncommon in surface exposures. In the subsurface, well logs indicate that the formation is predominantly blue clay. Sand and gravel layers are thin and discontinuous and are commonly cemented. Although the amount of coarse-grained material appears to decrease toward the north and south away from the Yuba River vicinity, considerable coarse materials occur in the Yuba River vicinity between depths of 150 to 600 feet.

The overall low permeability of the Laguna Formation provides low well yields in comparison to the overlying younger deposits. In addition to the formation's fine-grained character, permeability is also reduced because much of the thin sand and gravelly zones are cemented.

The Laguna Formation varies in thickness from 400 feet toward the center of the Yuba County groundwater subbasin to 1,000 feet in the southwestern portion of the basin.

Older Alluvium Formation

The Older Alluvium is the predominant surficial geologic formation. It extends from Dry Creek north to Honcut Creek, interrupted only by the wide floodplain of the Yuba River. On the west, it is bounded by the Older Floodplain Deposit Formation and on the east by the Laguna Formation.

This formation was created by alluvial materials laid down into alluvial fans by streams flowing from the Sierra Nevada. The alluvial materials were created through erosion of the Sierra Mountains by streams. When compared to the Laguna Formation, this formation has a greater proportion of sands and gravels.

The Older Alluvium Formation is comprised of loosely compacted silt, sand, and gravel with some clay. The deposits occur in lenticular beds and are more stratified than the Laguna Formation. Gravel deposits are more concentrated in the upper 150 feet of the formation. The amount of gravel and the thickness of the layer decrease in a westward downstream direction as the distance from the Yuba River increases.

The thickness of the formation varies widely. It is difficult to distinguish the contact of this formation with the Laguna Formation. Based on the concentration of gravel and sand deposits, it appears that the formation is about 150 feet thick in the Yuba River vicinity and thins to less than 100 feet to the south.

Wells drilled into this formation may yield up to 2,000 gpm. In water-bearing character, the Older Alluvium Formation is moderately permeable throughout, except at its surface, where hardpan and claypan soils have developed. Hardpan soils, a characteristic of the formation, provide an impediment to the infiltration of precipitation and unconsumed applied water. Nearly all domestic wells and shallow irrigation wells in the Yuba County groundwater subbasin have been drilled and completed in this formation because the gravels found in this formation usually provide adequate yields. Several wells with depths of less than 150 feet are known to yield 1,000 to 1,200 gpm. Higher-yielding wells in these areas are usually much deeper and obtain their additional yield from the underlying Laguna Formation.

Older Floodplain Deposit Formation

Bordering the Feather River adjacent to more recent alluvium is a 1- to 2-mile-wide bank of gravelly sand, silt, and clay deposited during flooding events. These deposits predate the younger stream and overbank deposits of the Feather River and overlie the Older Alluvium Formation on the east. Well logs show 5 to 15 feet of "topsoil" often overlying hardpan that is probably the buried surface of the Older Alluvium Formation. The formation is too thin to store appreciable amounts of groundwater and has no value as a source of extractions. Its moderate permeability, however, provides for the infiltration of precipitation and return of unconsumed irrigation water to the water table unless they are prevented by buried hardpan soils.

Stream Channel and Floodplain Deposit Formation

The alluvial materials in the Stream Channel and Floodplain Deposit Formation are of recent age and are made up of coarse sand and gravels along the present stream channels of Honcut Creek and the Yuba, Bear, and Feather Rivers. They also occur as abandoned overflow channels two to five miles south of the Yuba River. The greatest volume of coarse gravel occurs along the Yuba River in a band up to three and one-half miles in width. Huge quantities of rounded, very coarse, boulder- and cobble-sized gravel were laid down in the upper reach of the Yuba River after it flowed out of its canyon in the Sierras. Farther downstream in the agricultural areas, thick deposits of highly permeable sands and gravels provide large quantities of water to wells. These deposits are up to 110 feet thick. All of the stream channels and floodplain deposits along the Yuba River act as a large water intake area for recharge of the subbasin.

Dredger Tailings

In the upper reach of the Yuba River, extending from the Sierra Nevada Bedrock formation for 15 miles downstream, are large piles of very coarse gravels and cobbles that have been extensively dredged for gold. The thickness of the dredged gravels in the eastern area above Daguerre Point Dam is 60 to 80 feet. West and southwest of Hammonton, for a distance of one or two miles, the dredger tailings are 100 to 125 feet thick. In this central area of tailings, the gravels are underlain by white sands and clays, as revealed by mineral exploration bore holes. Here the underlying fine-grained sedimentary materials are probably part of the Laguna Formation.

GROUNDWATER OCCURRENCE AND DEVELOPMENT

Groundwater occurs generally under water table or unconfined conditions throughout most of the groundwater subbasin. Well drillers report no changes in water levels during the drilling in many wells, both moderately deep and shallow, indicating a lack of confinement. In some areas, the water levels in cable-tool-drilled holes are reported to rise after water was first encountered. This condition is more common in the deeper wells, particularly in the Laguna Formation, where groundwater is considered to be confined by overlying clay layers. Confinement probably occurs at depths in excess of 300 to 400 feet.

Well Yields

Well yields and water level drawdowns are known through the testing of industrial, irrigation, and community supply wells soon after they are drilled by either well drillers or pump installers. These yields may be recorded along with the well logs on the "Well Drillers Report" filed with the Department of Water Resources. Ninety-two driller reports filed with the Department of Water Resources and reviewed for the report *Groundwater Resources and Management in Yuba County* (Bookman-Edmonston, 1992) have production data. The average well yield per township area (36 square miles) ranges from 1,000 to 2,300 gpm, and the average specific capacity can range from 16 to 74 gallons per minute per foot.

The area of highest well yields is in the Stream Channel and Floodplain Deposit Formation of the Yuba River. Wells with depths of 200 to 400 feet can yield 2,000 to 4,000 gpm, with most of the yield derived from the upper 100 feet or more of sand and gravel. The area with the lowest yield is on the Beale Air Force Base property. Wells near the property range in depth from 264 to 354 feet and supply an average of 1,000 gpm per well.

Irrigation wells commonly produce between 1,000 to 2,000 gpm and range in depth from a few hundred feet to 700 feet. Typically, the well yield is primarily derived from the Older Alluvium Formation because the underlying Laguna Formation is much less permeable.

Specific Capacity

Specific capacity is a measure of a well's productive capability, accounting for both aquifer and well construction characteristics. Specific capacity is determined by pumping at a known rate from a well and measuring the resulting drawdown in water levels. Specific capacity is computed by dividing the pumping rate (in gallons per minute) by the drawdown (in feet). Because variations in specific capacity can reflect both aquifer and well construction characteristics, some care must be used in their interpretation. Depending on the source of specific capacity data, average specific capacity varies from 40 to 67 gpm/ft.

Storage Coefficient

In general terms, the storage coefficient quantifies the volume of water that is stored or released from storage when groundwater levels rise or fall. The ability of water-bearing material to store water is quantified by the storage coefficient. The storage coefficient is defined as the volume of water that an aquifer releases or takes into storage per unit surface area of the aquifer per unit change in water levels. The storage coefficient has no units and is frequently expressed as a percentage. Under confined conditions, the storage coefficient reflects only the expansion of water and compression of the aquifer that occur with changes in water levels. Both of these effects are relatively small, and confined storage coefficients are very low, ranging from 0.5 to 0.005 percent.

Specific Yield

The average specific yield in the groundwater basin is 6.8 percent. Specific yields will vary greatly as a result of the predominant geologic formation present at a particular location. For example, the Laguna Formation, which is present on the east side of the basin, has specific yields that range from 4 to 5 percent. The highest specific yields are 10 to 12 percent in the upper zones located in the middle of the study area along the Yuba River. Yields in all parts of the basin decrease with depth where the Laguna Formation and other older, more cemented formations are present.

Transmissivity

Transmissivity has been estimated to be approximately 260,000 gallons per day per foot of aquifer width for the majority of the groundwater basin. Estimated transmissivities for the western border of the groundwater basin are higher. Along the Feather River, transmissivities are about 390,000 gallons per day per foot. High transmissivities along the Feather River reflect the thick deposits (over 100 feet) of highly permeable stream channel sediments there. An area of low transmissivities reflects the presence of the poorly permeable Laguna Formation.

Groundwater Storage

Specific yield can be used to estimate the amount of groundwater storage. Average specific yield amounts by depth zone for the subbasin were estimated in studies by the U.S. Geological Survey that were presented in Bulletin No. 6 of the State Water Resources Control Board. Estimates of storage capacity for equivalent depth zones are presented separately in **Table C-1** for the Yuba North and Yuba South Basins. The Yuba River hydraulically divides the Yuba groundwater basin into the Yuba North Basin and the Yuba South Basin. These storage capacity estimates were computed directly from the area of each subarea, average specific yield in each depth zone, and the thickness of each depth zone.

Table C-1. Estimated Storage Capacities and Specific Yields				
	Depth Zones (feet)			
	20 to 50	**50 to 100**	**100 to 200**	**20 to 200**
Yuba North Basin				
Specific Yield (percent)	8.9	8.3	5.5	6.9
Storage Capacity (acre-feet)	130,000	210,000	280,000	620,000
Yuba South Basin				
Specific Yield (percent)	8.0	7.4	6.2	6.8
Storage Capacity (acre-feet)	210,000	330,000	550,000	1,090,000
Study Area Total Storage by Depth Zone (acre-feet)	**340,000**	**540,000**	**830,000**	**1,710,000**

For the groundwater basin north of the Yuba River, the groundwater storage capacity estimated to a depth of 200 feet is 620,000 acre-feet. Storage capacity in the groundwater basin south of the Yuba River is estimated to be 1,090,000 acre- feet. The total storage capacity in the study area is estimated as 1,710,000 acre-feet. This amount represents the entire quantity of groundwater contained to a depth of 200 feet. As can be seen from Table 1, if the proposed transfer were to use only that portion of the subbasin between 20 and 50 feet in depth, the operable storage would be about 340,000 acre-feet. If the 20- to 100-foot-deep range were used, the operable storage would increase to about 540,000 acre-feet. Caution should be taken when using these numbers because they do not represent the operational characteristics such as recharge rate, recharge origin, and pumping effects. However, they do indicate that a significant body of water from which to draw is available under various operational scenarios.

GROUNDWATER STORAGE CONDITIONS

As shown above, the Yuba North and Yuba South Basins provide 40 percent and 60 percent, respectively of the total groundwater storage capacity of the Yuba groundwater subbasin. Historically, irrigation demands in the Yuba North Basin area were sufficiently supplied with diversions from the Yuba River, except in the Ramirez Water District. Ramirez started receiving surface water in the late 1970's. Because of the historical surface supply in the Yuba North Basin, unlike the South Basin, the North Basin has not been drawn down extensively. However, the North Basin was historically significantly lower in storage than the pre-2001 transfer groundwater storage. After the late 1970's the storage of the basin increased, mainly due to the increased delivery of surface water in Ramirez Water District and the wetter conditions that occurred at that time after a severe two-year drought from 1976 to 1977. For the Yuba North Basin, the historical low groundwater storage condition occurred in the mid 1960's and again in the late 1970's Conversely, in the Yuba South Basin surface water deliveries were limited until the South Yuba Canal was developed in 1983. Prior to this time groundwater was used extensively for irrigation in the Yuba South Basin. This basin was in overdraft until 1983 and groundwater levels have substantially increased since that time.

Yuba South Basin

Historically, agricultural and urban water uses in the Yuba South Basin area relied heavily on groundwater supplies, resulting in a large pumping depression near the Wheatland area. Since the construction of the South Yuba Canal, and delivery of surface water by the YCWA to the member districts of Brophy Water District, South Yuba Water District, and, more recently, Dry Creek Mutual Water Company, groundwater storage has recovered to the extent that current groundwater storage in the Yuba South Basin area probably exceeds that of 1960 and is nearing the levels of the pre-development era. This condition remains today.

By 1997, the depth and extent of the depression in the Yuba South Basin area near Wheatland had been significantly reduced. The 1997 groundwater contours suggest that the groundwater basin in the Yuba South Basin area is primarily recharged by accretion from the Yuba River above the Marysville gage and by deep percolation of irrigation water and precipitation. The leveled groundwater contours near the Feather River suggest low accretion to the groundwater basin, if any, from this river.

Figure C-1 shows the amount of groundwater storage in the Yuba South Basin area for water years 1960 to 1998, assuming 200,000 acre-feet of storage in 1960 as a reference point. After 1983, most of the yearly storage changes are positive, implying a net gain in the groundwater basin. There are several significant changes in the historical trace of groundwater storage. These changes are as follows:

- There was an abrupt decrease in 1965, although its cause is unclear.
- The abrupt decrease in the 1976-1977 period was a result of the extensive drought in California.
- The beginning of a significant rebound of groundwater storage in 1983 was a result of the new water supply from YCWA through the South Yuba Canal.
- The storage decrease in 1991 was a result of a conjunctive use operation for the Department of Water Resources' Drought Water Bank, through which 80,000 acre-feet of groundwater was extracted and used for local supply, thus allowing an equivalent amount of surface water to be transferred.

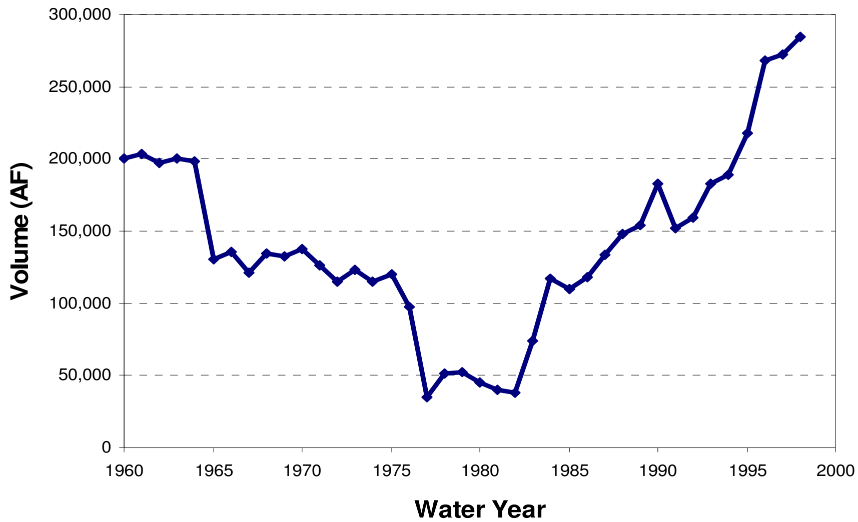

Figure C-1. Estimated Groundwater Storage in the Yuba-South Basin Area from 1960 to 1998 (based on 200,000 acre-feet of storage in 1960)

Based on this information, the estimated annual increase in groundwater storage for the Yuba South Basin area since construction of the South Yuba Canal ranges from 15,100 acre-feet to 21,200 acre-feet, depending on hydrologic conditions of the basin.

In 2001, two districts in the Yuba South Basin participated in a groundwater substitution transfer to the EWA and 2001 DWR Dry Year Water Purchase Program, pumping slightly more than 17,000 acre-feet from this basin. In addition, 2001 was a critically dry year in the Yuba River watershed. This added pumping for the transfer represents about one year's net recharge to the basin and therefore, as storage conditions were good prior to 2001, the basin had substantial storage that could be utilized in 2002. For the 2002 transfer the total pumping was about 24,000 acre-feet and included pumping in Brophy Water District as well as South Yuba Water District and Dry Creek Mutual Water Company. **Table C-2** is a listing of the pumping by District for the 2001 and 2002 groundwater substitution transfers. No water was pumped for groundwater substitution transfer in 2003 through 2006.

Table C-2. Groundwater Substitution Transfer Pumping by South District

District	2001 Transfer	2002 Transfer
Brophy WD	0	10,727
South Yuba WD	8,600	8,062
Dry Creek Mutual WC	8,500	5,330
TOTAL	**17,100**	**24,119**

Prior to 2001, the last time a Yuba South Basin district participated in groundwater substitution for a water transfer was in 1991 (only Yuba North Basin districts participated in groundwater substitution for the 1994 transfer). Therefore, since 1991, eleven years of recharge in mostly wet conditions occurred. For this reason, groundwater levels following the 2002 transfer were still considerably higher than the levels observed following the 1991 transfer. Because no water was pumped from 2003 to present for groundwater substitution transfers, levels are even higher today than they were in the spring of 2001, which is prior to the two transfer years of 2001 and 2002. Even with the 1991 transfer and resulting groundwater levels, no significant or unmitigated local impacts occurred at that time with those lower levels. Since the 2002 groundwater substitution transfer, the basin has continued to recharge to above pre-2001 levels. **Figure C-2** is a graph of water elevation in a monitoring well in the central portion of the South Basin, in Brophy Water District. The figure shows that the fall 2005 level is several feet above the the early summer 2002 level, is about five feet higher than the spring 2001 level and is substantially above the level of 1991, when a groundwater substitution transfer took place during the summer.

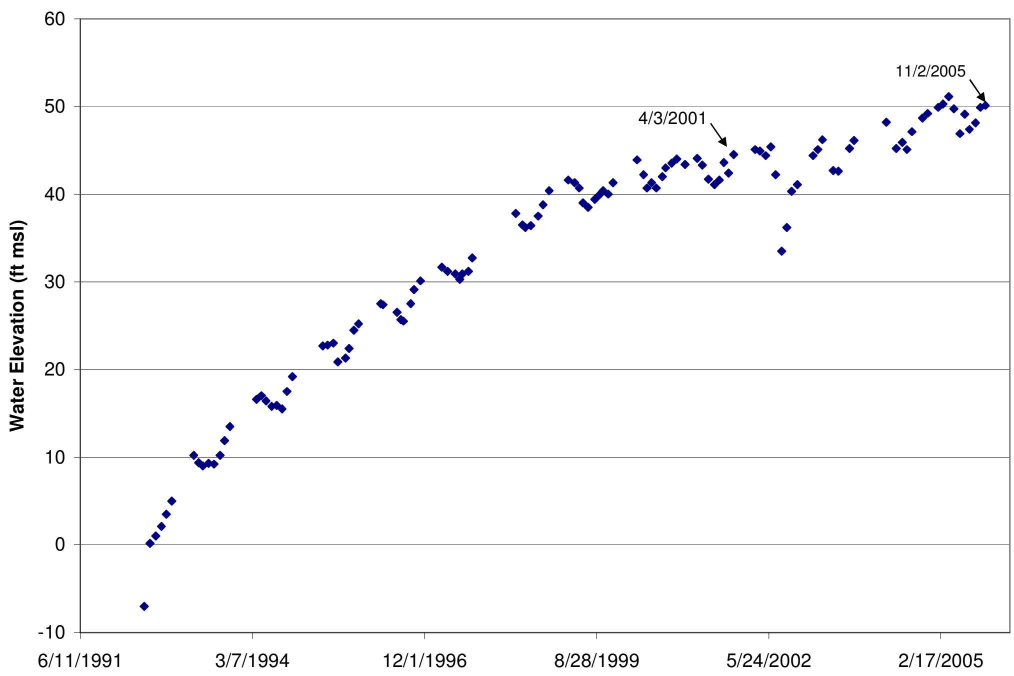

Figure C-2. Water Elevation in Monitoring Well #15N04E25H003M

Yuba North Basin

Unlike the Yuba South Basin, storage conditions have not fluctuated as dramatically in the Yuba North Basin. However, the storage and resulting groundwater levels underwent a generally moderate decline starting in the early 1950s, remained at a moderately lower level through to the 1970s, and then increased in the late 1970s and early 1980s. The reduction in groundwater levels in the Yuba North Basin were mainly caused by the expansion of groundwater development for agriculture in the 1950s for this area. The decline was small compared with the overdraft conditions seen in the Yuba South Basin. In addition to these long-term trends, hydrographs of groundwater levels from monitoring wells have clearly shown effects of drought conditions and of two previous groundwater substitution transfers in 1991 and 1994.

In 2001 and in 2002 Browns Valley ID, Cordua ID, Hallwood ID and Ramirez WD pumped groundwater in the Yuba North Basin in lieu of some surface water deliveries. In 2001, districts in the Yuba North Basin participated in a groundwater substitution transfer to the EWA and 2001 DWR Dry Year Water Purchase Program, pumping about 47,500 acre-feet from this basin. In 2002 pumping for groundwater substitution transfer to these two programs totaled about 31,000 acre-feet. The amounts of groundwater substitution transfer pumping by each District for those two years are listed in **Table C-3**. No water was pumped in the Yuba North Basin for groundwater substitution transfer in 2003 through 2006.

Table C-3. Groundwater Substitution Transfer Pumping by North District

District	2001 Transfer	2002 Transfer
BVID	3,500	6,017
Cordua ID	12,000	9,213
Hallwood ID	14,000	7,263
Ramirez WD	18,000	8,646
TOTAL	**47,500**	**31,139**

Figure C-3 is a graph of groundwater levels measured in a monitoring well for the spring of each year in the central portion of the Yuba North Basin and is representative of the basin conditions at this location. The graph shows the historical low levels in the 1960’s to the early 1980’s, then the increase of levels in the early 1980’s that is described above. The spring 2006 groundwater level, when examined in context with the historical water levels for the monitoring well, provides a reference for the current state of the Yuba North Basin. As shown in the figure, the current water level is slightly lower than in recent years prior to the 2001 and 2002 transfers, but somewhat higher than the levels that were experienced historically. Based on the spring 2006 groundwater level in this well, the spring 2007 level is expected to be near the historic high for this well, reflecting an increase in storage resulting from the absence of groundwater substitution pumping in 2003 through 2006.

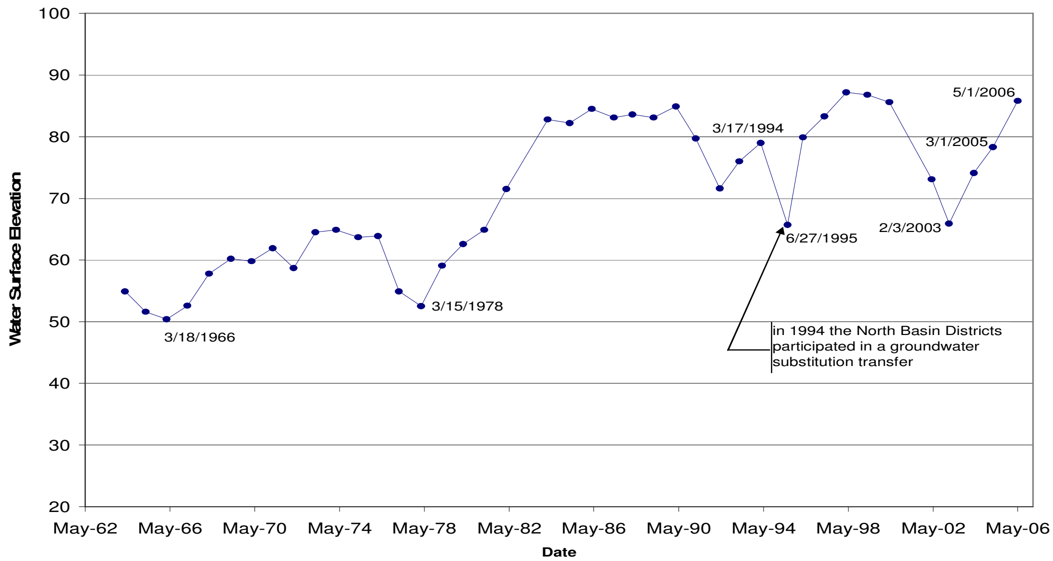

Figure C-3. Spring Water Elevation in Monitoring Well 17N04E33Q01M

Figure C-4 shows water elevations in monitoring well 16N04E17R002M, which is located in the south-central portion of the North Basin. The water levels in this monitoring well show that the reduction in basin levels in this area in response to the 2001 and 2002 pumping were moderate and totaled less than 10 feet. The recharge of the basin in 2003 through 2005 in this area as a result of no groundwater substitution transfer pumping is also clear. Groundwater levels in this area are expected to be at or near historic spring levels by the spring of 2007.

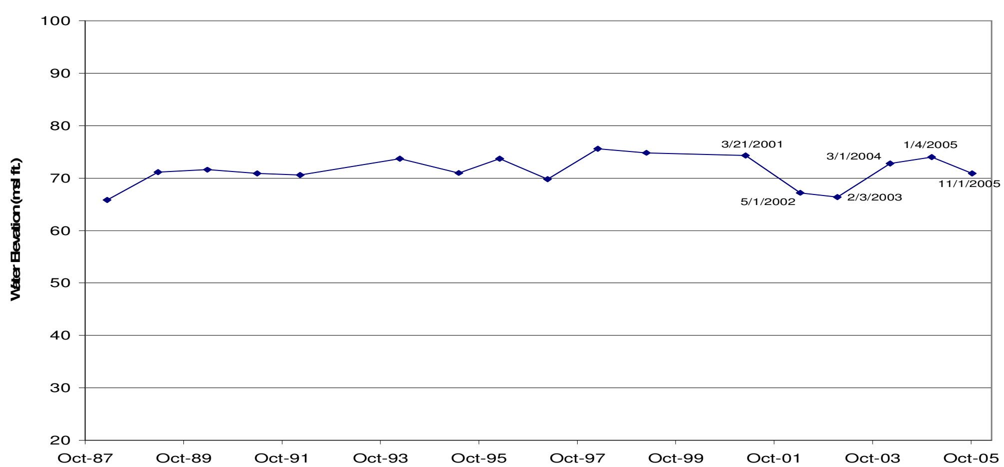

Figure C-4. Spring Water Elevation in Monitoring Well 16N04E17R002M

Based on review of well hydrographs for the Yuba North Basin, it is apparent that levels declined more in the northern portion of this basin that in other areas due to the 2001 and 2002 transfers, but no impacts have been reported for the northern area. Review of groundwater levels in more western portions of the basin, but still within the area of YCWA member districts, shows that the effects of the 2001 and 2002 operations are even less than in the hydrographs shown above. The monitoring well information suggests that the basin storage and recharge conditions are such that operations for 2001 and 2002 did not significantly reduce the overall storage in the basin. Examination of the response of the North Basin to the 2001 and 2002 transfers indicate that transfer operations in 2007 would not significantly draw down the basin storage to levels that would have significant negative impacts. Furthermore, the expected amount of decline in groundwater levels due to a maximum groundwater substitution transfer of 30,000 acre-feet would put fall 2007 levels at or above the levels experienced at the end of the 2002 transfer.

The current petition maximum transfer amount of 30,000 acre-feet, which would be split between both the north and south subbasins, would equal only 2 years of recharge of just the south subbasin. This information also shows that the total basin is gaining and is in good condition. Therefore, the transfer would not strain the water supply or the condition of the Yuba North basin or the Yuba South basin, and would not contribute to, or result in conditions of overdraft.

POTENTIAL IMPACT TO PUMPERS IN THE SUBBASIN

On the issue of known pumpers who might be impacted by the transfer, several items address this issue. First, a similar yet larger (over 80,000 acre-feet) transfer was accomplished in 1991, at a time when the Yuba South Basin was at a significantly lower level and the Yuba North Basin was somewhat lower. At that time, only a few impacts to residential wells were experienced, and within days of each impact, the situation was remedied by YCWA and member districts by the extension of the affected well to a greater depth. In 2001 several wells experienced lower water levels in the North Basin and in response to the reported impacts the affected wells were deepened or pumps were lowered. In 2002 one well in the North Basin was affected and it was immediately deepened. In addition, like the operations of 1991, 2001 and 2002, should any local groundwater users be significantly impacted by the 2007 transfer groundwater substitution operations, immediate remedial action would be taken.

For the past several years of transfers YCWA and member districts have refined the program for responding to groundwater users who raise issues of impact due to the potential affects of the transfer. YCWA and member districts have implemented a rapid response program to immediately investigate any claim of a potential impact. The process involves: 1) immediate response, 2) collection of relevant information, 3) analysis of the information and a determination of the likely cause, and 4) if appropriate, implementation of mitigation measures. A key part of this program is the designation of a contact person at YCWA and at each member district who will respond so that no time is lost in addressing the issue.

The Department of Water Resources (DWR) and YCWA have contractually agreed to monitor the basins extensively and investigate any instances of potential impact and to address these issues. As to known pumpers who would be impacted by the transfer, other than those who experienced temporary, somewhat lower groundwater levels in past years within the basin, there are no known potentially significantly impacted pumpers.

One area that was closely monitored for the 2002 operations was the Las Quintas area in the Yuba North Basin. This area, located at the start of the foothills on the eastern side of the basin, consists of a hill that has been recently developed as a residential subdivision. Because of this recent development, many of the homes in this area, which rely on individual domestic wells, have not experienced the groundwater levels that were reached in 1991 or 1994 or the extended lower levels of the 1950s to the 1970s. Several of the wells in this area were constructed to extend only a short distance into the water table. Because water levels have, in recent years, been higher than historical levels, and these wells were recently constructed, they were not constructed to pump water when the water table is at the lower historical levels. The area did see the effects of the 2001 transfer operations, and lower groundwater levels did occur in this area. Because of the lower levels, either reduced well pumping capacity or loss of pumping capacity did occur and in response, the Cordua Irrigation District (the member district for this area) lowered the pumps or deepened the wells for five residences. Thus, no significant unmitigated impacts to the residents of this area occurred.

For the 2002 operations, residents had expressed concern about the effects of groundwater substitution transfers. Therefore, YCWA and the Cordua Irrigation District have met with, and are continuing to work with, these residents to address their concerns. Recent activities have included providing surface water for certain needs in the area to reduce the potential for impacts.

GROUNDWATER MANAGEMENT

Through previous transfers Yuba County has learned that conjunctive use operations can and sometimes do cause isolated and site-specific effects. If immediate response is provided, significant short term or long term impacts can be avoided completely.

Over the past decade, YCWA and its member districts have taken an active and progressive role in managing the groundwater resources of the subbasin. YCWA also works with DWR in monitoring the basin and has been instrumental in extending the monitoring network of wells in the basin. Several of the districts in Yuba County have adopted groundwater management plans and YCWA has a plan under consideration. In the interim, YCWA and the districts participating in the transfer meet regularly to discuss the management of the basins. As part of basin management, YCWA, DWR, and the member districts have instituted a monitoring plan to record in detail the water levels and water quality of the basins. The monitoring plan, which is included in the contract for the transfer with DWR, is attached as Exhibit A of this report.

The groundwater management approach for groundwater substitution transfers in Yuba County is embodied in three principles:

1) Closely monitor conditions to watch for any potential significant impacts and to gain a better understanding of the groundwater resource;

2) Immediately respond to any significant impacts that occur and mitigate those impacts with appropriate measures; and

3) Utilize the transfer and associated activities to further the goal of effective management of the water resources of Yuba County through conjunctive use of groundwater and surface water.

SUMMARY

Based on the information presented herein, the groundwater substitution component of the proposed 2007 transfer to the EWA and DWR Dry Year Water Purchase Program would not have any significant negative unmitigated impacts on the groundwater resources of Yuba County or on the residents and groundwater users of Yuba County, or surrounding areas. The quantities of water that would be derived from groundwater pumping for local use, in lieu of surface water, are reasonable for the storage conditions of the basins. The expected water levels that would result from 2007 transfer operations would be within acceptable levels, and the groundwater levels throughout the basins will be closely monitored.

Attachment 1

Yuba County Water Agency

GROUNDWATER MONITORING AND REPORTING PROGRAM

In cooperation with the Department of Water Resources (Department), Yuba County Water Agency (Yuba) has monitored Yuba County groundwater conditions for over a decade and many aspects of the groundwater resource are well known. Yuba and the Department have worked cooperatively to develop a transfer monitoring and reporting program specific to Yuba County. For example, the delivery of transferred water is measured at the Marysville Gage. For this groundwater substitution transfer, the operations of the Yuba River Development Project are modified to provide assurance that the quantities of water pumped by Member Units in lieu of surface water deliveries are delivered to the Department. This monitoring program is needed to assess effects of the transfer on the groundwater resource and to provide a reasonable assurance that the water pumped and accounted as part of the transfer is in lieu of surface water deliveries. Yuba will continue to work with the Department to identify and resolve any new monitoring issues.

1. The water levels in selected production wells, geographically disbursed throughout each Member Unit in the 2007 program, will be measured prior to initial pumping. Selection of these wells will be by mutual agreement by the Department and Yuba. Upon termination of pumping, the water levels will be measured and such measurements will continue on a monthly basis until water levels have recovered to the pre-pumping level or have stabilized. In no case will water level measurements be required following spring high water levels in 2008.

2. Water levels in each monitoring well in the Yuba network will be measured monthly beginning with the effective date of the contract between the Department and Yuba. Upon termination of pumping, the water levels will be measured and such measurements will continue on a monthly basis until water levels have recovered to the pre-pumping level or have stabilized. In no case will water level measurements be required following spring high water levels in 2008. The Department and Yuba will cooperate in obtaining these measurements.

3. Flow meter readings will be recorded every other month for each production well through the pumping period. In addition, electric meter readings and fuel consumption for diesel pumps will be recorded by the Member Units and made

available to the Department or Yuba upon request. The quantity of water pumped between successive readings will be calculated and reported.

4. Electrical Conductivity (EC) will be determined for selected production wells at the initiation of pumping (or as soon thereafter as practicable), two months after initial EC measurements and at the termination of pumping.

5. For selected production wells (to be identified before the monitoring plan is finalized) near Yuba monitoring wells, drawdown analyses (distance and time) will be completed and comparisons made to monitoring well water levels.

6. Recognizing that the selection of production wells for this transfer is partially based on limiting surface water impacts, a monitoring of selected locations and analysis of the potential for impact to the Bear River will be made. This monitoring and analysis will be done as a cooperative effort between the Yuba and the Department. The results of this review will be documented in the final summary report on the transfer.

All monitoring data will be reported every other month, and a final summary report prepared, evaluating the impacts of the water transfer program. The final report will include water level contour maps for the ground water basin showing initial water levels and final recovered water levels.

Appendix D

Analysis of Weighted Usable Areas for Spawning Salmonids

Appendix D

Analysis of Weighted Usable Areas for Spawning Salmonids

The potential effects of flows on the adult spawning life stage of lower Yuba River Chinook salmon and steelhead were evaluated by examining spawning habitat available to Chinook salmon and steelhead during their spawning seasons. Spawning habitat availability was expressed as annual scaled composite usable area that corresponds to Chinook salmon and steelhead spawning areas associated with monthly flows under the proposed project and the basis of comparison.

For spring-run Chinook, the annual scaled composite weighted usable area (i.e., $\widehat{CWUA}_Y$) was calculated as the sum of the usable areas that correspond to the monthly flows during its spawning season (i.e., September through November; CDFG 1991) over one reach located above Daguerre Point Dam, divided by the sum of the maximum WUA in each of the spawning season months. Thus, the annual scaled composite weighted usable area for spring-run Chinook salmon is expressed by the following formula:

$$\widehat{CWUA}_Y = \frac{\sum_{m=1}^{3} WUA_1\left(Q_{m,Y}\right)}{\sum_{m=1}^{3} \max\left(WUA_1\right)} \qquad \textbf{(1)}$$

where m is any of the 3 months of the spring-run Chinook salmon spawning season in a particular year. $WUA_1\left(Q_{m,Y}\right)$ is the weighted usable area (WUA) of the upstream of Daguerre Point Dam Reach at the monthly flow $Q_{m,Y}$, measured at the Smartville Gage, that was obtained from the WUA-flow relationships developed by the IFIM studies completed in the spawning grounds (CDFG 1991). In the denominator, $\max\left(WUA_1\right)$ is the maximum weighted usable area of the WUA-flow relationship developed for the upstream of Daguerre Point Dam Reach. Also, percent of maximum WUA was calculated separately for the month of September, because this is the only month during the spring-run Chinook salmon spawning period that is assumed to not temporally overlap with fall-run Chinook salmon spawning (CDFG 2000).

Fall-run Chinook salmon utilize k = 2 distinct reaches within the lower Yuba River, during m = 3 months of a particular year (i.e., October through December). Thus, the scaled composite weighted usable area (i.e., $\widehat{CWUA}_Y$) for fall-run Chinook salmon is expressed by the following formula:

$$\widehat{CWUA}_Y = \frac{\sum_{m=1}^{3}\sum_{k=1}^{2} WUA_k\left(Q_{m,Y}\right)}{\sum_{m=1}^{3}\sum_{k=1}^{2} \max\left(WUA_k\right)} \qquad \textbf{(2)}$$

where $WUA_k\left(Q_{m,Y}\right)$ is the weighted usable area (WUA) of reach k at the monthly flow $Q_{m,Y}$ obtained from the WUA-flow relationships developed by the IFIM studies completed in the spawning grounds (CDFG 1991), and $\max\left(WUA_k\right)$ is the maximum weighted usable area of reach k over the flow range for which the WUA-flow relationship was developed.

Because the steelhead spawning period in the Yuba River generally extends from January through April, and most steelhead spawning activity is believed to take place in the lower Yuba River, upstream of Daguerre Point Dam, the annual scaled composite weighted usable area for steelhead spawning comprises only the weighted usable areas (WUA) upstream of Daguerre Point Dam. Because the span of the proposed water transfer extends from March 1, 2007 through December 31, 2007, it does not include the entire steelhead spawning period (January through April). Thus, an annual scaled composite weighted usable area was generated to describe steelhead spawning habitat availability during March and April 2007 with the formula:

$$\widehat{CWUA}_{Y,1} = \frac{\sum_{m=1}^{2} WUA_1\left(Q_{m,Y}\right)}{\sum_{m=1}^{2} \max\left(WUA_1\right)}. \qquad \textbf{(3)}$$

The following sections describe the origin of the data and calculations associated with the computation of the annual scaled composite weighted usable areas $\widehat{CWUA}_Y$ (**Equations 1 through 3**).

Lower Yuba River Salmonid Spawning WUA-Flow Relationships

The present analysis utilized the WUA-flow relationships described in CDFG (1991) to evaluate the habitat available to Chinook salmon and steelhead spawning at different lower Yuba River flows. The instream flow incremental methodology study described in CDFG (1991) divided the lower Yuba River into four reaches two of which are located above Daguerre Point Dam and two located below Daguerre Point Dam (**Table D-1**).

Table D-1. Names and River Miles (RM) of the Limits of Lower Yuba River Reaches With WUA-Flow Relationships Developed by CDFG (1991)

Reach *k*	Upstream limit	RM	Downstream limit	RM
1	Englebright Dam	23.9	Terminus of the Narrows	21.5
2	Terminus of the Narrows	21.5	Daguerre Point Dam	11.4
3	Daguerre Point Dam	11.4	Terminus of Feather River Backwater Influence	3.5
4	Terminus of Feather River Backwater Influence	3.5	Feather River Confluence	0

Reach 1, also termed the Narrows reach, consists of 11,400 feet of river with steep-walled canyon topography, dominated by deep pools, and bedrock and large boulder substrate. This reach is believed to be an important site for spring-run Chinook salmon holding during late spring, summer and fall. This reach has never been sampled for fall-run Chinook salmon redds or carcasses. The spawning WUA-flow relationships developed for fall-run Chinook salmon and steelhead at this uppermost reach showed zero WUA values for flows between 100 cfs and 2,500 cfs. The 56,400-foot long Reach 2, known as the Garcia Gravel Pit Reach, and the 41,400-foot Reach 3, known as the Daguerre Point Dam Reach, are believed to have good spawning potential. Both reaches, which have been customarily sampled during the annual fall-run Chinook salmon carcass surveys performed by CDFG and YCWA, consist of repeating segments of long, deep pools, shallow pools, run/glide, and long low-gradient riffles, with fewer riffles and more pools in Reach 3. Finally, Reach 4, named the Simpson Lane Reach, consists of 18,500 feet of river with low gradient and water velocities, characterized by deep pools under the influence of Feather River waters. This reach has been normally sampled, but has not been differentiated from Reach 3 during the CDFG and YCWA fall-run Chinook salmon carcass surveys, and is believed to have limited spawning potential.

Although CDFG (1991) developed spawning WUA-flow relationships for both Chinook salmon and steelhead, only the relationships for Chinook salmon were based upon depth, velocity and substrate data collected on lower Yuba River Chinook salmon redds. CDFG (1991) steelhead WUA-flow relationships were developed from suitability habitat criteria recommended by Bovee (1978). The comparison of Bovee's steelhead HSI curves with HSI curves developed for the species in the lower Feather River, lower American River and Trinity River suggests that Bovee's criteria may not be completely representative of Central Valley steelhead (**Figure D-1**) (DWR 2003; Hampton 1997; USFWS 2000).

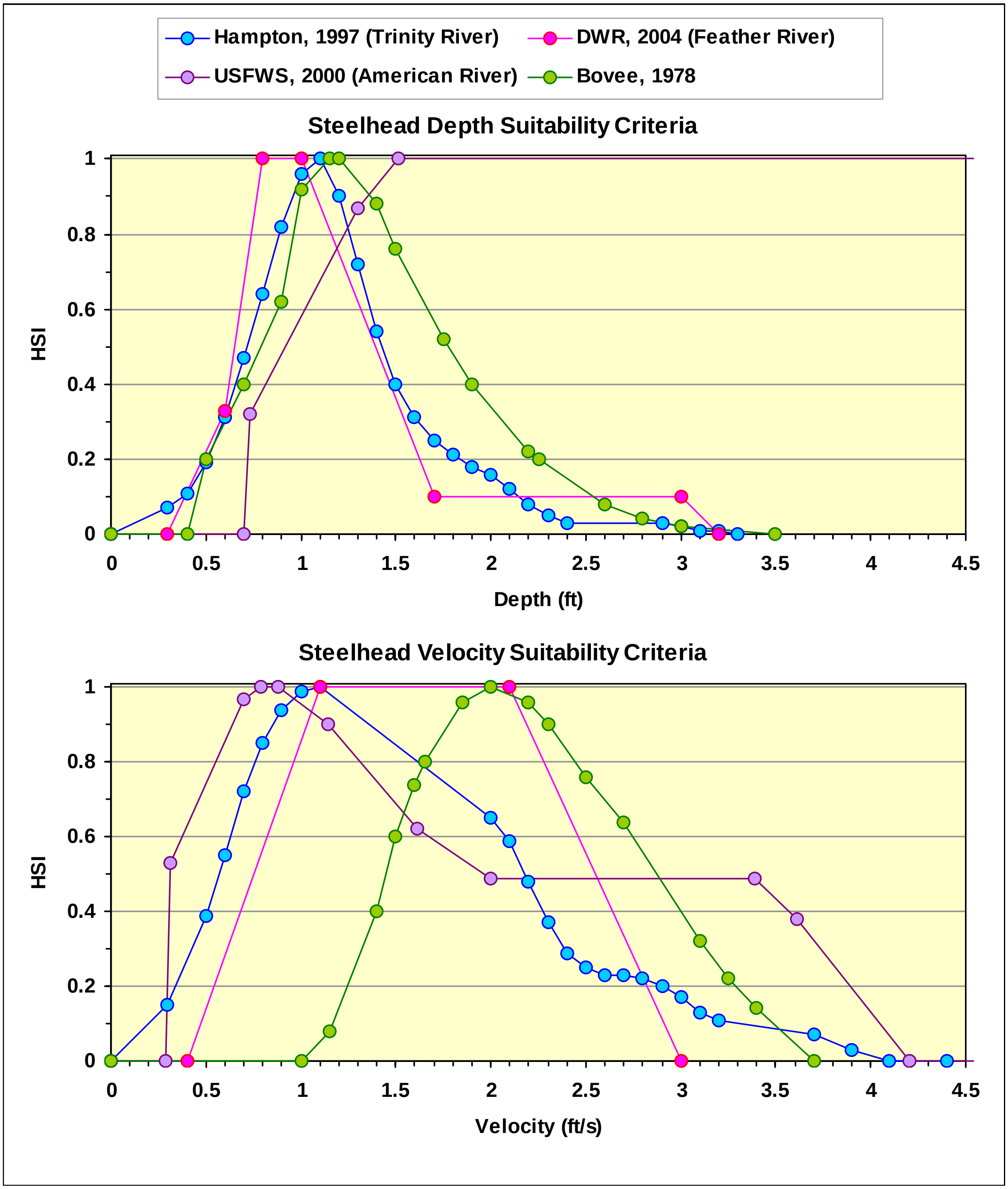

Figure D-1. Comparison of Steelhead Depth and Velocity Habitat Suitability Index (HSI) Curves

For the computation of Chinook salmon $\widehat{CWUA}_Y$ (Equations 1 and 2), the Chinook salmon WUA-flow relationships for IFIM reaches located above and below Daguerre Point Dam were used. The Chinook salmon WUA-flow relationships for IFIM Reaches 1 and 2 (Table D-1) were combined by summing WUA values corresponding to the sampled flow levels to define the

WUA-flow relationship upstream Daguerre Point Dam (**Figure D-2**, blue circles and line). In a similar fashion Reaches 3 and 4 (Table D-1) were summed to define the WUA-flow relationship downstream of Daguerre Point Dam (Figure D-2, pink circles and lines).

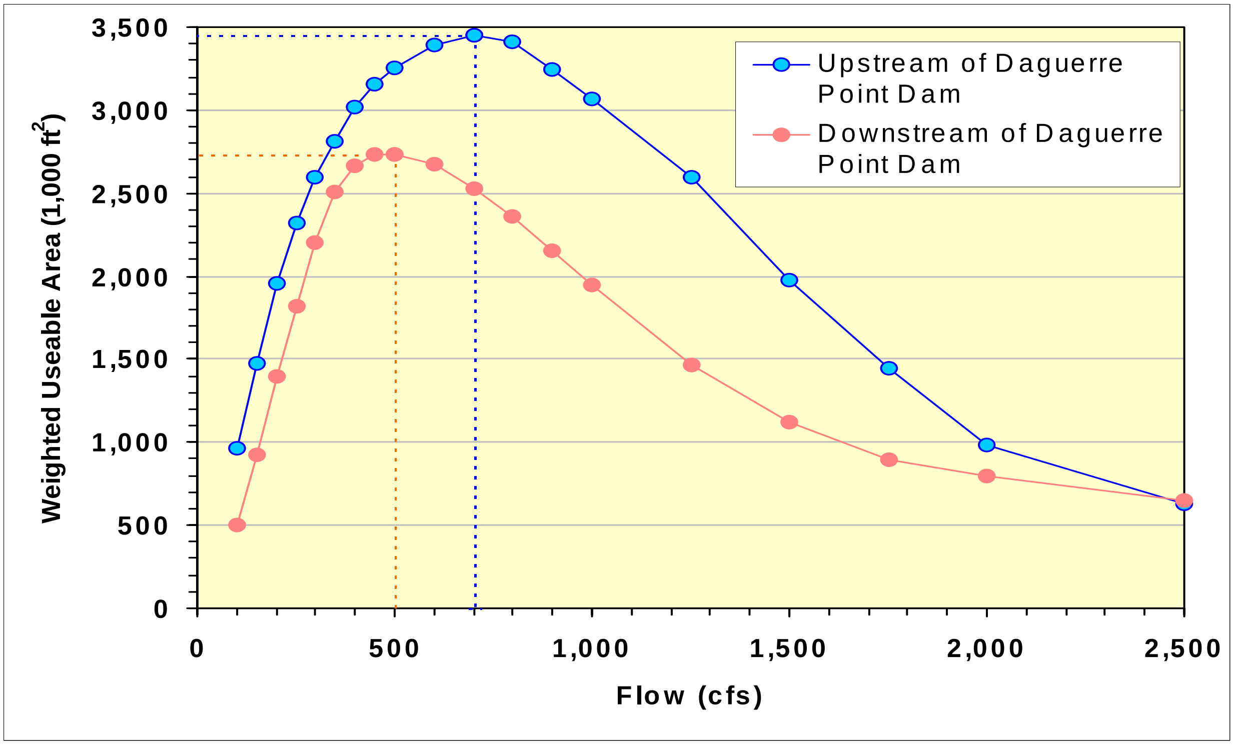

Figure D-2. Relationships Between WUA and Flow for Chinook Salmon Spawning in the Lower Yuba River

The computation of spring-run Chinook salmon $\widehat{CWUA}_Y$ (Equation 1) utilizes only the WUA-flow relationships for IFIM reaches located above Daguerre Point Dam (Figure D-2, blue circles and line), while the computation of the fall-run Chinook salmon $\widehat{CWUA}_Y$ (Equation 2) makes use of the two WUA-flow relationships depicted in Figure D-2.

Similarly, for the computation of steelhead $\widehat{CWUA}_{Y,1}$ (Equation 3), the steelhead WUA-flow relationships for IFIM Reaches 1 and 2 (Table D-1) were combined by summing WUA values corresponding to the sampled flow levels to define the steelhead WUA-flow relationship upstream of Daguerre Point Dam (**Figure D-3**, blue circles and line).

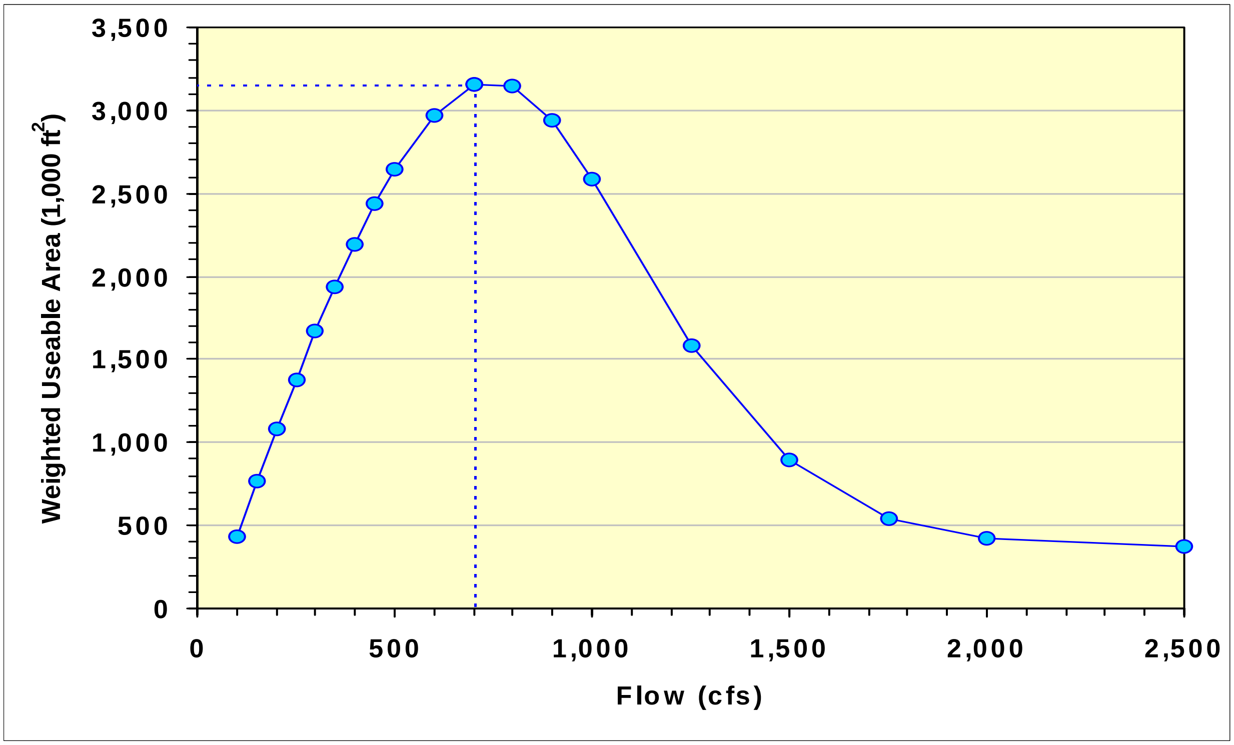

Figure D-3. Relationship Between WUA and Flow for Steelhead Spawning in the Lower Yuba River, Upstream of Daguerre Point Dam

References

Bovee, K. D. 1978. Probability of Use Criteria for the Family Salmonidae. Report No. FWS/OBS-78/07. Instream Flow Information Paper No. 4. Fish and Wildlife Service.

CDFG. 1991. Lower Yuba River Fisheries Management Plan.

DWR. 2003. SP-F16, Phase 2: Evaluation of Project Effects on Instream Flows and Fish Habitat, Draft Final Report. Oroville Facilities Relicensing, FERC Project No. 2100. California Department of Water Resources.

Hampton, M. 1997. Microhabitat Suitability for Anadromous Salmonids of the Trinity River.

USFWS. 2000. Effects of the January 1997 Flood on Flow-Habitat Relationships for Steelhead and Fall-Run Chinook Salmon Spawning in the Lower American River. Sacramento, California: Energy, Power and Instream Flow Assessment Branch.

Appendix 3

Flow Exceedance Plots

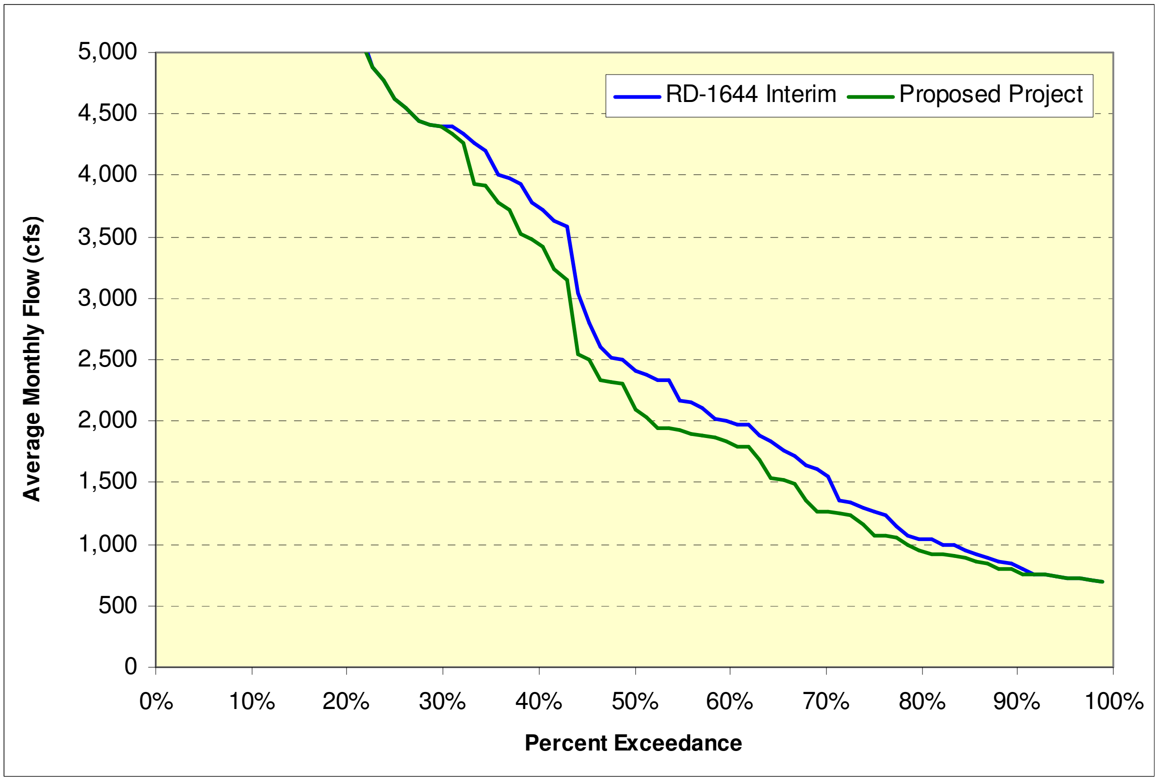

Figure A3-1. Exceedance Plot of Average Flows at the Marysville Gage During the Month of March 2007 Over the 83-Year Simulation Period

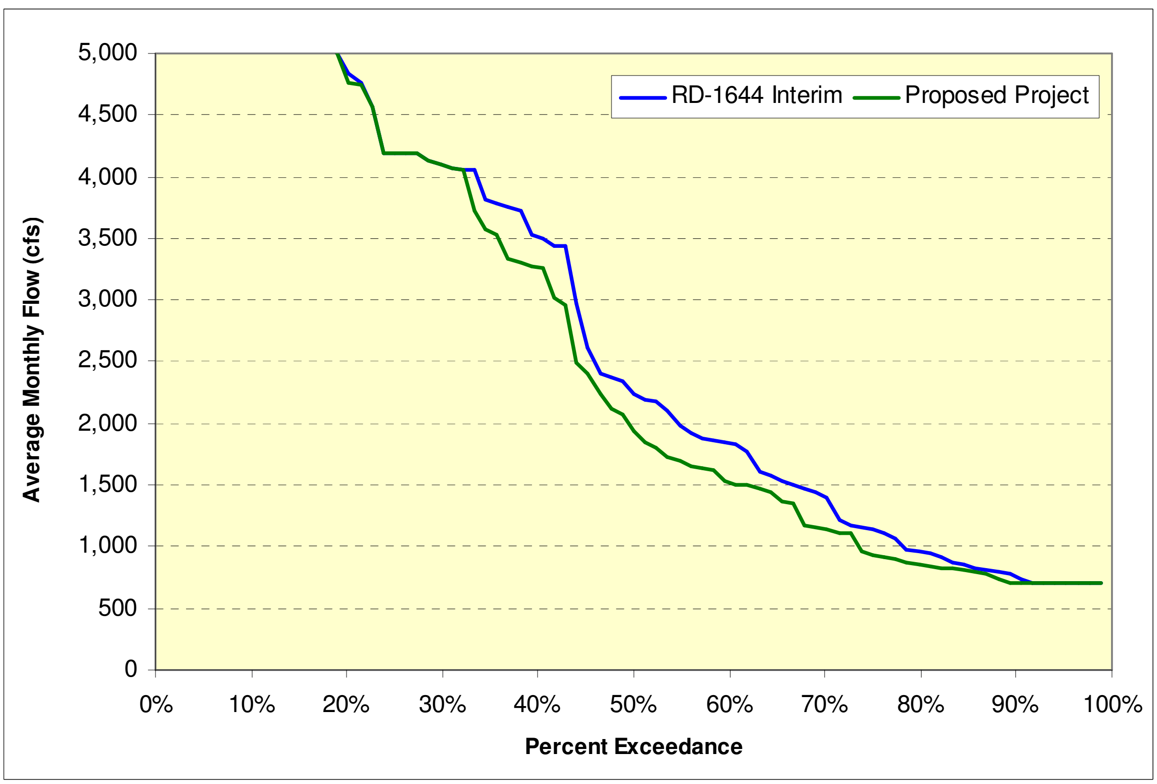

Figure A3-2. Exceedance Plot of Average Flows at the Smartville Gage During the Month of March 2007 Over the 83-Year Simulation Period

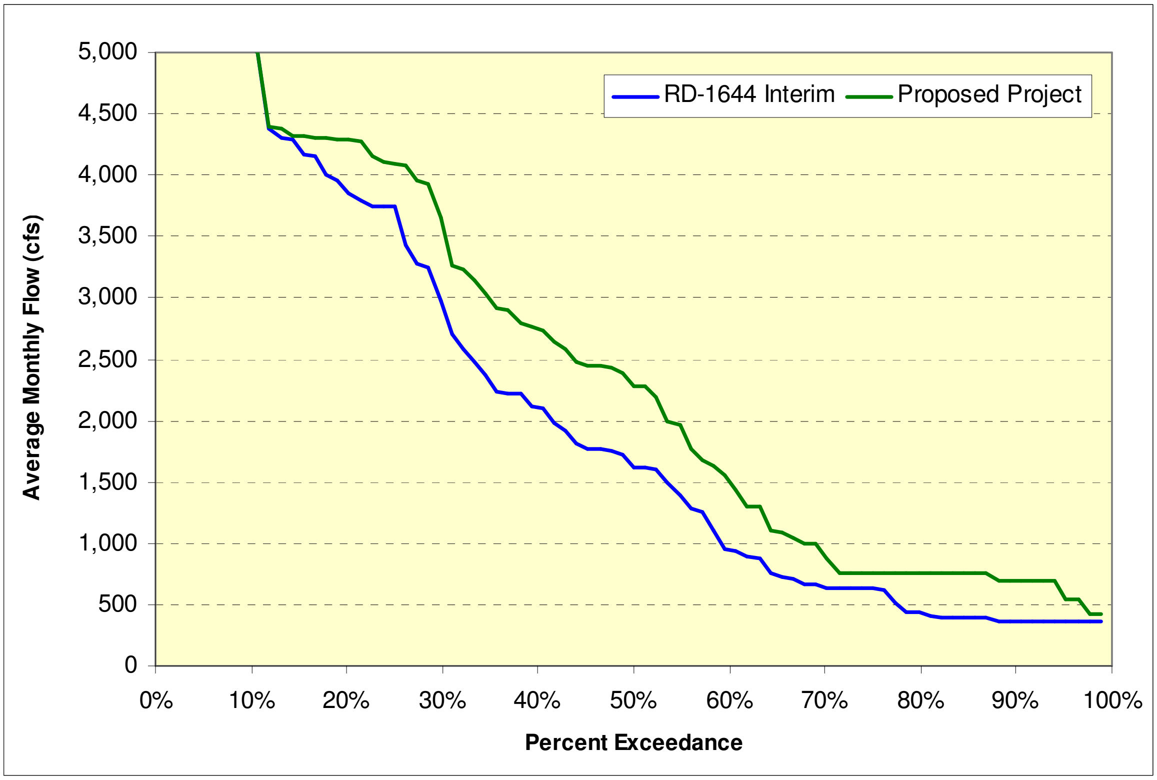

Figure A3-3. Exceedance Plot of Average Flows at the Marysville Gage During the Month of April 2007 Over the 83-Year Simulation Period

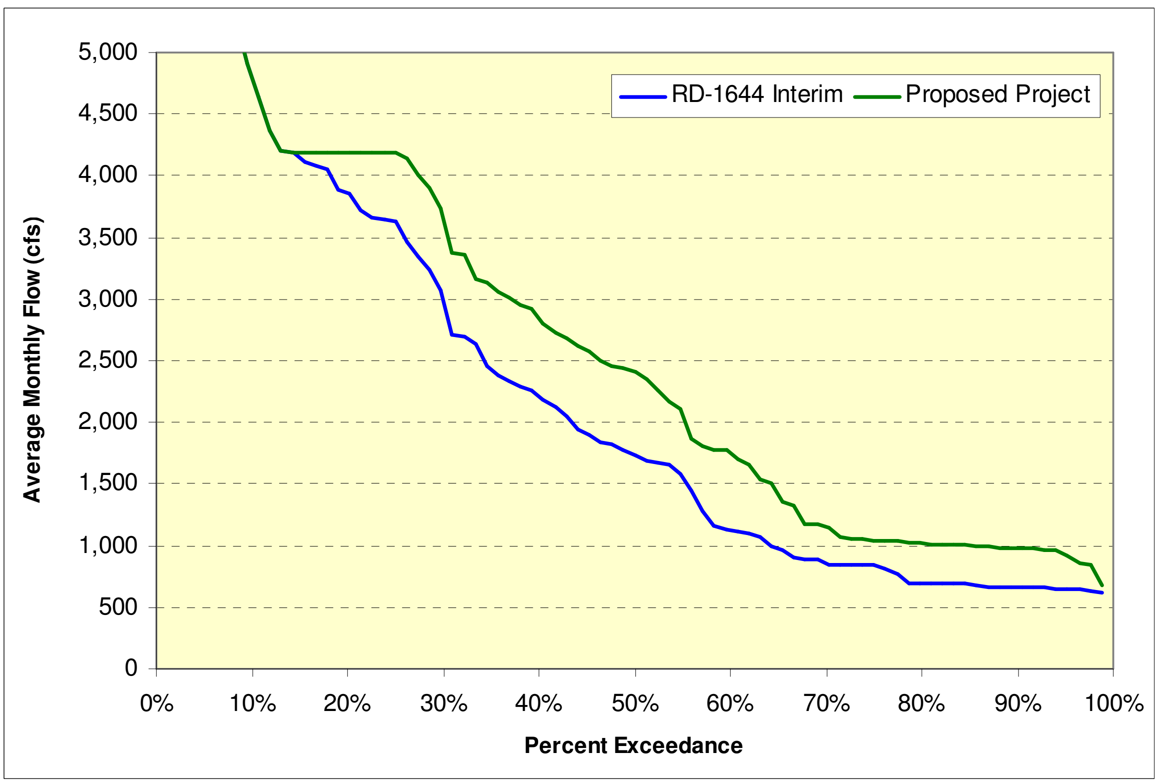

Figure A3-4. Exceedance Plot of Average Flows at the Smartville Gage During the Month of April 2007 Over the 83-Year Simulation Period

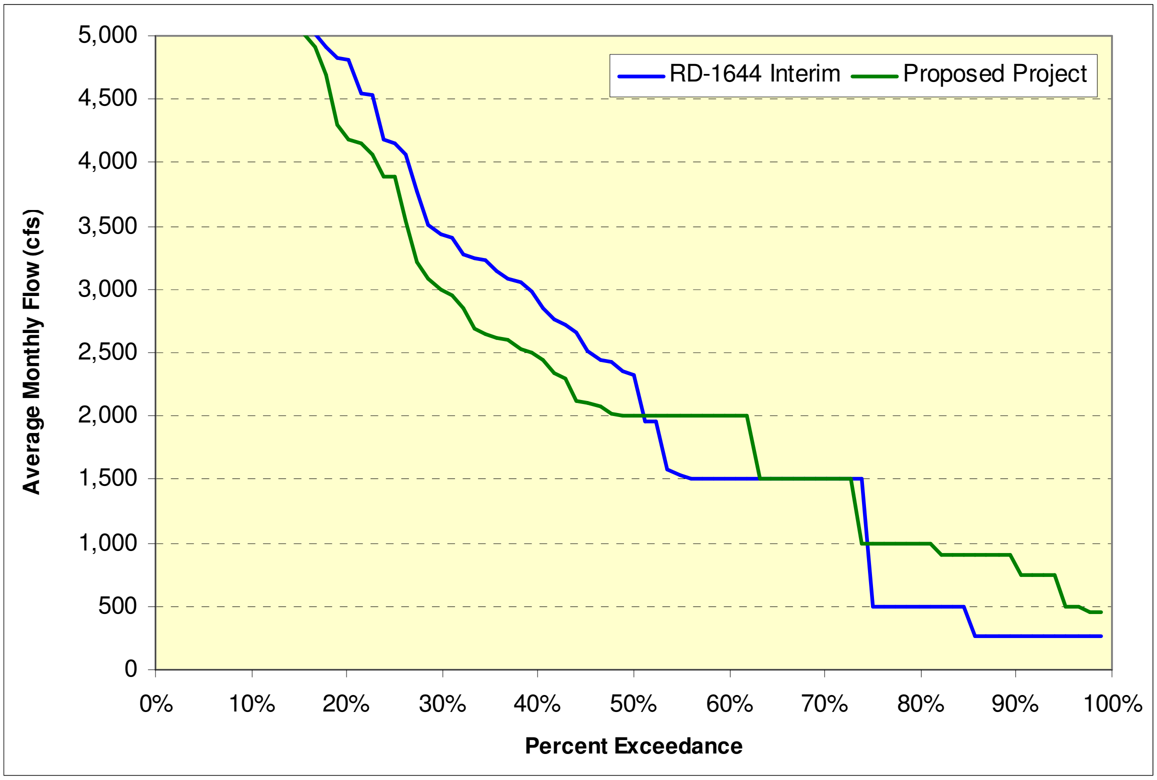

Figure A3-5. Exceedance Plot of Average Flows at the Marysville Gage During the Month of May 2007 Over the 83-Year Simulation Period

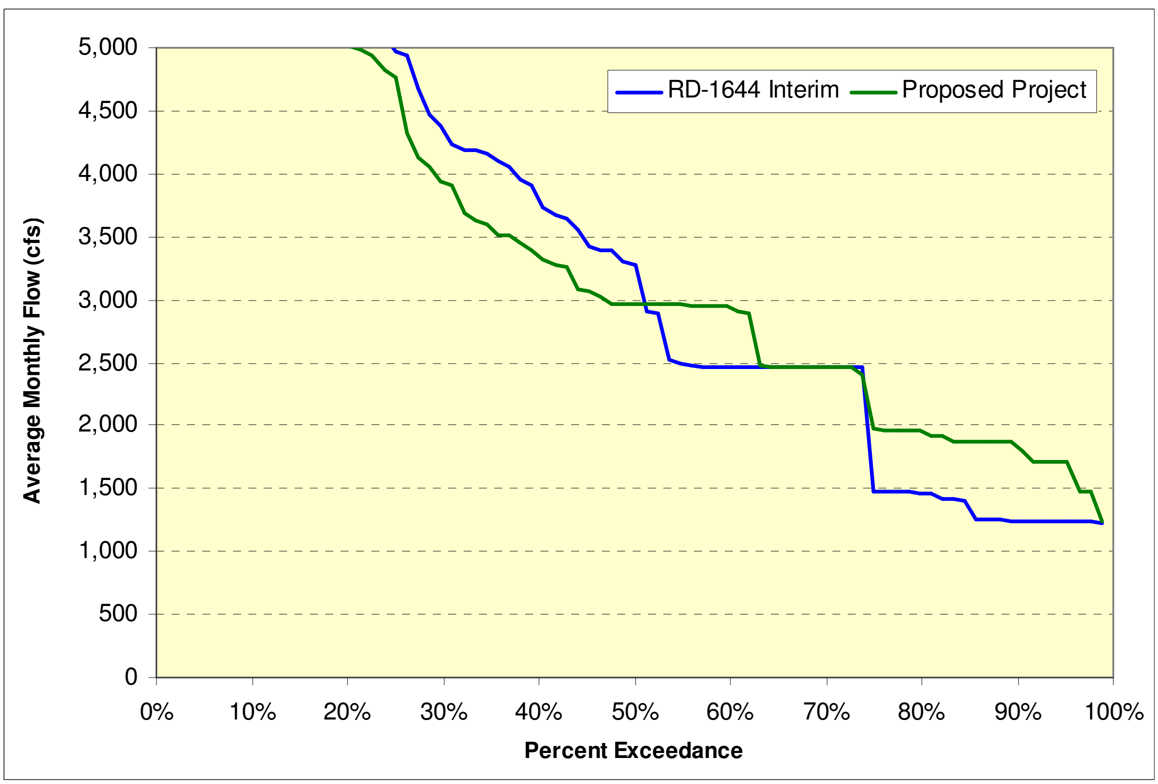

Figure A3-6. Exceedance Plot of Average Flows at the Smartville Gage During the Month of May 2007 Over the 83-Year Simulation Period

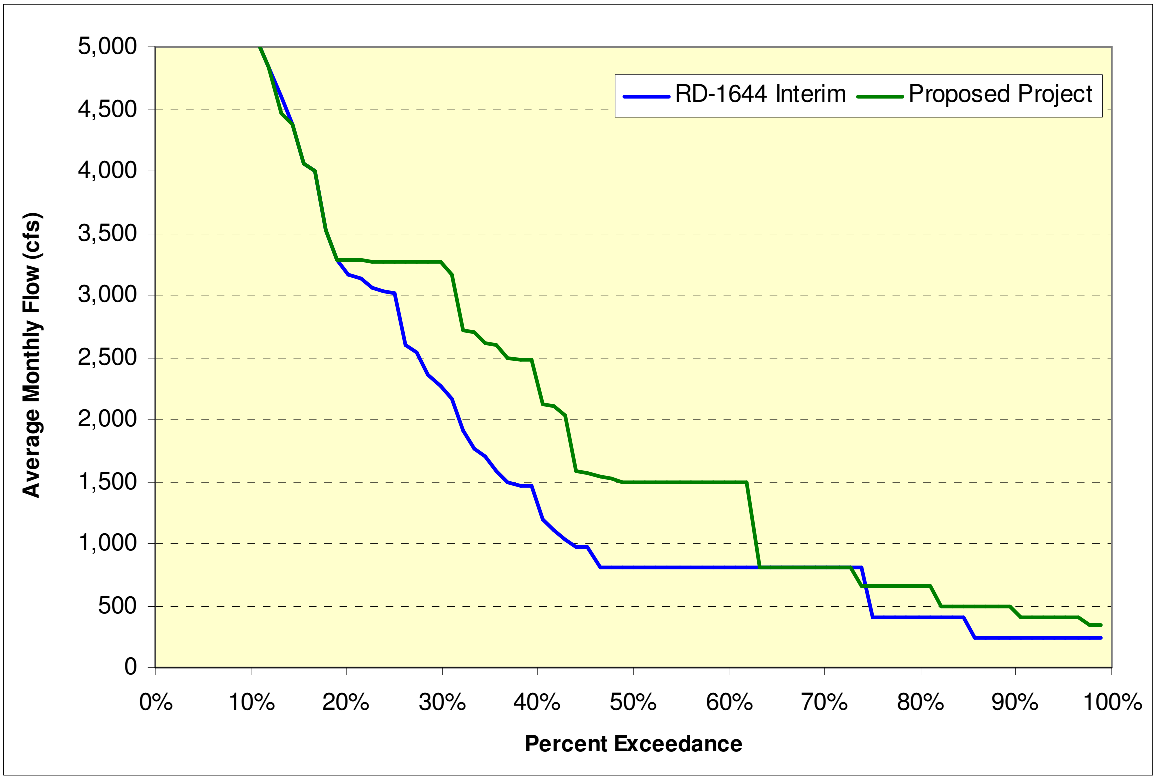

Figure A3-7. Exceedance Plot of Average Flows at the Marysville Gage During the Month of June 2007 Over the 83-Year Simulation Period

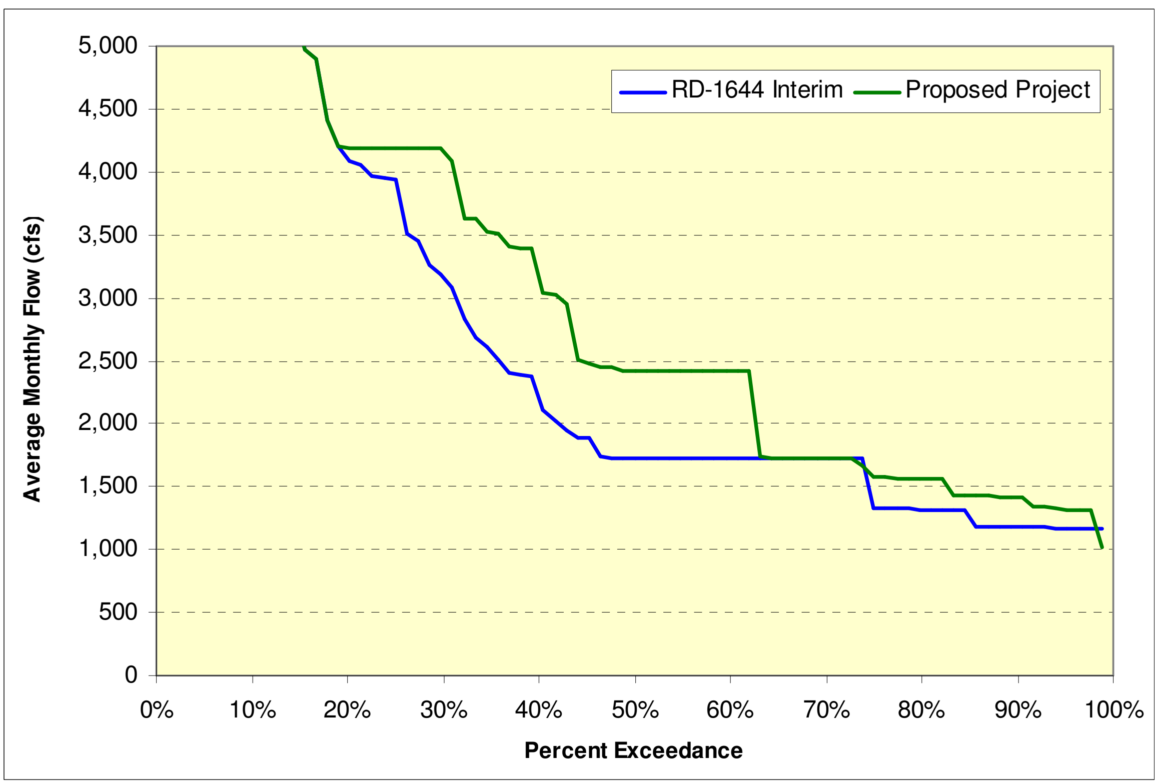

Figure A3-8. Exceedance Plot of Average Flows at the Smartville Gage During the Month of June 2007 Over the 83-Year Simulation Period

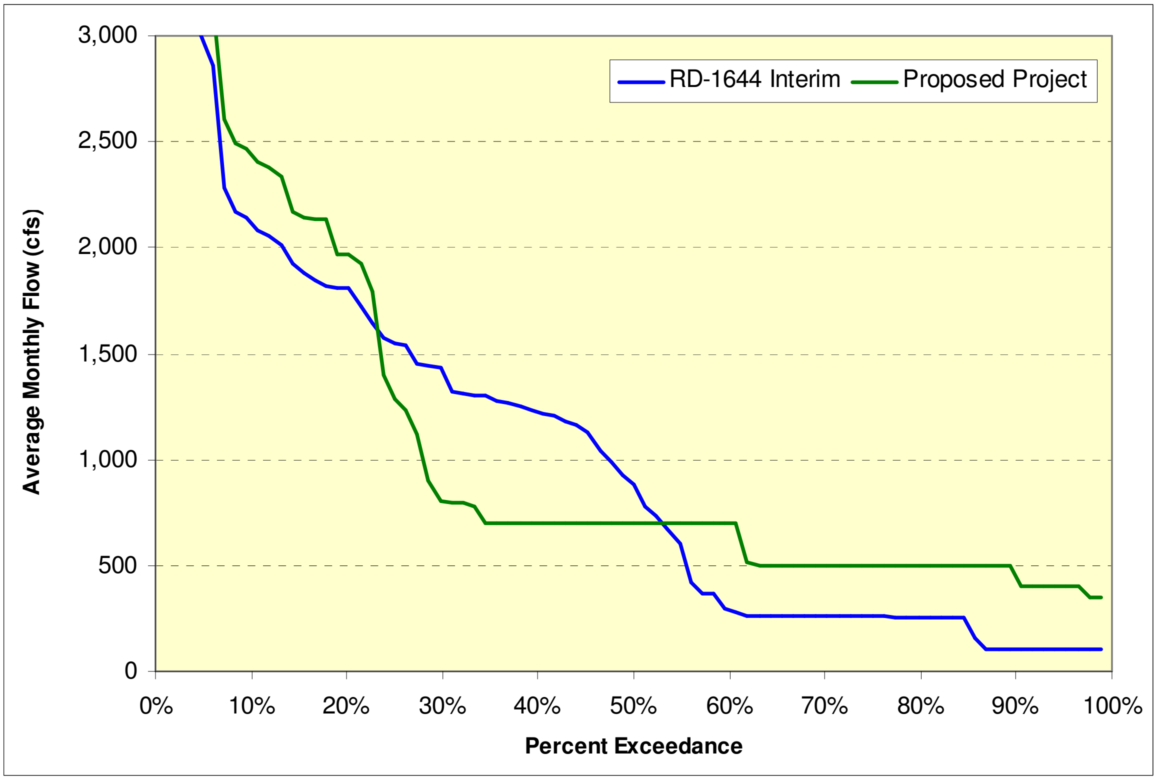

Figure A3-9. Exceedance Plot of Average Flows at the Marysville Gage During the Month of July 2007 Over the 83-Year Simulation Period

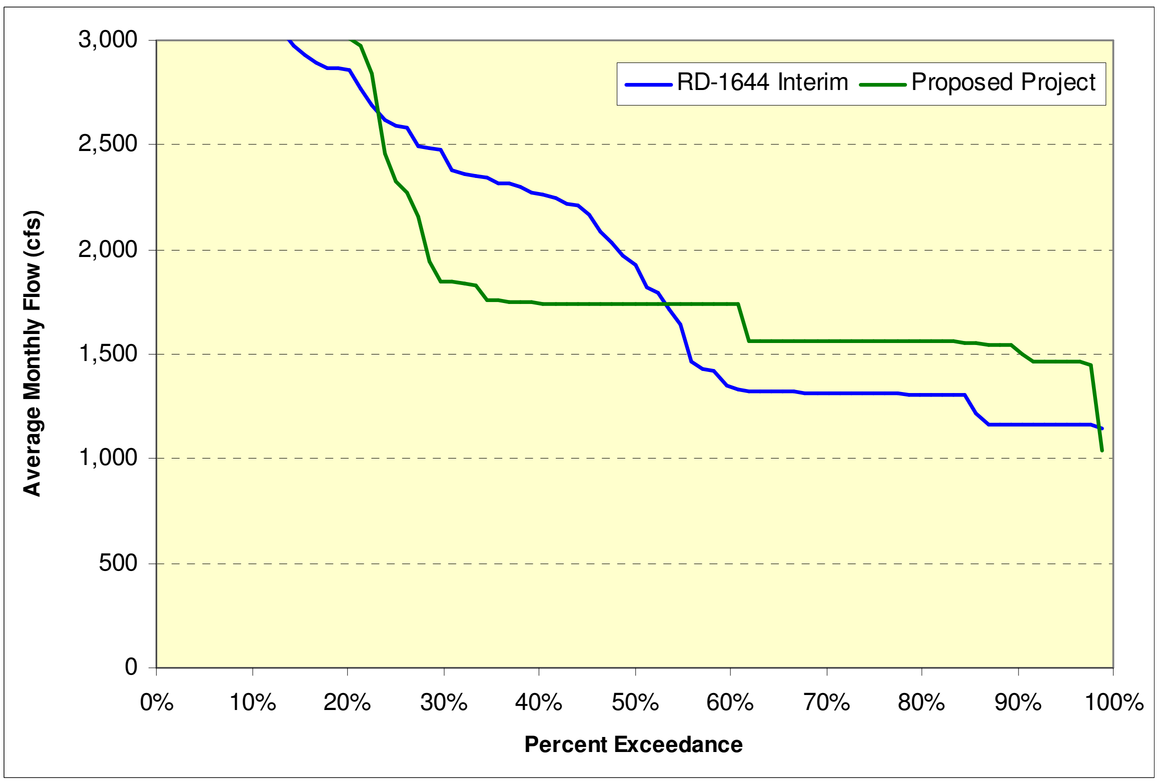

Figure A3-10. Exceedance Plot of Average Flows at the Smartville Gage During the Month of July 2007 Over the 83-Year Simulation Period

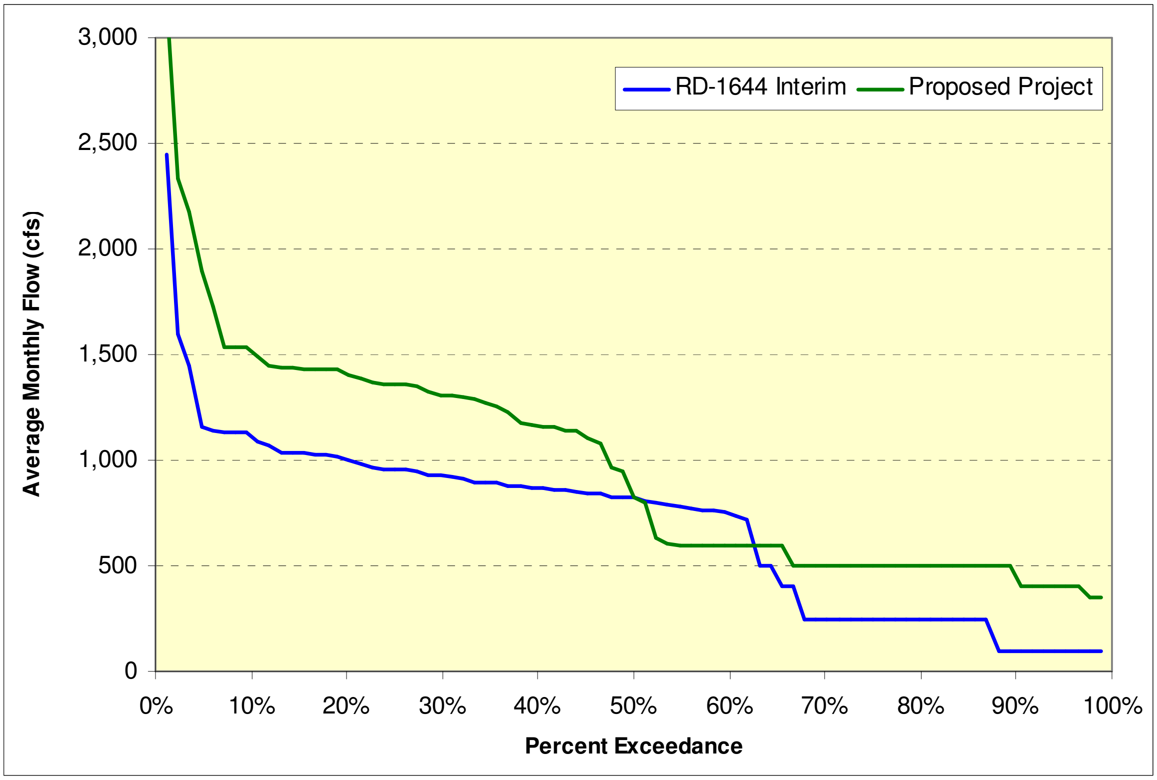

Figure A3-11. Exceedance Plot of Average Flows at the Marysville Gage During the Month of August 2007 Over the 83-Year Simulation Period

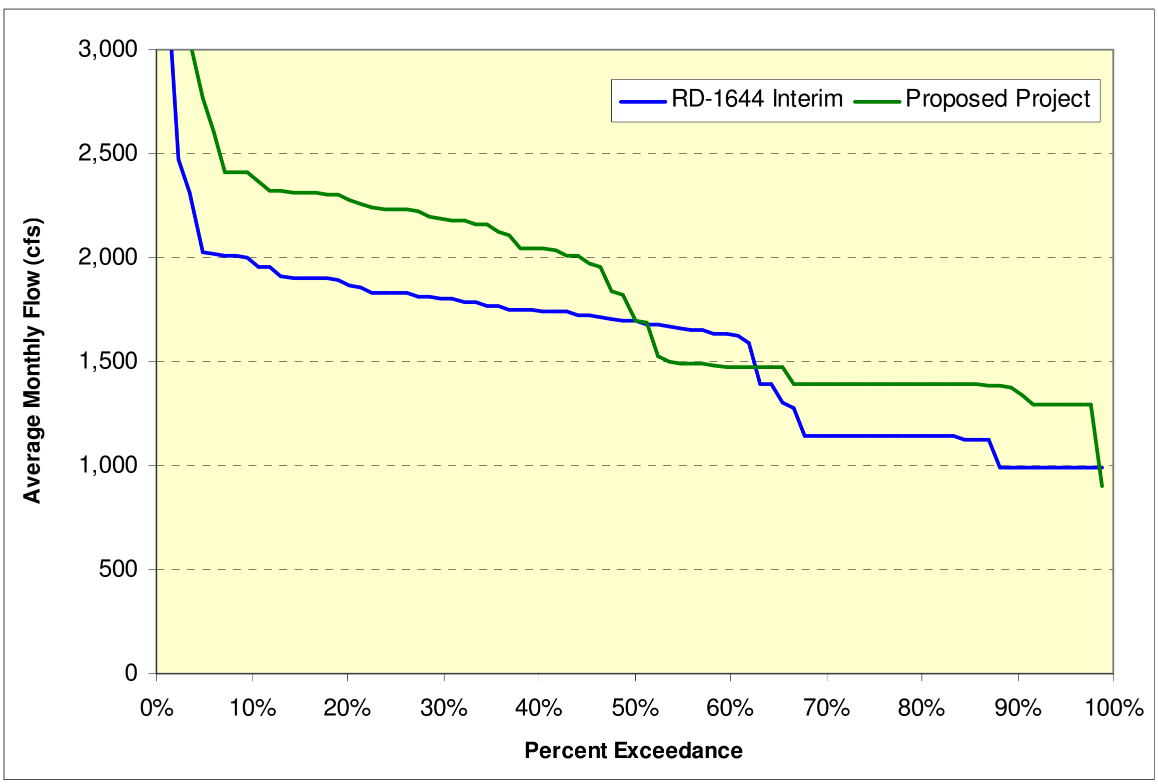

Figure A3-12. Exceedance Plot of Average Flows at the Smartville Gage During the Month of August 2007 Over the 83-Year Simulation Period

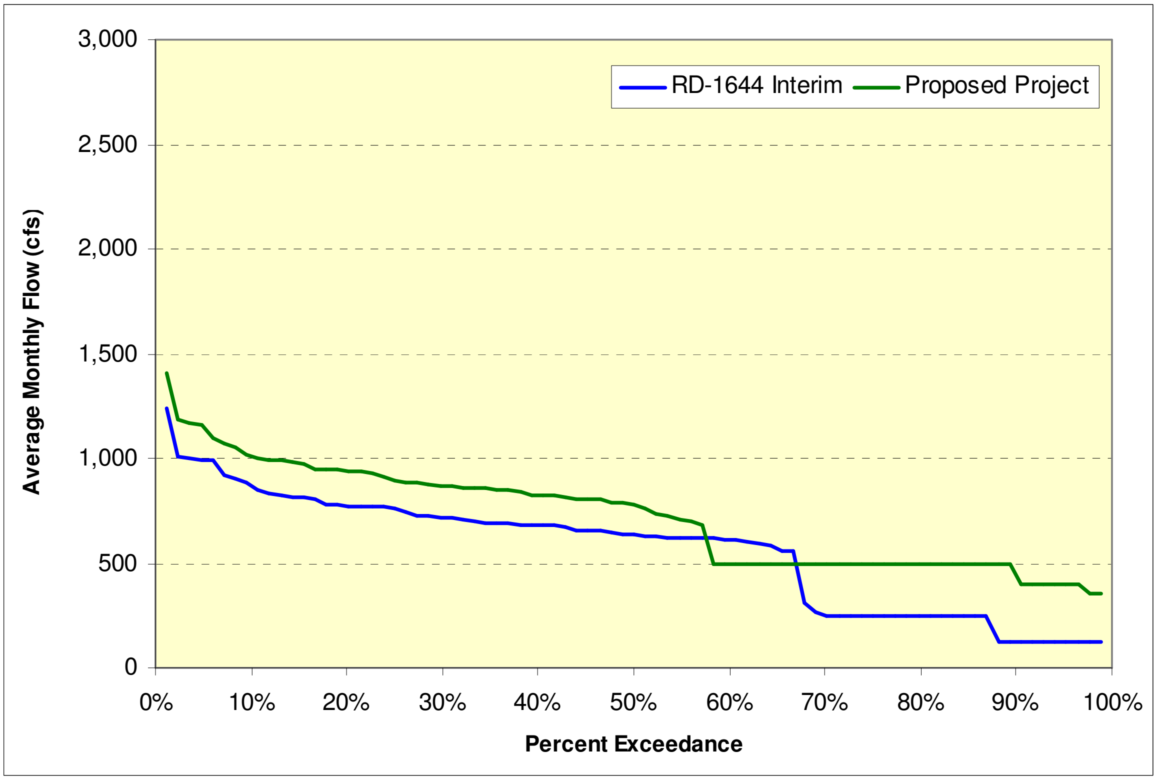

Figure A3-13. Exceedance Plot of Average Flows at the Marysville Gage During the Month of September 2007 Over the 83-Year Simulation Period

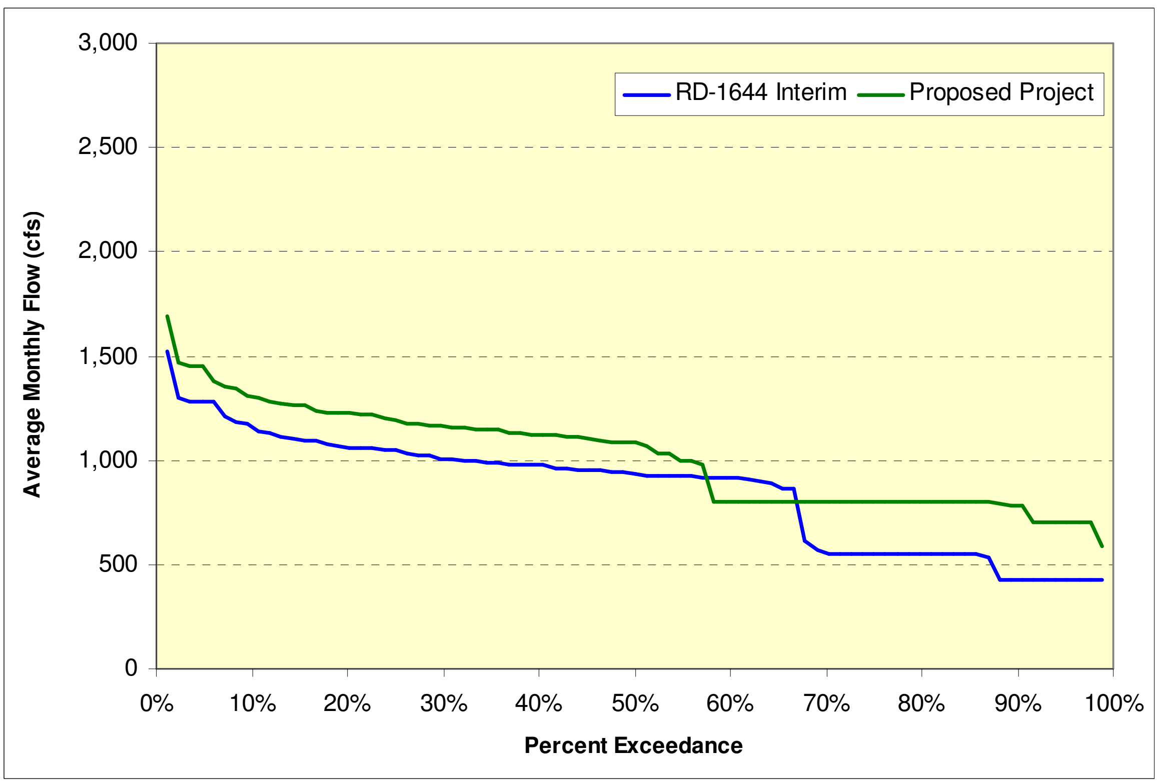

Figure A3-14. Exceedance Plot of Average Flows at the Smartville Gage During the Month of September 2007 Over the 83-Year Simulation Period

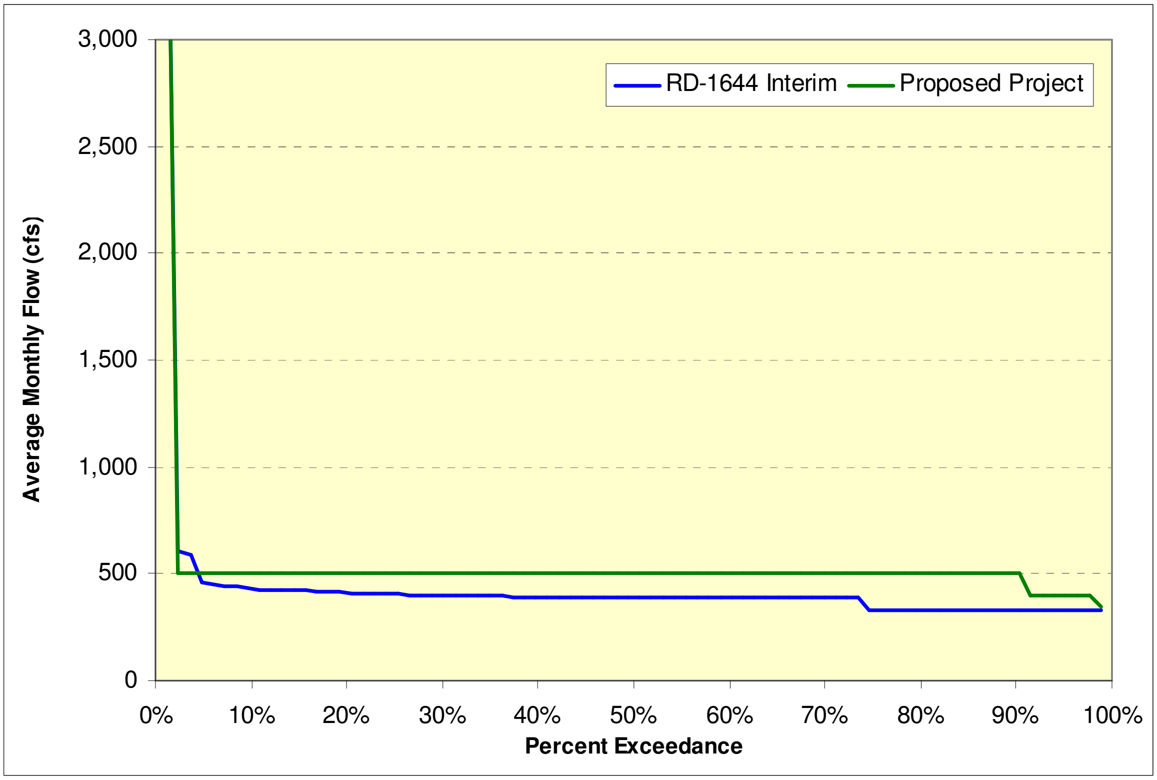

Figure A3-15. Exceedance Plot of Average Flows at the Marysville Gage During the Month of October 2007 Over the 83-Year Simulation Period

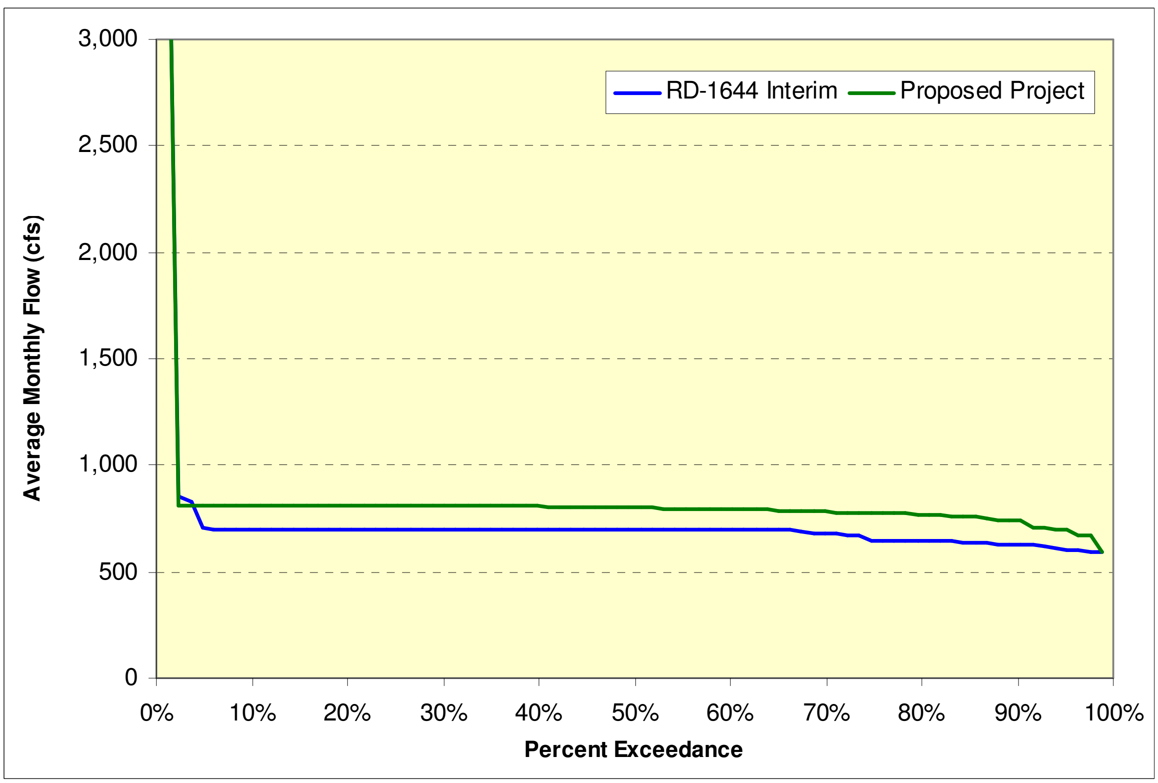

Figure A3-16. Exceedance Plot of Average Flows at the Smartville Gage During the Month of October 2007 Over the 83-Year Simulation Period

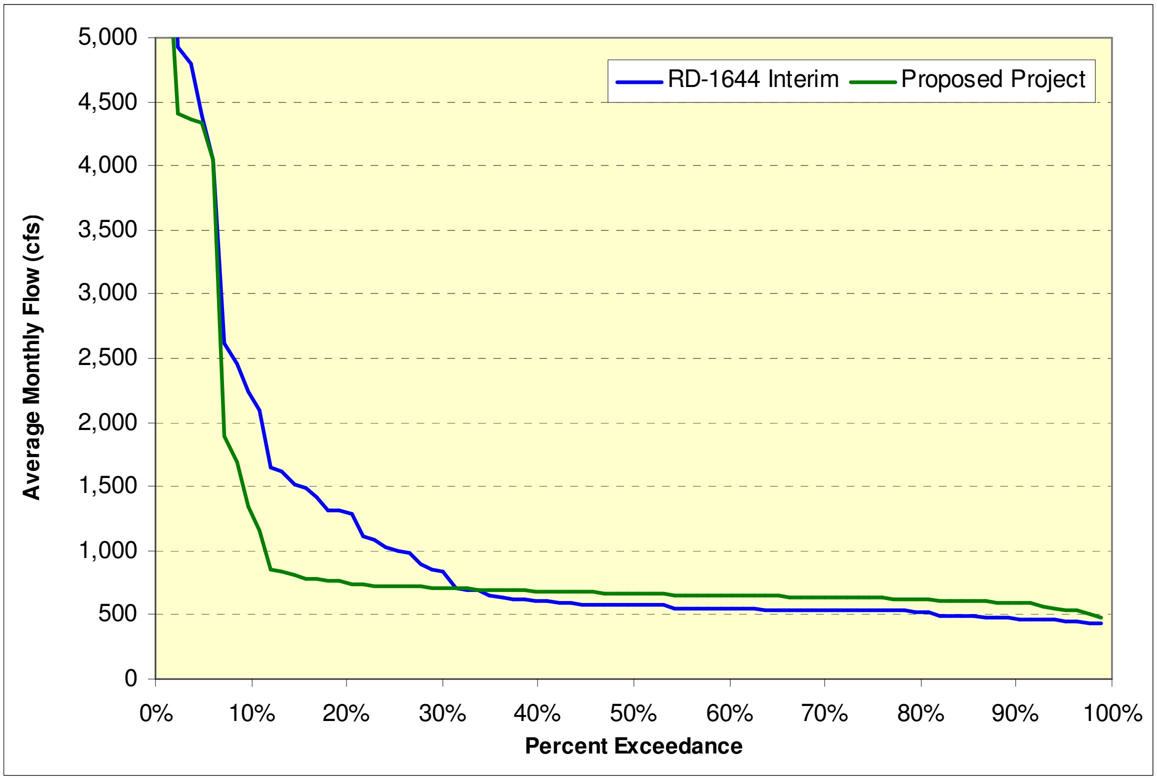

Figure A3-17. Exceedance Plot of Average Flows at the Marysville Gage During the Month of November 2007 Over the 83-Year Simulation Period

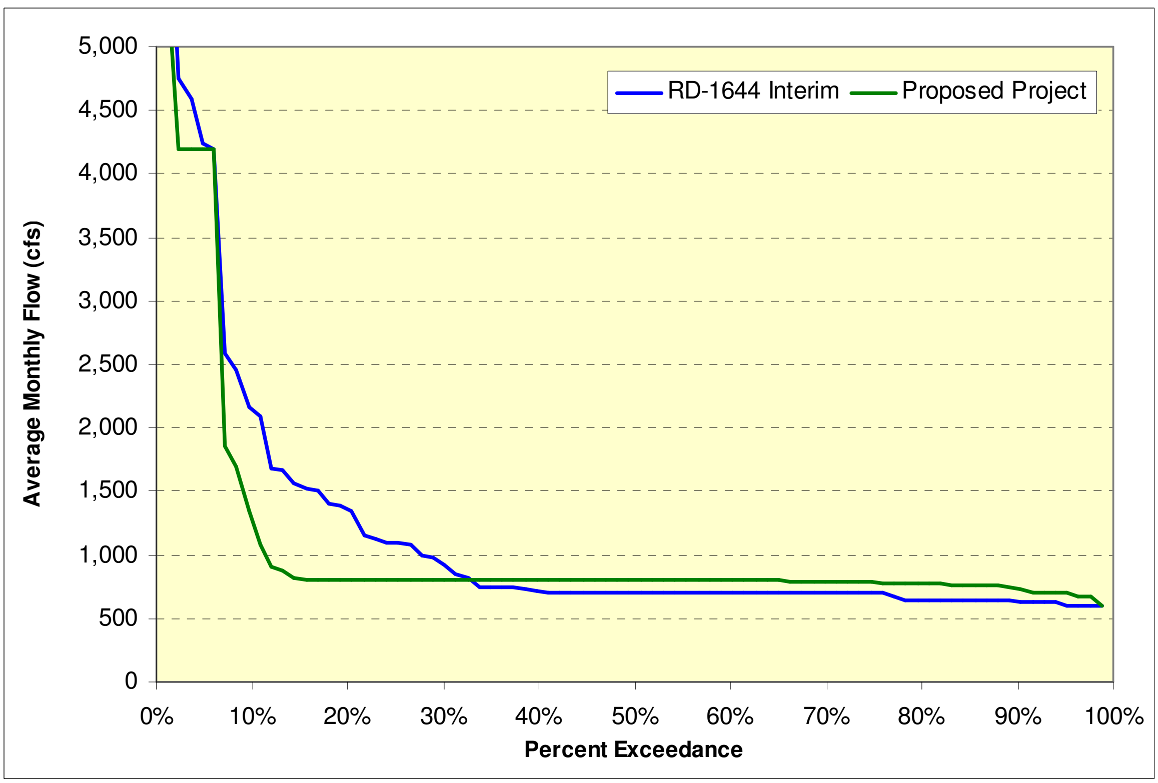

Figure A3-18. Exceedance Plot of Average Flows at the Smartville Gage During the Month of November 2007 Over the 83-Year Simulation Period

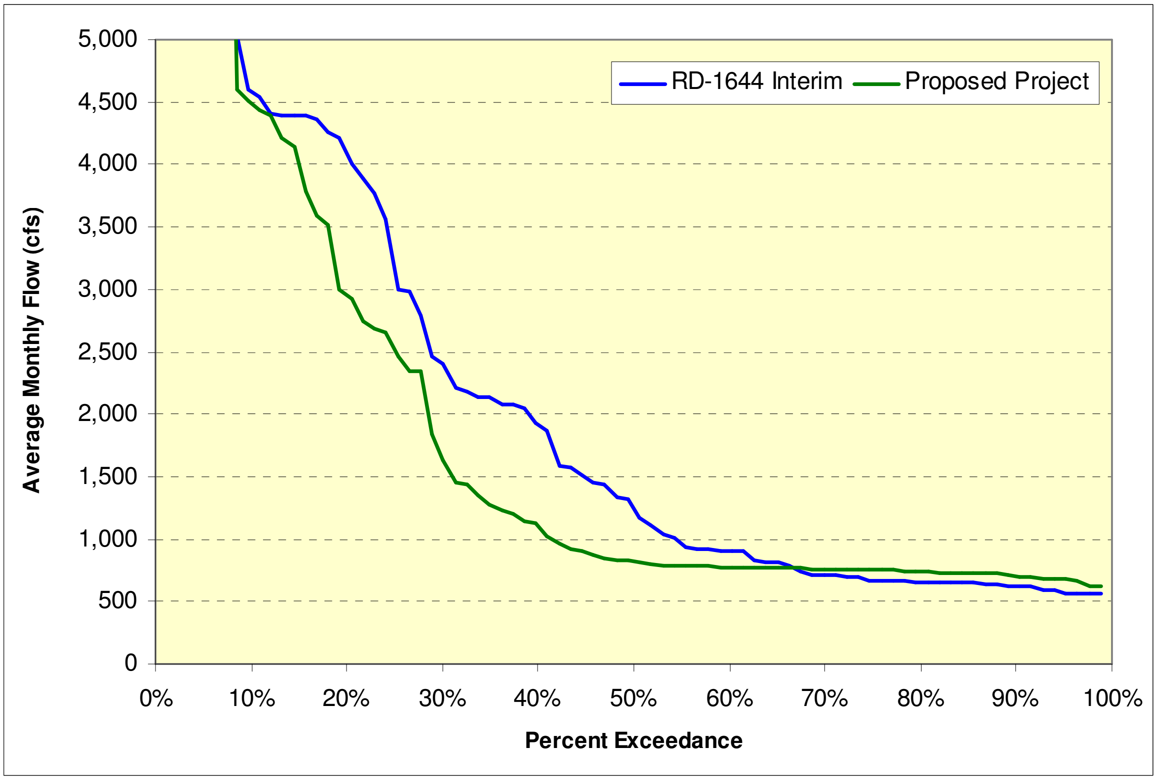

Figure A3-19. Exceedance Plot of Average Flows at the Marysville Gage During the Month of December 2007 Over the 83-Year Simulation Period

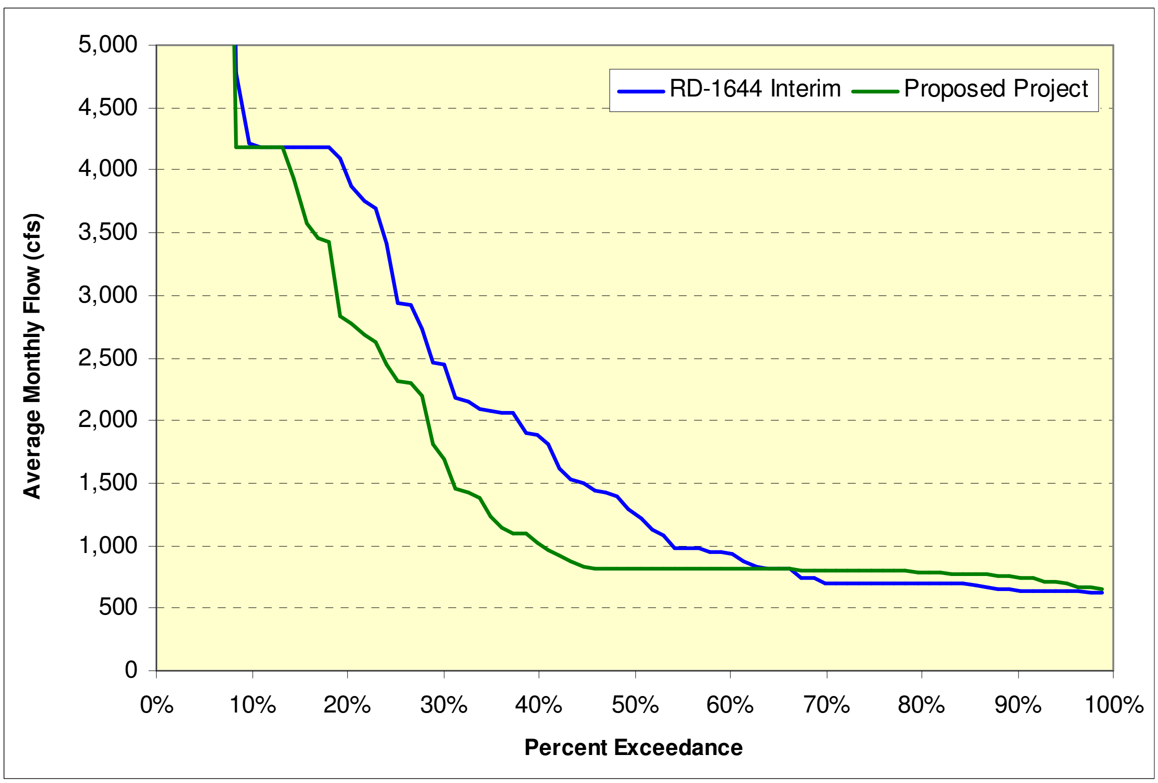

Figure A3-20. Exceedance Plot of Average Flows at the Smartville Gage During the Month of December 2007 Over the 83-Year Simulation Period

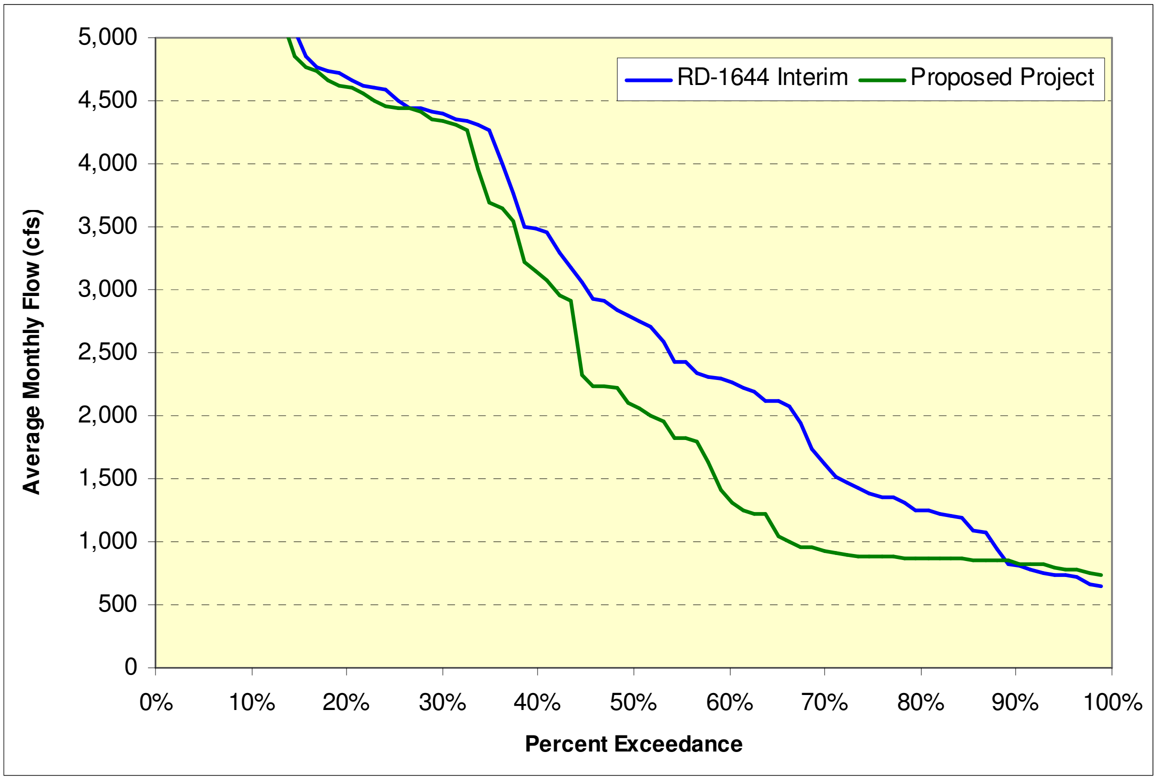

Figure A3-21. Exceedance Plot of Average Flows at the Marysville Gage During the Month of January 2008 Over the 83-Year Simulation Period

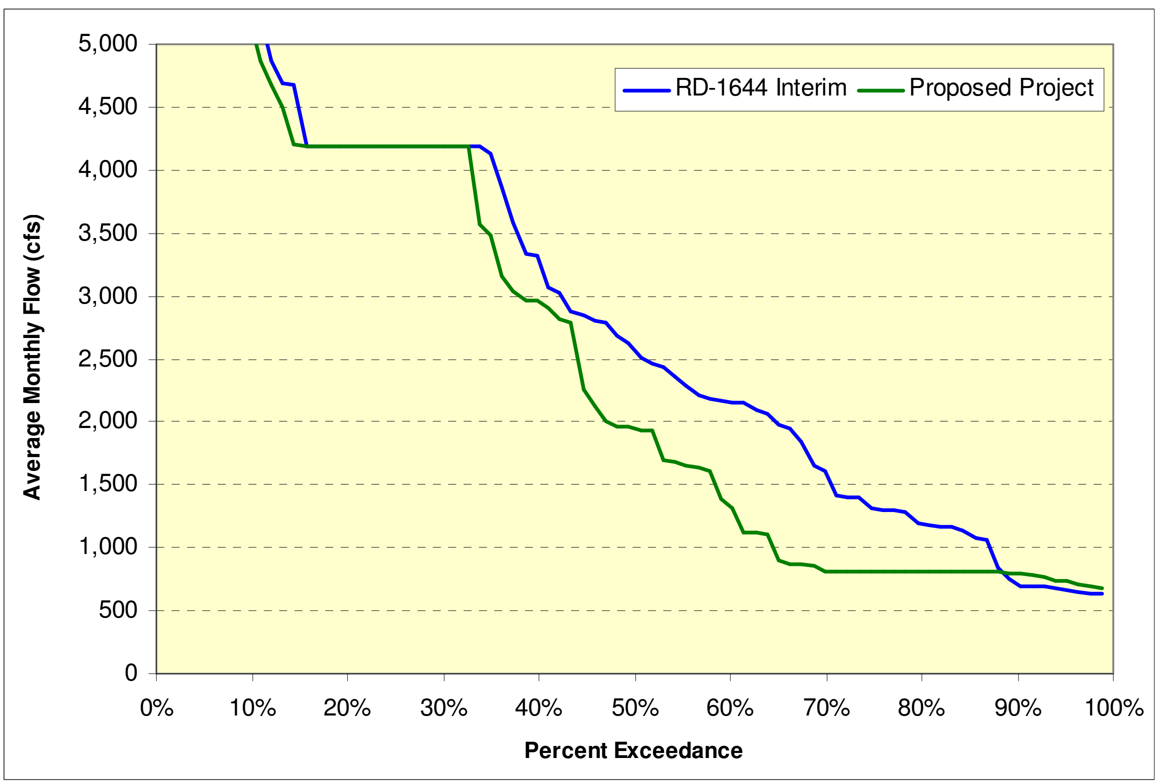

Figure A3-22. Exceedance Plot of Average Flows at the Smartville Gage During the Month of January 2008 Over the 83-Year Simulation Period

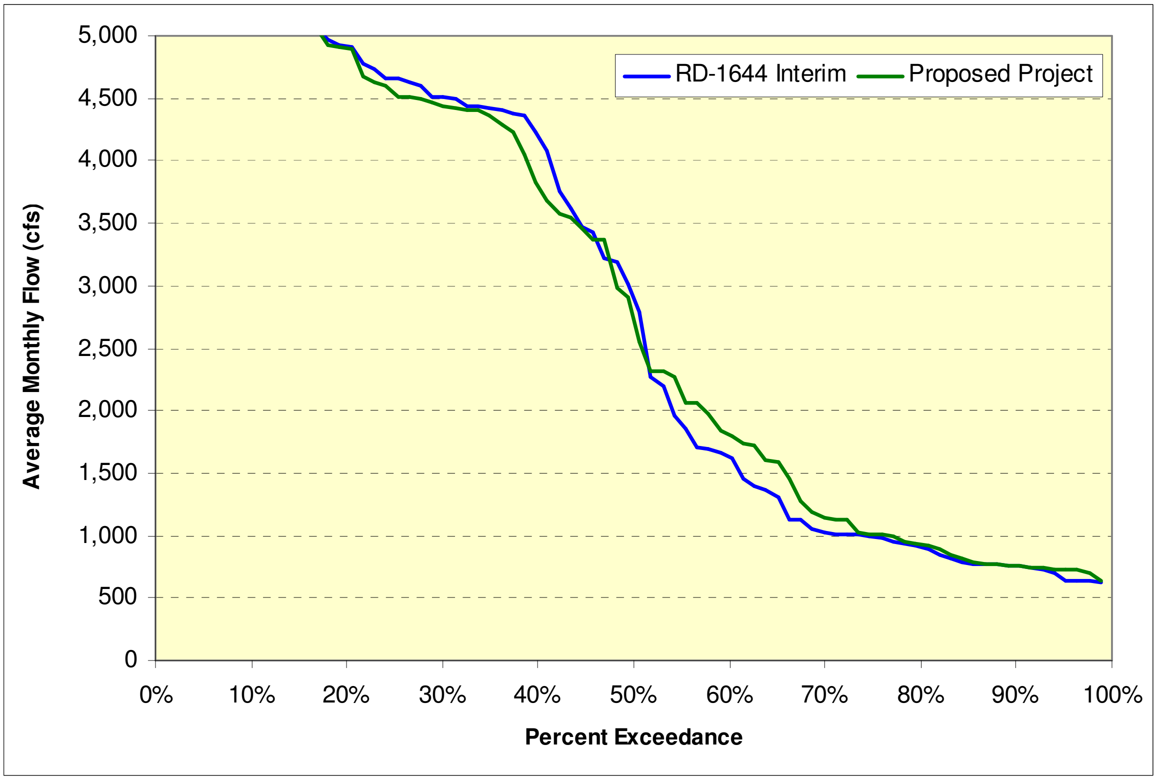

Figure A3-23. Exceedance Plot of Average Flows at the Marysville Gage During the Month of February 2008 Over the 83-Year Simulation Period

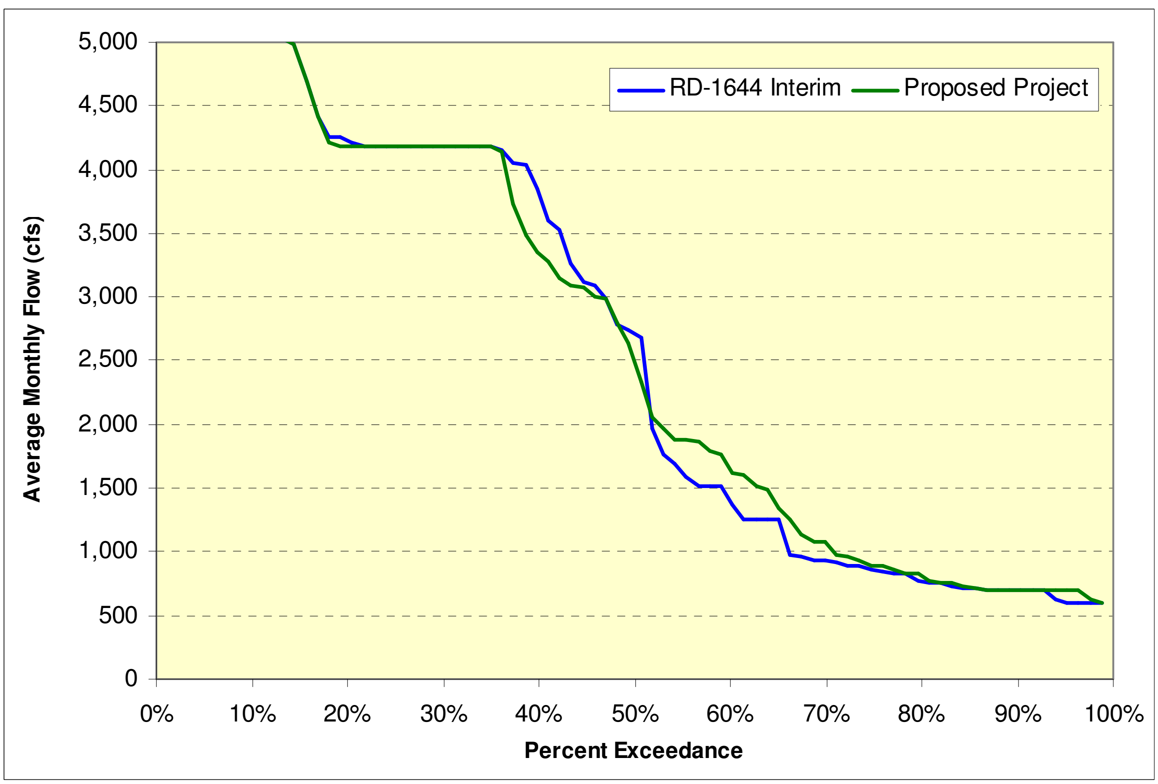

Figure A3-24. Exceedance Plot of Average Flows at the Smartville Gage During the Month of February 2008 Over the 83-Year Simulation Period

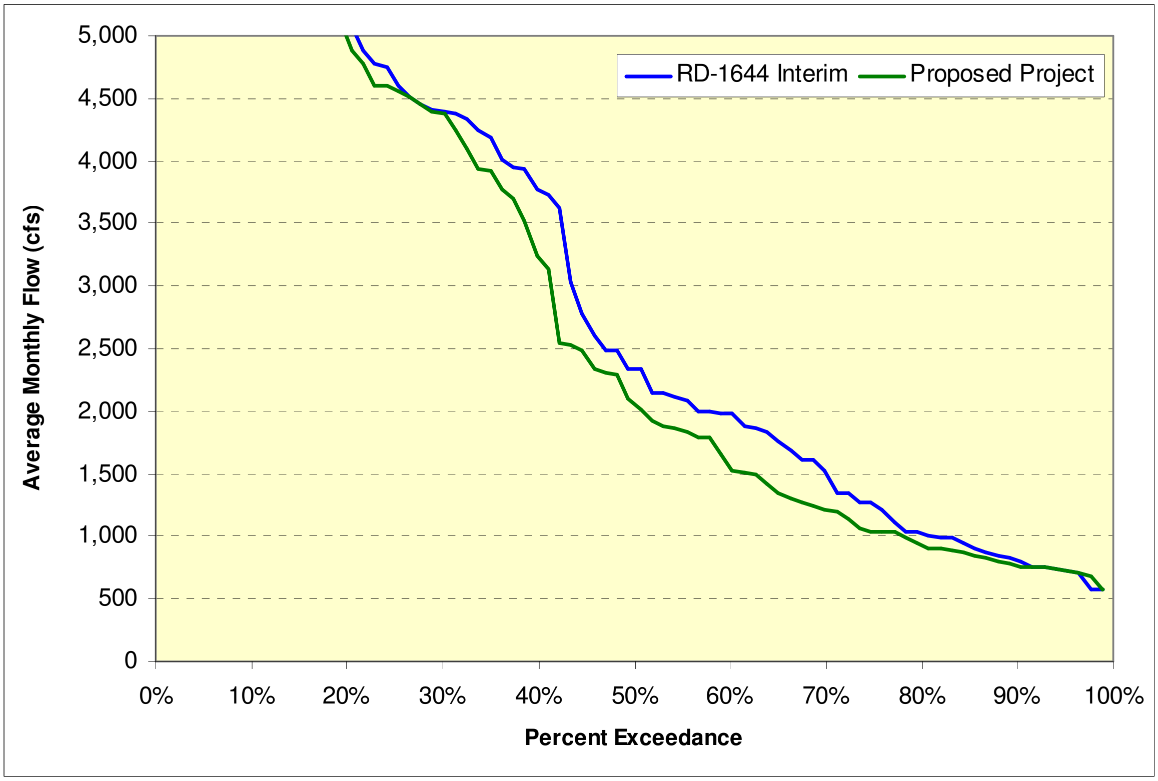

Figure A3-25. Exceedance Plot of Average Flows at the Marysville Gage During the Month of March 2008 Over the 83-Year Simulation Period

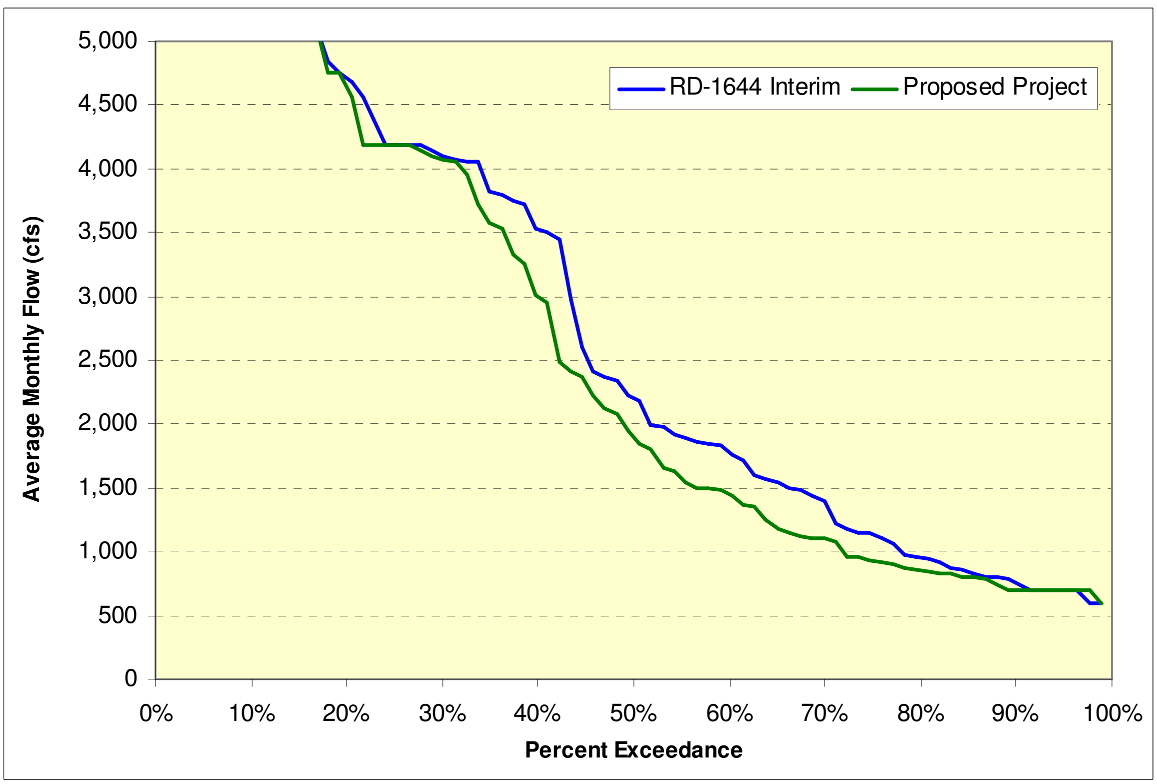

Figure A3-26. Exceedance Plot of Average Flows at the Smartville Gage During the Month of March 2008 Over the 83-Year Simulation Period

Appendix 4

Average Monthly Water Temperature

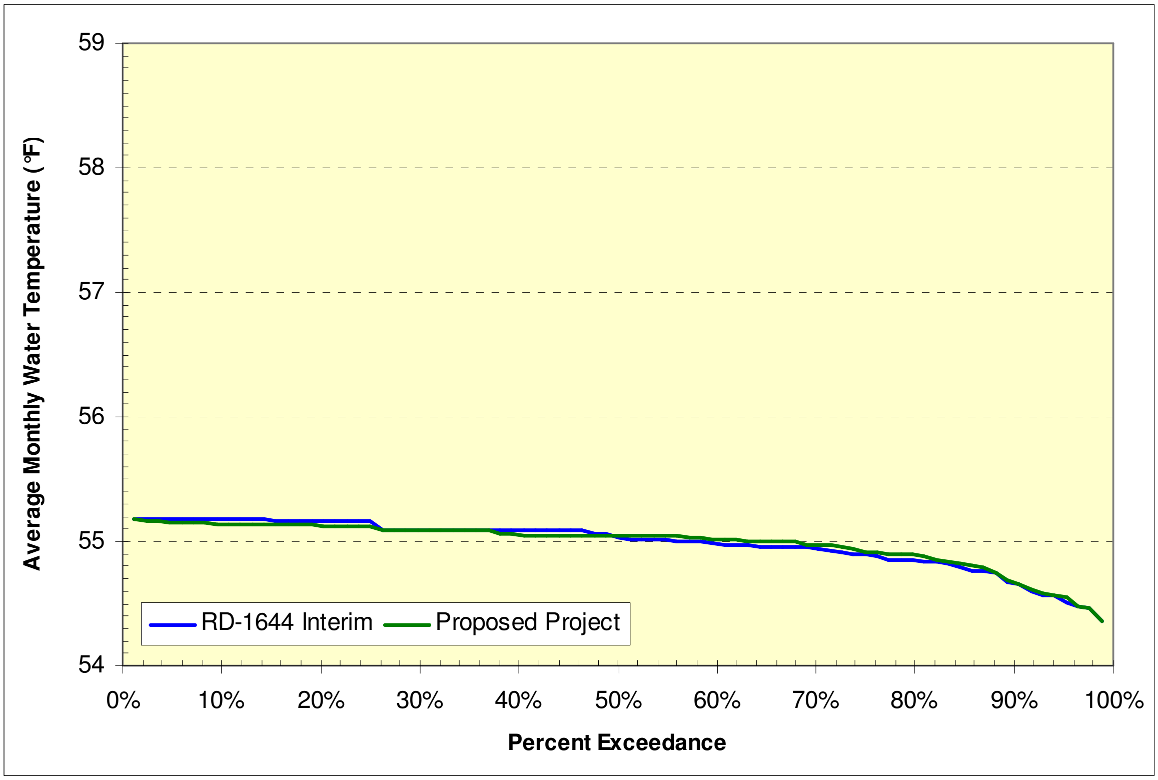

Figure A4-1. Exceedance Plot of Average Water Temperatures at Daguerre Point Dam During the Month of May 2007 Over the 83-Year Simulation Period

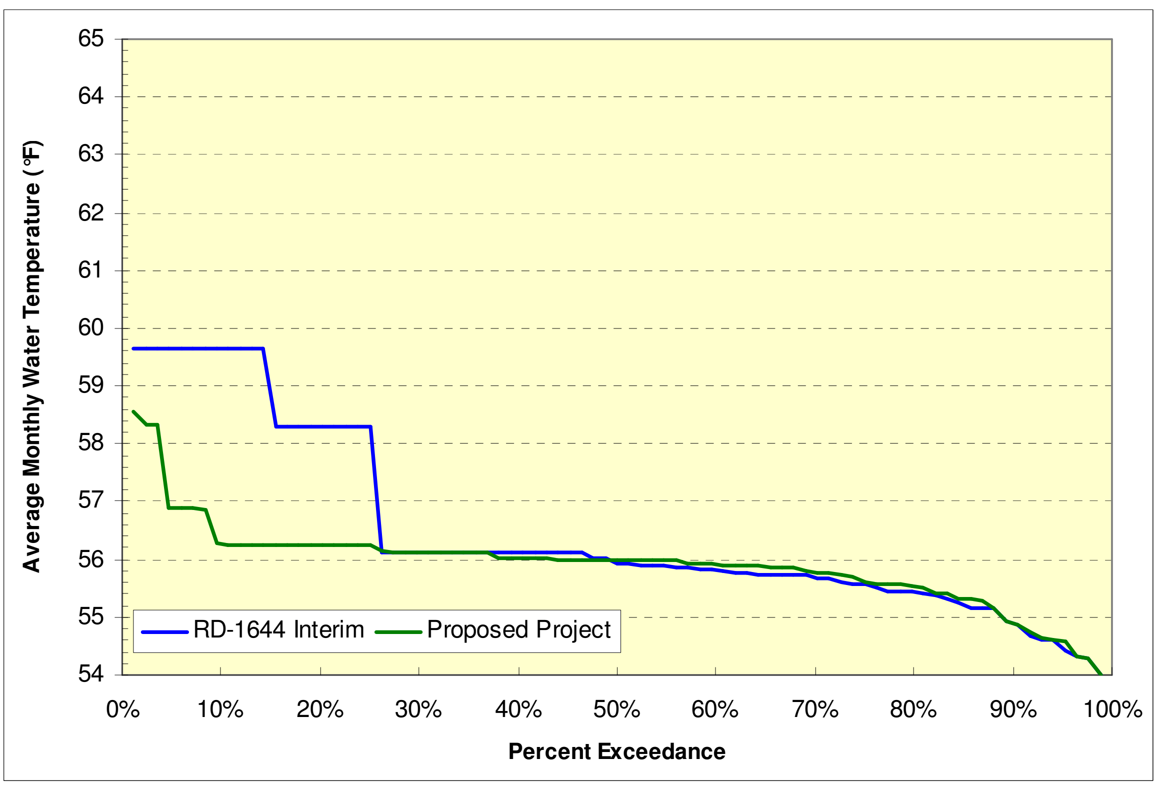

Figure A4-2. Exceedance Plot of Average Water Temperatures at Marysville During the Month of May 2007 Over the 83-Year Simulation Period

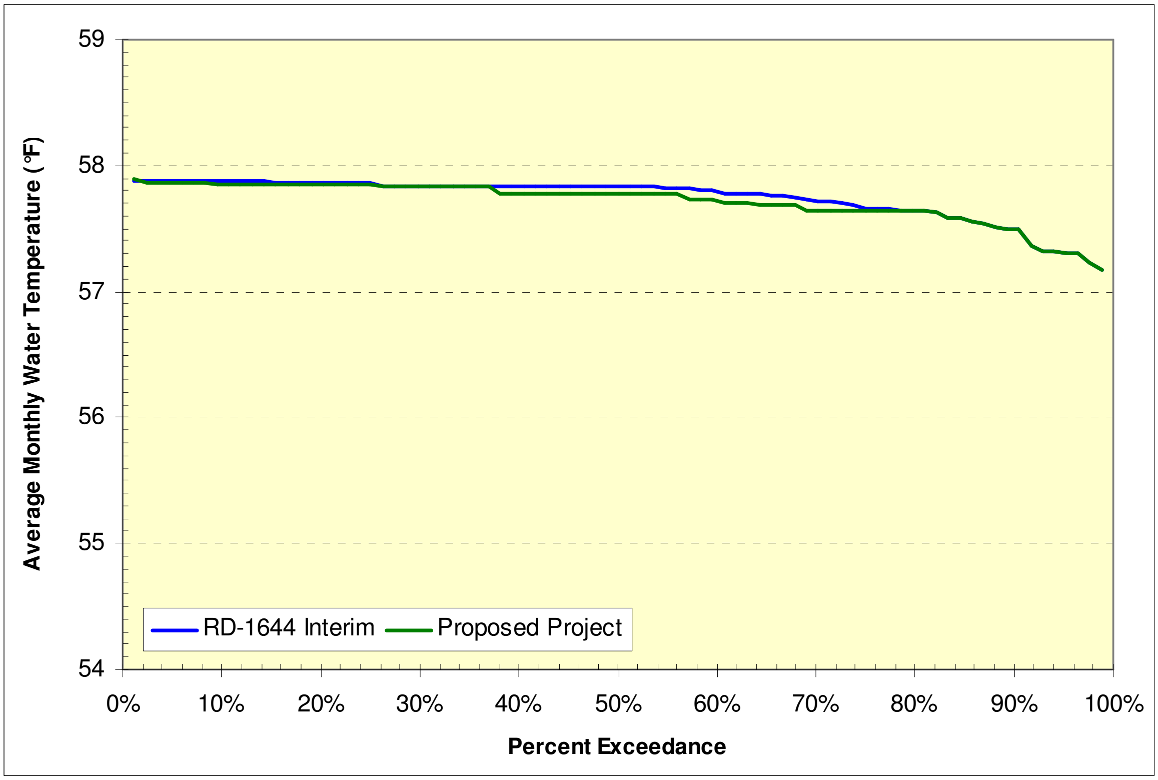

Figure A4-3. Exceedance Plot of Average Water Temperatures at Daguerre Point Dam During the Month of June 2007 Over the 83-Year Simulation Period

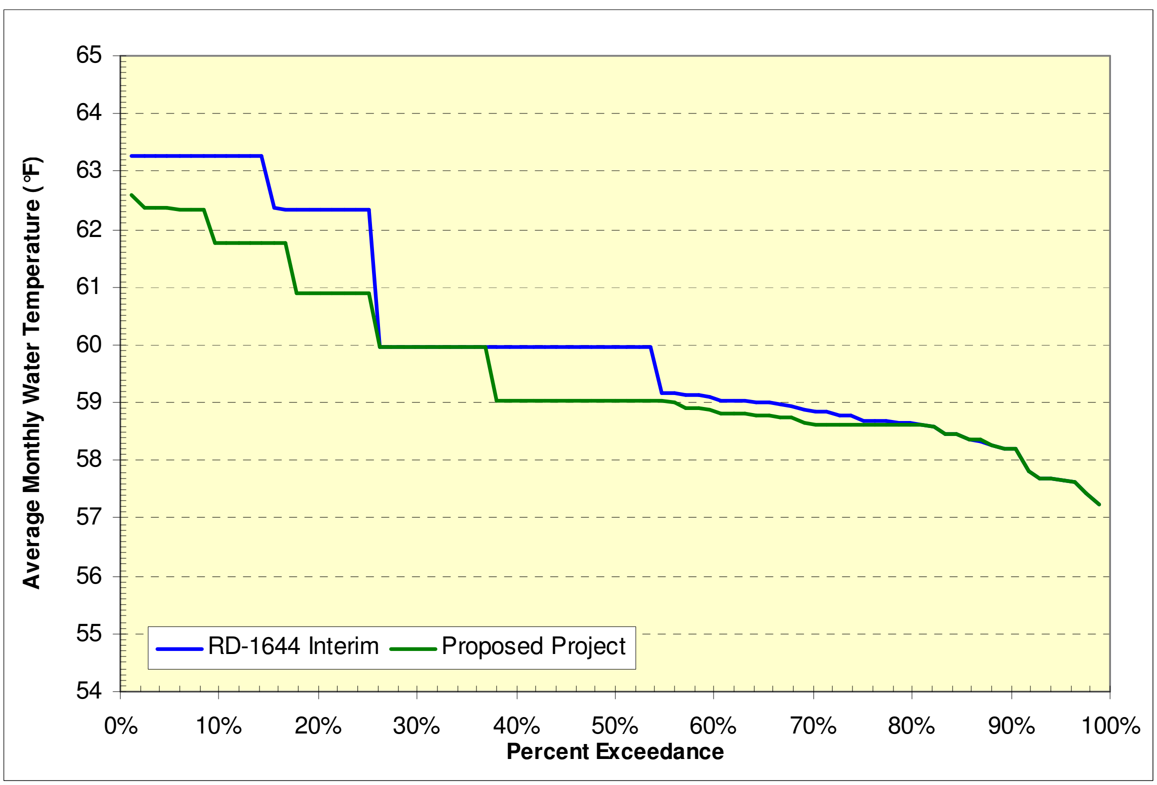

Figure A4-4. Exceedance Plot of Average Water Temperatures at Marysville During the Month of June 2007 Over the 83-Year Simulation Period

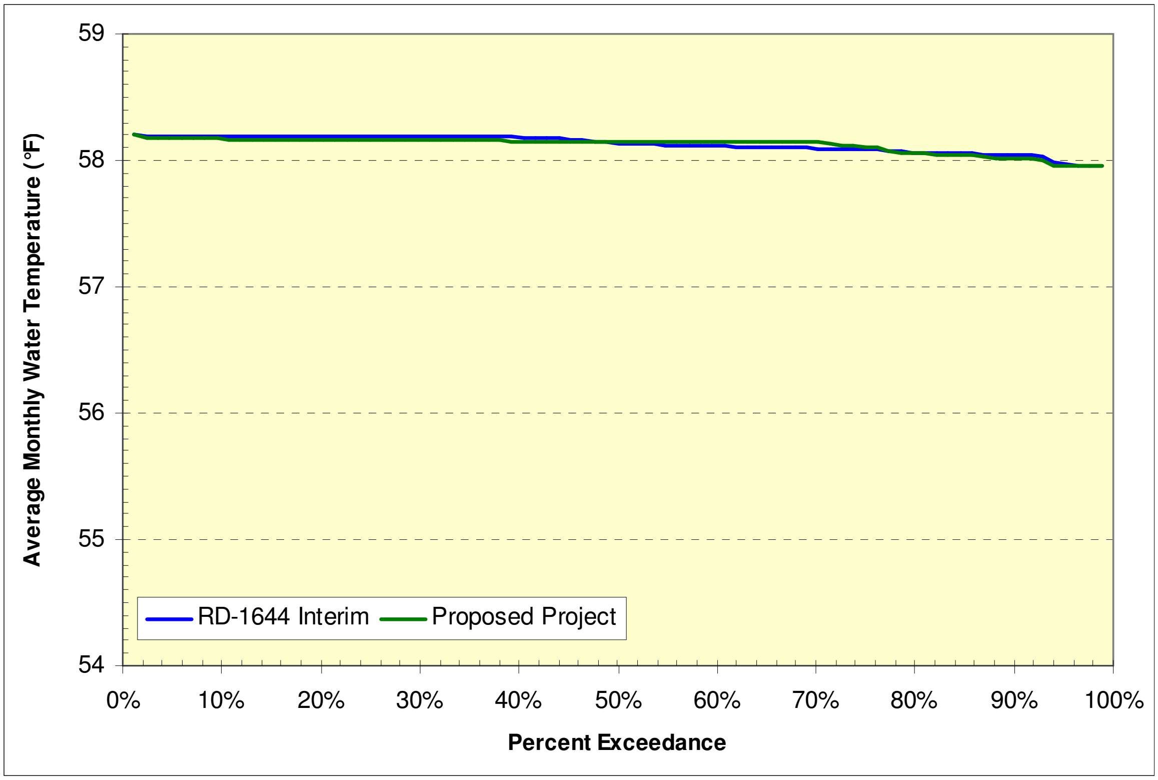

Figure A4-5. Exceedance Plot of Average Water Temperatures at Daguerre Point Dam During the Month of July 2007 Over the 83-Year Simulation Period

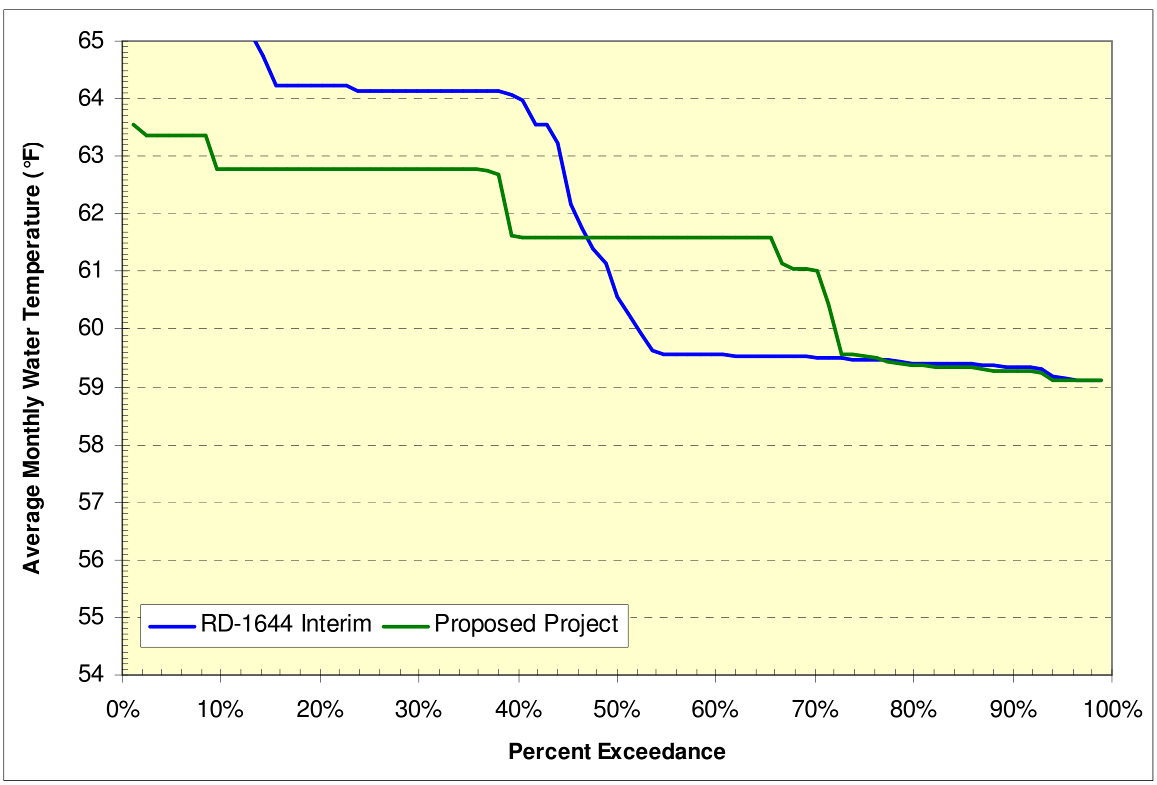

Figure A4-6. Exceedance Plot of Average Water Temperatures at Marysville During the Month of July 2007 Over the 83-Year Simulation Period

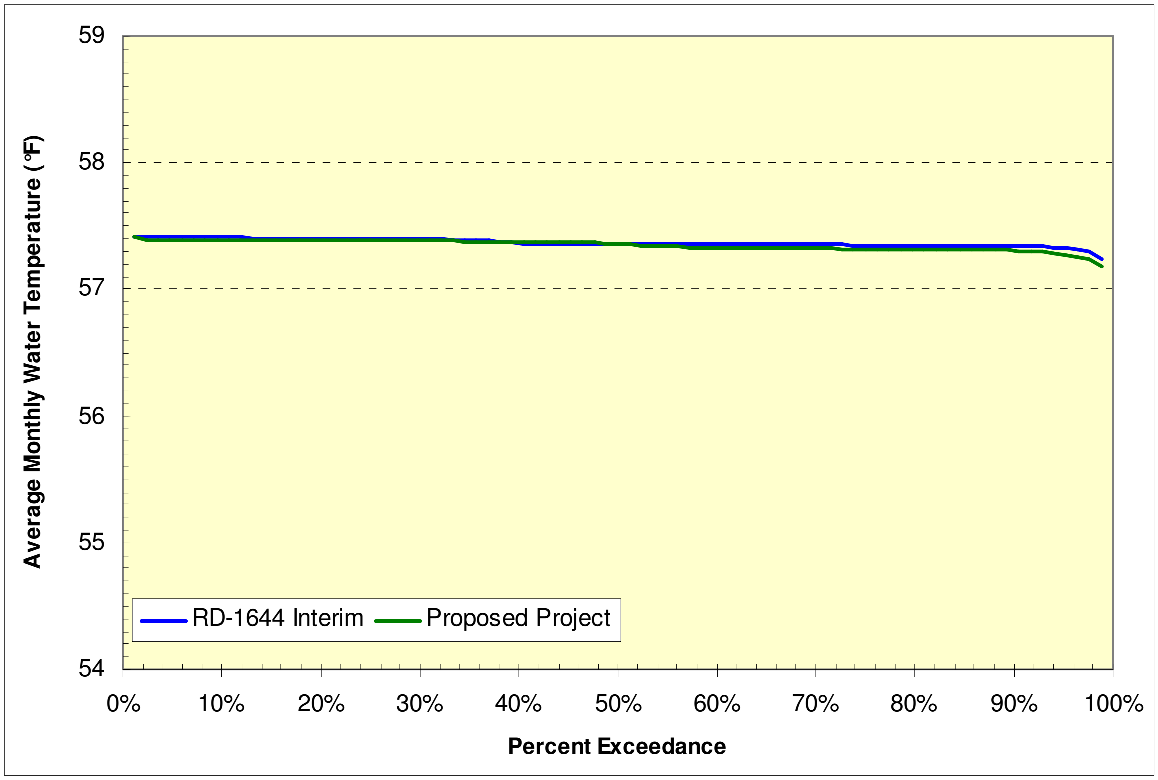

Figure A4-7. Exceedance Plot of Average Water Temperatures at Daguerre Point Dam During the Month of August 2007 Over the 83-Year Simulation Period

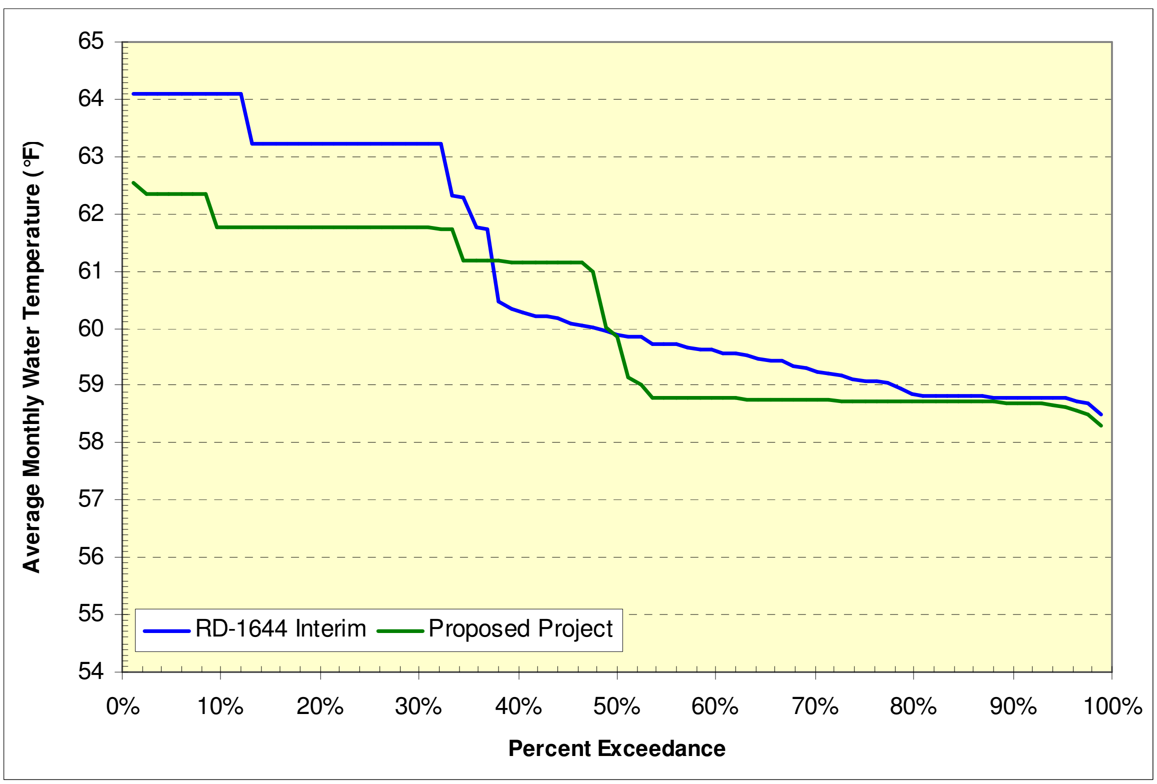

Figure A4-8. Exceedance Plot of Average Water Temperatures at Marysville During the Month of August 2007 Over the 83-Year Simulation Period

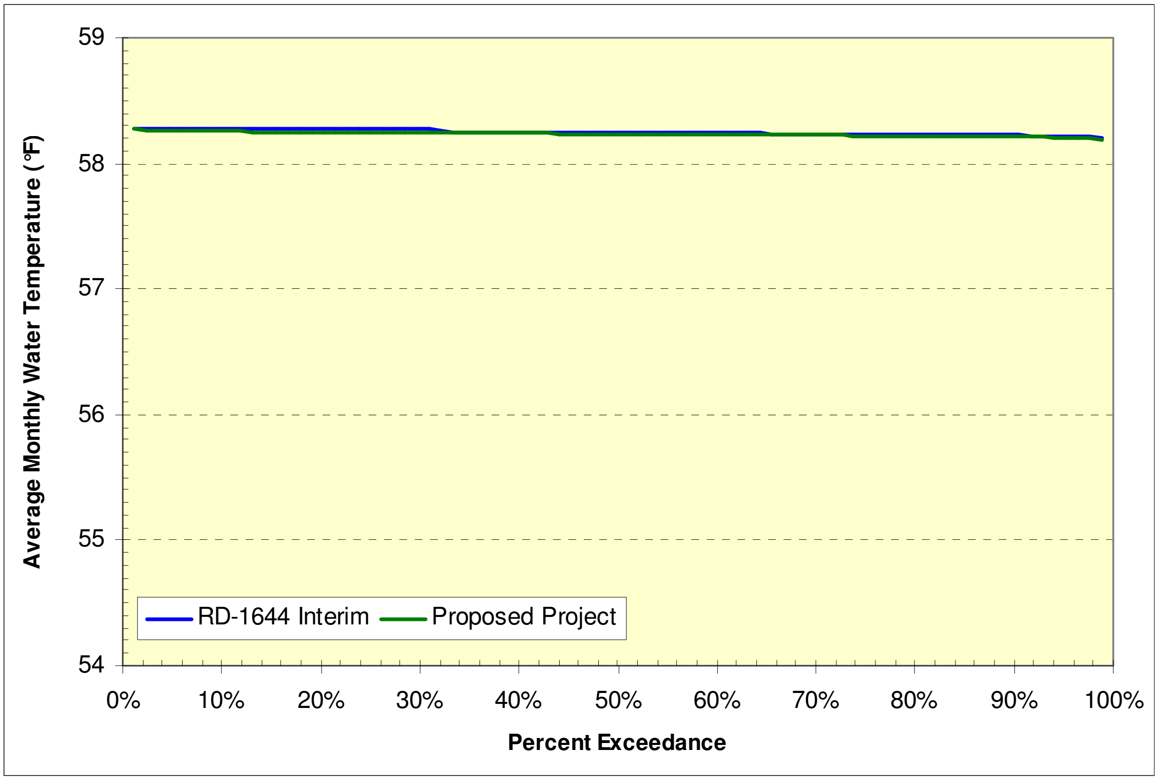

Figure A4-9. Exceedance Plot of Average Water Temperatures at Daguerre Point Dam During the Month of September 2007 Over the 83-Year Simulation Period

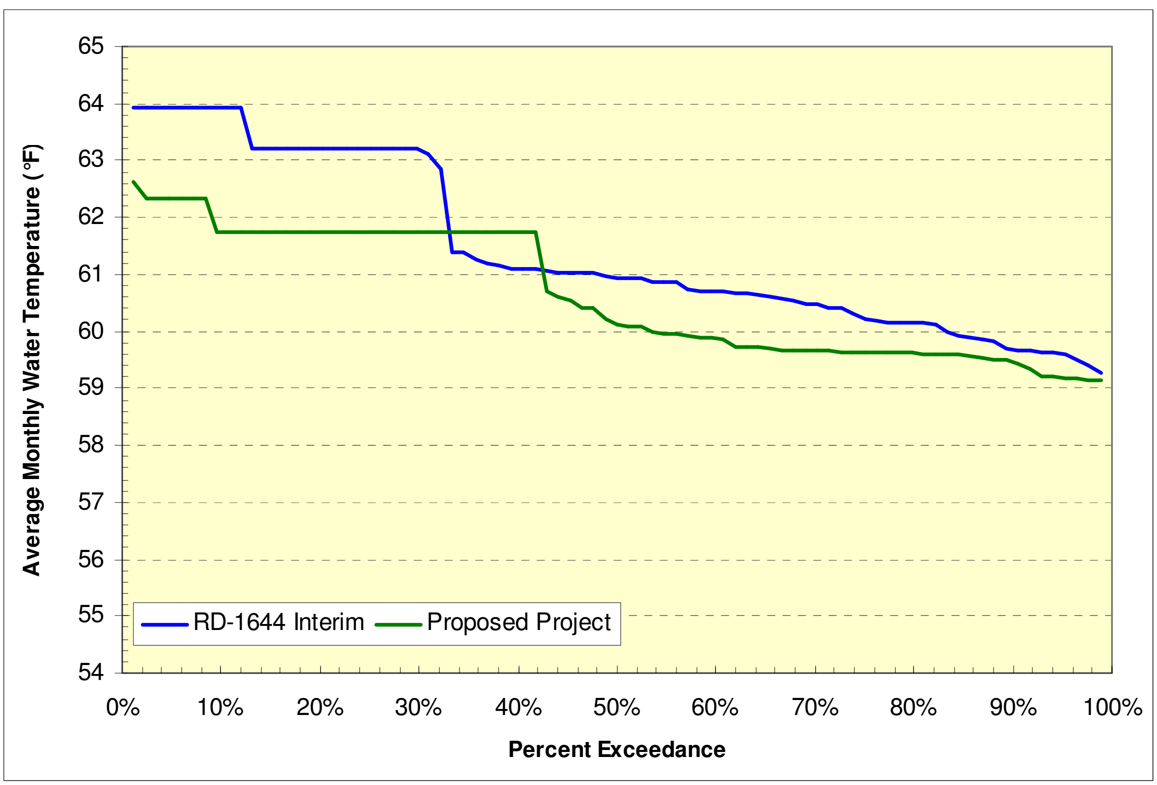

Figure A4-10. Exceedance Plot of Average Water Temperatures at Marysville During the Month of September 2007 Over the 83-Year Simulation Period

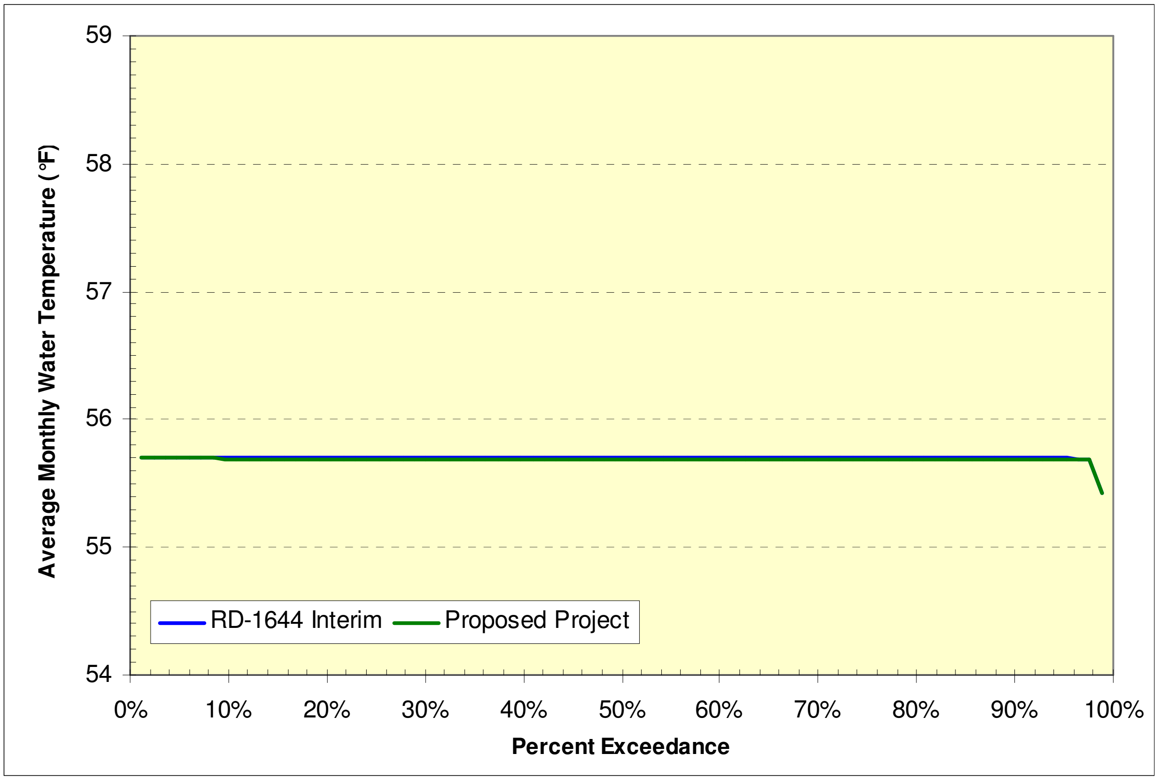

Figure A4-11. Exceedance Plot of Average Water Temperatures at Daguerre Point Dam During the Month of October 2007 Over the 83-Year Simulation Period

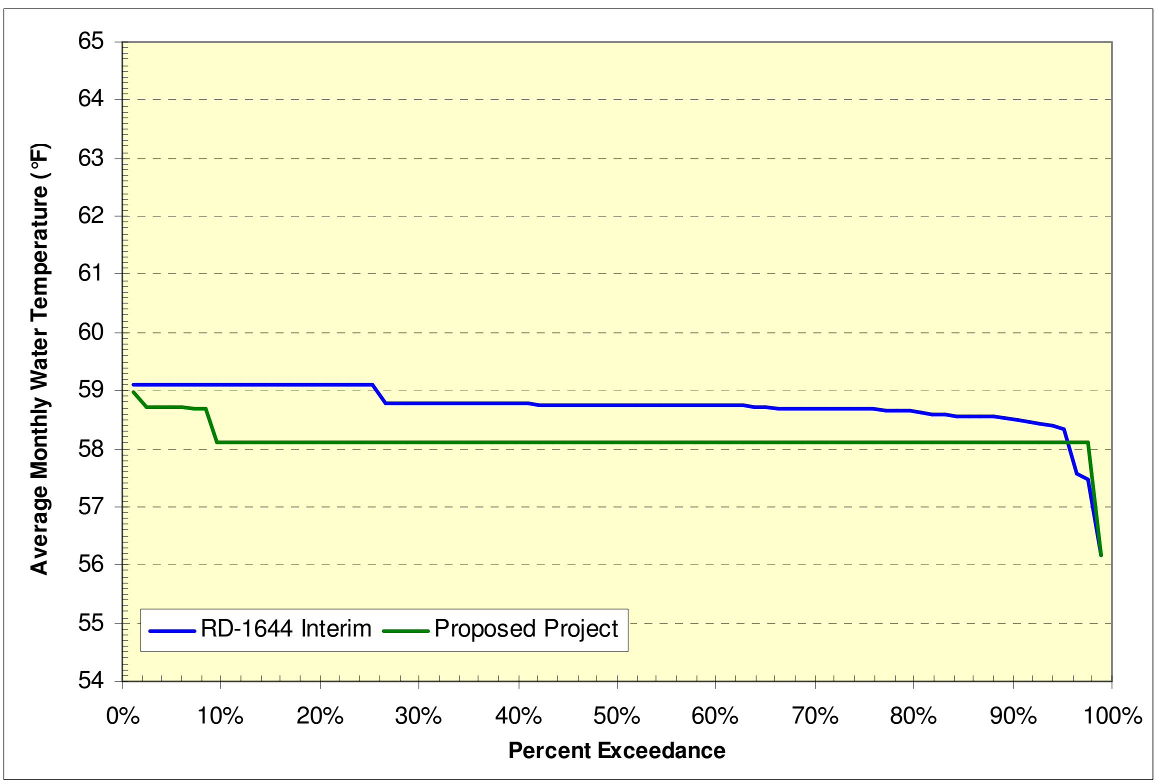

Figure A4-12. Exceedance Plot of Average Water Temperatures at Marysville During the Month of October 2007 Over the 83-Year Simulation Period

Appendix 5

Analysis of Weighted Usable Areas for Spawning Salmonids

Appendix 5

Analysis of Weighted Usable Areas for Spawning Salmonids

The potential effects of flows on the adult spawning life stage of lower Yuba River Chinook salmon and steelhead were evaluated by examining spawning habitat available to Chinook salmon and steelhead throughout their spawning seasons. Spawning habitat availability was expressed as annual scaled composite usable area that corresponds to Chinook salmon and steelhead spawning areas associated with monthly flows under the proposed project and the basis of comparison.

For spring-run Chinook, the annual scaled composite weighted usable area (i.e., $\widehat{CWUA}_Y$) was calculated as the sum of the usable areas that correspond to the monthly flows during its spawning season (i.e., September through November; CDFG 1991) over one reach located above Daguerre Point Dam, divided by the sum of the maximum WUA in each of the spawning season months. Thus, the annual scaled composite weighted usable area for spring-run Chinook salmon is expressed by the following formula:

$$\widehat{CWUA}_Y = \frac{\sum_{m=1}^{3} WUA_1\left(Q_{m,Y}\right)}{\sum_{m=1}^{3} \max\left(WUA_1\right)} \qquad \textbf{(1)}$$

where m is any of the 3 months of the spring-run Chinook salmon spawning season in a particular year. $WUA_1\left(Q_{m,Y}\right)$ is the weighted usable area (WUA) of the upstream of Daguerre Point Dam Reach at the monthly flow $Q_{m,Y}$, measured at the Smartville Gage, that was obtained from the WUA-flow relationships developed by the IFIM studies completed in the spawning grounds (CDFG 1991). In the denominator, $\max\left(WUA_1\right)$ is the maximum weighted usable area of the WUA-flow relationship developed for the upstream of Daguerre Point Dam Reach. Also, percent of maximum WUA was calculated separately for the month of September, because this is the only month during the spring-run Chinook salmon spawning period that is assumed to not temporally overlap with fall-run Chinook salmon spawning (CDFG 2000).

Fall-run Chinook salmon utilize k = 2 distinct reaches within the lower Yuba River, during m = 3 months of a particular year (i.e., October through December). Thus, the scaled composite weighted usable area (i.e., $\widehat{CWUA}_Y$) for fall-run Chinook salmon is expressed by the following formula:

$$\widehat{CWUA}_Y = \frac{\sum_{m=1}^{3}\sum_{k=1}^{2} WUA_k\left(Q_{m,Y}\right)}{\sum_{m=1}^{3}\sum_{k=1}^{2} \max\left(WUA_k\right)} \qquad \textbf{(2)}$$

where $WUA_k\left(Q_{m,Y}\right)$ is the weighted usable area (WUA) of reach k at the monthly flow $Q_{m,Y}$ obtained from the WUA-flow relationships developed by the IFIM studies completed in the spawning grounds (CDFG 1991), and $\max\left(WUA_k\right)$ is the maximum weighted usable area of reach k over the flow range for which the WUA-flow relationship was developed.

Because the steelhead spawning period in the Yuba River generally extends from January through April, and most steelhead spawning activity is believed to take place in the lower Yuba River, upstream of Daguerre Point Dam, the annual scaled composite weighted usable area for steelhead spawning comprises only the weighted usable areas (WUA) upstream of Daguerre Point Dam during the spawning months of January through April. Because the span of the 2007 Pilot Program includes portions of two water years, and none of these portions includes the whole steelhead spawning period, two annual scaled composite weighted usable areas were generated for steelhead spawning in the Yuba River. The 2007 Pilot Program spans from March 2007 through March 2008, involving the 2007 water year from March 2007 through September 2007, and the 2008 water year from October 2007 through March 2008. Thus, a first annual scaled composite weighted usable area was generated to describe steelhead spawning habitat availability during March and April 2007 with the formula:

$$\widehat{CWUA}_{Y,1} = \frac{\sum_{m=1}^{2} WUA_1\left(Q_{m,Y}\right)}{\sum_{m=1}^{2} \max\left(WUA_1\right)}. \qquad \textbf{(3)}$$

The second annual scaled composite weighted usable area describes spawning habitat availability from January through March 2008. Its value was computed with the formula:

$$\widehat{CWUA}'_{Y,1} = \frac{\sum_{m=1}^{3} WUA_1\left(Q_{m,Y}\right)}{\sum_{m=1}^{3} \max\left(WUA_1\right)}. \qquad \textbf{(4)}$$

The following sections describe the origin of the data and calculations associated with the computation of the annual scaled composite weighted usable areas $\widehat{CWUA}_Y$ (**Equations 1 through 4**).

Lower Yuba River Salmonid Spawning WUA-Flow Relationships

The present analysis utilized the WUA-flow relationships described in CDFG (1991) to evaluate the habitat available to Chinook salmon and steelhead spawning at different lower Yuba River flows. The instream flow incremental methodology study described in CDFG (1991) divided the lower Yuba River into four reaches two of which are located above Daguerre Point Dam and two located below Daguerre Point Dam (**Table A5-1**).

Table A5-1. Names and River Miles (RM) of the Limits of Lower Yuba River Reaches With WUA-Flow Relationships Developed by CDFG (1991)

Reach *k*	Upstream limit	RM	Downstream limit	RM
1	Englebright Dam	23.9	Terminus of the Narrows	21.5
2	Terminus of the Narrows	21.5	Daguerre Point Dam	11.4
3	Daguerre Point Dam	11.4	Terminus of Feather River Backwater Influence	3.5
4	Terminus of Feather River Backwater Influence	3.5	Feather River Confluence	0

Reach 1, also termed the Narrows reach, consists of 11,400 feet of river with steep-walled canyon topography, dominated by deep pools, and bedrock and large boulder substrate. This reach is believed to be an important site for spring-run Chinook salmon holding during late spring, summer and fall. This reach has never been sampled for fall-run Chinook salmon redds or carcasses. The spawning WUA-flow relationships developed for fall-run Chinook salmon and steelhead at this uppermost reach showed zero WUA values for flows between 100 cfs and 2,500 cfs. The 56,400-foot long Reach 2, known as the Garcia Gravel Pit Reach, and the 41,400-foot Reach 3, known as the Daguerre Point Dam Reach, are believed to have good spawning potential. Both reaches, which have been customarily sampled during the annual fall-run Chinook salmon carcass surveys performed by CDFG and YCWA, consist of repeating segments of long, deep pools, shallow pools, run/glide, and long low-gradient riffles, with fewer riffles and more pools in Reach 3. Finally, Reach 4, named the Simpson Lane Reach, consists of 18,500 feet of river with low gradient and water velocities, characterized by deep pools under the influence of Feather River waters. This reach has been normally sampled, but has not been differentiated from Reach 3 during the CDFG and YCWA fall-run Chinook salmon carcass surveys, and is believed to have limited spawning potential.

Although CDFG (1991) developed spawning WUA-flow relationships for both Chinook salmon and steelhead, only the relationships for Chinook salmon were based upon depth, velocity and substrate data collected on lower Yuba River Chinook salmon redds. CDFG (1991) steelhead WUA-flow relationships were developed from suitability habitat criteria recommended by Bovee (1978). The comparison of Bovee's steelhead HSI curves with HSI curves developed for the species in the lower Feather River, lower American River and Trinity River suggests that

Bovee's criteria may not be completely representative of Central Valley steelhead (**Figure A5-1**) (DWR 2003; Hampton 1997; USFWS 2000).

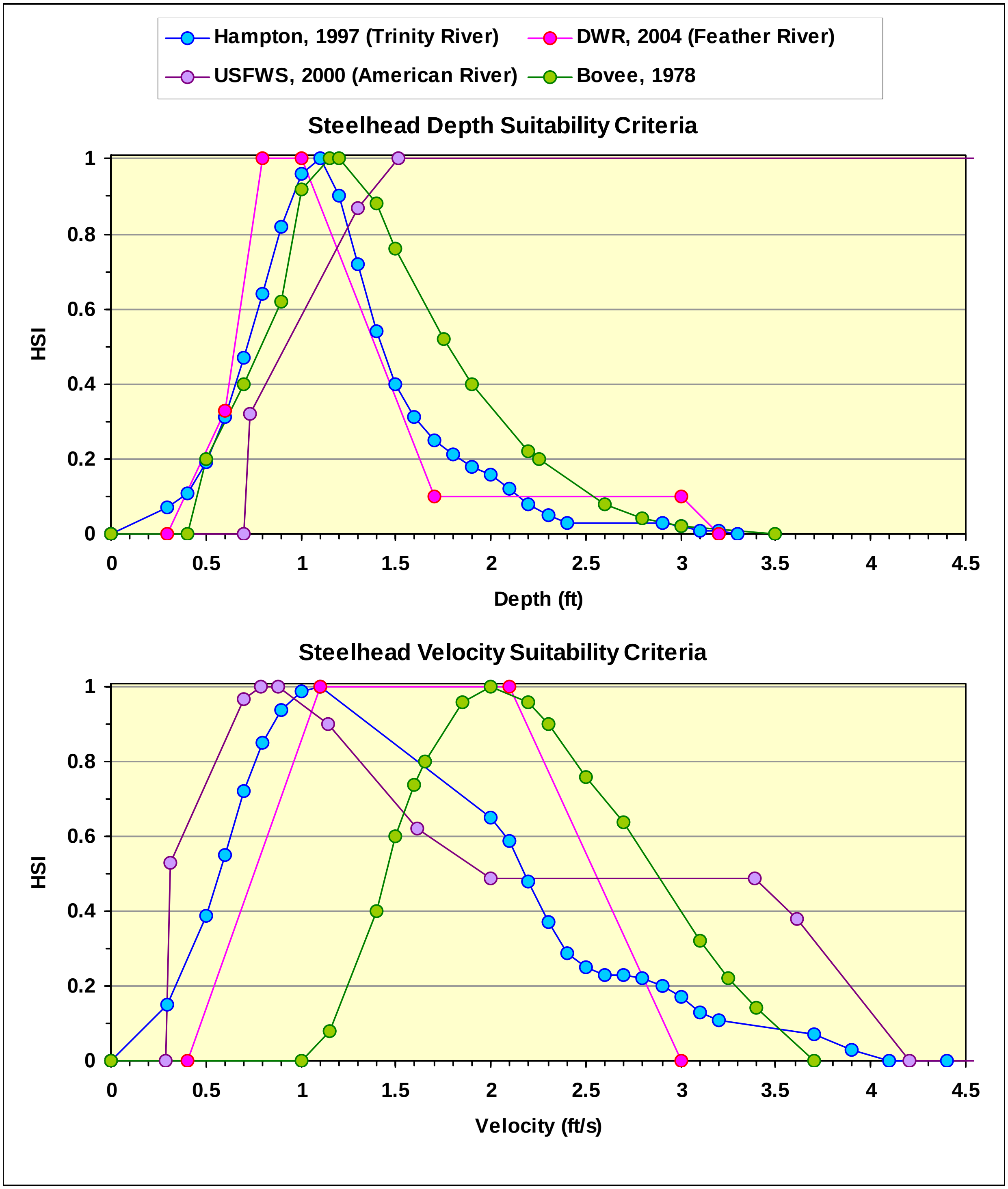

Figure A5-1. Comparison of Steelhead Depth and Velocity Habitat Suitability Index (HSI) Curves

For the computation of Chinook salmon $\widehat{CWUA}_Y$ (Equations 1 and 2), the Chinook salmon WUA-flow relationships for IFIM reaches located above and below Daguerre Point Dam were used. The Chinook salmon WUA-flow relationships for IFIM Reaches 1 and 2 (Table A5-1) were combined by summing WUA values corresponding to the sampled flow levels to define the WUA-flow relationship upstream Daguerre Point Dam (**Figure A5-2**, blue circles and line). In a similar fashion Reaches 3 and 4 (Table A5-1) were summed to define the WUA-flow relationship downstream of Daguerre Point Dam (Figure A5-2, pink circles and lines).

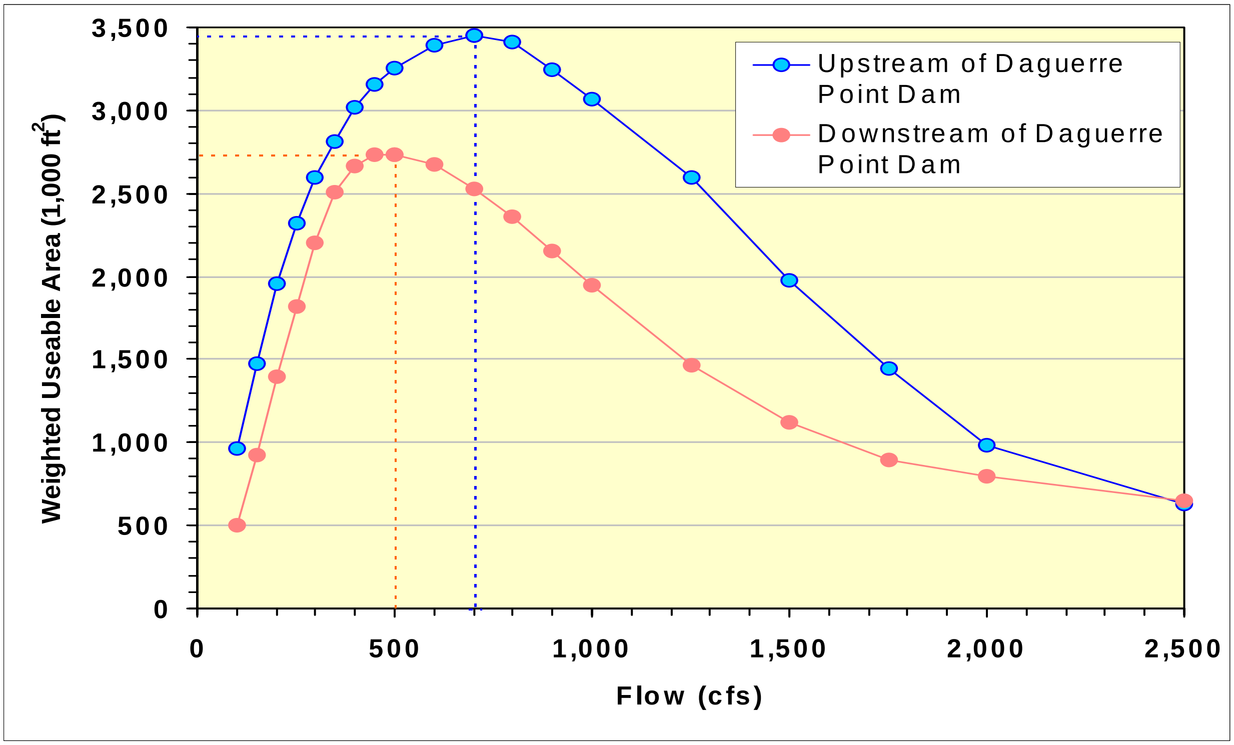

Figure A5-2. Relationships Between WUA and Flow for Chinook Salmon Spawning in the Lower Yuba River

The computation of spring-run Chinook salmon $\widehat{CWUA}_Y$ (Equation 1) utilizes only the WUA-flow relationships for IFIM reaches located above Daguerre Point Dam (Figure A5-2, blue circles and line), while the computation of the fall-run Chinook salmon $\widehat{CWUA}_Y$ (Equation 2) makes use of the two WUA-flow relationships depicted in Figure A5-2.

Similarly, for the computation of steelhead $\widehat{CWUA}_{Y,1}$ and $\widehat{CWUA}'_{Y,1}$ (Equations 3 and 4), the steelhead WUA-flow relationships for IFIM Reaches 1 and 2 (Table A5-1) were combined by summing WUA values corresponding to the sampled flow levels to define the steelhead WUA-flow relationship upstream of Daguerre Point Dam (**Figure A5-3**, blue circles and line).

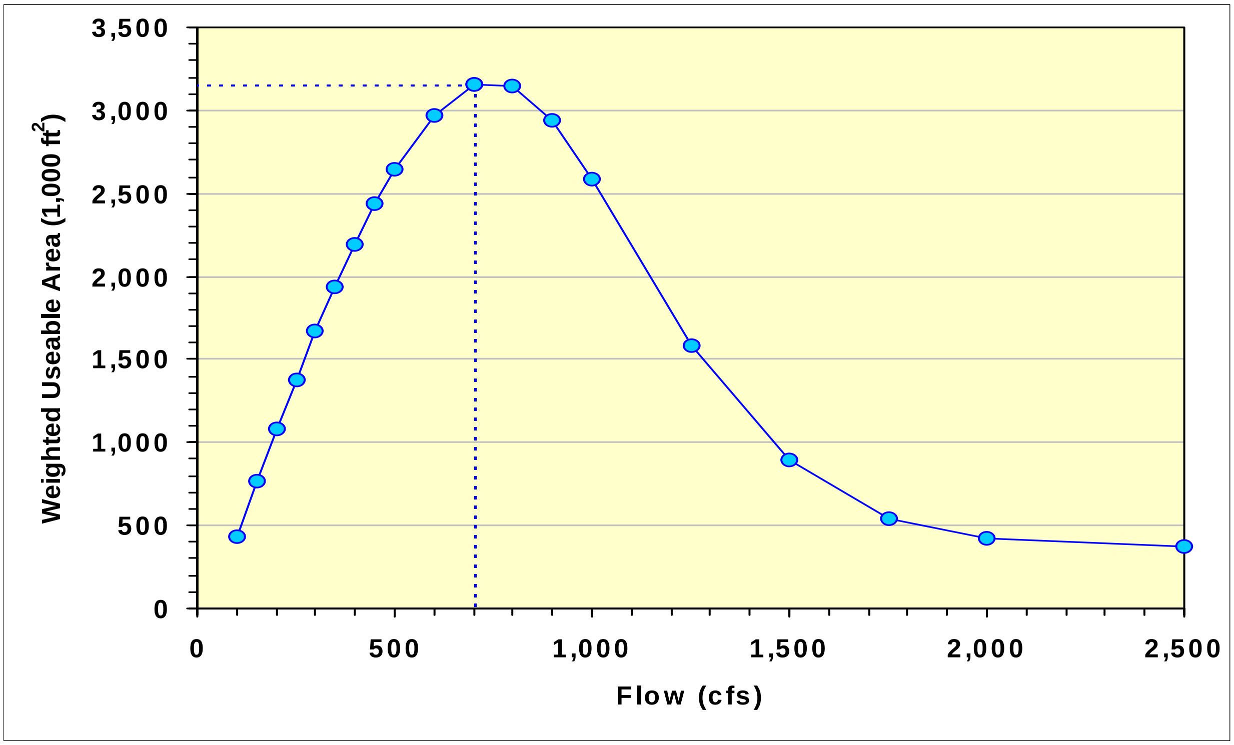

Figure A5-3. Relationship Between WUA and Flow for Steelhead Spawning in the Lower Yuba River, Upstream of Daguerre Point Dam

References

Bovee, K. D. 1978. Probability of Use Criteria for the Family Salmonidae. Report No. FWS/OBS-78/07. Instream Flow Information Paper No. 4. Fish and Wildlife Service.

CDFG. 1991. Lower Yuba River Fisheries Management Plan.

DWR. 2003. SP-F16, Phase 2: Evaluation of Project Effects on Instream Flows and Fish Habitat, Draft Final Report. Oroville Facilities Relicensing, FERC Project No. 2100. California Department of Water Resources.

Hampton, M. 1997. Microhabitat Suitability for Anadromous Salmonids of the Trinity River.

USFWS. 2000. Effects of the January 1997 Flood on Flow-Habitat Relationships for Steelhead and Fall-Run Chinook Salmon Spawning in the Lower American River. Sacramento, California: Energy, Power and Instream Flow Assessment Branch.

Appendix 6

Exceedance Plot Comparison of Salmonid Spawning Habitat Availability

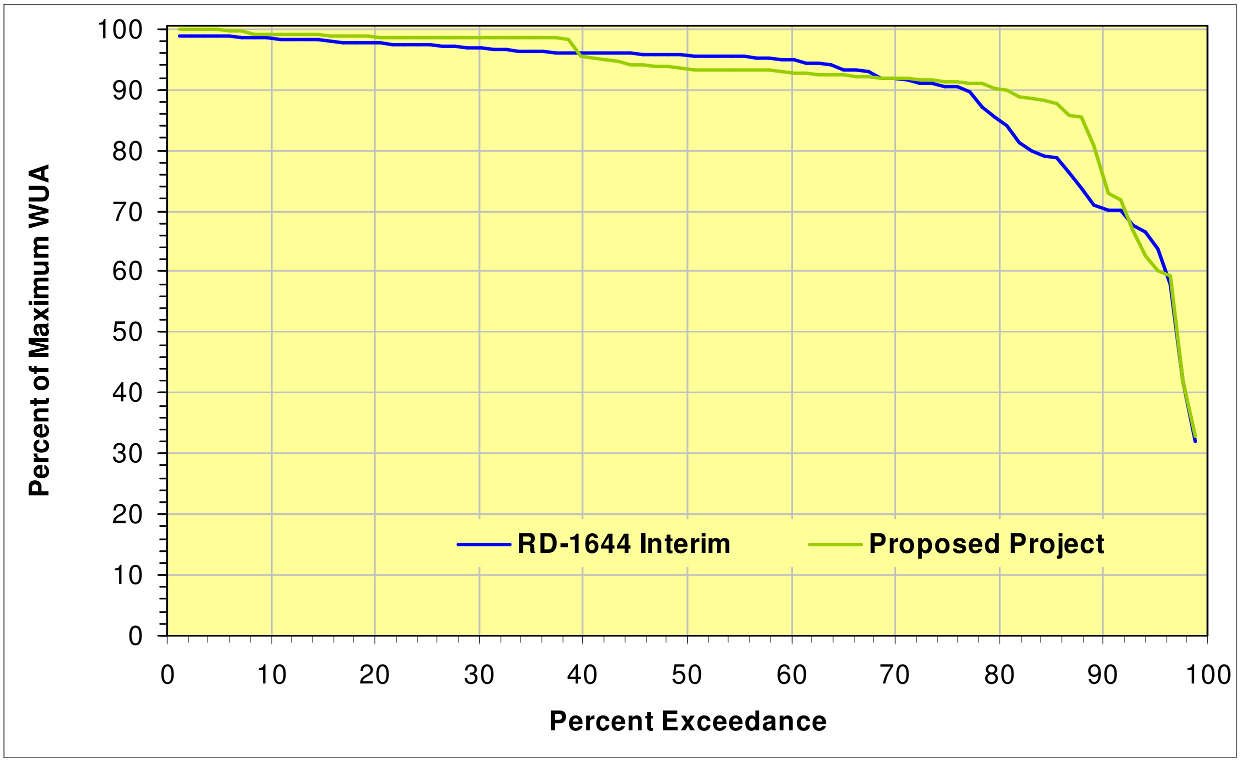

Figure A6-1. Exceedance Plot Comparison of the Annual Spring-Run Chinook Salmon Spawning Habitat Availability, as Represented by WUA Upstream of Daguerre Point Dam, During September through November Under the Proposed Project and Under the RD-1644 Interim Instream Flow Requirements

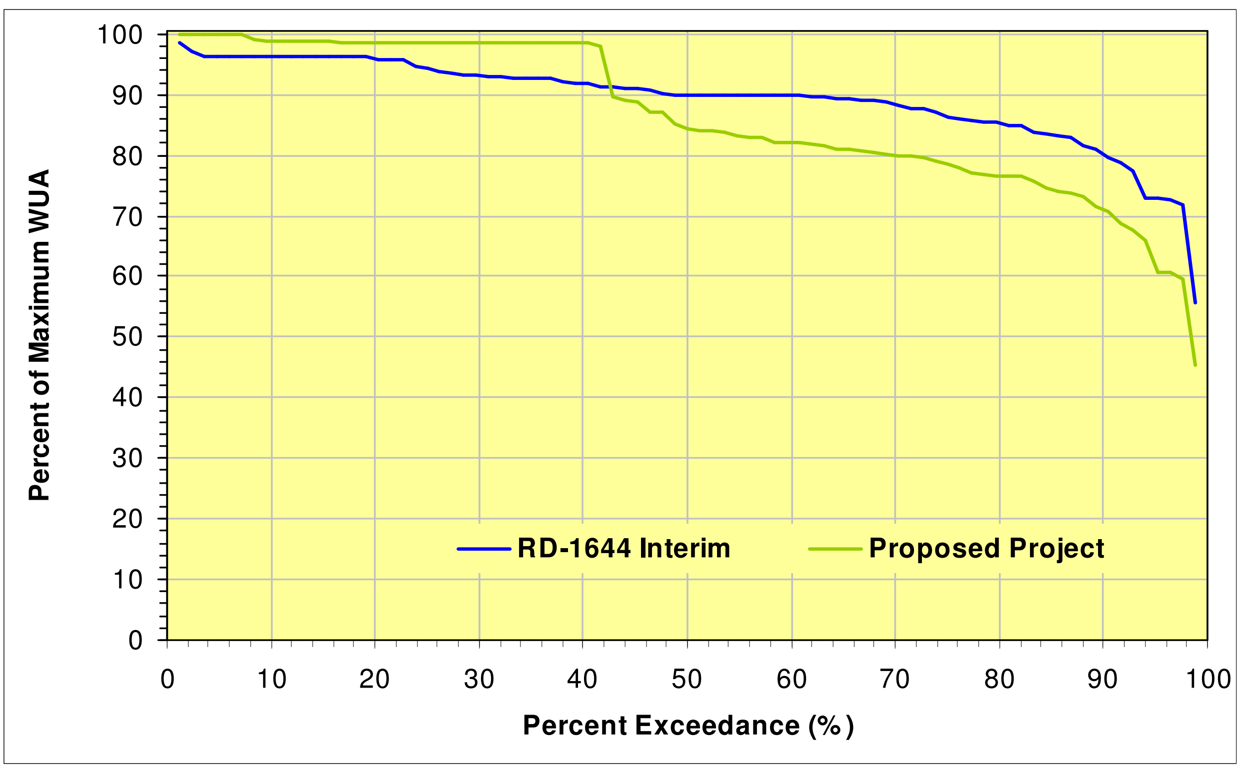

Figure A6-2. Exceedance Plot Comparison of Spring-Run Chinook Salmon Spawning Habitat Availability, as Represented by WUA Upstream of Daguerre Point Dam, During September Under the Proposed Project and Under the RD-1644 Interim Instream Flow Requirements

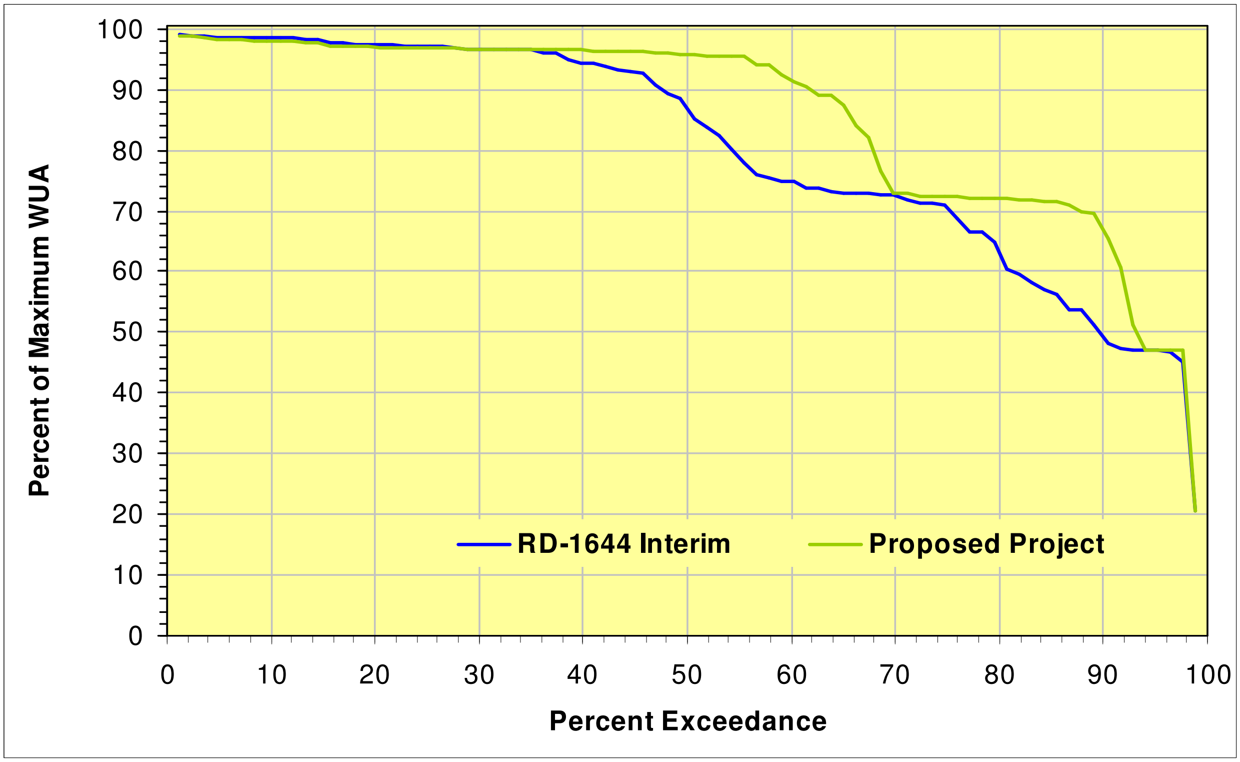

Figure A6-3. Exceedance Plot Comparison of the Annual Fall-Run Chinook Salmon Spawning Habitat Availability, as Represented by WUA Upstream and Downstream of Daguerre Point Dam, During October through December 2007 Under the Proposed Project and Under the RD-1644 Interim Instream Flow Requirements.

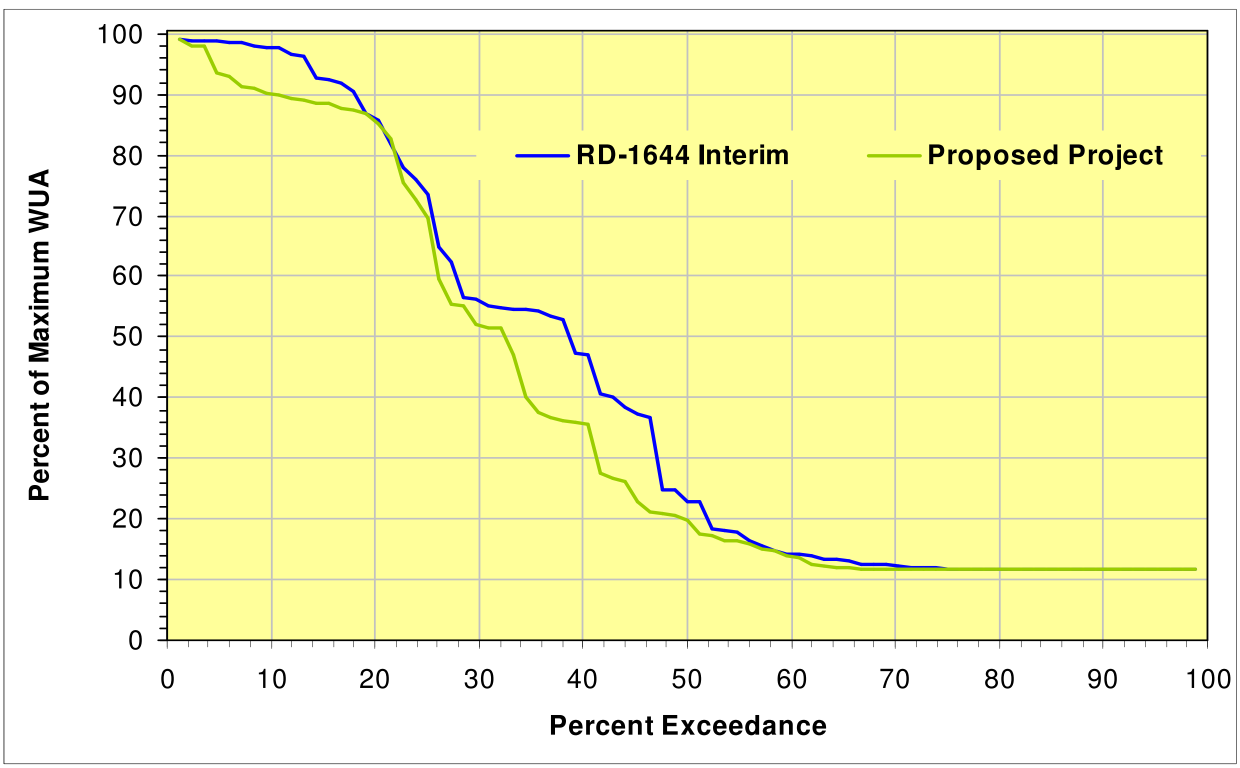

Figure A6-4. Exceedance Plot Comparison of the Annual Steelhead Spawning Habitat Availability, as Represented by WUA Upstream of Daguerre Point Dam, During March through April 2007 Under the Proposed Project and Under the RD-1644 Interim Instream Flow Requirements.

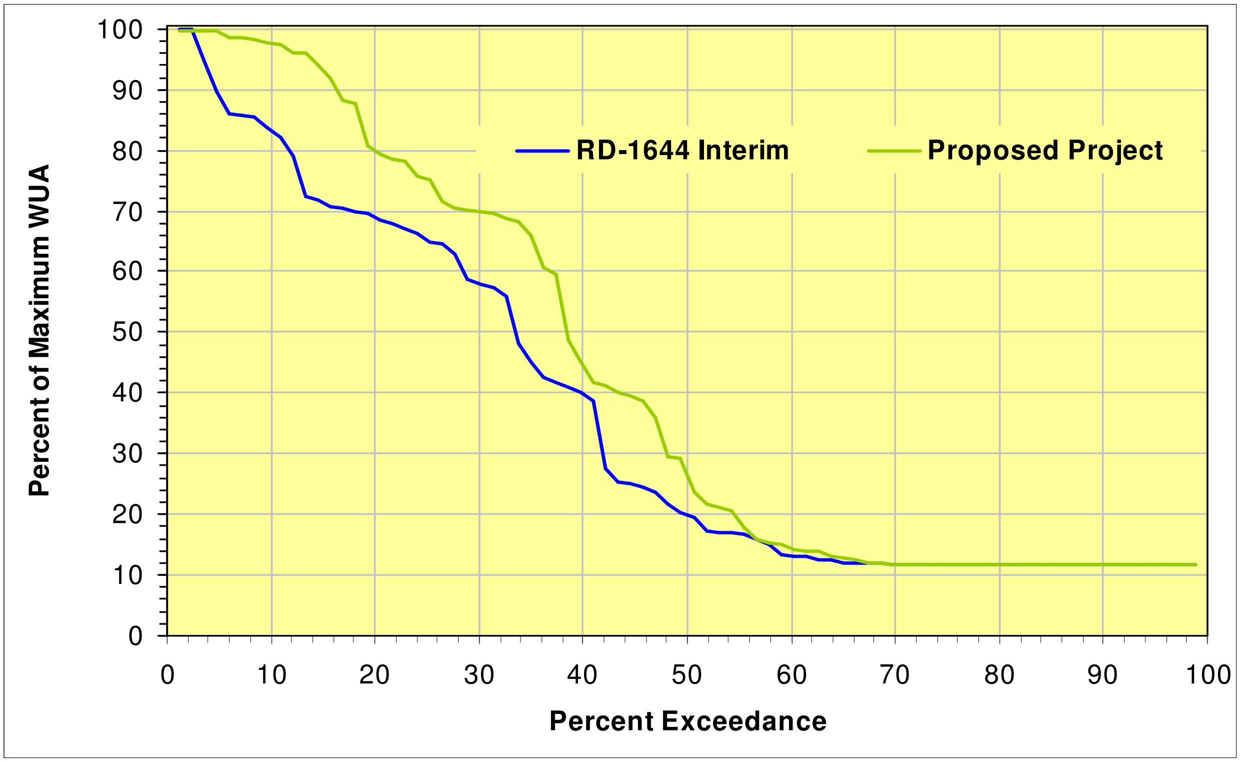

Figure A6-5. Exceedance Plot Comparison of the Annual Steelhead Spawning Habitat Availability, as Represented by WUA Upstream of Daguerre Point Dam, During January through March 2008 Under the Proposed Project and Under the RD-1644 Interim Instream Flow Requirements

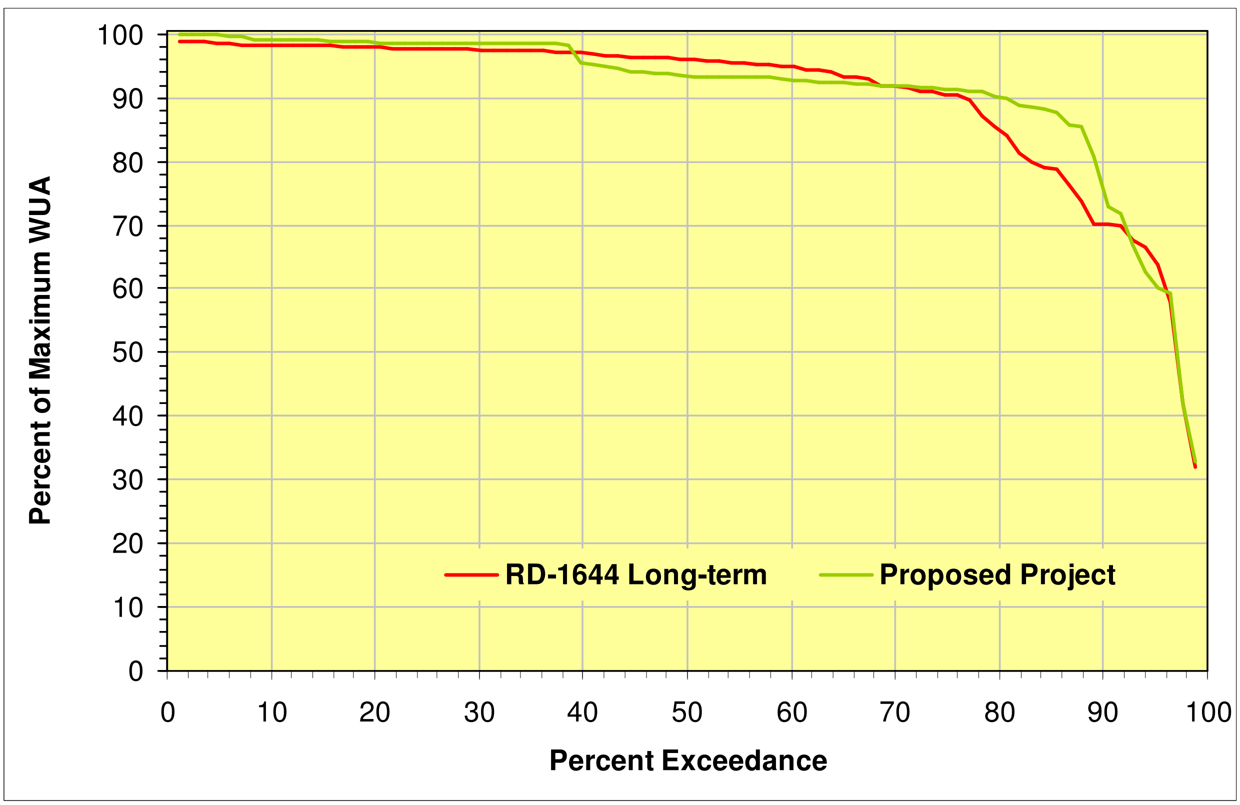

Figure A6-6. Exceedance Plot Comparison of the Annual Spring-Run Chinook Salmon Spawning Habitat Availability, as Represented by WUA Upstream of Daguerre Point Dam, During September through November Under the Proposed Project and Under the RD-1644 Long-term Instream Flow Requirements

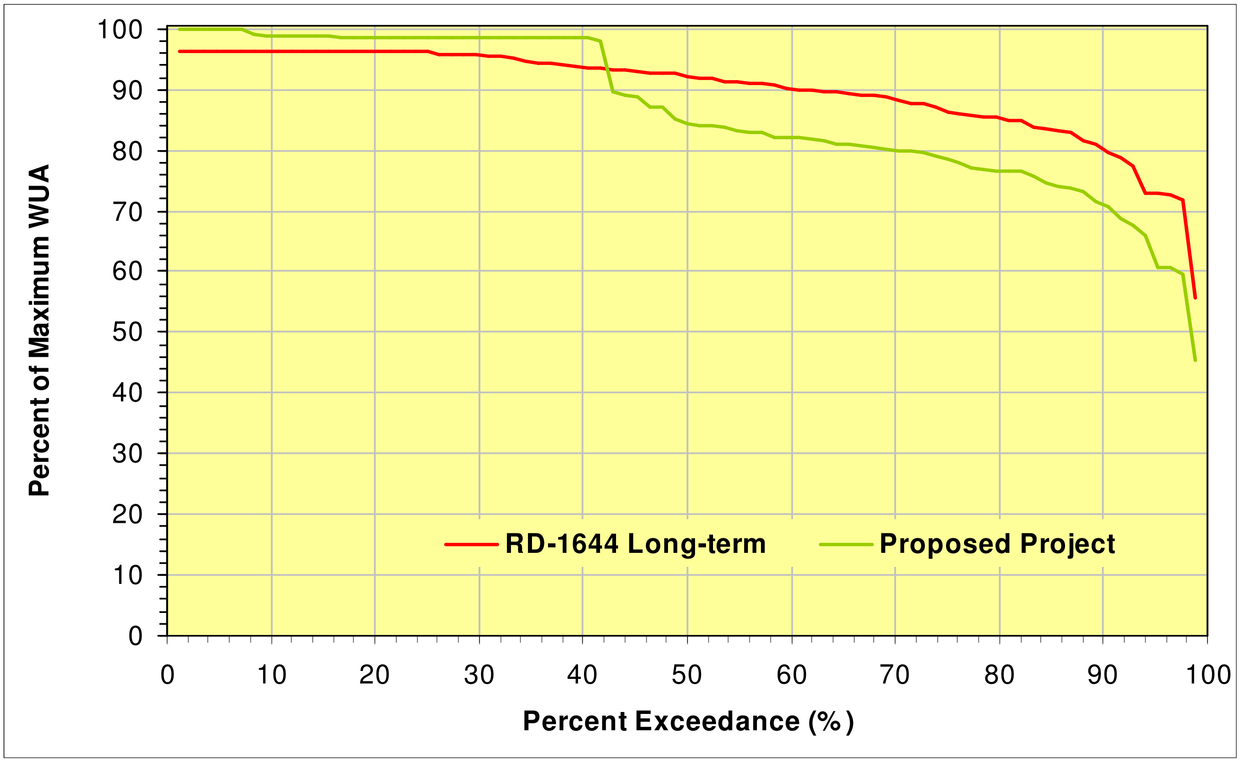

Figure A6-7. Exceedance Plot Comparison of Spring-Run Chinook Salmon Spawning Habitat Availability, as Represented by WUA Upstream of Daguerre Point Dam, During September Under the Proposed Project and Under the RD-1644 Long-term Instream Flow Requirements

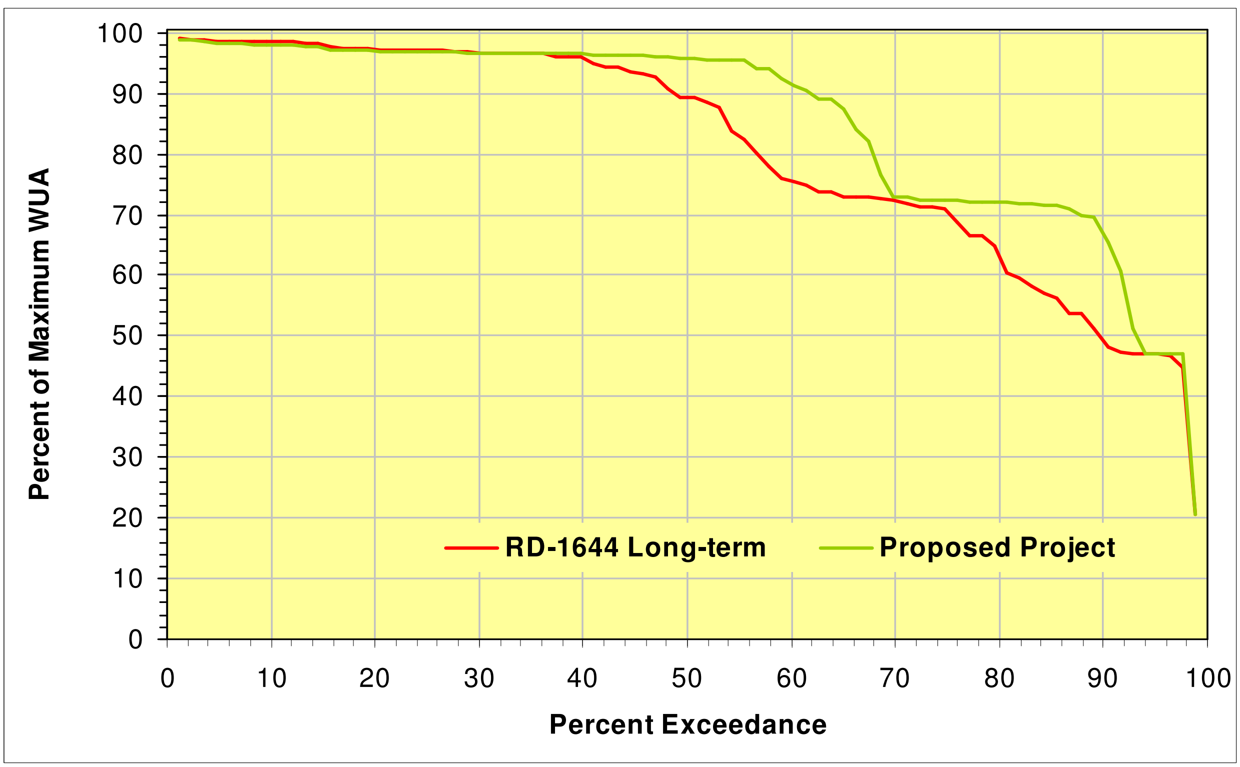

Figure A6-8. Exceedance Plot Comparison of the Annual Fall-Run Chinook Salmon Spawning Habitat Availability, as Represented by WUA Upstream and Downstream of Daguerre Point Dam, During October through December 2007 Under the Proposed Project and Under the RD-1644 Long-term Instream Flow Requirements.

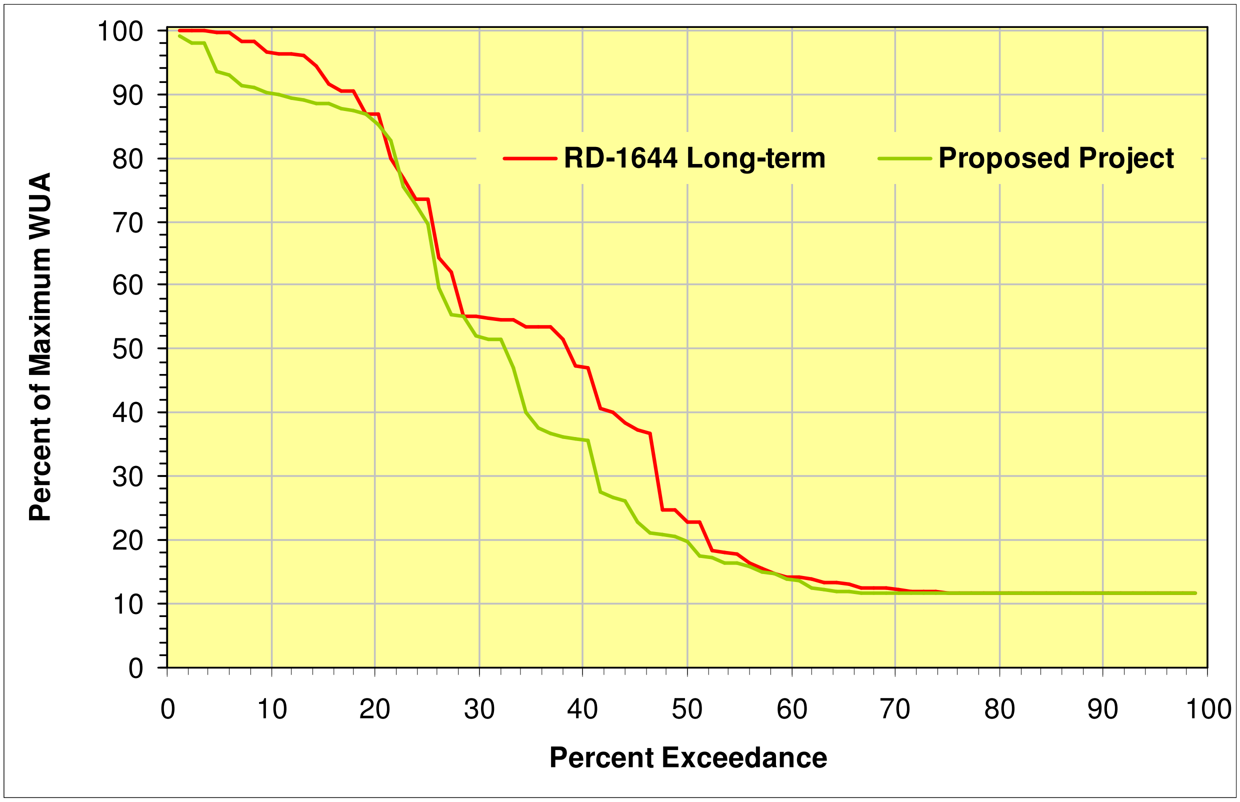

Figure A6-9. Exceedance Plot Comparison of the Annual Steelhead Spawning Habitat Availability, as Represented by WUA Upstream of Daguerre Point Dam, During March through April 2007 Under the Proposed Project and Under the RD-1644 Long-term Instream Flow Requirements.

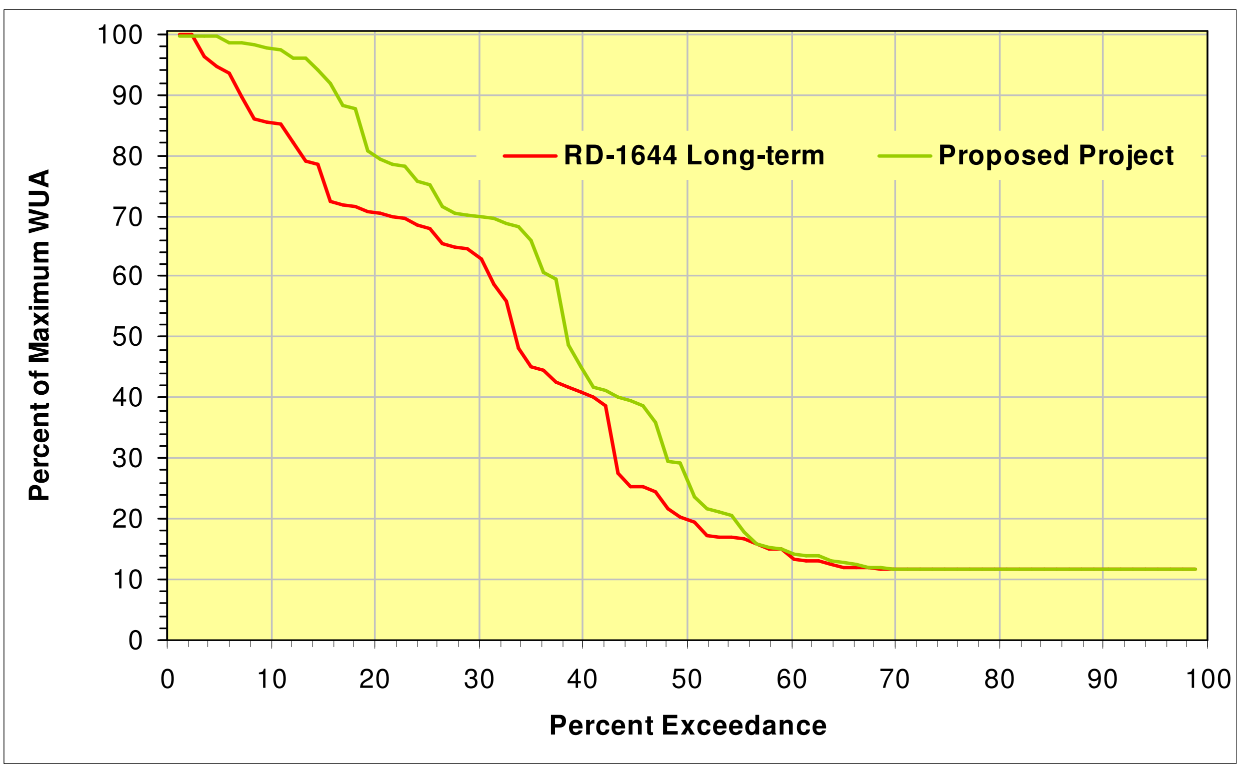

Figure A6-10. Exceedance Plot Comparison of the Annual Steelhead Spawning Habitat Availability, as Represented by WUA Upstream of Daguerre Point Dam, During January through March 2008 Under the Proposed Project and Under the RD-1644 Long-term Instream Flow Requirements

Appendix 7

Special-Status Species List

Common Name	Scientific Name	Status			Species Determination			Habitat Associations
		Federal	State	Other	Species Evaluated	Species Considered But Not Further Evaluated	Decision Criteria	
Mammals								
American badger	*Taxidea taxus*	-	CSC	-		X	B	POW, BOW, NNG
Big free -tailed bat	*Nyctinomops macrotis*	-	CSC	-		X	D	MIC, MOH
Fringed myotis bat	*Myotis thysanodes*	SC	-	CAL		X	D	OAV, FRF, CRF, ORF, POW, BOW
Greater western mastiff-bat	*Eumops perotis californicus*	SC	CSC	CAL		X	D	FAL, FEW, FRF, CRF, ORF, POW, BOW, NNG
Long-eared myotis bat	*Myotis evotis*	SC	-	CAL		X	D	OAV, FRF, CRF, ORF, POW, BOW
Long-legged myotis bat	*Myotis volans*	SC	-	CAL		X	D	OAV, FRF, CRF, ORF, POW, BOW
Marysville Heermann's kangaroo rat	*Dipodomys californicus eximius*	SC	CSC	-		X	C	NNG
Pacific fisher	*Martes pennanti pacifica*	C	CSC	CAL		X	B	MIC, MOH
Pacific western big-eared bat	*Corynorhinus (=Plecotus) townsendii townsendii*	SC	-	CAL		X	D	FAL, OAV, FRF, CRF, ORF, POW, BOW, NNG
Pale Townsend's big-eared bat	*Corynorhinus (=Plecotus) townsendii pallescens*	SC	CSC	CAL		X	D	FAL, FEW, OAV, FRF, CRF, ORF, POW, BOW, NNG
Pallid bat	*Antrozous pallidus*	-	CSC	CAL		X	D	FRF, CRF, ORF, POW, BOW, NNG, MIC, MOH, CHA

Common Name	Scientific Name	Status			Species Determination			Habitat Associations
		Federal	State	Other	Species Evaluated	Species Considered But Not Further Evaluated	Decision Criteria	
Ringtail	*Bassariscus astutus*	-	FP	-		X	C	FRF, CRF, ORF, POW, BOW, NNG, MIC, MOH, CHA
Salt-marsh harvest mouse	*Reithrodontomys raviventris*	E	CE/FP	CAL		X	C	SEW
San Joaquin kit fox	*Vulpes macrotis mutica*	E	CT	CAL		X	B	POW, BOW, NNG
San Joaquin pocket mouse	*Perognathus inornatus inornatus*	-	-	CAL		X	B	NNG
Sierra Nevada snowshoe hare	*Lepus americanus tahoensis*	SC	CSC	-		X	B	MIC
Small-footed myotis bat	*Myotis ciliolabrum*	SC	-	CAL		X	D	OAV, FRF, CRF, ORF, POW, BOW
Spotted bat	*Euderma maculatum*	SC	CSC	CAL		X	D	FAL, OAV, FRF, CRF, ORF, FEW, POW, BOW, NNG
Suisun shrew	*Sorex ornatus sinuosus*	-	CSC	CAL		X	B	SEW
Townsend's big-eared bat	*Corynorhinus townsendii*	-	CSC	-		X	D	FAL, OAV, FRF, CRF, ORF, POW, BOW, NNG
Yuma myotis bat	*Myotis yumanensis*	SC	-	CAL		X	D	OAV, FRF, CRF, ORF, POW, BOW
Birds								
Aleutian Canada goose	*Branta canadensis leucopareia*	D	-	CAL		X	C	FAL, FEW, SEW
American dipper	*Cinclus mexicanus*	SLC	-	-		X	B	N/A
American peregrine falcon	*Falco peregrinus anatum*	D	CE/FP	-		X	D	All Community Types

Common Name	Scientific Name	Status			Species Determination			Habitat Associations
		Federal	State	Other	Species Evaluated	Species Considered But Not Further Evaluated	Decision Criteria	
American white pelican	*Pelecanus erythrorhynchos*	-	CSC	CAL		X	D	FAL, FEW, SEW
Bald eagle	*Haliaeetus leucocephalus*	T	CE	CAL	X		A	FAL, FEW, SEW, FRF, CRF, ORF
Bank swallow	*Riparia riparia*	-	CT	-	X		A	FRF, CRF, ORF
Barrows goldeneye	*Bucephala islandica*	-	CSC	-		X	D	N/A
Black swift	*Cypseloides niger*	SC	CSC	CAL		X	B	MIC, MOH
Black-crowned night heron	*Nycticorax nycticorax*	-	-	CAL		X	D	FAL, FEW, SEW, FRF, CRF, ORF
Black tern	*Chlidonias niger*	-	CSC	CAL		X	C	FAL, FEW
Burrowing owl	*Athene cunicularia*	-	CSC	-		X	D	FAL, POW, NNG
California black rail	*Laterallus jamaicensis coturniculus*	-	CT/FP	CAL		X	C	FAL, FEW, SEW
California clapper rail	*Rallus longirostris obsoletus*	E	CE/FP	CAL		X	C	SEW
California gull	*Larus californicus*	-	CSC	-		X	D	FAL, FEW, SEW
California horned lark	*Eremophila alpestris actia*	-	CSC	-		X	C	NNG
California least tern	*Sterna antillarum browni*	E	CE/FP	CAL		X	C	FEW, SEW
California spotted owl	*Strix occidentalis occidentalis*	SC	CSC	CAL		X	D	MIC, MOH
California thrasher	*Toxostoma redivivum*	SC	-			X	D	FRF, CRF, ORF, POW, CHA
Common loon	*Gavia immer*	-	CSC	-		X	D	N/A
Cooper's hawk	*Accipiter cooperii*	-	CSC	-		X	D	FAL, OAV, FEW, FRF, CRF, ORF, POW, BOW, NNG

Common Name	Scientific Name	Status			Species Determination			Habitat Associations
		Federal	State	Other	Species Evaluated	Species Considered But Not Further Evaluated	Decision Criteria	
Double-crested cormorant	*Phalacrocorax auritus*	-	CSC	-		X	D	FAL, FEW, SEW, FRF, CRF, ORF
Ferruginous hawk	*Buteo regalis*	SC	CSC	CAL		X	D	FAL, NNG
Flammulated owl	*Otus flammeolus*	SC	-	-		X	D	MIC, MOH
Golden eagle	*Aquila chrysaetos*	-	CSC; FP	-		X	D	POW, BOW, NNG, MIC, MOH, CHA
Great blue heron	*Ardea herodias*	-	-	CAL		X	D	FAL, FEW, SEW, FRF, CRF, ORF
Great egret	*Ardea alba*	-	SB	CAL	X		A	FAL, FEW, SEW, FRF, CRF, ORF
Greater sandhill crane	*Grus canadensis tabida*	-	CT/FP	-		X	C	FAL, FEW
Lawrence's goldfinch	*Carduelis lawrencei*	SC	-	-		X	D	FRF, CRF, ORF, POW, BOW, NNG
Lewis' woodpecker	*Melanerpes lewis*	SC	-	-		X	D	OAV, FRF, CRF, ORF, POW, BOW
Little willow flycatcher	*Empidonax traillii brewsteri*	-	CE	CAL		X	C	FEW, FRF, CRF, ORF
Loggerhead shrike	*Lanius ludovicianus*	SC	CSC	-		X	D	FAL, OAV, FRF, CRF, ORF, POW, BOW, NNG
Long-billed curlew	*Numenius americanus*	SC	CSC	-		X	C	FAL, FEW, SEW
Long-eared owl	*Asio otus*	-	CSC	-		X	D	FRF, CRF, ORF, POW, BOW
Merlin	*Falco columbarius*	-	CSC			X	D	All Community Types

Common Name	Scientific Name	Status			Species Determination			Habitat Associations
		Federal	State	Other	Species Evaluated	Species Considered But Not Further Evaluated	Decision Criteria	
Mountain plover	*Charadrius montanus*	-	CSC	CAL		X	D	NNG
Northern goshawk	*Accipiter gentilis*	-	CSC	CAL		X	C	MIC, MOH
Northern harrier	*Circus cyaneus*	-	CSC	-		X	D	FAL, FEW, SEW, NNG
Nuttall's woodpecker	*Picoides nuttallii*	SLC	-	-		X	D	OAV, FRF, POW, BOW
Oak titmouse	*Baeolophus inornatus*	SLC	-	-		X	D	FRF, CRF, ORF, POW, BOW
Prairie falcon	*Falco mexicanus*	-	CSC	-		X	D	POW, BOW, NNG, MIC, MOH, CHA
Osprey	*Pandion haliaetus*	-	CSC/SB		X		A	FEW, FRF, CRF, ORF
Purple martin	*Progne subis*	-	CSC	-		X	C	FAL, OAV, FRF, CRF, ORF, POW, BOW
Rufous hummingbird	*Selasphorus rufus*	SC	-	-		X	D	OAV, FRF, CRF, ORF, POW, BOW, NNG
Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*	-	CSC	CAL		X	C	SEW
San Pablo song sparrow	*Melospiza melodia samuelis*	-	CSC	CAL		X	B	SEW
Sharp-shinned hawk	*Accipiter striatus*	-	CSC	-		X	D	All Community Types
Short-eared owl	*Asio flammeus*	-	CSC	-		X	D	FAL, OAV, FRF, CRF, ORF, NNG
Snowy egret	*Egretta thula*	-	SB	CAL	X		A	FAL, FEW, SEW, FRF, CRF, ORF
Suisun song sparrow	*Melospiza melodia maxillaris*	-	CSC	CAL		X	C	SEW

Common Name	Scientific Name	Status			Species Determination			Habitat Associations
		Federal	State	Other	Species Evaluated	Species Considered But Not Further Evaluated	Decision Criteria	
Swainson's hawk	*Buteo swainsoni*	-	CT	-	X		A	FAL, FEW, FRF, CRF, ORF, POW, BOW, NNG
Tricolored blackbird	*Agelaius tricolor*	-	CSC	CAL		X	C	FAL, FEW
Vaux's swift	*Chaetura vauxi*	SC	CSC	-		X	B	POW
Western burrowing owl	*Athene cunicularia hypugaea*	SC	-	CAL		X	D	FAL, POW, NNG
Western snowy plover (critical habitat)	*Charadrius alexandrinus nivosus*	T	CSC	CAL		X	D	SEW
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	C	CE	-	X		A	OAV, FRF, CRF, ORF
White-faced ibis	*Plegadis chihi*	-	CSC	CAL		X	D	FAL, FEW
White-headed woodpecker	*Picoides albolarvatus*	SC	-	-		X	B	MIC, MOH
White-tailed kite	*Elanus leucurus*	SC	FP	-		X	D	FAL, FEW, NNG
Yellow warbler	*Dendroica petechia brewsteri*	-	CSC	-		X	D	FRF, CRF, ORF, POW, BOW
Yellow-breasted chat	*Icteria virens*	-	CSC	-		X	C	FEW, FRF, CRF, ORF
Reptiles								
California horned lizard	*Phrynosoma coronatum frontale*	SC	CSC	CAL		X	C	FRF, CRF, ORF, NNG
Giant garter snake	*Thamnophis gigas*	T	CT	CAL		X	C	FAL, FEW
Northwestern pond turtle	*Emys (=Clemmys) marmorata marmorata*	SC	CSC	-		X	D	FAL, FEW
Silvery legless lizard	*Anniella pulchra pulchra*	-	CSC	CAL		X	B	FRF, CRF, ORF, POW, BOW, CHA
Western pond turtle	*Emys (=Clemmys) marmorata*	-	CSC	CAL		X	D	FAL, FEW
Amphibians								

Common Name	Scientific Name	Status			Species Determination			Habitat Associations
		Federal	State	Other	Species Evaluated	Species Considered But Not Further Evaluated	Decision Criteria	
California red-legged frog (critical habitat)	*Rana aurora draytonii*	T	CSC	CAL	X		A	FAL, FEW, SEW, FRF, CRF, ORF
California tiger salamander	*Ambystoma californiense*	T	CSC	CAL		X	C	FAL, , FEW, VEP, ORF, BOW, NNG
Foothill yellow-legged frog	*Rana boylii*	-	CSC	CAL		X	C	FAL, FEW, FRF, CRF, ORF, POW, BOW, NNG
Shasta salamander	*Hydromantes shastae*	-	CT	CAL		X	C	POW, BOW, MIC, MOH
Western spadefoot toad	*Spea hammondii (was Scaphiopus h.)*	SC	CSC	CAL		X	C	FAL, FEW, VEP, FRF, CRF, ORF, POW, BOW
Western tailed frog	*Ascaphus truei*	-	CSC	CAL		X	B	FEW, FRF, CRF, ORF
Fish								
Bull trout	*Salvelinus confluentus*	T	CE	-		X	B	N/A
Central Valley ESU fall/late fall-run Chinook salmon (essential fish habitat)	*Oncorhynchus tshawytscha*	SC	CSC	-	X		A	N/A
Central Valley ESU spring-run Chinook salmon (critical habitat) (essential fish habitat)	*Oncorhynchus tshawytscha*	T	CT	CAL	X		A	N/A
Central Valley ESU steelhead (critical habitat)	*Oncorhynchus mykiss*	T	-	CAL	X		A	N/A
Delta smelt (critical habitat)	*Hypomesus transpacificus*	T	CT	CAL	X		A	N/A
Green sturgeon	*Acipenser medirostris*	P	CSC	-	X		A	N/A
Hardhead	*Mylopharodon conocephalus*	-	CSC	-	X		E	N/A
Longfin smelt	*Spirinchus thaleichthys*	SC	CSC	-	X		E	N/A
Northern anchovy (essential fish habitat)	*Engraulis mordax*	-	-	-		X	A	N/A
Pacific lamprey	*Lampetra tridentata*	SC	-	CAL		X	E	N/A
River lamprey	*Lampetra ayresi*	SC	CSC	-	X		A	N/A

Common Name	Scientific Name	Status			Species Determination			Habitat Associations
		Federal	State	Other	Species Evaluated	Species Considered But Not Further Evaluated	Decision Criteria	
Sacramento perch	*Archoplites interruptus*	SC	CSC	CAL	X		E	N/A
Sacramento River ESU winter-run Chinook salmon (critical habitat) (essential fish habitat)	*Oncorhynchus tshawytscha*	E	CE	CAL	X		A	N/A
Sacramento splittail	*Pogonichthys macrolepidotus*	-	CSC	CAL	X		A	N/A
San Joaquin roach	*Lavinia symmetricus spp.*	-	CSC	-	X		E	N/A
Starry flounder (essential fish habitat)	*Platichthys stellatus*	-	-	-		X	A	N/A
Invertebrates								
Amphibious caddisfly	*Desmona bethula*	SC	-	CAL		X	C	FAL, FEW, FRF, CRF, ORF, POW, BOW, NNG
Antioch andrenid bee	*Perdita scituta antiochensis*	-	-	CAL		X	C	N/A
Antioch Dunes anthicid beetle	*Anthicus antiochensis*	-	-	CAL		X	C	N/A
Antioch efferian robberfly	*Efferia antiochi*	-	-	CAL		X	C	N/A
Antioch multilid wasp	*Myrmosula pacifica*	-	-	CAL		X	C	N/A
California linderiella	*Linderiella occidentalis*	-	-	CAL		X	B	VEP
Callippe silverspot butterfly	*Speyeria callippe callippe*	E	-	CAL		X	B	POW, BOW, CHA
Conservancy fairy shrimp	*Branchinecta conservatio*	E	-	CAL		X	C	VEP
Curved-foot hygrotus diving beetle	*Hygrotus curvipes*	-	-	CAL		X	C	FEW, VEP
Hurd's metapogon robberfly	*Metapogon hurdi*	-	-	CAL		X	B	N/A
Lange's metalmark butterfly	*Apodemia mormo langei*	E	-	CAL		X	C	N/A
Middlekauff's shieldback katydid	*Idiostatus middlekauffi*	-	-	CAL		X	B	N/A
Midvalley fairy shrimp	*Branchinecta mesovallensis*	-	-	CAL		X	C	VEP
Redheaded sphecid wasp	*Eucerceris ruficeps*	-	-	CAL		X	B	N/A
Ricksecker's water scavenger beetle	*Hydrochara rickseckeri*	-	-	CAL		X	B	N/A
Sacramento anthicid beetle	*Anthicus sacramento*	-	-	CAL		X	C	N/A
Sacramento Valley tiger beetle	*Cicindela hirticollis abrupta*	-	-	CAL		X	C	N/A
Sagehen Creek goracean caddisfly	*Goeracea oregona*	SC	-	-		X	C	POW
San Joaquin dune beetle	*Coelus gracilis*	-	-	CAL		X	B	N/A

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		Federal	State	Other	Species Evaluated	Species Considered But Not Further Evaluated	Decision Criteria	
Shasta sideband	*Monadenia troglodytes*	-	-	CAL		X	C	N/A
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T	-	CAL	X		A	FRF, CRF, ORF
Vernal pool fairy shrimp	*Branchinecta lynchi*	T	-	CAL		X	C	VEP
Vernal pool tadpole shrimp	*Lepidurus packardi*	E	-	CAL		X	C	VEP
Plants								
Adobe-lily	*Fritillaria pluriflora*	-	-	1B/CAL		X	D	OAV, FRF, CRF, ORF, POW, BOW, CHA
Ahart's dwarf rush	*Juncus leiospermus var. ahartii*	-	-	1B/CAL		X	C	VEP
Ahart's paronychia	*Paronychia ahartii*	-	-	1B/CAL		X	D	OAV, FRF, CRF, ORF, POW, BOW, NNG
Alkali milk-vetch	*Astragalus tener var. tener*	-	-	1B/CAL		X	C	VEP, NNG
Antioch Dunes evening-primrose	*Oenothera deltoides ssp. howellii*	E	CE	1B/CAL		X	C	N/A
Baker's navarretia	*Navarretia leucocephala ssp. bakeri*	-	-	1B		X	D	FAL. VEP, OAV, FEW , FRF, CRF, ORF, POW, BOW, NNG
Bearded popcorn-flower	*Plagiobothrys hystriculus*	-	-	1A		X	C	VEP, NNG
Bellinger's meadowfoam	*Limnanthes floccosa ssp. bellingeriana*	-	-	1B/CAL		X	C	N/A
Big tarplant	*Blepharizonia plumosa*	-	-	1B		X	C	NNG
Blue skullcap	*Scutellaria lateriflora*	-	-	2		X	D	FEW
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	-	CE	1B		X	C	FEW, VEP

Common Name	Scientific Name	Status			Species Determination			Habitat Associations
		Federal	State	Other	Species Evaluated	Species Considered But Not Further Evaluated	Decision Criteria	
Brandegee's clarkia	*Clarkia biloba ssp. brandegeeae*	-	-	1B		X	D	OAV, FRF, CRF, ORF, POW, BOW, CHA
Brewer's western flax	*Hesperolinon breweri*	-	-	1B/CAL		X	D	OAV, FRF, CRF, ORF, POW, BOW, NNG
Bristly sedge	*Carex comosa*	-	-	2		X	D	FEW, NNG
Brittlescale	*Atriplex depressa*	-	-	1B/CAL		X	D	FAL, FRF, CRF, ORF, NNG, VEP
Brownish beaked-rush	*Rhynchospora capitellata*	-	-	2		X	D	FEW, POW
Butte County checkerbloom	*Sidalcea robusta*	-	-	1B/CAL		X	D	CHA
Butte County fritillary	*Fritillaria eastwoodiae*	SC	-	3/CAL		X	D	POW, BOW, CHA
Butte County golden clover	*Trifolium jokerstii*	-	-	1B		X	C	VEP, NNG
Butte County meadowfoam	*Limnanthes floccosa ssp. californica*	E	CE	1B/CAL		X	C	VEP
Cantelow's lewisia	*Lewisia cantelovii*	-	-	1B		X	D	OAV, FRF, CRF, ORF, POW, BOW, NNG
Caper-fruited tropidocarpum	*Tropidocarpum capparideum*	-	-	1B/CAL		X	C	NNG
Carquinez goldenbush	*Isocoma arguta*	-	-	1B/CAL		X	C	NNG
Columbian watermeal	*Wolffia brasiliensis*	-	-	2		X	D	FAL, FEW
Colusa grass	*Neostapfia colusana*	T	CE	1B/CAL		X	C	VEP
Colusa layia	*Layia septentrionalis*	-	-	1B		X	D	OAV, FRF, CRF, ORF, POW, BOW, NNG
Congdon's tarplant	*Centromadia parryi ssp. congdonii*	-	-	1B/CAL		X	C	NNG

Common Name	Scientific Name	Status			Species Determination			Habitat Associations
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Contra Costa goldfields	*Lasthenia conjugens*	E	-	1B/CAL		X	C	VEP
Contra Costa wallflower	*Erysimum capitatum ssp. angustatum*	E	CE	1B/CAL		X	C	N/A
Coulter's goldfields	*Lasthenia glabrata ssp. coulteri*	-	-	1B		X	D	FAL, FEW, VEP
Cut-leaved ragwort	*Senecio eurycephalus var. lewisrosei*	-	-	1B		X	C	POW, CHA
Delta button-celery	*Eryngium racemosum*	-	CE	1B		X	D	FRF, CRF, ORF
Delta mudwort	*Limosella subulata*	-	-	2		X	D	FAL, FEW
Delta tule pea	*Lathyrus jepsonii var. jepsonii*	-	-	1B/CAL		X	D	FAL, FEW
Diablo helianthella	*Helianthella castanea*	-	-	1B/CAL		X	D	FRF, CRF, ORF, POW, BOW, CHA
Diamond-petaled California poppy	*Eschscholzia rhombipetala*	-	-	1B/CAL		X	C	NNG
Dwarf downingia	*Downingia pusilla*	-	-	2		X	C	VEP, NNG
Eel-grass pondweed	*Potamogeton zosteriformis*	-	-	2		X	D	FAL, FEW, SEW
Ferris's milk-vetch	*Astragalus tener var. ferrisiae*	-	-	1B/CAL		X	D	FAL, FEW, NNG
Four-angled spikerush	*Eleocharis quadrangulata*	-	-	2		X	D	FAL, FEW
Fox sedge	*Carex vulpinoidea*	-	-	2		X	D	FAL, FEW, FRF, CRF, ORF
Fragrant fritillary	*Fritillaria liliacea*	-	-	1B/CAL		X	C	NNG
Greene's tuctoria	*Tuctoria greenei*	E	R	1B/CAL		X	C	VEP
Hairy orcutt grass	*Orcuttia pilosa*	E	CE	1B/CAL		X	C	VEP
Hartweg's golden sunburst	*Pseudobahia bahiifolia*	E	CE	1B/CAL		X	C	BOW, NNG
Heckard's pepper-grass	*Lepidium latipes var. heckardii*	-	-	1B		X	C	NNG
Henderson's bent grass	*Agrostis hendersonii*	-	-	3/CAL		X	D	FAL, FEW, NNG, VEP

Common Name	Scientific Name	Status			Species Determination			Habitat Associations
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Hispid bird's-beak	*Cordylanthus mollis ssp. hispidus*	-	-	1B/CAL		X	D	FAL, FEW
Hoover's cryptantha	*Cryptantha hooveri*	-	-	1B		X	C	NNG
Hoover's spurge	*Chamaesyce hooveri*	T	-	1B/CAL		X	C	VEP
Jepson's onion	*Allium jepsonii*	-	-	1B/CAL		X	D	POW, MIC, MOH
Marsh skullcap	*Scutellaria galericulata*	-	-	2		X	D	FEW, NNG
Mason's lilaeopsis	*Lilaeopsis masonii*	-	R	1B/CAL		X	D	FAL, FRF, CRF, ORF
Mildred's clarkia	*Clarkia mildrediae ssp. mildrediae*	-	-	1B		X	C	POW, MIC, MOH
Mosquin's clarkia	*Clarkia mosquinii*	-	-	1B		X	D	POW, MIC, MOH
Mt. Diablo buckwheat	*Eriogonum truncatum*	-	-	1A/CAL		X	C	NNG, CHA
Mt. Diablo fairy-lantern	*Calochortus pulchellus*	-	-	1B		X	D	OAV, FRF, CRF, ORF, POW, BOW, CHA
Mt. Diablo manzanita	*Arctostaphylos auriculata*	-	-	1B		X	C	CHA
Northern California black walnut	*Juglans hindsii*	-	-	1B/CAL		X	D	FRF, CRF, ORF
Northern clarkia	*Clarkia borealis ssp. borealis*	-	-	1B		X	C	POW, BOW, MIC, MOH, CHA
Oval-leaved viburnum	*Viburnum ellipticum*	-	-	2		X	D	OAV, FRF, CRF, ORF, POW, BOW, CHA
Palmate-bracted bird's-beak	*Cordylanthus palmatus*	E	CE	1B/CAL		X	C	FAL, FEW, SEW, NNG
Pappose tarplant	*Centromadia parryi ssp. parryi*	-	-	1B		X	C	SEW, NNG

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Pink creamsacs	*Castilleja rubicundula ssp. rubicundula*	-	-	1B		X	D	FAL, OAV, FEW, FRF, CRF, ORF, POW, BOW, NNG
Pointed broom sedge	*Carex scoparia*	-	-	2		X	C	CHA
Quincy lupine	*Lupinus dalesiae*	-	-	1B		X	D	OAV, FRF, CRF, ORF, POW, BOW, CHA
Rayless ragwort	*Senecio aphanactis*	-	-	2		X	C	POW, BOW, MIC, MOH
Recurved larkspur	*Delphinium recurvatum*	-	-	1B/CAL		X	D	OAV, FRF, CRF, ORF, POW, BOW, NNG
Red Bluff dwarf rush	*Juncus leiospermus var. leiospermus*	-	-	1B		X	C	VEP, POW, BOW, CHA
Red-anthered rush	*Juncus marginatus var. marginatus*	-	-	2		X	D	FAL, FEW
Robust monardella	*Monardella villosa ssp. globosa*	-	-	1B		X	C	POW, BOW, NNG
Rose-mallow	*Hibiscus lasiocarpus*	-	-	2		X	D	FAL, FEW
Round-leaved filaree	*Erodium macrophyllum*	-	-	2		X	C	POW, BOW, NNG
San Joaquin spearscale	*Atriplex joaquiniana*	-	-	1B/CAL		X	C	NNG
Sanford's arrowhead	*Sagittaria sanfordii*	-	-	1B/CAL		X	D	FEW, SEW, FAL
Shasta clarkia	*Clarkia borealis ssp. arida*	-	-	1B/CAL		X	C	POW, BOW
Shasta snow-wreath	*Neviusia cliftonii*	-	-	1B		X	D	FRF, CRF, ORF, POW
Showy madia	*Madia radiata*	-	-	1B		X	C	POW, BOW, NNG

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Silky cryptantha	*Cryptantha crinita*	-	-	1B/CAL		X	D	FRF, CRF, ORF, POW, BOW, NNG
Slender orcutt grass	*Orcuttia tenuis*	T	CE	1B/CAL		X	C	VEP
Soft bird's-beak	*Cordylanthus mollis ssp. mollis*	E	R	1B		X	C	SEW
Sticky pyrrocoma	*Pyrrocoma lucida*	-	-	1B		X	C	POW
Stony Creek spurge	*Chamaesyce ocellata ssp. rattanii*	-	-	1B		X	C	NNG
Suisun Marsh aster	*Aster lentus*	-	-	1B/CAL		X	D	FAL, FEW, SEW
Suisun thistle	*Cirsium hydrophilum var. hydrophilum*	E	-	1B/CAL		X	C	SEW
Thread-leaved beardtongue	*Penstemon filiformis*	-	-	1B/CAL		X	C	POW, BOW
Veiny monardella	*Monardella douglasii ssp. venosa*	-	-	1B/CAL		X	C	POW, BOW, NNG
Western leatherwood	*Dirca occidentalis*	-	-	1B		X	C	POW, BOW, CHA
White-stemmed clarkia	*Clarkia gracilis ssp. albicaulis*	-	-	1B		X	C	POW, BOW, CHA
Wright's trichocoronis	*Trichocoronis wrightii var. wrightii*	-	-	2		X	D	FAL, FEW, SEW, FRF, CRF, ORF

Federal Status		State Status		Other Status	
E	Listed as endangered under ESA	**CE**	Listed as endangered under CESA	**1A**	California Native Plant Society (CNPS) list 1A
T	Listed as threatened under ESA	**CT**	Listed as threatened under CESA	**1B**	CNPS list 1B
P	Officially proposed for listing as either threatened or endangered under ESA	**CSC**	Species of special concern under CESA	**2**	CNPS list 2
C	Candidate - candidate to become a proposed species under ESA	**R**	Listed as rare under California Native Plant Protection Act	**3**	CNPS list 3
D	Delisted - monitoring to continue for 5 years following delisting	**FP**	Fully protected species under California Fish and Game Code	**CAL**	Other species of concern identified by CALFED
SC	Species of concern under ESA	**SB**	Specified bird under California Fish and Game Code		
SLC	Species of local concern - Other species of concern to the Sacramento U.S. Fish & Wildlife Office				

Decision Criteria

A	Species included because the species occurs in habitat that has the potential to be affect by project actions
B	Species not included because the species occurs in habitat not found within the study area
C	Species not included because the species occurs in habitat that would not be adversely affected by project actions
D	Species not included because the species is not likely to be affected by project actions because habitat is not limiting and/or the species is mobile
E	Fish species not included because life history requirements would not be affected by project actions

Vegetative Community Definitions

FAL	Seasonally flooded agricultural lands
OAV	Orchards and vineyards
FEW	Freshwater emergent wetlands
SEW	Saline emergent wetlands
VEP	Vernal pools
FRF	Valley foothill riparian forest
CRF	Great valley cottonwood riparian forest
ORF	Great valley oak riparian forest
POW	Foothill pine-oak woodland
BOW	Blue oak woodland
NNG	Non-native grassland
MIC	Mixed conifer
MOH	Montane hardwood
CHA	Chaparral
N/A	Species does not occur within one of the primary vegetative communities found within the study area