



Mid-Pacific Region
Sacramento, California



Department of
Water Resources

North-of-the-Delta Offstream Storage Investigation Initial Alternatives Information Report

May 2006



NORTH-OF-THE-DELTA OFFSTREAM STORAGE INVESTIGATION

FINAL INITIAL ALTERNATIVES INFORMATION REPORT

Prepared For:



**California Department of Water Resources
Division of Planning and Local Assistance
901 P Street
Sacramento, CA 95814**



**Bureau of Reclamation
Mid Pacific Region
Federal Office Building
2800 Cottage Way
Sacramento, CA 95825**

Prepared By:



**2870 Gateway Oaks Drive, Suite 150
Sacramento, CA 95833**

May 2006

This page intentionally
left blank.

Table of Contents

ABBREVIATION AND ACRONYM LIST	vii
EXECUTIVE SUMMARY	ES-1
Basis of Investigation	ES-1
Study Area Emphasis	ES-2
Study Authorization	ES-2
Problems, Needs, and Opportunities	ES-2
Planning Objectives.....	ES-6
Resource Management Measures Screening.....	ES-6
Further Measures Screening	ES-10
Strategy for the Development of Initial Alternatives	ES-14
Study Management and Public Involvement.....	ES-15
Future Actions	ES-15
Federal Interest in Continuing with a Plan Formulation Study	ES-16
1. INTRODUCTION AND BACKGROUND	1-1
1.1 Purpose of Investigation.....	1-1
1.2 Study Authorization	1-1
1.2.1 State.....	1-2
1.2.2 Federal.....	1-2
1.3 Study Area.....	1-3
1.4 Purpose and Scope of the IAIR	1-3
1.5 Existing Agreements	1-4
1.5.1 Clean Water Act Section 404 Memorandum of Understanding.....	1-4
1.5.2 Sites Reservoir Memorandum of Understanding	1-4
1.6 Report Organization	1-4
2. RELATED STUDIES, PROJECTS, AND PROGRAMS	2-1
2.1 Bureau of Reclamation Projects and Programs	2-1
2.1.1 Central Valley Project	2-1
2.1.2 Operational Influences	2-2
2.1.3 CVP Water Users	2-2
2.1.4 Central Valley Project Improvement Act.....	2-3
2.2 CALFED Bay-Delta Program	2-3
2.2.1 CALFED Bay-Delta Program Mission Statement, Objectives, and Solution Principles.....	2-4
2.2.2 CALFED Programs	2-5
2.2.3 Notice of Initiation of Federal Feasibility Studies	2-7
2.3 Program Management by the Bureau of Land Management.....	2-7
2.4 NOAA Fisheries Salmon and Steelhead Proposed Recovery Plan	2-7
2.5 United States Environmental Protection Agency Iron Mountain Mine Restoration	2-8
2.6 United States Army Corps of Engineers Sacramento Valley Programs.....	2-8
2.7 California Department of Water Resources Projects and Plans	2-9
2.7.1 State Water Project.....	2-9
2.7.2 California Water Plan.....	2-9
2.8 California Department of Fish and Game Restoration and Recovery Programs.....	2-10
2.9 Interagency Ecological Program on Pelagic Organism Decline	2-10
2.10 SWRCB Phase 8 Delta Water Quality Requirements	2-10

Table of Contents (Continued)

2.11	Other Federal, State, and Local Programs and Projects	2-11
2.11.1	Sacramento River Conservation Area Program	2-11
2.11.2	Riparian Habitat Joint Venture.....	2-12
2.11.3	Resource Conservation Districts	2-13
2.12	Other Programs by Private Organizations.....	2-13
2.13	Common Assumptions for CALFED Surface Water Storage Projects	2-15
3.	WITHOUT-PROJECT CONDITIONS	3-1
3.1	Existing Conditions	3-2
3.1.1	Physical Environment.....	3-2
3.1.2	Biological Resources.....	3-5
3.1.3	Socioeconomic Resources.....	3-7
3.1.4	Land Use	3-8
3.1.5	Water Supply.....	3-8
3.1.6	Cultural Resources	3-10
3.1.7	Transportation	3-10
3.1.8	Recreation.....	3-10
3.2	Future Without-Project Conditions	3-13
3.2.1	Physical Environment.....	3-13
3.2.2	Biological Environment	3-14
3.2.3	Socioeconomic Conditions.....	3-14
3.2.4	Energy and Power	3-14
3.2.5	Cultural Resources	3-15
3.2.6	Recreation.....	3-15
3.2.7	CALFED Complementary Actions	3-15
3.2.8	Water Resources Infrastructure/Operations	3-15
4.	PROBLEMS, NEEDS, AND OPPORTUNITIES	4-1
4.1	Water Supply Reliability	4-1
4.2	Water Supply	4-2
4.3	Water Management Flexibility.....	4-4
4.4	CVP, CALFED, and Related Environmental Concerns	4-4
4.5	Anadromous Fish Survival.....	4-5
4.6	Water Quality	4-7
4.7	Other Opportunities.....	4-8
4.7.1	Hydropower Generation.....	4-8
4.7.2	Recreation.....	4-9
4.7.3	Flood Protection	4-9
4.8	Summary	4-9
5.	PLAN FORMULATION APPROACH.....	5-1
5.1	Plan Formulation Process	5-1
5.1.1	Federal Planning Process.....	5-1
5.1.2	State Planning Process.....	5-3
5.1.3	Scoping.....	5-3
5.2	Planning Objectives.....	5-4
5.2.1	Primary Objectives.....	5-4
5.2.2	Secondary Objectives.....	5-4

Table of Contents (Continued)

5.3	Planning Constraints and Guiding Principles.....	5-4
5.3.1	Constraints.....	5-4
5.3.2	Guiding Principles.....	5-5
6.	RESOURCE MANAGEMENT MEASURES	6-1
6.1	Definition of Resource Management Measures	6-1
6.2	CALFED Storage Investigations.....	6-1
6.2.1	CALFED Groundwater Storage	6-2
6.2.2	CALFED Surface Storage	6-2
6.3	Resource Management Measures Screening	6-3
6.4	Measures to Address Primary Planning Objectives	6-4
6.4.1	Measures to Address Water Supply, Reliability, and Management Flexibility Needs.....	6-4
6.4.2	Measures to Address Anadromous Fish Survival	6-4
6.5	Measures to Address Secondary Planning Objectives	6-4
6.5.1	Measures to Address Increasing Hydropower Generation.....	6-5
6.5.2	Measures to Address Recreation Opportunities in the Study Area	6-5
6.5.3	Measures to Address Flood Control Opportunities in the Study Area	6-5
6.6	Summary of Measures Retained for Further Consideration.....	6-5
6.6.1	Measures that Address the Primary Planning Objectives.....	6-5
6.6.2	Measures that Address the Secondary Planning Objectives.....	6-22
6.7	NODOS Measures Screening	6-23
6.7.1	Additional Considerations of Surface Storage Measures to Address the Water Supply Reliability Objective	6-25
6.7.2	Preliminary Capital Cost and Unit Cost Comparison of Offstream Surface Storage Measures.....	6-26
6.7.3	Preliminary Environmental Impact Comparison of Offstream Surface Storage Measures.....	6-28
6.7.4	Summary of NODOS Surface Storage Measures Screened from Further Consideration	6-29
6.7.5	Storage Measures Retained	6-30
6.7.6	Further Screening of Measures to Address the Anadromous Fish Survival Objective	6-31
6.8	Summary of Remaining Resource Management Measures.....	6-31
7.	DEVELOPMENT OF INITIAL ALTERNATIVE CONCEPTS	7-1
7.1	Strategy for Development of Initial Action Alternatives	7-1
7.2	Retained Resource Management Measures	7-2
7.3	Conveyance Methods for Initial Alternatives.....	7-3
7.4	Operations/Benefits Scenarios	7-4
7.5	NODOS Initial Action Alternative Configurations	7-4
7.6	No-Action Alternative	7-9
7.7	Plan Formulation Range for Initial Alternatives	7-10
8.	STUDY MANAGEMENT AND PUBLIC INVOLVEMENT	8-1
8.1	Study Management.....	8-1
8.2	Public and Stakeholder Involvement.....	8-2
8.2.1	Scoping.....	8-2

Table of Contents (Continued)

8.2.2	California Bay-Delta Public Advisory Committee Water Supply Subcommittee Briefings	8-3
8.2.3	Stakeholders/Interested Parties Briefings.....	8-3
8.2.4	Landowners Meetings	8-3
8.2.5	Sacramento River Flow Regime Technical Advisory Group.....	8-3
8.2.6	Interagency Coordination and Involvement	8-4
8.2.7	Coordination with Native American Representatives	8-4
8.2.8	Study Area Tours	8-4
8.2.9	Common Assumptions Ad-Hoc Stakeholder Technical Workgroup	8-5
8.2.10	Future Public and Stakeholder Involvement Plans.....	8-5
9.	FUTURE ACTIONS.....	9-1
9.1	Alternatives Formulation.....	9-1
9.2	Schedule	9-1
9.3	Investigation Process Factors	9-1
9.4	Additional Plan Formulation Considerations	9-2
9.4.1	Delta Pelagic Fish Decline	9-2
9.4.2	Banks Pumping Plant Permitted Capacity.....	9-2
10.	SUMMARY OF FINDINGS	10-1
10.1	Conclusions	10-1
10.2	Recommendations	10-2
10.3	Federal Interest in Continuing with a Plan Formulation Study	10-3
11.	REFERENCES	11-1

Appendices

- A: Local Climate and Water Resources
- B: Geology and Soils
- C: Botanical Surveys
- D: Biological Surveys
- E: Cultural Resource Surveys
- F: Preliminary Measures Screening – CALFED and NODOS Investigations
- G: Potential Reservoir Sites

List of Figures

Figure ES-1	Potential NODOS Primary and Extended Study Areas	ES-3
Figure ES-2	NODOS Initial Offstream Storage Alternatives	ES-11
Figure 1-1	NODOS Study Areas	1-5
Figure 3-1	Sacramento River Watershed.....	3-3
Figure 5-1	Federal Planning Process	5-2
Figure 6-1	Proposed Offstream Storage Locations	6-19

List of Tables

Table ES-1	Problems, Needs, and Opportunities Relative to Planning Objectives	ES-7
Table ES-2	Retained Measures that Address the Primary Objectives	ES-8
Table ES-3	Retained Measures that Address the Secondary Objectives	ES-9
Table ES-4	Relative Environmental Impacts Comparison	ES-13
Table 3-1	California Water Balance Summary	3-11
Table 4-1	California Water Demand Under Three Future Scenarios (MAF).....	4-3
Table 4-2	Problems, Needs, and Opportunities Relative to Planning Objectives	4-9
Table 6-1	Resource Management Measures to Address Water Supply Needs and Reliability.....	6-7
Table 6-2	Resource Management Measures to Address Anadromous Fish Survival	6-9
Table 6-3	Resource Management Measures to Address Opportunities for Hydropower Generation.....	6-11
Table 6-4	Resource Management Measures to Address Recreational Opportunities	6-13
Table 6-5	Resource Management Measures to Address Incremental Flood Control Storage Opportunities	6-15
Table 6-6	Retained Measures that Address the Primary Objectives	6-17
Table 6-7	Retained Measures that Address the Secondary Objectives	6-23
Table 6-8	Summary of Resource Management Measures that Address Planning Objectives	6-24
Table 6-9	Reservoir Dam Costs for Sites, Colusa, and Newville Reservoirs	6-27
Table 6-10	Comparison of Storage, Yield, and Reservoir/Dam Construction Costs	6-28
Table 6-11	Relative Environmental Impacts Comparison	6-29
Table 6-12	Measures Carried Forward for Development of Initial Alternatives	6-31
Table 7-1	Summary of Measures Retained Through Screening Process	7-3
Table 7-2	Ability of Retained Measures to Address Elements of the Planning Objectives	7-5
Table 7-3	Conceptual Scenarios for Initial Action Alternatives	7-7

This page intentionally
left blank.

ABBREVIATION AND ACRONYM LIST

Accord	Bay-Delta Accord
ACID	Anderson Cottonwood Irrigation District
AF	acre-feet
AFRP	Anadromous Fish Restoration Project
Agreement	Sacramento Valley Water Management Agreement
Banks Pumping Plant	Harvey O. Banks Pumping Plant
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin River Delta
BCWC	Battle Creek Watershed Conservancy
BDPAC WSS	Bay-Delta Advisory Committee Water Supply Subcommittee
BLM	Bureau of Land Management
BMP	best management practice
CALFED	California Bay-Delta Program
CalTrout	California Trout
CBDA	California Bay-Delta Authority
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
cfs	cubic feet per second
COA	Coordinated Operations Agreement
Comp Study	Sacramento and San Joaquin River Basins Comprehensive Study
Corps	United States Army Corps of Engineers
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
Delta	Sacramento-San Joaquin River Delta
DOI	Department of Interior
DWR	Department of Water Resources
ECw	electrical conductivity measurement
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EQ	environmental quality
ERP	Ecosystem Restoration Program
ESA	Endangered Species Act
ESU	evolutionarily significant units
EWA	Environmental Water Account
FERC	Federal Energy Regulatory Commission
FS	feasibility study
FY	fiscal year
GCID	Glenn-Colusa Irrigation District

ABBREVIATION AND ACRONYM LIST (Continued)

IAIR	Initial Alternatives Information Report
IEP	Interagency Ecological Program
ISI	Integrated Storage Investigations
JPOD	joint point of diversion
kW	kilowatt
KRCD	Kings River Conservation District
M&I	municipal and industrial
MAF	million acre-feet
MOU	Memorandum of Understanding
NED	national economic development
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NODOS	North-of-the-Delta Offstream Storage
NOI	Notice of Intent
NOP	Notice of Preparation
O&M	operation and maintenance
OCAP	Operations Criteria and Plan
OSE	other social effects
PEIS/EIR	Programmatic Environmental Impact Statement/Environmental Impact Report
PFR	Plan Formulation Report
P&Gs	<i>Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies</i>
PM ₁₀	particulates less than 10 microns
PMT	Project Management Team
PPA	Preferred Program Alternative
Progress Report	Final Draft North-of-the-Delta Offstream Storage Investigation Progress Report (July 2000)
RBDD	Red Bluff Diversion Dam
RCD	Resource Conservation District
Reclamation	United States Department of the Interior Bureau of Reclamation
RED	regional economic development
RHJV	Riparian Habitat Joint Venture
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SDIP	South Delta Improvements Program
SWAG	Sacramento Watershed Action Group
SWP	State Water Project
SWRCB	State Water Resources Control Board

ABBREVIATION AND ACRONYM LIST (Continued)

TAF	thousand acre-feet
TAG	technical advisory group
TC Canal	Tehama-Colusa Canal
TCCA	Tehama-Colusa Canal Authority
TNC	The Nature Conservancy
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VELB	valley elderberry longhorn beetle
WCB	Wildlife Conservation Board
WUE	water use efficiency
°F	degrees Fahrenheit

This page intentionally
left blank.