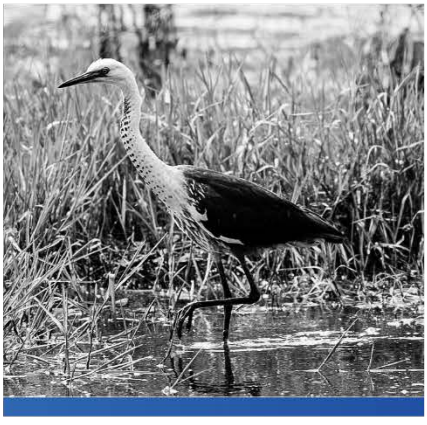
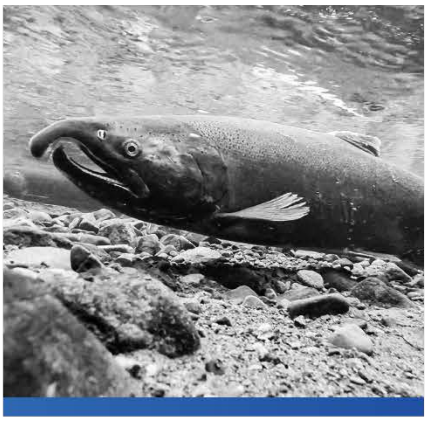
Kern Fan Groundwater Storage Project

FEASIBILITY REPORT

October 21, 2019
Updated April 13, 2020





Irvine Ranch
WATER DISTRICT

Rosedale-Rio Bravo
WATER STORAGE DISTRICT

Table of Contents

Executive Summary 11
ES.1 Introduction 11
ES.2 Study Authorization 11
ES.3 Project Purpose and Planning Objectives 12
ES.4 Development of Alternatives 13
ES.4.1 No Action/No Project Alternative 13
ES.4.2 Existing Water Bank Plan Alternative 13
ES.4.3 Kern Fan Groundwater Storage Project Alternative Plans 14
ES.5 Feasibility 14
ES.5.1 Technical Feasibility 14
ES.5.2 Environmental Feasibility 15
ES.5.3 Economic Feasibility 15
ES.5.4 Financial Feasibility 15
ES.6 Project Costs and Benefits 15
ES.6.1 Cost Allocation to Beneficiaries 16
ES.7 Risks and Uncertainty 17
ES.8 Federal Funding Request 17
Chapter 1 : Introduction 19
1.1 Feasibility Study Purpose 19
1.1.1 Study Authorization 19
1.2 Background 20
1.3 Non-Federal Sponsors 21
1.3.1 Rosedale Rio-Bravo Water Storage District 21
1.3.2 Irvine Ranch Water District 21
1.4 Problems, Needs, and Opportunities 22
1.4.1 Water Supply Benefits 24
1.4.2 Ecosystem Benefits 26
1.4.3 Emergency Water Supply Benefits 27
1.4.4 Other Project Benefits 27
1.5 Study Area 28
1.6 Related Studies, Projects, and Programs 30
Chapter 2 : Water Resources and Related Conditions 31
2.1 Existing Conditions 31

2.1.1 Physical Infrastructure 31
2.1.2 Physical Environment 32
2.1.3 Biological Resources 35
2.1.4 Cultural Resources 36
2.1.5 Land Use and Population 36
2.2 Likely Future without Project Conditions Summary 38
2.2.1 Physical Environment 38
2.2.2 Biological and Cultural Resources 38
2.2.3 Land Use and Population 39
2.2.4 Groundwater Resources 39
2.2.5 Climate Variability 39
Chapter 3 : Description of Project Alternatives 41
3.1 No Action/No Project Alternative 41
3.2 Existing Water Bank Alternative 42
3.2.1 Operation 42
3.2.2 Costs 42
3.3 Kern Fan Groundwater Storage Project – Kern Water Bank Alignment Alternative 43
3.3.1 Groundwater Recharge and Recovery Facilities 43
3.3.2 Project Conveyance Alignment 45
3.3.3 Operation 46
3.3.4 Costs 47
3.4 Kern Fan Groundwater Storage Project – Buena Vista Alignment Alternative 48
3.4.1 Project Conveyance Alignment 48
3.4.2 Costs 49
3.5 Kern Fan Groundwater Storage Project – East Side Canal Alignment Alternative 49
3.5.1 Project Conveyance Alignment 50
3.5.2 Costs 51
Chapter 4 : Plan Evaluation and Comparison 52
4.1 Alternative Plan Evaluation 52
4.1.1 M&I Water Supply Benefits 52
4.1.2 Groundwater Benefits 54
4.1.3 Agricultural Water Supply Benefits 55
4.1.4 Ecosystem Enhancement Benefits 56
4.1.5 Emergency Response Benefits 59

4.1.6 Agricultural Impact Benefits 61
4.1.7 Preliminary Cost Estimates 62
4.1.8 Preliminary Results 63
4.2 Mitigation of Unavoidable Adverse Effects 63
4.3 Alternative Plan Comparison 64
4.3.1 Completeness 64
4.3.2 Effectiveness 67
4.3.3 Acceptability 69
4.3.4 Efficiency 72
4.4 Summary of Comparisons 73
Chapter 5 : Recommended Plan 74
5.1 Description of Recommended Plan 74
5.1.1 Major Components 74
5.1.2 Project Operations 77
5.1.3 Beneficiaries of Project 80
5.2 Economic Benefits Summary 87
5.2.1 Implementation Schedule 88
5.2.2 Cost Allocation 88
5.2.3 Ability to Pay 92
5.3 Determination of Feasibility of the Recommended Plan 95
5.3.1 Technical Feasibility 95
5.3.2 Environmental Feasibility 96
5.3.3 Economic Feasibility 97
5.3.4 Financial Feasibility 97
5.4 Risk and Uncertainty 97
5.4.1 Project Operations 97
5.4.2 Project Design and Cost Estimates 98
5.4.3 Project Schedule 98
5.4.4 Monetizing Project Benefits 98
5.5 Unresolved Issues and Special Considerations 99
5.5.1 Agreements 99
Chapter 6 : Coordination and Public Involvement 100
6.1 Stakeholder and Public Outreach 100
6.2 Agency Coordination 100

6.2.1 California Department of Water Resources 100
6.2.2 California Department of Fish and Wildlife 101
6.2.3 California Water Commission 101
6.2.4 Dudley Ridge Water District 101
6.2.5 Kern County Water Agency 101
6.2.6 Metropolitan Water District 101
6.2.7 State Water Resources Control Board 102
6.2.8 Kern Groundwater Authority 102
6.2.9 Kern County and Other Agencies 102
Chapter 7 : Findings and Considerations 103
7.1 Need for Project 103
7.2 Summary of Recommended Plan 103
7.2.1 Preliminary Costs and Benefits 103
7.2.2 Feasibility 104
7.2.3 Risk and Uncertainty 105
7.3 Policy Compliance 105
7.3.1 Federal Objective 105
7.3.2 Achievement of Guiding Principles 105
7.4 Implementation 107
7.5 Federal Funding Request 107
References 109

Tables

Table ES-1 : Location and Description of Project Benefits 12
Table ES-2 : Annual Economic Benefits and Cost of Alternatives 16
Table ES-3 : Federal and Non-Federal Cost Allocation 17
Table 1-1 : Location and Description of Project Benefits 23
Table 3-1 : Existing Water Bank Alternative Plan Cost Estimates 43
Table 3-2 : KWB Alignment Alternative Plan Cost Estimates 48
Table 3-3 : BV Alignment Alternative Plan Cost Estimates 49
Table 3-4 : ESC Alignment Alternative Plan Cost Estimates 51
Table 4-1 : Additional Water Available for M&I Uses for Each Alternative Plan 53
Table 4-2 : Annual M&I Water Supply Benefits of Alternatives 54
Table 4-3 : Groundwater Left Behind for Benefit of Groundwater Basin Under Each Alternative 55
Table 4-4 : Annual Benefits of Groundwater Recharge Under 2030 Conditions 55
Table 4-5 : Additional Water for Agricultural Uses for Each Alternative 55
Table 4-6 : Annual Benefits of Additional Agricultural Water Supplies for Each Alternative 56
Table 4-7 : Annual Ecosystem Benefits for Each Alternative 58
Table 4-8 : Annual Wetland Ecosystem Benefits for Each Alternative 59
Table 4-9 : Annual Emergency Drought Response Benefits for Alternatives 60
Table 4-10 : Annual Delta Levee Failure Emergency Response Benefit for Each Alternative 61
Table 4-11 : Annual Agricultural Impact Benefits for Each Alternative 62
Table 4-12 : Total Annual Costs of Alternatives 62
Table 4-13 : Annual Economic Benefits and Costs of Alternatives 63
Table 4-14 : Alternative Full Spectrum Ratings 66
Table 4-15 : Alternative Reliability Ratings 66
Table 4-16 : Alternative Physical Implementation Rating 67
Table 4-17 : Alternatives Ratings on Ability to Create More Reliable Water Supply 68
Table 4-18 : Alternatives Ratings on Improving Habitat Conditions of Important Species 68
Table 4-19 : Alternatives Ratings on Contributing to a More Resilient and Sustainable Water Infrastructure 69
Table 4-20 : Alternative Ratings for Acceptability 70

Table 4-21 : Alternatives Ratings for Efficiency in Delivering Economic Benefits 72
Table 5-1 : Location and Description of Project Benefits 81
Table 5-2 : Kern Fan Project Benefits Summary 88
Table 5-3 : Kern Fan Project – KWB Alignment Capital and Annual Costs 89
Table 5-4 : Construction Cost Allocated to Each Kern Fan Project Purpose and Benefit (Million $) 90
Table 5-5 : Federal Authority for Cost Allocations 91
Table 5-6 : Percentages for Assigning Federal and Non-Federal Costs 91
Table 5-7 : Kern Fan Project Costs Assigned to Beneficiaries 92
Table 7-1 : Summary of Preliminary Costs and Benefits 104
Table 7-2 : Kern Fan Groundwater Storage Project and PR&G Guiding Principles 106

Figures

Figure 1-1 : Exchange Operations to Produce Ecosystem Benefits 24
Figure 1-2 : Diagram Depicting Joint Benefits to IRWD and DRWD 26
Figure 1-3 : Location of Kern Fan Groundwater Storage Project 28
Figure 1-4 : Preliminary Location of Kern Fan Groundwater Storage Project Facilities (Updated) 29
Figure 3-1 : Potential Location of Third Site (Phase 1 Project Site) in Stockdale EIR 44
Figure 3-2 : California Aqueduct Pools in Vicinity of Kern Fan Project 45
Figure 3-3 : Preliminary Location of Kern Fan Groundwater Storage Project Facilities with KWB Alignment (Updated) 46
Figure 3-4: Preliminary Location of Kern Fan Groundwater Storage Project Facilities with BV Alignment (Updated) 49
Figure 3-5 : Preliminary Location of Kern Fan Groundwater Storage Project Facilities with ESC Alignment (Updated) 51
Figure 4-1 : Criteria, Performance, and Rating Scales 65
Figure 4-2 : Summary of Alternatives Plan Evaluations and Comparison (Updated) 73
Figure 5-1 : Preliminary Layout of Kern Fan Groundwater Storage Project with BV Alignment (Updated) 76
Figure 5-2 : Modeling Estimates of Article 21 Water Available to Project 78
Figure 5-3 : Diagram of Exchanges that will Facilitate Ecosystem Pulse Flows 80
Figure 5-4 : Frequency of Ecosystem Pulses by Water Year Type 82
Figure 5-5 : Storage and Releases from Lake Oroville Demonstrating No Project Impacts 83
Figure 5-6 : Diagram Depicting Joint Benefits to IRWD and DRWD 86
Figure 5-7 : IRWD and Rosedale Previously Constructed Water Banking Projects 96

List of Appendices

Appendix A : Letters Authorizing State-Led Storage Projects

Appendix B : Environmental Documentation (Stockdale Integrated Banking Project Final Environmental Impact Report, 2015)

Appendix C : Modeling Technical Report including Climate Variability Analysis (MBK Engineers Technical Memorandum and Supporting Documentation)

Appendix D : Engineering Designs and Costs (**30%** Design Report by Dee Jaspar & Associates, Inc. **2020**)

Appendix E : Existing Water Bank Alternative (Willow Springs Water Bank Project Information)

Appendix F : Economic Benefits Evaluation and Supporting Documentation (M.Cubed Technical Memorandum and Supporting Documentation)

Appendix G : Cost Allocation Supporting Documentation

Appendix H : Ecosystem Benefit in the Delta Technical Report (Cramer Fish Sciences, 2019)

Appendix I : Groundwater Technical Report (Thomas Harder & Co., 2018)

Appendix J : Kern Fan Groundwater Storage Project Schedule

List of Acronyms

ACWA	Association of California Water Agencies
AF	acre-feet
AFY	acre-feet per year
ASP	Department of the Interior Agency Specific Procedures for Implementing the Council on Environmental Quality's, Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies
AVEK	Antelope Valley-East Kern
BV	Buena Vista
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CFS	Cramer Fish Sciences
CWC	California Water Commission
CVC	Cross Valley Canal
CVP	Central Valley Project
Delta	Sacramento-San Joaquin River Delta Estuary
DJA	Dee Jaspar & Associates, Inc.
DRWD	Dudley Ridge Water District
D&S	Reclamation Manual Directives and Standards
DWR	California Department of Water Resources
EIR	Environmental Impact Report
ESA	Endangered Species Act
ESC	East Side Canal
GO	general obligation
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
hp	horsepower
I-5	Interstate-5
IG	Interagency Guidelines
IRWD	Irvine Ranch Water District
IMPLAN	Impact Analysis for Planning
JPA	Joint Powers Authority
KCWA	Kern County Water Agency
KCFD	Kern County Fire Department
KGA	Kern Groundwater Authority
KWB	Kern Water Bank
KWBA	Kern Water Bank Authority
M&I	municipal and industrial
MOU	Memorandum of Understanding
MWD	Metropolitan Water District of Southern California
MWDOC	Municipal Water District of Orange County
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service

NOP	Notice of Preparation
O&M	Operations and Maintenance
OM&R	Operations, Maintenance and Replacement
P&R	Principles and Requirements for Federal Investments in Water Resources
PR&G	P&R, IG, and ASP
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
Rosedale	Rosedale-Rio Bravo Water Storage District
RWQCB	Regional Water Quality Control Board
SCRO	South Central Region Office
SGMA	Sustainable Groundwater Management Act
SJVAB	San Joaquin Valley Air Basin
SOI	Sphere of influence
SWAP	Statewide Agricultural Production Model
SWP	California State Water Project
SWRCB	State Water Resources Control Board
TAF	Thousand acre-feet
USFWS	U.S. Fish and Wildlife Service
WIIN	Water Infrastructure Improvements for the Nation Act
WSIP	Water Storage Investment Program
WSWB	Willow Springs Water Bank

Executive Summary

ES.1 Introduction

This Feasibility Report was prepared to document the development, evaluation, and comparison of alternatives for new water conveyance, groundwater storage, recharge, and recovery facilities for the proposed Kern Fan Groundwater Storage Project (Kern Fan Project or Project) and to identify the recommended project. The study identifies and documents that the proposed Kern Fan Project is a technically, environmentally, and financially feasible project that provides Federal benefits greater than the Federal share of costs.

Following the submission of the Kern Fan Groundwater Storage Project Feasibility Report on October 21, 2019, alternatives and evaluations were refined based upon additional project design. This updated Feasibility Report has been prepared in response to further refinement in the development of project design and the identification of a new preferred alternative for the Project. This updated Feasibility Report includes the following:

- **Updated and refined project design and related cost estimates demonstrating technical feasibility of the project and the preferred project alignment. The updated 30% Design Report and engineering Class 3 Level Cost Estimate in Appendix D replaces the previously submitted Preliminary Design Report.**

- **Refinements in the project alternatives evaluation based on the updated project design has resulted in a new preferred alternative for the Project. The revised information related to the new preferred alignment alternative is presented in Chapters 1, 3, 4, 5, 7 and Appendix G.**

- **Updated information on the formation of a Joint Powers Authority for the Project called the Groundwater Banking Authority, is presented in Chapters 1 and 5.**

Changes to text and tables as a result of these updates to the original Feasibility Report dated October 21, 2019, are shown in this updated Feasibility Report document delineated in bold font.

ES.2 Study Authorization

The project sponsors, Irvine Ranch Water District (IRWD) and Rosedale Rio-Bravo Water Storage District (Rosedale), consulted with the Bureau of Reclamation on the feasibility investigation and the guidelines for this Report. This investigation and Feasibility Report were prepared to meet the eligibility requirements of the Water Infrastructure for Improvements to the Nation (WIIN) Act Sec. 4007. It was prepared in accordance with the Department of the Interior's Agency Specific Procedures for Implementing the Council on Environmental Quality's, Principles, Requirements, and Guidelines for Water and Land Related Resources

Implementation Studies (PR&Gs) dated November 10, 2015, which provides guidance to Federal agencies for planning and water resource-related projects.

ES.3 Project Purpose and Planning Objectives

The Kern Fan Groundwater Storage Project will recharge and store up to 100,000 acre-feet (AF) per year of water that would otherwise be lost to the ocean for subsequent recovery and use for Federal and non-Federal benefits. The project facilities would be located in the Kern County Groundwater Sub-basin of the Tulare Lake Groundwater Basin.

Building upon a successful track record of water banking, IRWD and Rosedale propose to develop a regional water bank in the Kern Fan area to capture, recharge and store unallocated State Water Project (SWP) Article 21 water, that would otherwise be lost to the ocean, and other water sources available during wet year conditions and to extract water when needed to provide important ecosystem, emergency supply, agricultural, municipal and industrial (M&I), and water supply benefits.

The Kern Fan Project operation will address the following project objectives:

- Enhance water supply reliability;
- Reduce imported water demands on the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Delta) to benefit spring and winter-run Chinook salmon, steelhead trout and green sturgeon;
- Provide a water supply during drought conditions;
- Provide a water supply for emergency response benefits;
- Establish temporary wetlands through intermittent recharge events that will attract migratory and other water fowl in Kern County;
- Benefit the water levels in the Kern County Groundwater Sub-basin;
- Provide sustainable water supply for local agricultural use; and
- Be integrated into other water storage projects and storage reservoirs to provide greater statewide benefits.

The primary Project beneficiaries and location of benefits are shown in Table ES-1.

Table ES-1 : Location and Description of Project Benefits

Beneficiary	Location of Benefits	Description of Project Benefit(s)
Environment	Delta, Sacramento River, and Feather River	• Reduces demands on the Delta by recovering stored groundwater to supply local demands in lieu of exporting water from the Delta; • Provides ecosystem benefits in dry and critical years by releasing pulses of water from Lake Oroville for Delta outflow; • Decreases water exported from the Delta and increases river flows during critical periods to support fish spawning; and • Provides an emergency supply in the event of a levee failure in the Delta.

Beneficiary	Location of Benefits	Description of Project Benefit(s)
Environment	Kern County	Provides temporary wetlands (recharge basins) that attract water birds
Rosedale	Kern County	• Provides greater operational flexibility by utilizing contingency groundwater storage to augment supplies during periods when other water sources may be limited or unavailable (emergency response – extended drought); • Provides a firm water supply for the preservation of permanent agricultural crops; and • Provides increased groundwater levels.
IRWD	Orange County	Augments M&I supplies to IRWD during periods when other supply sources may be limited or unavailable (emergency response – extended drought).
DRWD	Kings County	Augments agricultural supplies during periods when other supply sources may be limited or unavailable (emergency response – extended drought).

ES.4 Development of Alternatives

ES.4.1 No Action/No Project Alternative

The No Action/No Project Alternative includes a description of existing conditions and reasonably foreseeable future conditions that would exist if the project were not implemented. Under the No Project Alternative, up to 12 recovery wells would not be constructed, approximately 1,200 acres of recharge basins would not be constructed and the needed conveyance facilities would not be built. The lands would continue to be operated for agricultural production and groundwater would continue to be pumped from agricultural wells to support agricultural activities with no additional recharge. Under the No Project Alternative, there would not be basins nor water supply available for intermittent wetlands, and there would not be releases of pulse flows to benefit environmentally sensitive and special status species in the Delta. There would not be an increase in local groundwater levels, nor an emergency water supply available in the event of a Delta levee failure event or long-term drought. There would not be a new agricultural water supply available to sustain permanent plantings. Under the No Project Alternative, IRWD's water supply would be less reliable during periods when existing supplies may be reduced or interrupted.

ES.4.2 Existing Water Bank Plan Alternative

Under the Existing Water Bank Alternative Plan, IRWD and Rosedale would purchase storage, recharge and recovery capacity in an existing water bank. No new recharge or recovery capacity would be developed in the Kern County Sub-basin to provide intermittent wetland benefits, or increased groundwater levels. The project sponsors would need to purchase water within the Delta system, if available, to provide pulse flows for ecosystem benefits in the Delta.

ES.4.3 Kern Fan Groundwater Storage Project Alternative Plans

The Kern Fan Groundwater Storage Project (Project) would be developed as a regional water bank in Kern County, California. Three alternative plans were developed for the Kern Fan Groundwater Storage Project that contemplate three potential alignments of the Project conveyance canal. The three alignments comprise the Project Alternative Plans evaluated in this study. The three alignments are referred to as the Buena Vista (BV) Alignment, Kern Water Bank (KWB) Alignment, and East Side Canal (ESC) Alignment. The general configuration of the groundwater recharge and recovery facilities will remain the same regardless of the conveyance alignment.

The purpose of the Project is to capture and recharge water during wet year conditions that would otherwise be lost to the ocean and extract water when needed to provide ecosystem, emergency supply and water supply benefits. The total storage capacity to be developed from the Project is expected to be 100,000 acre-feet (AF). The Project would be operated such that in wet years, surplus water, including unallocated SWP Article 21 water and other available water sources, would be stored in the Project for subsequent recovery and use to provide a multitude of benefits. Up to 25 percent of the stored unallocated SWP Article 21 water would be used for ecosystem benefit purposes in the Delta, and up to 75 percent of the water stored would be later used for water supply benefits for agriculture and M&I, including droughts and emergencies. The stored water would be recovered when needed through the use of groundwater recovery wells. Based on of the wide range of benefits, the Kern Fan Groundwater Storage Alternative Plan is identified as the Recommended Plan.

ES.5 Feasibility

The Kern Fan Groundwater Storage Project is shown to be technically, environmentally, economically and financially feasible.

ES.5.1 Technical Feasibility

Rosedale and IRWD have significant prior experience designing and constructing groundwater recharge and recovery facilities. Experience includes environmental review and permitting, design, construction, equipping, and operation of wells, recharge basins, conveyance facilities, and turnout structures. Project facilities would be designed, located and constructed to minimize potential impacts to adjacent users and would be constructed using existing, well-established, efficient and reliable engineering techniques. The project would be constructed in two phases.

An engineering **30%** design report was prepared which provides an analysis of project alternatives, description of the proposed facilities, how the Project facilities would be integrated with existing water banking facilities, construction methods, capital and operations cost estimates, and replacement cost estimates. Based on the analyses performed, the proposed Kern Fan Groundwater Storage Project is considered to be technically feasible, constructible and can be cost-effectively operated and maintained.

ES.5.2 Environmental Feasibility

The evaluation of environmental feasibility considers the environmental impacts to endangered species, cultural, Indian Trust Assets, and other resources that would result from the construction and operation of the project.

The Kern Fan Groundwater Storage Project is subject to the environmental review process established in the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) to be considered for federal funding. Based on a programmatic environmental review performed previously, IRWD and Rosedale anticipate that upon further project-level analysis, the Kern Fan Project will not result in significant or unavoidable impacts. A Supplemental EIR is being prepared in compliance with the CEQA and NEPA requirements for the construction and operation of the facilities contemplated in the Kern Fan Project.

ES.5.3 Economic Feasibility

The economic feasibility of the Project has been evaluated to confirm that constructing and operating the Project would result in positive net benefits. The Kern Fan Groundwater Storage Project Alternative Plan, the recommended plan, is economically feasible because it will generate over $15 million in net benefits per year with annual costs of approximately $10 million.

ES.5.4 Financial Feasibility

The evaluation of financial feasibility of the Project includes a cost allocation and determination of the financial capability of the beneficiaries' ability to pay their allocated costs, including capital and operating costs.

The financial feasibility includes a determination that the Kern Fan Groundwater Storage Project Alternative Plan provides Federal benefits greater than the Federal share of costs.

ES.6 Project Costs and Benefits

Based on the updated 30% design and Class 3 level cost estimate for construction of the preferred Kern Fan Groundwater Storage Project, the BV Alignment Alternative is estimated to be $225 million. Annual costs including replacement and operations and maintenance (O&M) would be **$10.4 million** over a 50-year operations period at a 2.87% discount rate and based on 2018 costs.

Benefits evaluated for the alternatives included in this Feasibility Report include M&I water supply, agricultural water supply, emergency water supply, ecosystem benefits in the Delta, intermittent wetlands, and enhanced groundwater level benefits.

The Kern Fan Groundwater Storage Alternative Plans would provide increased water supply reliability for M&I and agricultural users, as well as provide emergency water supplies for use during extended drought or in the event of a Delta levee failure. The Plan will also provide pulse flow releases in the Delta for the benefit of special status fish species such as spring-run Chinook salmon, steelhead trout and green sturgeon, which are listed as threatened under the Federal Endangered Species Act (ESA). The Project will also create intermittent wetlands for the benefit of migratory birds and other waterfowl in Kern County.

Table ES-2 summarizes the annual economic benefits and costs of the alternatives considered in this feasibility study. The table also indicates the annual benefits and costs and the benefit-cost ratio for each alternative. Based on the evaluation, the three Kern Fan Groundwater Storage Alternative Plans are the only plans with a benefit-cost ratio greater than one.

Table ES-2 : Annual Economic Benefits and Cost of Alternatives (Updated)

	Existing Water Bank Participation	Kern Fan Project - KWB Alignment	Kern Fan Project - BV Alignment	Kern Fan Project - ESC Alignment
Annual Water Supply Benefits - M&I (Million $)	$2.09	$2.09	$2.09	$2.09
Annual Water Supply Benefits - Agriculture (Million $)	$3.17	$3.17	$3.17	$3.17
Annual Water Supply Benefits - Groundwater (Million $)	$0.52	$0.37	$0.37	$0.37
Annual Ecosystem Benefits - Salmon Recovery (Million $)	NA	$1.38	$1.38	$1.38
Annual Ecosystem Benefits - Intermittent Wetland Habitat (Million $)	NA	$5.18	$5.18	$5.18
Annual Emergency Response Benefits - Extended Drought (Million $)	$0.72	$0.72	$0.72	$0.72
Annual Emergency Response Benefits - Delta Failure (Million $)	$1.51	$1.51	$1.51	$1.51
Annual Agricultural Impact Benefits (Million $)	NA	$0.95	$0.95	$0.95
Total Annual Benefits (Million $)[1]	**$8.01**	**$15.37**	**$15.37**	**$15.37**
Total Construction Cost (Million $)	$340.91	$204.64	$225.07	$216.52
Annual Costs (Million $)[2]	**$20.33**	**$9.35**	**$10.40**	**$10.04**
Net Annual Benefits or Costs (Million $)	($12.32)	$6.02	$4.97	$5.33
Benefit-Cost Ratio	**0.39**	**1.64**	**1.48**	**1.53**

Notes: [1] Benefits represent annual benefits estimated in the year 2030. Benefits described in Section 4.
[2] Annual costs for the Kern Fan Project alternatives include construction cost amortized over 50 years at a 2.875% discount rate, annual O&M costs, and replacement costs. Annual costs for the Existing Water Bank Participation alternative include the initial purchase of participation shares (capital), annual estimated recharge and recovery fees (O&M), and annual fixed service charge.

ES.6.1 Cost Allocation to Beneficiaries

The allocation of water to beneficiaries is the basis for the allocation of the Project's costs. Costs allocated to each benefit are assigned to Federal taxpayers (non-reimbursable) and project beneficiaries (reimbursable) based on the specific project authorization and Federal law. The project beneficiaries shall pay the Non-federal costs. Table ES-3 presents the estimated annual cost allocation summary for the Recommended Kern Fan Project Alternative Plan.

Table ES-3 : Federal and Non-Federal Cost Allocation (Updated)

	Construction		OM&R	
Cost Category	Federal Non-Reimbursable Costs	Non-Federal Costs	Federal Non-Reimbursable Costs	Non-Federal Costs
Ecosystem Benefit - Salmon	$4.2	$16.0	$0.0	$0.2
Ecosystem Benefit - Intermittent Wetlands	$46.0	$29.9	$0.0	$0.6
Emergency Response - Extended Drought	$0.0	$10.6	$0.0	$0.1
Emergency Response - Delta Failure	$0.0	$22.1	$0.0	$0.2
Agricultural Direct Benefits - Crop Substitution	$0.0	$13.9	$0.0	$0.1
Water Supply Benefits - Agriculture	$0.0	$46.4	$0.0	$0.4
Water Supply Benefits - M&I	$0.0	$30.6	$0.0	$0.3
Groundwater Benefits	$0.0	$5.4	$0.0	$0.0
Total	**$50.2**	**$174.9**	**$0.0**	**$1.9**

In May 2018, the California Water Commission (CWC) approved conditional funding in the amount of $67.5 million for the Kern Fan Groundwater Storage Project through the Water Storage Investment Program (WSIP). The final award of this funding is expected in 2022 following successful completion of the Proposition 1 funding requirements associated with environmental documents, contracts for the administration of WSIP public benefits, and funding commitments for the WSIP non-public benefits.

ES.7 Risks and Uncertainty

The project sponsors have considered various risks and uncertainties, which could affect the implementation of the Kern Fan Groundwater Storage Alternative Plan. These risks have been evaluated through the Project modeling and includes the future conditions under climate change.

ES.8 Federal Funding Request

The Project sponsors, IRWD and Rosedale, consulted with the Bureau of Reclamation on the feasibility investigation and the guidelines for this Report. This investigation and Feasibility Report were prepared to meet the eligibility requirements of the Water Infrastructure for Improvements to the Nation (WIIN) Act Sec. 4007. It was prepared in accordance with the Department of the Interior's Agency Specific Procedures for Implementing the Council on Environmental Quality's, Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies dated November 10, 2015, which provides guidance to Federal agencies for planning and water resource-related projects.

In accordance with the WIIN Act, the Secretary of the Interior may participate in a State-led storage project in an amount equal to not more than 25 percent of the total cost to the State-led storage project. **In section, 5 of this Feasibility Report, the project sponsors have established an authority for Federal financial participation in the Kern Fan Groundwater Storage Project in the amount of $50.2 million for construction costs. Accordingly, the Project Sponsors seek Federal participation in the Project in the amount of $50.2 million based on 25% of eligible construction costs.**

Chapter 1 : Introduction

1.1 Feasibility Study Purpose

The purpose of this Feasibility Report is to document the development, evaluation, and comparison of the alternatives for new groundwater storage, recharge, and recovery. This Feasibility Report (report) documents the assessment of the identified alternatives and of the Recommended Plan.

This report was prepared in accordance with the Principles and Requirements for Federal Investments in Water Resources (P&R, March 2013), Interagency Guidelines (IG, December 2014), and the Department of the Interior Agency Specific Procedures for Implementing the Council on Environmental Quality's, Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies (ASP Handbook, November 10, 2015). Taken together, the P&R, IG and ASP Handbook, are collectively referred to as the Principles, Requirements and Guidelines for Water and Land Related Resources Implementation Studies (PR&G).

For an action to be recommended, there must be Federal interest in the action and it must be technically, environmentally, economically and financially feasible as defined in the PR&G. This study provides a determination that the Recommended Plan, the proposed Kern Fan Groundwater Storage Project with the preferred **Buena Vista (BV)** alignment, is technically, environmentally, and financially feasible and that it provides Federal benefits greater than the Federal share of costs.

1.1.1 Study Authorization

The non-Federal sponsors, IRWD and Rosedale, consulted with Reclamation on the feasibility investigation and the guidelines for this Feasibility Report. The feasibility investigation and study was prepared to meet the eligibility requirements of the Water Infrastructure for Improvements to the Nation (WIIN) Act Sec. 4007, utilizing Reclamation's Directives and Standards (D&S) for Water and Related Resources Feasibility Studies (CMP 09-02), which provides guidance to Federal agencies for planning and water resource-related projects.

IRWD and Rosedale are seeking State funding for the Kern Fan Groundwater Storage Project through the California Water Commission's (CWC) Water Storage Investment Program (WSIP). In August 2017, IRWD and Rosedale submitted an application to the CWC for funding of the Kern Fan Groundwater Storage Project pursuant to the WSIP under Proposition 1. Proposition 1 of 2014 dedicated $2.7 billion for investments in water storage projects. The CWC is administering the WSIP to fund public benefits associated with eligible projects, including the Kern Fan Groundwater Storage Project. **For purposes of the WSIP, public benefits are defined by section 79753(a) of the California Water Code as ecosystem improvements, water quality improvements, emergency response, and recreational purposes. Under the WSIP all other project benefits are referred to as non-public benefits.** In May 2018, the CWC approved conditional funding in the amount of $67.5 million for construction of the Kern

Fan Groundwater Storage Project. Following successful completion of the WSIP funding requirements under Proposition 1, a final award of this funding is expected in 2022. The funding requirements include requirements for environmental documents, contracts for the administration of WSIP public benefits and funding commitments for WSIP non-public benefits.

In a letter dated August 27, 2018, State of California Governor Brown, requested federal participation in the Kern Fan Groundwater Storage Project under the WIIN Act. This was acknowledged by the Secretary of the Interior in a letter dated November 16, 2018 (See Appendix A).

1.2 Background

The Recommended Plan, Kern Fan Groundwater Storage Project, would be developed as a regional water bank in the Kern Sub-unit of the Tulare Lake Groundwater Basin in Kern County, California. Portions of Kern County are characterized by hydrogeologic conditions that are particularly suitable for groundwater recharge operations. Kern County is strategically located in central California near federal, state and local water supply conveyance facilities.

The Project would be designed to capture, recharge and store wet-year water that would otherwise be lost to the ocean for later use as needed. The Project is a groundwater banking project that would coordinate the management of surface water and groundwater supplies for maximum benefit otherwise known as conjunctive use. Pursuant to the California Water Plan, "conjunctive management or conjunctive use refers to the coordinated and planned use and management of both surface water and groundwater resources to maximize the availability and reliability of water supplies in a region to meet various management objectives."

The Project objective is to cost-effectively recharge and store groundwater for subsequent recovery to address the following needs:

- Enhance water supply reliability;
- Reduce imported water demands on the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Delta) to benefit spring and winter-run Chinook salmon, steelhead trout and green sturgeon;
- Provide water supply during drought conditions;
- Provide water supply for emergency response benefits;
- Establish temporary wetlands through intermittent recharge events that will attract migratory and other waterfowl in Kern County;
- Benefit the water levels in the Kern County Groundwater Sub-basin;
- Provide sustainable water supply for local agricultural use; and
- Be integrated into other water storage projects and storage reservoirs to provide greater statewide benefits.

1.3 Non-Federal Sponsors

Through the formation of **a Joint Powers Authority (JPA)**, IRWD and Rosedale will partner to implement the Kern Fan Project. **An agreement between Rosedale and IRWD creating the Groundwater Banking Authority (a Joint Powers Authority) to develop and implement the Project was approved by both the Boards of Directors of Rosedale and IRWD and was executed on April 8, 2020.** IRWD and Rosedale share a ten-year history of implementing successful water banking projects in Kern County. The Project concept, sizing, location, features and operations are based on the experience and knowledge gained from IRWD's and Rosedale's existing water banking projects.

1.3.1 Rosedale Rio-Bravo Water Storage District

Rosedale was established in 1959 as an independent special district to develop a groundwater recharge program to offset overdraft conditions in the regional Kern County aquifer area. Located west of Bakersfield, the Rosedale service area encompasses 44,150 acres in Kern County, with 27,500 acres developed as irrigated agricultural use and about 7,500 acres developed for urban uses. Rosedale's service area overlies the Kern Sub-unit of the Tulare Lake Groundwater Basin. For the benefit of its landowners, Rosedale developed a Groundwater Storage, Banking, Exchange, Extraction & Conjunctive Use Program (Conjunctive Use Program) and manages more than 470,000 acre-feet (AF) of stored groundwater in the basin, with a total storage capacity in excess of 1.7 million AF. (ESA, Rosedale Environmental Compliance Summary, 2011). Rosedale is a member unit of the Kern County Water Agency (KCWA), which is a State Water Project (SWP) Contractor.

1.3.2 Irvine Ranch Water District

IRWD was established in 1961 as a California Water District pursuant to the California Water District Law (California Water Code, Division 13). IRWD provides potable and recycled water, sewage collection and treatment, and urban runoff treatment to Municipal and Industrial (M&I) and agricultural customers within its 181 square mile service area in Orange County, California. Since 2007, IRWD has diversified its water supply reliability by developing water banking projects in Kern County. IRWD entered into a long-term water banking partnership with Rosedale to operate IRWD's Strand Ranch and Stockdale West water banking projects. IRWD can store water in the underlying groundwater basin and recover portions of the stored water to supply its demands during critical drought conditions or water supply interruptions. Recovered water is conveyed to IRWD's service area via existing canals, the California Aqueduct, and Metropolitan Water District of Southern California (MWD) facilities. IRWD receives imported water through the Municipal Water District of Orange County (MWDOC), a member agency of MWD. MWD is the SWP Contractor for IRWD's service area. In total, IRWD has developed 126,000 AF of storage capacity, 63,600 AF of recharge capacity, and 35,100 AF of recovery capacity.

IRWD is a landowner in the Dudley Ridge Water District (DRWD), a SWP Contractor, and has the rights to the use of State Water Project Table A water. IRWD and DRWD have successfully implemented unbalanced exchange programs, with the approval of MWD and the California

Department of Water Resources (DWR) that facilitates the use of portions of this water in IRWD's service area for dry year reliability.

1.4 Problems, Needs, and Opportunities

The purpose of the Project is to capture and recharge water that would otherwise be lost to the ocean during wet year conditions, and then to extract the stored water when needed to provide ecosystem, emergency supply and water supply benefits. Groundwater storage projects coordinate the management of surface water and groundwater resources to maximize the availability and reliability of water supplies.

The SWP, which was initiated in the late 1950s, is a water storage and delivery system of reservoirs, aqueducts and pumping plants that span over 700 miles. The system provides water to over 26 million Californians through the SWP Contractors. The SWP Contractors are made up of 29 public agencies and local water districts that have long-term water supply contracts with the DWR. The water supply contracts set forth a maximum amount of SWP water a SWP Contractor may request, called Table A. Due to varying hydrologic conditions each year the DWR sets an allocation that designates a percentage of the SWP Contractors' Table A amounts that they can request. During years when water supplies exceed SWP Contractors' Table A requests, the surplus water becomes available as Article 21 water. The DWR informs SWP Contractors of Article 21 availability and receives their Article 21 requests. If the amount of Article 21 water exceeds the Contractors' requests, the Article 21 water becomes unallocated.

Due to California's highly variable hydrology, during wet years there are surplus supplies in excess of demands and storage capacities that are oftentimes lost to the ocean. During dry years and extreme drought conditions there are insufficient surface water supplies to meet demands. To improve reliability of water supplies, additional storage is needed to coordinate with the SWP system to maximize the management of water supplies in the State. In addition, many stresses exist within the Delta, a critical link in the State's water supply, which also contains important ecosystems for endangered and threatened species. The Delta contains vulnerable levees, which could collapse in the event of a major earthquake and cause saltwater from the ocean to contaminate the freshwater in the Delta, and therefore impact a critical source of water supply for up to 26 million people. Given these problems, there is a need for additional groundwater recharge, storage, and recovery capacity in the Kern Fan area.

The Kern Fan Project is a unique ground water banking project that will provide up to 100,000 AF of groundwater storage in Kern County to capture and store wet year water supply sources for substantial water supply and ecosystem benefits. Approximately 25 percent of the stored unallocated Article 21 SWP water in the Project would be held as SWP system water that would be later called on to be used for ecosystem benefits for improving habitat for fish in the Feather and Sacramento Rivers and Delta. The remaining 75 percent of the stored water would be used for emergency water and agricultural and M&I water supply reliability. The Kern Fan Project addresses several problems and needs within California's water system.

In addition to the Article 21 water that will be available to the Project, IRWD and Rosedale anticipate that they will be able to secure other water supplies for the Project from exchange and

transfer programs. These programs will substantially augment the water supplies available for recharge at the Project. The Project benefits established in this Feasibility Study do not consider the availability of these other supplies and are therefore considered to be understated.

Table 1-1 shows the beneficiaries, location of benefits and a description of the benefits from the Kern Fan Project.

Table 1-1 : Location and Description of Project Benefits

Beneficiary	Location of Benefits	Description of Project Benefit(s)
Environment	Delta, Sacramento River, and Feather River	• Reduces demands on the Delta by recovering stored groundwater to supply local demands in lieu of exporting water from the Delta; • Provides ecosystem benefits in dry and critical years by releasing pulses of water from Lake Oroville for Delta outflow; • Decreases water exported from the Delta and increases river flows during critical periods to support fish spawning; and • Provides an emergency supply in the event of a levee failure in the Delta.
Environment	Kern County	Provides temporary wetlands (recharge basins) that attract water birds
Rosedale	Kern County	• Provides greater operational flexibility by utilizing contingency groundwater storage to augment supplies during periods when other water sources may be limited or unavailable (emergency response – extended drought); • Provides a firm water supply for the preservation of permanent agricultural crops; and • Provides increased groundwater levels.
IRWD	Orange County	Augments M&I supplies to IRWD during periods when other supply sources may be limited or unavailable (emergency response – extended drought).
DRWD	Kings County	Augments agricultural supplies during periods when other supply sources may be limited or unavailable (emergency response – extended drought).

To provide the ecosystem benefits in the Delta, the unallocated Article 21 water would be stored and managed so that during critical years short term pulse flows would be released and exchanged for the water previously stored by the project. Figure 1-1 shows a schematic of how the project would be operated using exchanges that would result in the stored unallocated Article 21 water being available by exchange to provide ecosystem benefits in the Delta. The California Department of Water Resources (DWR) has informed IRWD and Rosedale that the exchanges would be feasible.

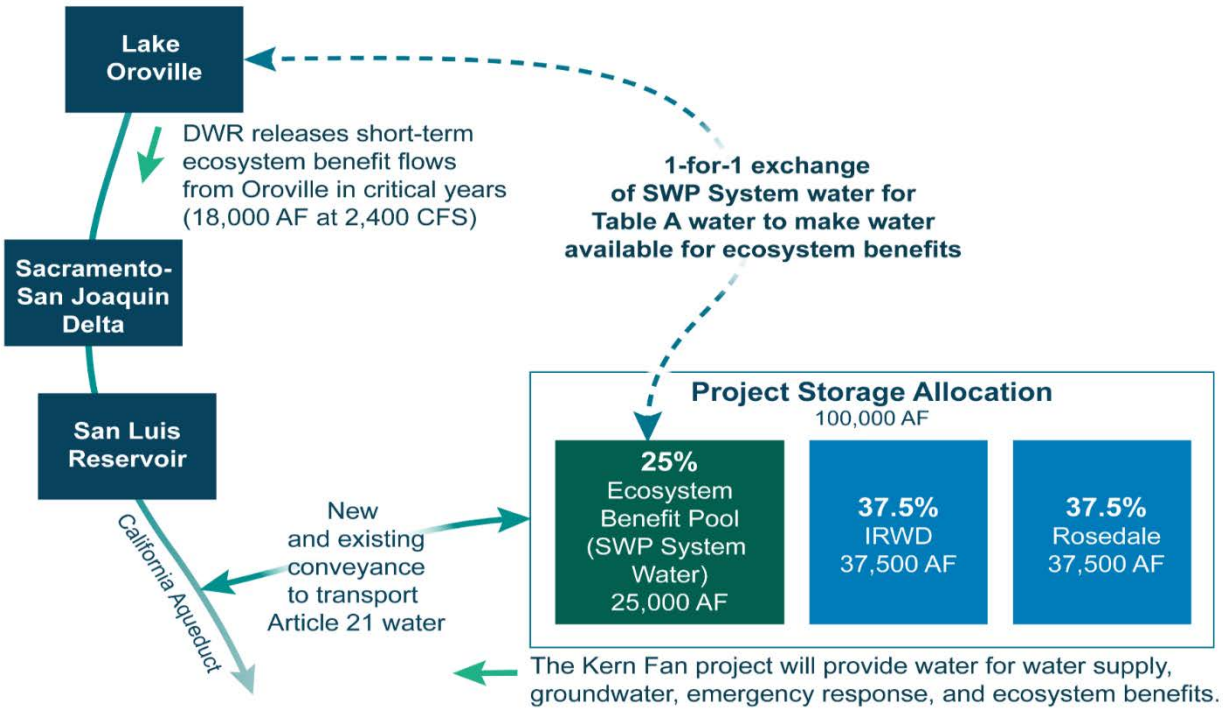


Figure 1-1 : Exchange Operations to Produce Ecosystem Benefits

1.4.1 Water Supply Benefits

The Kern Fan Project will provide improved reliability and redundancy in supplies for Rosedale, IRWD and DRWD and their program partners.

1.4.1.1 Water Supply Benefits to Kern County

The Kern Fan Project would provide substantial water supply benefits to Kern County from the Article 21 water available to the Project, including emergency water supply during Delta levee failure events, emergency water supply for drought, in addition to intermittent wetland habitat, agricultural water supply, and groundwater level benefits. In addition to the Article 21 water that will be available to the Project, IRWD and Rosedale anticipate that they will be able to secure other water supplies for the Project from exchange and transfer programs. These programs will substantially augment the water supplies available for recharge at the Project. The Project benefits established in this Feasibility Study do not consider the availability of these other supplies and are therefore considered to be understated.

The Project is estimated to generate an average annual water supply benefit for Rosedale. An additional agricultural benefit from the Kern Fan Project would be the preservation of permanent agricultural crops that either would need to be replaced with low-value crops, or the land could be permanently fallowed, if the water from the Project were not available. Without the Kern Fan Project, Rosedale estimates that about 600 acres of permanent planted crops in its service area would have to be planted in lower value crops (such as alfalfa or cotton) or fallowed in order to meet the requirements of California's Sustainable Groundwater Management Act (SGMA).

Permanent crops cannot be fallowed during dry years, so the probable alternative is to switch to row crops, which could be fallowed. The water supplies that would be stored by the project will help to firm up Rosedale's overall water supplies and allow up to 600 acres of permanent crops to stay in production.

The additional water stored in Kern County as a result of the proposed project will benefit water levels in the Kern County Sub basin and help support groundwater sustainability. The groundwater basin in Kern County is operated such that a portion of banked groundwater is not recovered by the banking entity and remains in the ground to bolster local groundwater levels. A model analysis was completed to quantify the potential groundwater level benefits from the project. The analysis provided in Appendix I shows the project would result in measurable increases in groundwater elevations and therefore a groundwater level benefit.

1.4.1.2 Water Supply Benefits to IRWD and DRWD

Water stored in the IRWD account, as shown in Figure 1-1 above, will provide a water supply benefit to both IRWD and DRWD during times of reduced water supply. As presented in Figure 1-2, the Article 21 water stored in the Project for IRWD (a landowner in DRWD) would be exchanged for SWP Table A water on a 1-for-1 basis to IRWD. Under the terms of an unbalanced exchange, 50% of this water would be returned to DRWD and 50% recovered for use in IRWD's service area via existing canals, the California Aqueduct, and MWD facilities. IRWD would receive water reliability benefits for M&I uses and DRWD would receive water reliability benefits for agricultural uses. IRWD would also be able to store non-SWP water supplies as available for additional water reliability benefits.

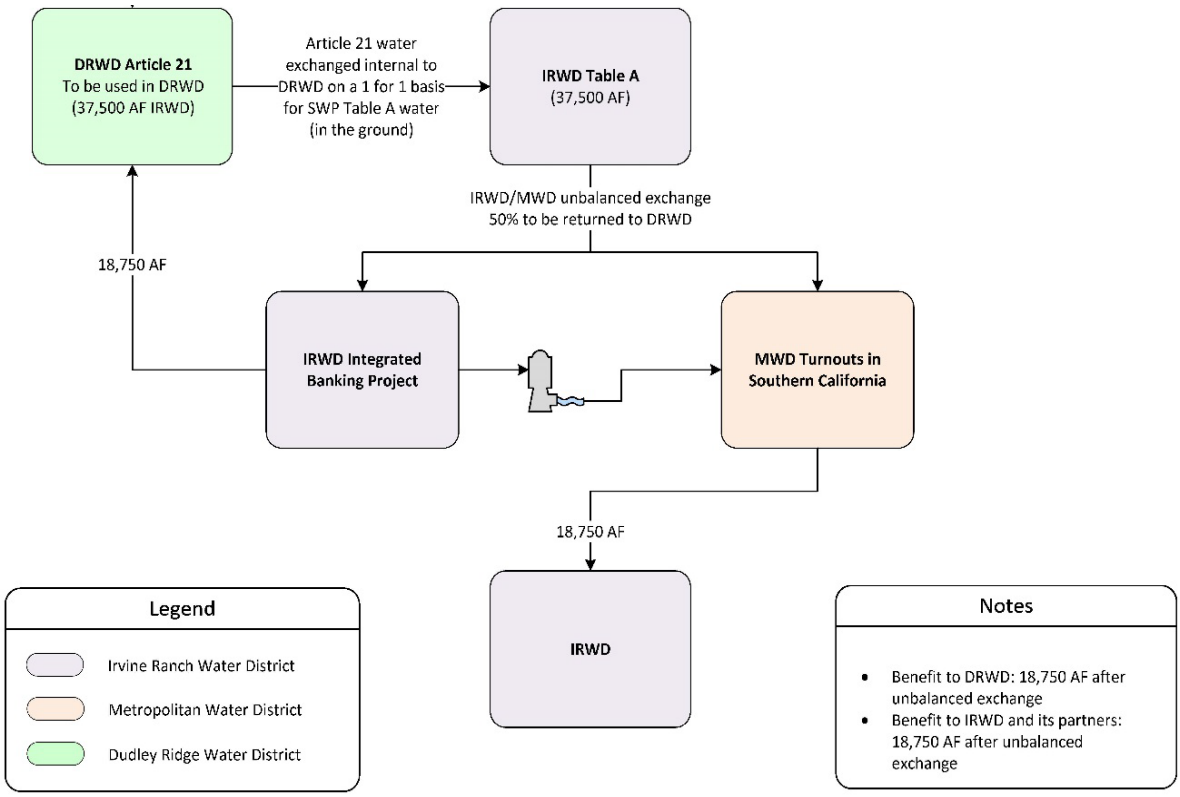


Figure 1-2 : Diagram Depicting Joint Benefits to IRWD and DRWD

1.4.2 Ecosystem Benefits

Approximately 25 percent of the unallocated SWP Article 21 water (up to 25,000 AF) stored by the Project would be held as SWP system water that would be used for ecosystem benefits for improving habitat for fish in the Feather and Sacramento Rivers and Delta downstream from the Lake Oroville. To provide the ecosystem benefits in the Delta, the unallocated Article 21 water would be stored and managed so that during critical years short term pulse flows would be released from Lake Oroville and exchanged for the water previously stored by the project as shown in figure 1-1. The pulse flows would be coordinated through the DWR. The water would be available for use by DWR through 1-for-1 exchanges to provide short-term ecosystem pulse flows to generate ecosystem benefits. This provides flexibility to DWR by making water available for instream flows when needed in dry and critical dry years. Analysis completed shows the pulse flows provided by the Project provide specific benefits for the Chinook spring run salmon, steelhead trout and green sturgeon, all of which are federally protected species.

The Kern Fan Project will also provide intermittent wetland habitat along the recharge basins where marsh-like environments are established during recharge periods and create ideal habitat for waterfowl, shorebirds, raptors, and other native and migrating birds. These conditions will exist whenever recharge activity occurs on the Project sites.

The intermittent wetland habitat provided by the Project will be approximately 1,200 acres in size, which is the area of the recharge ponds. Water will be typically recharged at the Project sites during the winter months and will provide temporary habitat during wet, above normal, and normal water years when recharge activity occurs.

1.4.3 Emergency Water Supply Benefits

A major benefit of the Project is that it will provide a supplemental emergency water supply to IRWD, Rosedale, and DRWD in the event of extreme drought, when other water resources are at their most expensive or may be limited. Water stored as part of the project will be available to call on during a drought emergency, or as an alternative supply in the case of a local supply outage. Water used for emergency response purposes will be physically extracted from the Project utilizing the project recovery wells, which will be available when needed during a multi-year drought. The Project recovery wells will have sufficient capacity to recover this emergency response drought water.

A separate emergency response benefit of the Project is the water supply that the Project could provide in the event of a levee failure in the Delta that curtails water project deliveries. The Kern Fan Project will dedicate water supplies in storage that can be made available following any major event that would impact the operations in the Delta including a Delta levee failure. Similar to the drought emergency supply, the Project can provide emergency water in the event of a Delta failure by storing water south of the Delta that can be extracted and made available after a failure event. The Kern Fan Project can provide a supplemental water supply south of the Delta that can meet a portion of water demands.

1.4.4 Other Project Benefits

The Kern Fan Groundwater Storage Project offers opportunities to further improve the operation of the State water system through the integration of operations with other projects funded through the Water Storage Investment Program. For example, participants of the proposed Sites Reservoir, another state-led storage project, could be offered the opportunity to store water in the Kern Fan Project under mutually beneficial terms to help increase the yield of Sites Reservoir and the Kern Fan Project. Such integration efforts could improve the yield of the State water system, improve water supply reliability, reduce competition for water supplies during dry periods and reduce stresses on ecosystems.

The Project will further provide additional operating flexibility for Rosedale's Conjunctive Use Program and future programs. It will be a critical element of IRWD's water supply reliability portfolio.

1.5 Study Area

As shown in Figure 1-3, the proposed Kern Fan Groundwater Storage Project would be located in western Kern County, about six miles west of the City of Bakersfield. The Project site would overlie the Kern Sub-unit of the Tulare Lake Groundwater Basin. Portions of the Kern County Sub-basin, known as the Kern Fan area, are characterized by geologic conditions that are particularly suitable for groundwater recharge operations.

Figure 1-3 : Location of Kern Fan Groundwater Storage Project

The soils in the Kern Fan area are highly permeable and underground storage space has a storage potential of up to 40 million AF (DWR, 2006).

Kern County is also strategically located in central California near federal, state, and local water supply conveyance facilities.

Because of favorable conditions for groundwater banking, several ground water banking projects operate within the Kern Fan region.

The Kern Fan Project would be constructed in two phases. The Phase 1 and Phase 2 project sites would be comprised of 640 acres each and would include construction of conveyance, recharge and recovery facilities as necessary to develop a fully functioning water banking project. The total Project would include approximately 1,200 acres of spreading basins with associated pipelines to convey water to and from the Project sites. Water will be conveyed from the California Aqueduct to and from the Project via a newly proposed turnout at the California Aqueduct and a new conveyance canal or pipeline with up to 500 cfs conveyance capacity. Figure 1-4 shows a preliminary site layout of the project.

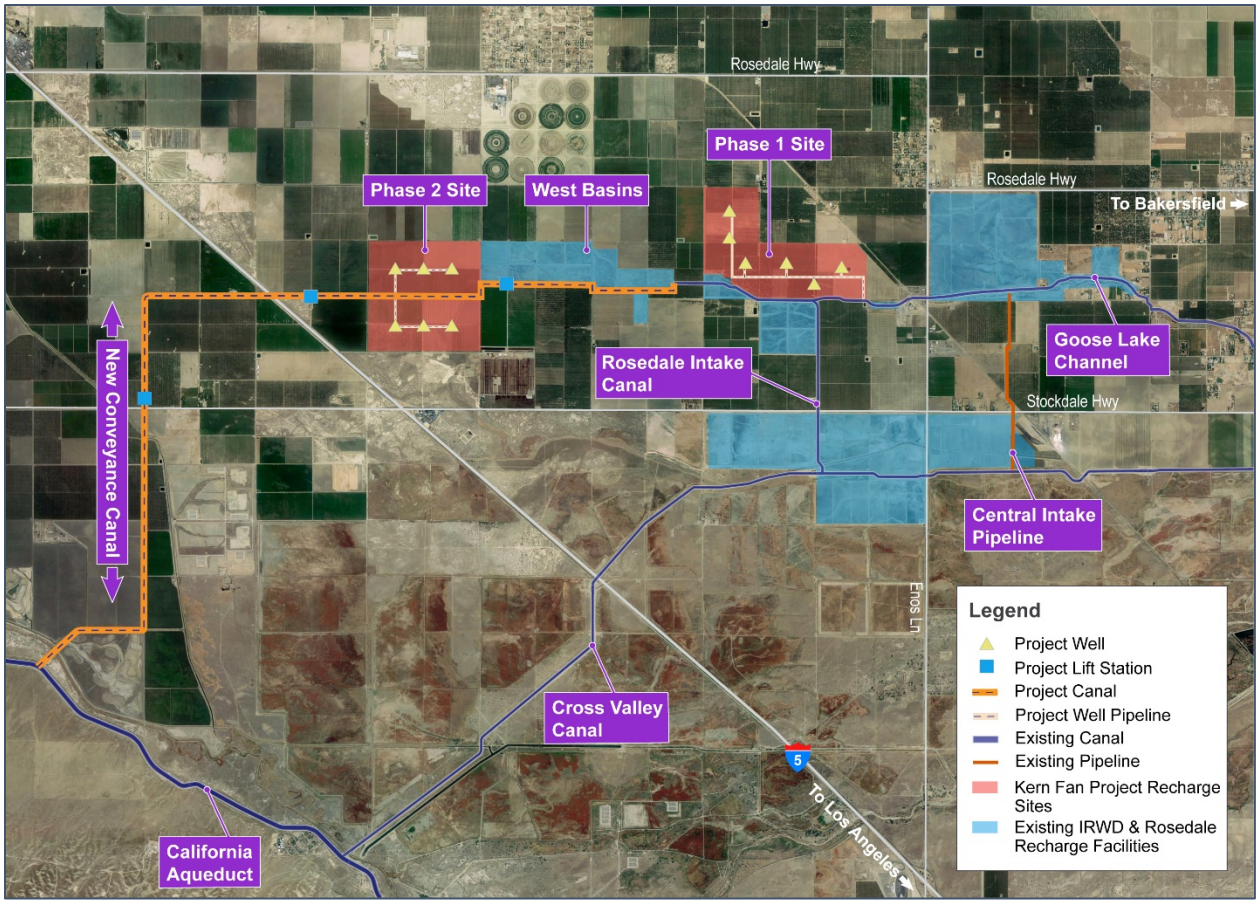


Figure 1-4 : Preliminary Location of Kern Fan Groundwater Storage Project Facilities (Updated)

It is expected that a total of up to 12 recovery wells will be constructed, each with an approximate capacity of 5 to 6 cfs to extract the stored groundwater as needed. The wells are expected to be 20 inches in diameter, cased to a depth upwards of 900 feet below ground surface. The wells will be equipped with vertical turbine pumps, 400 horsepower motors, discharge piping, electrical and controls, other appurtenances, and site improvements. A conveyance pipeline ranging in size from 10 to 36 inches would collect extracted water from the recovery wells and return it to the California Aqueduct, Goose Lake **Channel**, or to the Cross Valley Canal (CVC) via the Rosedale Intake Canal.

The total storage capacity to be developed from the Project is expected to be 100,000 AF. The Project would be operated such that in wet years, IRWD and Rosedale would take delivery of surplus unallocated SWP Article 21 supplies and other water supplies to store in the Project. IRWD and Rosedale would equally share 75 percent of the water delivered into storage for water supply benefits. 25 percent of the stored unallocated Article 21 water, up to 25,000 AF, will be held as SWP system water that would be used for ecosystem benefit purposes.

1.6 Related Studies, Projects, and Programs

Studies have been prepared to document the operation of the Project and confirm how it will achieve the goal of improving water supply reliability and water use in the Delta. In 2017, the Association of California Water Agencies (ACWA) completed a Storage Integration Study (June 2017). ACWA undertook this study to define and quantify the benefits of integrating the operations of new storage projects with the existing SWP and the Federal Central Valley Project (CVP). The study also analyzed how improved Delta conveyance capability could increase the benefits of integrated operations of proposed and existing storage facilities to help fulfill statewide water supply needs and priorities. ACWA found that significant surplus water was available in most years, which could be stored for later use during water short years. ACWA identified the Kern Fan Groundwater Storage Project, as proposed by Rosedale and IRWD, as a way to improve water supply reliability and operational flexibility of the SWP and CVP systems during periods of drought. By integrating the operation of SWP and CVP surface reservoirs with ground water banking projects in the Kern River Fan, water supply reliability could be improved at a minimum cost. The re-regulation of SWP and CVP supplies through the implementation of creative groundwater banking and exchange programs in partnership with agencies and districts in the Kern Fan area would allow SWP and CVP contractors to increase dry year yields while providing local water supply benefits to the Kern Fan area (ACWA, June 2017).

Chapter 2 : Water Resources and Related Conditions

This section provides an evaluation of the existing water resources and how these conditions may change in the future. Defining the existing and likely future conditions is pertinent in establishing the basis for comparing potential alternative plans. The following describes existing and likely future conditions in the study area identified during programmatic environmental review of Phase 1 of the Kern Fan Groundwater Storage Project. This environmental review was conducted as part of the Stockdale Integrated Banking Project Environmental Impact Report, where Phase 1 was included as a future third site. The Stockdale Integrated Banking Project Final EIR is provided as Appendix B. These resources will be more thoroughly analyzed in the CEQA and NEPA environmental review of the project.

2.1 Existing Conditions

2.1.1 Physical Infrastructure

The DWR delivers water to 29 SWP Contractors, including 21 contractors south of the Delta. The California Aqueduct is a primary part of the SWP and carries water from the Delta to the San Joaquin Valley and Southern California. SWP Contractors can order water up to their Table A amounts under a given allocation set by DWR based on hydrologic conditions. Rosedale currently receives SWP water for its Conjunctive Use Program through a water supply contract with KCWA, one of the SWP Contractors. IRWD currently receives SWP water through a water supply contract with DRWD associated with its property in DRWD, a SWP Contractor. During wet hydrologic years, DWR may declare Article 21 water available, which is uncontrolled water that cannot be stored in State reservoirs. Article 21 supplies are available usually in short duration, and, if conveyance capacity exists, can be purchased, diverted, and stored for future use. Rosedale and/or IRWD could divert and purchase excess Article 21 water and other supplies through its SWP Contractor for delivery to existing project recharge facilities using the existing CVC or the proposed Project facilities when such water and conveyance capacity is available. Under certain contracts and/or guidelines, DWR allows for the exchange of stored water on an even or unbalanced basis. Unbalanced exchanges are permissible by DWR on an unbalanced ratio of two-for-one, such that in return for storage the original water contractor leaves behind up to half of the water stored. SWP water available for exchange could be acquired for the proposed Project. The banking of water through the execution of even or unbalanced exchanges or other transactions approved by DWR requires the cooperation and agreement of the exchange State Water Contractor, DWR, KCWA, DRWD and MWD.

Water acquired by IRWD for delivery to its service area would be made from the proposed Project facilities or its existing Strand Ranch or Stockdale West projects to the CVC to the California Aqueduct. The delivery would be subject to supply and conveyance capacity availability and approval by MWD and KCWA.

The project proposes to construct a 500 cubic feet per second (cfs) turnout structure within Pool 28 or Reach 2 E of the California Aqueduct. Currently, there are two CVC Turnouts, capable of delivering up to 1,500 cfs, located within this reach of the aqueduct. Additional physical

infrastructure within the project study area includes Rosedale's recharge and recovery facilities as part of its Conjunctive Use Program including the Gooselake **Channel** conveyance and other water conveyances facilities that enable Rosedale to take delivery of SWP, Central Valley Project (CVP), and Kern River water supplies. IRWD's Strand Ranch and Stockdale West Ranch recharge basins, pipelines and recovery facilities are integrated within Rosedale's Conjunctive Use program.

2.1.2 Physical Environment

The study area is within the southern San Joaquin Valley in Kern County near the cities of Bakersfield, Wasco, McFarland, and Shafter. The San Joaquin Valley, along with the Sacramento Valley to the north, makes up the greater California Central Valley, which is a large, flat valley that dominates the central portion of the state. The San Joaquin Valley is bounded by the Sierra Nevada to the east, the Tehachapi Mountains to the south, the Coast Range to the west, and the Sacramento Valley to the north. As described in the Stockdale Integrated Banking Project Final Environmental Impact Report (EIR), the study area is within a rural area of western Kern County with surrounding land uses primarily consisting of agriculture, roadside commercial zones, and low-density rural residential communities. The Stockdale Integrated Banking Project Final EIR is provided as Appendix B.

According to the Kern County Fire Department Office of Emergency Services, the Project area is not in an area with a shallow water table and is+ not likely to be susceptible to liquefaction. Erosion problems in Kern County are prevalent on steep slopes, alluvial fans, earthquake fault zones, and urban drainage systems (KCFD, 2012). In general, the project sites do not contain steep slopes or alluvial fan soils and are not located near an earthquake fault zone. The Project sites would be located near urban drainage systems and contain soils with a moderate to slight potential for erosion. Therefore, the Project sites could be susceptible to wind erosion. A recent assessment determined that total subsidence during 2007 to 2011 was between 0.0 to 0.5 feet throughout the Central Valley, including the project area (Groundwater Voices Coalition, 2014). The Kern Fan Monitoring Committee uses extensometers to monitor subsidence in the Project area. Between 1994 and 2013, water surface elevation has increased by 0.7736 feet, based on the extensometer at State Well 30S/25E-16L005M just south of the project area (DWR South Central Region Office, 2013). This increase denotes swelling rather than subsidence in the project area.

The study area is underlain by dense sands at a depth of 24 to 44 feet of mostly well-drained soil with moderately rapid permeability. Based on the properties of these soils and their high permeability, all of the soils types in the study area have a very low surface runoff potential and therefore, are not highly susceptible to fluvial erosion.

The Kern Fan has been identified as an excellent resource for groundwater banking operations due to its significant storage capacity and highly permeable overlying materials. The aquifer has been estimated to range in thickness from approximately 700 to 1,100 feet thick with some thicker areas in the east. The total storage capacity of the Kern Sub-unit of the Tulare Lake Groundwater Basin has been estimated by the Kern County Water Agency to be 40 million AF,

covering an area of approximately 1 million acres. Of this, approximately 10 million acre-feet of storage is available (See Appendix B).

2.1.2.1 Water Quality

Surface waters used for recharge in Kern County are primarily from the Kern River, the SWP, or the federal Friant-Kern canal. The water quality of the surface water sources for groundwater banking is generally lower in constituent concentrations than that of the local groundwater, therefore with blending, groundwater quality would likely improve. The Stockdale Integrated EIR describes how introduction of surface water into the shallow zone will improve water quality as it has been shown to occur for IRWD's Strand Ranch project (See Appendix B).

As part of the requirements of the Clean Water Act, beneficial uses for surface waters must be identified in the Central Valley Regional Water Quality Control Board's (RWQCB) Water Quality Control Plan (Basin Plan). The project site is located within the Tulare Lake Basin where the Kern River has a number of beneficial uses identified including municipal supply, agricultural supply, industrial supply, industrial process, hydropower generation, contact and non-contact recreation; warm freshwater habitat; wildlife habitat; rare, threatened or endangered species; and groundwater recharge (RWQCB, 2004). Water quality management for the Kern River is based on these identified uses (See Appendix B).

The Basin Plan sets water quality objectives that are qualitative and quantitative in order to protect those uses. The water quality parameters for which numerical limits were selected from the sources listed above are: total alkalinity, total mercury, dissolved iron, dissolved copper, dissolved zinc, dissolved arsenic, dissolved lead, chloride, and ammonia. However, in some cases the natural background level of a particular constituent is higher than the beneficial use protective numerical limit. In such instances, the natural background level is considered to comply with the water quality objective (RWQCB, 2004). According to the requirements of the Clean Water Act, the Central Valley RWQCB has listed impaired water bodies due to elevated levels of contaminants. The Kern River is not listed as an impaired water body (RWQCB, 2010).

2.1.2.2 Groundwater Resources

The Kern River originates on the eastern side of Tulare County west of Mount Whitney in the high Sierra Nevada Mountains. As it flows south through the Sierra Nevada, it emerges at Kernville into a widening valley before entering Lake Isabella. Downstream from the Isabella Dam it flows southwest, through rugged canyons until emerging east of Bakersfield. Past Bakersfield, the river is highly diverted through a series of canals for agricultural and municipal water supply purposes. The Kern River Fan, referred to locally as the Kern Fan, covers an area of approximately 200 square miles and contains prolific subsurface water-bearing sedimentary deposits that make up the principal groundwater bearing units (See Appendix B).

Several hydrogeological studies have been performed in the Kern Fan area that analyzes the aquifer characteristics within the region. DWR developed a ground water model of the Kern Fan area in 1995 that describes the three-layer semi-confined aquifer condition generally accepted in the area. The highest specific yield measurements are associated with sediments of the Kern Fan

west of Bakersfield. The well-sorted, sandy sediments have higher specific yields than finer grained silts and clays. Groundwater flow has remained consistent toward the Northwest since the 1940s (see Appendix B). Specific yield is the ratio between the volume of water the aquifer will release from storage due to gravity drainage to the total volume of aquifer.

Because of the favorable conditions (e.g. large storage capacities and high permeable soils, etc.), numerous groundwater banking projects are operating in the Kern Fan region. Many of these surrounding water districts have entered into a Memorandum of Understanding (MOU) that provides measures to protect the groundwater basin from overdraft, impairing water quality, or otherwise adversely affecting the basin or adjacent entities. The MOU includes details regarding minimum operating criteria, groundwater banking accounting practices, project monitoring responsibilities, and dispute resolution procedures. In addition to the MOU, Rosedale has also developed the Long Term Operations Plan that implements the provisions of the MOU by designating specific measures to prevent, eliminate or mitigate significant adverse effects resulting from operation of the proposed project.

For the purposes of artificial recharge projects, groundwater storage capacity is defined as the theoretical amount of groundwater that can be stored in an aquifer through surface recharge by direct or in-lieu means. The available aquifer storage capacity at any given time is estimated as the difference between the total storage capacity and the existing volume of groundwater storage. Groundwater levels in the Kern Fan Area have been observed to fluctuate significantly over time as a result of recharge and recovery operations. Thus, the available aquifer storage capacity in this area increases during periods of low groundwater levels and decreases during periods of high groundwater levels. As mentioned above, the total storage capacity of the San Joaquin Valley Sub-basin has been estimated by the Kern County Water Agency to be 40 million AF within the Kern County portion of the sub-basin, covering an area of approximately 1 million acres. Of this, approximately 10 million acre-feet of storage is available (see Appendix B).

2.1.2.3 Air Quality

As described in the Stockdale Integrated Banking Project EIR, the Project area lies within the San Joaquin Valley Air Basin (SJVAB), a flat area bordered on the east by the Sierra Nevada Mountains; on the west by the Coast Ranges; and to the south by the Tehachapi Mountains. Airflow in the SJVAB is primarily influenced by marine air that enters through the Carquinez Straits where the San Joaquin-Sacramento Delta empties into the San Francisco Bay. The region's topographic features restrict air movement through and out of the basin. As a result, the SJVAB is highly susceptible to pollutant accumulation over time. Frequent transport of pollutants into the SJVAB from upwind sources also contributes to poor air quality. The SJVAB is currently designated by the U.S. Environmental Protection Agency as nonattainment for the ozone and fine particulate matter national and California ambient air quality standards, nonattainment for the inhalable particulate matter.

The SJVAB has an inland Mediterranean climate that is characterized by warm, dry summers and cooler winters. Summer high temperatures often exceed 100 degrees Fahrenheit (°F), averaging from the low 90s in the northern part of the valley to the high 90s in the south. The daily summer temperature variation can be as high as 30 degrees °F. Winters are for the most

part mild and humid. Average high temperatures during the winter are in the 50s, while the average daily low temperature is approximately 45 degrees °F. The vertical dispersion of air pollutants in the valley is limited by the presence of persistent temperature inversions. Air temperatures usually decrease with an increase in altitude.

2.1.2.4 Noise

Noise sources in rural areas are typically natural, including insects, birds, wind, and weather. Accordingly, existing ambient noise levels in rural areas such as the study area are low. The primary sources of noise in the rural agricultural areas are roadway traffic and farm machinery on a seasonal basis (See Appendix B).

2.1.3 Biological Resources

As described more thoroughly in the Stockdale Integrated Banking Project EIR, within the study area in Kern County there are three distinct plant communities found: developed agriculture, developed recharge basins, and non-native grassland. The majority of the parcels in the study area are agricultural land supporting orchards, row crops, and fallow land. Crops found within this vegetation community include cotton, alfalfa, onions, safflower, almonds, carrots, and grapes divided by dirt access roads.

The vegetation communities within the project site and immediate vicinity support a wide variety of resident, nesting, and migratory birds typical of the region and habitat types present. The study area also supports suitable foraging and hunting habitat for a number of raptors, including burrowing owl, red-tailed hawk (*Buteo jamaicensis*), and Swainson's hawk (*Buteo swainsoni*). Adjacent existing water banking areas, such as the Kern Water Bank (KWB) attract waterfowl and migratory birds.

Per the Kern Water Bank Authority's (KWBA) Conservation and Storage Project EIR, during wet years the KWB supports approximately 7,000 acres of aquatic or semiaquatic habitats (recharge ponds) along the Pacific Flyway and provides essential habitat for a high diversity of species and an abundance of wintering waterfowl. (KWBA Conservation and Storage Project EIR, 2018).

Recharge basins in Kern County have been shown to play a role in how water management provides value to native wildlife. Pictured here from the KWB's 2011-12 bird survey are an abundance of Great and Snowy egrets, White-faced ibis, American White Pelicans and Double-

crested Cormorants within a KWB recharge basin (Kern Water Bank Bird Survey Report: October – mid-April 2012).

Other wildlife species observed in the project area are typical for the region. Reptiles expected to be present include California kingsnake (*Lampropeltis getula californiae*), long-tailed brush lizard (*Urosaurus graciosus*), glossy snake (*Arizona* elegans), and western diamondback (*Crotalus* atrox). Mammals expected to be observed include, California ground squirrel (*Spermophilus beechyi*), desert cottontail (*Sylvilagus audubonii*), mule deer (*Odocoileus hemionus*), desert kit fox (*Vulpes macrotis*), Gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), round-tailed ground squirrel (*Spermophilus tereticaudus*), desert woodrat (*Neotoma lepida*), and other species of common mice and rats typical of the western Mojave Desert region. There is a potential for observance of San Joaquin kit fox (*Vulpes macrotis mutica*) in the study area.

2.1.3.1 Threatened, Endangered and Special-Status Species

Several species within the Delta have been listed as threatened or endangered under the Federal ESA or California ESA or are special-status species. Under the WSIP Technical Reference, the California Department of Fish and Wildlife (CDFW) documents its highest priority species that depend on the Delta and its tributaries for their survival. These species include winter-run, spring-run, fall-run, and late-fall run Chinook salmon; Central Valley steelhead and rainbow trout; green sturgeon; white sturgeon; Delta smelt; longfin smelt; Pacific lamprey; and Sacramento splittail.

In addition, aquatic, riparian, and wetland habitats that support migratory birds of the Pacific Flyway, neo-tropical migratory birds, and native reptiles, amphibians, mammals, and plants are also priorities for CDFW (CWC WSIP Technical Reference, CDFW, 2016).

2.1.4 Cultural Resources

The Stockdale Integrated Banking Project EIR contains detailed information on the cultural studies completed in the study area. Included in the study includes documentation of recorded prehistoric archaeological sites within the study area and archival records search. A field reconnaissance survey was completed. The location of the parcels for the Kern Fan Groundwater Storage Project recharge basins have not yet been determined but have been identified within the study area.

The records search indicated that a total of 23 cultural resources studies have been conducted within a 1-mile radius of the proposed area. Of these 23 studies, three included portions of the project area. Approximately 40% the project area appears to have been included in past cultural resources studies.

2.1.5 Land Use and Population

Land use near the Project area is dominated by agriculture and open space, but also includes groundwater recharge activities, mineral and petroleum extraction, industrial land uses, and

scattered rural residences. As described in the Stockdale Integrated Banking EIR, Kern County leads the state in grape, citrus, and milk production and other notable agricultural commodities such as almonds, pistachios, cotton, and cottonseed. Other important agricultural commodities for Kern County include carrots, hay/alfalfa, potatoes, cattle, tomatoes, roses, bell peppers, silage/forage, wheat, turf, eggs, apples, and cherries.

The majority of land within the radius of the project area is designated Intensive Agriculture by the Kern County General Plan and is zoned Exclusive Agriculture according to the Zoning Map of Kern County. The purpose of the Exclusive Agriculture District is to designate areas suitable for agricultural uses and prevent encroachment by and conversion of land to nonagricultural uses. Permitted Uses in the Exclusive Agriculture District include water storage and groundwater recharge facilities (County Zoning Ordinance, Section 19.12.020 (F)). Ground water storage projects are exempt from the County Zoning Ordinance per Government Code 53091, which states that the building and zoning ordinances "of a county or city shall not apply to the location or construction of facilities for the production, generation, storage, treatment, or transmission of water…by a local agency." Although agricultural land can be converted to groundwater banking facilities, agricultural land uses, such as annual farming, grazing, or fallowing, is allowed within recharge basins when not needed for water recharge or water management purposes.

Within Rosedale's service area, there are approximately 27,500 acres of irrigated agriculture, 4,100 acres of undeveloped lands, 7,500 acres of residential, commercial and industrial development. The areas not developed for typical land uses or undeveloped are mostly developed for water banking facilities, which include storage basin berms, water control structures, canals, groundwater wells, and power lines. The water banking areas total approximately 2,500 acres.

2.1.5.1 Population

Rosedale's overall service area consists predominately of rural agricultural land uses. However, its eastern portions are within the Metropolitan Bakersfield planning area and are experiencing development and population growth. The City of Bakersfield in coordination with Kern County prepared a General Plan in 2002 evaluating growth in the Bakersfield sphere of influence (SOI) (City of Bakersfield and Kern County, 2007). The proposed project boundaries are partially located within the designated City of Bakersfield SOI. Based on the Kern Council of Governments' most recently published Regional Transportation Plan, the Metropolitan Bakersfield Planning would have an estimated population growth of 59 percent by the year 2035. The population of the City of Bakersfield was 350,020 in 2010, approximately 65 percent of the Metropolitan Bakersfield Planning Area population of 533,461 (see Appendix B).

Population within IRWD's service area is projected to increase by approximately 6.5 percent by 2035, from about 420,000 today to approximately 447,000 in 2035. IRWD has more than adequate water supplies (existing and under development) to meet projected water demands to the year 2035. IRWD has invested in groundwater banking facilities as a means of offsetting existing supplies during periods when existing sources may be reduced or interrupted and as a cost effective means of managing contingency and drought planning needs. The banked supplies would not be capable of providing water every year and therefore could not support the

continuous demands associated with population growth. California's Urban Water Management Planning Act of 1993 requires water suppliers to identify sources of water to meet three-year drought scenarios. Water banking provides a future drought supply to augment IRWD's drought planning requirements.

2.2 Likely Future without Project Conditions Summary

This section describes the expected future conditions without the Project (No Project) and without additional developed groundwater recharge, recovery, and storage to address water supply reliability, ecosystem benefits in the Delta, temporary wetland habitat, emergency water supply, groundwater levels in Kern County and water supply for sustainable agriculture. Expected changes in conditions and the environment within the study area assuming that the project was not implemented are discussed.

2.2.1 Physical Environment

Physical conditions within the study area are anticipated to remain unchanged in the future. No changes to area topography, geology or soils are expected.

2.2.2 Biological and Cultural Resources

Biological conditions in the study area may be expected to change in the future as the population and urban growth continues in Kern County encroaching on the existing agricultural and fallowed lands, which could adversely affect wildlife.

Without any action to improve the water flow or quality in the Delta during dry and critical water shortages, the threatened or endangered species would be adversely impacted. Under a No Project condition, there would not be water stored in Oroville Reservoir available for a pulse flow release for ecosystem benefits to habitat and survival of the chinook salmon, steelhead trout and green sturgeon species.

Without additional recharge capacity constructed, intermittent wetland habitat along the Project recharge basins would not exist. As described by the KWBA, recharge ponds provide exceptional intermittent wetland habitat along the Pacific Flyway, benefiting thousands of water birds and water dependent upland birds and wildlife. These marsh-like environments established during recharge periods would not be available to create ideal habitat for waterfowl, shorebirds, raptors, and other native and migrating birds. If no additional intermittent wetlands were created, the benefits resulting from these wetlands would not be realized to the same extent as with the project. It is also likely that if the land is not preserved for groundwater banking uses that land uses would convert from agricultural use to housing and commercial development to support increases in population (see Land Use and Population below). This urban growth encroachment on agricultural and open lands could adversely affect wildlife.

Cultural resources within the study area are not expected to change in the future.

2.2.3 Land Use and Population

In order to support the expected population increases in Kern County, land uses likely would convert from agricultural to housing and commercial development. In addition, without additional water supplies, in order to meet the requirements under SGMA, acreage currently irrigated would need to be fallowed. Pursuant to Rosedale's draft of its chapter of the Groundwater Sustainability Plan for the Kern Groundwater Authority, Rosedale expects that in the future at least 2,000 acres of agricultural land will convert to urban uses. Rosedale also expects future water demands through the year 2070 may increase over time due to climate change affecting evapotranspiration. Without a sufficient water supply, Rosedale estimates that about 600 acres of permanent planted crops in its service area would have to be planted in lower value crops (such as alfalfa or cotton) or be fallowed in order to meet the sustainability requirements of the SGMA. Permanent crops cannot be fallowed during dry years, so the probable alternative is to switch to row crops, which can be fallowed during times of water shortage.

2.2.4 Groundwater Resources

Without access to additional recharge and recovery facilities, Rosedale would be limited to the recharge capacity of its existing recharge basins and forego the benefits of additional water and the increased groundwater levels from additional water in storage.

Under the No Project alternative, IRWD's water supply would be less reliable during periods when existing supplies may be reduced or interrupted. During periods of shortage of imported supplies for IRWD, demands in the IRWD service area would continue to be met with potentially less imported water. During periods of catastrophic supply interruption and multi-year drought conditions, IRWD would not benefit from the water supply diversification provided by the project. IRWD would be more vulnerable to water supply disruptions caused by drought or other catastrophic water supply interruptions to infrastructure failures, Delta water supply reductions, or reductions in other imported water deliveries it receives from MWD. Without the project, DRWD would not receive the agricultural water supply reliability and the emergency water supply benefits in its service area.

If the project were not implemented, the emergency water supply benefits during extended drought or Delta outage would not be available to IRWD and Rosedale. There would not be additional temporary wetlands over 1,200 acres in Kern County created for the benefit of waterfowl and migratory birds. The groundwater levels in the area of the project would not increase if the project were not implemented.

2.2.5 Climate Variability

Changes in climate conditions with global climate variability are expected to result in a wide variety of impacts in the state of California and the Central Valley. Uncertainties in future climates are primarily related to changes in temperature and precipitation. These changes will result in changes in runoff, snowpack and sea level rise that can affect water supplies and the

operations of the SWP. In addition, Rosedale expects future water demands through the year 2070 may increase over time due to climate change affecting evapotranspiration.

The IRWD and Rosedale Kern Fan Groundwater Storage Project application for CWC WSIP funding details the potential effects of uncertainties related to climate variability using the CalSim II model. CalSim II is a water operations planning model developed by DWR and Reclamation. It simulates the SWP and the CVP, and areas tributary to the Sacramento-San Joaquin Delta. MBK Engineers estimated the Project performance using the CalSim II model results that depict the without-Project (Baseline) scenario within a spreadsheet model. The operation of Project was then layered onto the baseline operation of the CalSim II results to simulate the with-Project scenario. Project benefits were then determined and quantified by comparison of the with-Project and without-Project scenarios. This model simulation is described as a without-project, 2030 and 2070 future conditions with projected climate and sea-level conditions for a thirty-year period centered at 2030. MBK Engineers performed the climate change analysis using the 2070 dataset that reflects future climate and sea level conditions for a 30-year period centered at year 2070. The results show that although the Project performance is reduced with 2070 climate conditions, they are similar to the 2030 baseline.

MBK Engineers Technical Memorandum provides additional detail on the analytical approach and is included in Appendix C.

Chapter 3 : Description of Project Alternatives

The non-Federal sponsors, IRWD and Rosedale, developed alternatives that address defined water resource challenges and achieve Reclamation's objectives. Per the ASP Handbook, the level of detail required to support alternative analyses may vary, but should be sufficient to inform the decision-making process efficiently and effectively. The level of detail, scope, and complexity of analyses should be commensurate with the scale, impacts, costs, scientific complexities, uncertainties, risk, and other aspects (e. g. public concern) inherent in potential decisions.

This chapter describes the No Action/No Project Alternative, also referred to as the No Action Alternative, an alternative involving participation in an existing water bank, and three alternative plans for the Kern Fan Groundwater Storage Project evaluated at the feasibility-level in this Feasibility Report. Appendix D includes the Project **30%** Design Report, which provides descriptions of the feasibility-level designs for these alternative plans. The three alternative plans are identified as:

- Kern Fan Groundwater Storage Project - Kern Water Bank Alignment Alternative
- Kern Fan Groundwater Storage Project - Buena Vista Alignment Alternative
- Kern Fan Groundwater Storage Project - Eastside Canal Alignment Alternative

3.1 No Action/No Project Alternative

The No Action/No Project Alternative would leave the current water banking facilities, operations, and programs for IRWD and Rosedale unchanged and would not provide new facilities for the additional recharge, storage, and recovery of groundwater. The No Project Alternative would result in a reduced ability to meet future Statewide and regional water management objectives by:

- Not providing additional enhancement to water supply reliability;
- Not releasing pulse flows benefitting spring and winter-run Chinook salmon, steelhead trout and green sturgeon;
- Not providing an additional water supply during drought conditions;
- Not providing an additional water supply for emergency response benefits;
- Not establishing temporary wetlands through intermittent recharge events that will attract migratory and other water fowl in Kern County;
- Not benefitting groundwater levels in the Kern County Groundwater Sub-basin;
- Not providing sustainable water supply for local agricultural use; and
- Not providing integration with other water storage projects and storage reservoirs to provide greater statewide benefits.

3.2 Existing Water Bank Alternative

The Existing Water Bank Alternative Plan would involve participation in the Willow Springs Water Bank (WSWB). WSWB is an existing facility located in the Antelope Valley in Southern California capable of storing 500,000 acre-feet of water underground. The WSWB is situated on highly permeable soils near three major water conveyance facilities (East Branch of the California Aqueduct, the Antelope Valley-East Kern (AVEK) West Feeder, and the Los Angeles Aqueduct) and offers water storage opportunities to both upstream and downstream water agencies.

As part of this alternative plan, IRWD and Rosedale would pay WSWB to buy into the developed capacities of the WSWB to store up to 100,000 AF of water. The water stored by IRWD and Rosedale could consist of a mix of unallocated Article 21 and non-Article 21 SWP water. Since the water would be stored in an existing water banking facility, only a portion of the benefits identified as part of the Kern Fan Groundwater Storage Project would be realized. Participation in the WSWB would not generate any new intermittent wetland benefits, agricultural benefits resulting from crop substitution or improved groundwater level benefits in the Kern Fan area of Kern County.

3.2.1 Operation

IRWD and Rosedale would acquire capacity in WSWB by initially purchasing shares of capacity where one share is equal to 5 AF of storage, 1/3 AF per year of recharge capacity, and 1 AF per year of recovery capacity. Based on the share structure of WSWB program, recharge and recovery capacity is the limiting constraint for moving water into and out of the project facility. To have similar recharge and recovery capacities as compared with the Kern Fan Groundwater Storage Project alternatives, IRWD and Rosedale would need to acquire approximately 227,000 shares from WSWB.

The WSWB Alternative would operate on a simple concept where IRWD and Rosedale would deliver Article 21 and other SWP water supplies via the California Aqueduct and an eight-mile diversion pipeline to the WSWB recharge basins. Water delivered to WSWB would need to be pumped to the turnouts on the East Branch of the California Aqueduct which adds substantial power costs to the delivered water. When the stored water is needed, it would be extracted through the WSWB wellfield and returned to the California Aqueduct for delivery. The water would be directly delivered to IRWD's service area through MWD, its SWP Contractor. There would need to be an exchange with another SWP Contractor in order for Rosedale and DRWD to receive their share of stored water within the respective service areas which are north of the WSWB on the SWP system.

3.2.2 Costs

Table 3-1 shows feasibility-level cost estimates for the Existing Water Bank Alternative Plan.

Table 3-1 : Existing Water Bank Alternative Plan Cost Estimates

	Existing Water Bank Participation
Buy-in Cost for 227,000 Shares	$341 million
Annual Operation and Maintenance Costs[1]	$7.43 million

Notes:
[1]O&M costs reflect an average annual put/take of 5,600 AFY associated with Article 21 and other SWP supplies.

The Annual O&M costs associated with the WSWB includes the additional cost of power to pump the available Article 21 and other SWP supplies to the project diversions off of the California Aqueduct. Several uncertainties exist with the WSWB Alternative including access to available capacity in the California Aqueduct beyond the Kern County Water Agency's (KCWA) service area. It is expected that additional approvals would be needed from DWR, KCWA, and the SWP Contractors in order to utilize conveyance capacity in the California Aqueduct, when available, to move this water to the WSWB. It is also uncertain whether there would be exchange capacity available during critically dry years through another SWP Contractor in order for Rosedale and DRWD to reasonably expect to receive stored water when needed.

The WSWB project also received conditional funding from the CWC under the WSIP Prop 1 program. WSWB provided its own uncertainty analysis for its overall program, a summary of which is provided in Appendix E. WSWB will need to obtain its own DWR approvals and contracts for the administration of WSIP public benefits including proposed pulse flows for ecosystem benefits in the Delta. Other institutional issues and agreements would be needed related to establishing a commitment by a SWP Contractor to WSWB in order to execute the necessary exchange of water to create the pulse flow for the ecosystem benefit in the Delta. To date, the WSWB has not identified a SWP contractor willing to act on its behalf.

3.3 Kern Fan Groundwater Storage Project – Kern Water Bank Alignment Alternative

The Kern Fan Project will include the construction of new conveyance, groundwater recharge, and groundwater recovery facilities. **As part of the updated Project design report included in Appendix D, three different conveyance alignments were evaluated for the project.** The general configuration of the groundwater recharge and recovery facilities will remain the same regardless of the conveyance alternative that is ultimately selected.

3.3.1 Groundwater Recharge and Recovery Facilities

The Kern Fan Project would be developed in two phases. The first phase would be to develop the proposed third project site as contemplated by IRWD and Rosedale in the Environmental Impact Report for the Stockdale Integrated Water Banking Project. The Stockdale Integrated Banking Project, approved in 2015, comprises IRWD's Stockdale West property and Rosedale's Stockdale East property and a proposed third site to be located within a specified boundary. Figure 3-1 shows the boundary radius within Rosedale's service area for the proposed third site in the Stockdale Integrated Banking Project.

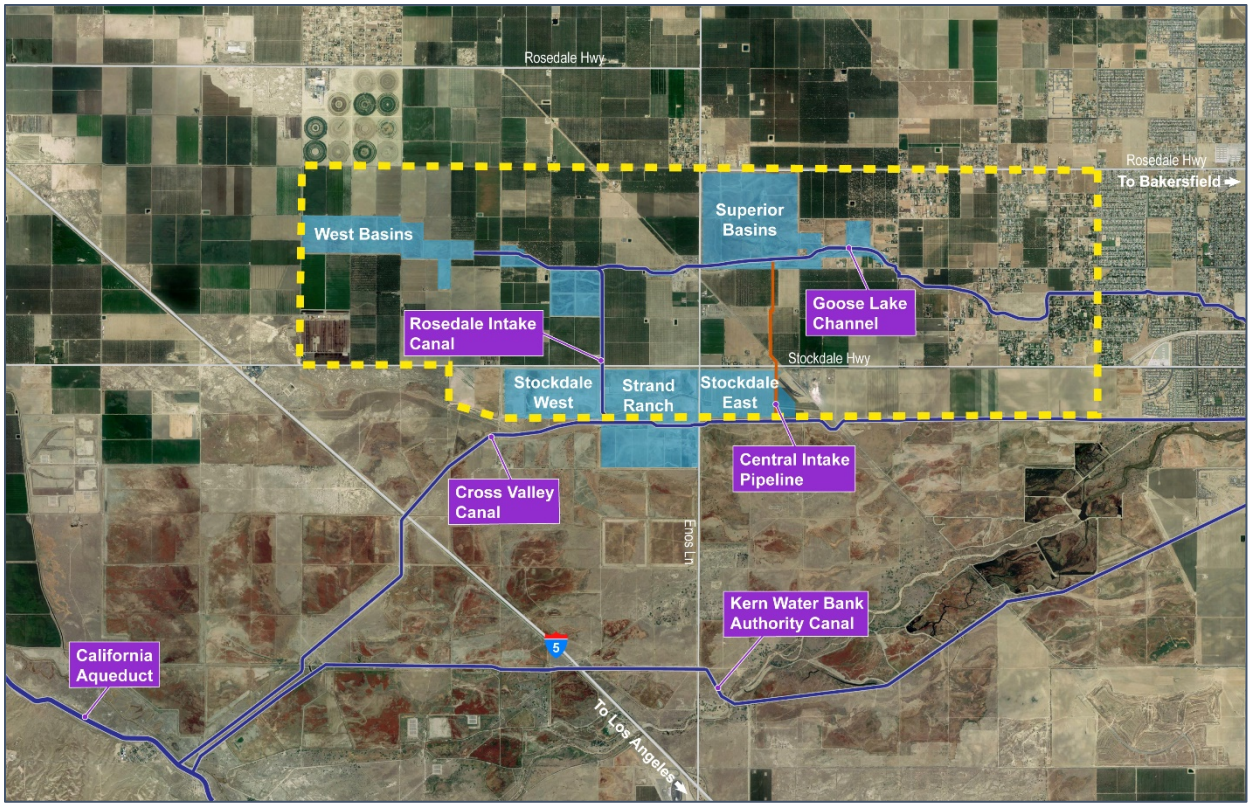


Figure 3-1 : Potential Location of Third Site (Phase 1 Project Site) in Stockdale EIR

The Kern Fan Project Phase 1 site will be located at a proposed 640-acre site within the additional Stockdale Integrated Banking Project site radius that is delineated in Figure 3-1. The Phase 2 site will be located at one or more non-contiguous properties that will comprise 640 acres within the Rosedale service area. For Phase 1 and Phase 2, IRWD and Rosedale will jointly acquire up to 1,280 acres in the Kern Fan area and will construct conveyance, recharge and recovery facilities as necessary to develop a fully functioning water banking project. The proposed project sites currently consist of agricultural land. The Project would include approximately 1,200 acres of spreading basins and up to 12 new extraction wells and associated pipelines. Water will be conveyed from the California Aqueduct to and from the sites via a newly proposed turnout at the California Aqueduct and a new conveyance canal with up to 500 cubic feet per second (cfs) conveyance capacity. **The California Aqueduct pools and check structures located in the vicinity of the Kern Fan Project are shown in Figure 3-2.**

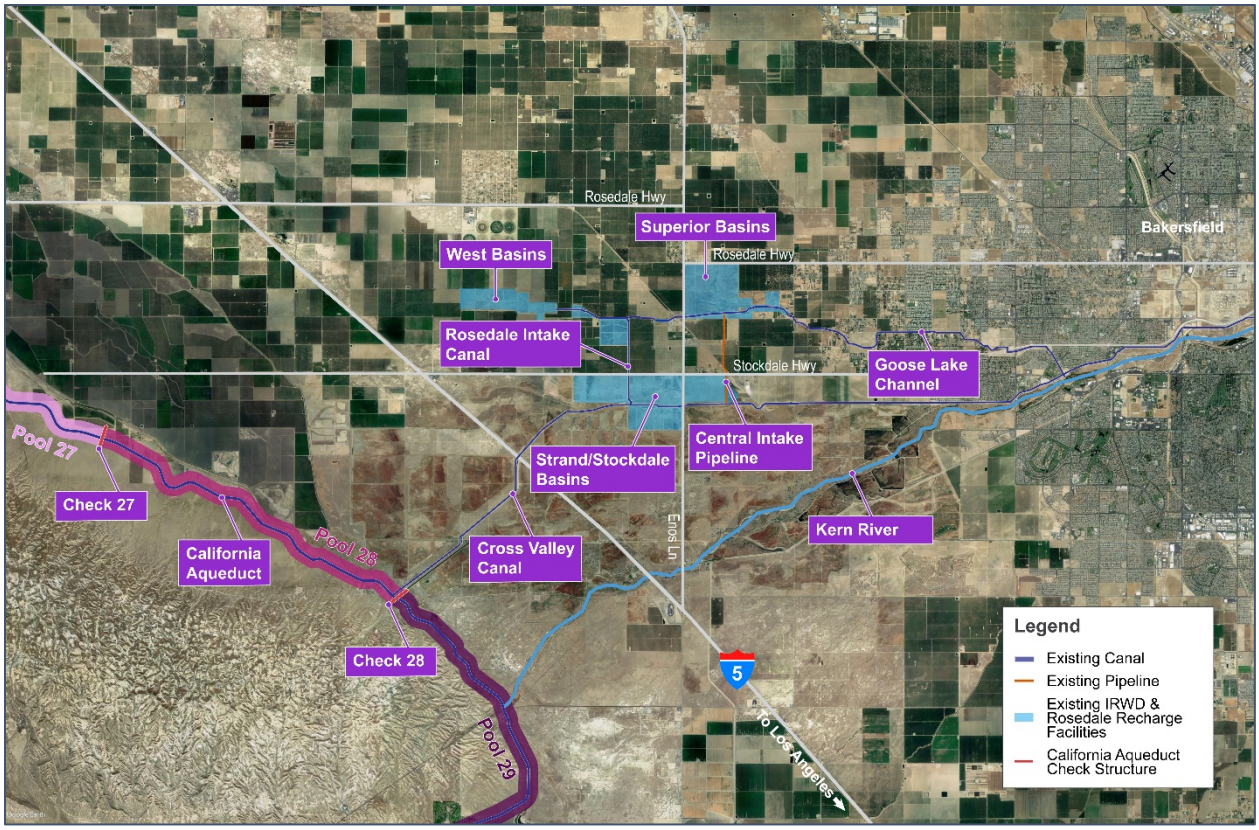


Figure 3-2 : California Aqueduct Pools in Vicinity of Kern Fan Project

In both Phase 1 and Phase 2 of the Project, six recovery wells will be constructed, each with an approximate capacity of 5 to 6 cfs to extract the stored groundwater as needed. The 12 wells would be 20-inches in diameter, cased to a depth of approximately 920 feet below ground surface. The wells would be equipped with vertical turbine pumps, 400 horsepower (hp) motors, discharge piping, appurtenances, electrical and controls, and site improvements. A conveyance pipeline ranging in size from 16- to 36-inches would collect extracted water from the recovery wells and return it to the California Aqueduct, Goose Lake **Channel** or to the CVC via the Rosedale Intake Canal.

3.3.2 Project Conveyance Alignment

The Kern Water Bank (KWB) Alignment alternative features an approximately 7.6 mile long conveyance canal alignment from the California Aqueduct to the Project recharge facilities across the Kern Water Bank Authority property as shown in **Figure 3-3**. The use of an open canal for the entire length of the conveyance facility will result in the need for two lift stations to be constructed. Each lift station would have a capacity of 500 cfs at an approximate total dynamic head of 20 feet. The Aqueduct turnout would be a reinforced concrete structure with a single eleven foot diameter pipe from the turnout structure discharging into an open canal. **The turnout would be located in Pool 28 or Reach 12E of the California Aqueduct just north of the existing Kern County Water Agency – Cross Valley Canal Turnout located at Milepost 238.04 and Check No. 28.** The conveyance canal cross section has been estimated as 20-ft wide

at the bottom with an 9-ft depth with 1.5:1 side slopes in the lined portions and 3:1 side slopes in the unlined portions. The canal will have an undercrossing at the KWB Main Canal and will utilize one 10-ft diameter siphon pipe. A 500 cfs, 1,800 hp lift station will be constructed near the I-5 freeway crossing. The crossing at the I-5 freeway will consist of one 10-ft diameter pipeline, which discharges into an open canal on the easterly side of the I-5 Freeway north of the KWB Pioneer Canal. The canal will have a siphon crossing at Stockdale Highway using one 10-ft diameter siphon pipe. The second lift station of similar size and capacity to the first lift station will be constructed near the southwest corner of the Rosedale West Basins. The final canal reach will deliver water to the east end of the Rosedale West Basins, the Goose Lake **Channel**, and the Phase 2 spreading basins.

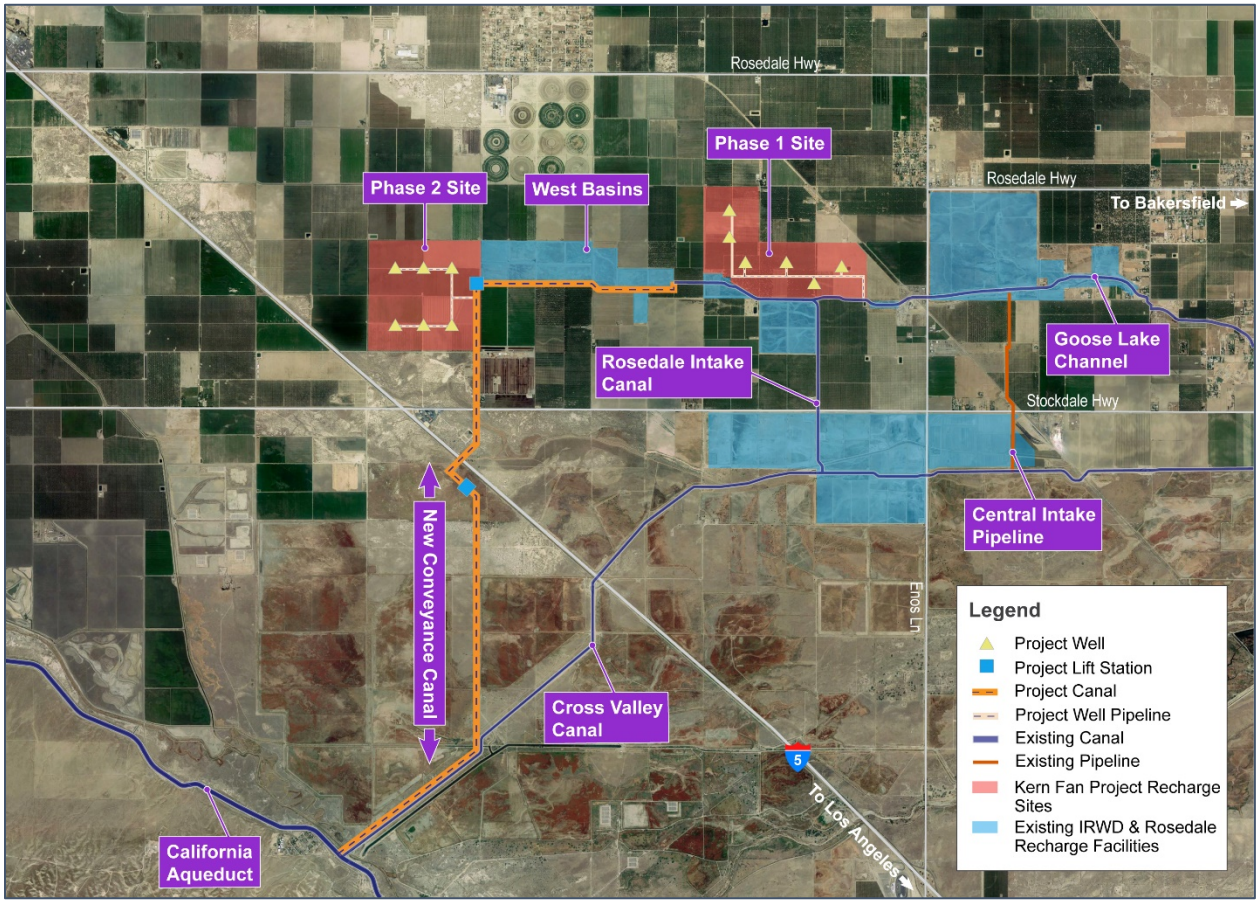


Figure 3-3 : Preliminary Location of Kern Fan Groundwater Storage Project Facilities with KWB Alignment (Updated)

The **30%** Design Report prepared for the project provides details of the Kern Water Bank and other conveyance alignments (See Appendix D).

3.3.3 Operation

Unallocated Article 21 and other sources of water will be delivered to the Project utilizing available capacity in the California Aqueduct to an existing or new turnout near the Cross Valley Canal. The turnout diversions would deliver water to a new 500 cfs pipeline or canal that would

be constructed as part of the Project and will provide dedicated conveyance capacity to move water from the California Aqueduct through multiple pump stations to the Project spreading basins. The canal would also facilitate the delivery by gravity of water recovered from Project wells back to the aqueduct. This new conveyance canal will convey water to approximately 1,200 acres of spreading basins. During droughts or times of need when available supplies are reduced, stored groundwater will be recovered from the Project via 12 new extraction wells, each with a capacity of 5 to 6 cfs, and conveyed to points of use in DRWD, IRWD and Rosedale's service areas. Some water recovered from the Project would be used within Rosedale's service area and some would be delivered through the new canal or the CVC to the California Aqueduct for delivery to IRWD or DRWD's service area. Water deliveries to DRWD would occur via operational exchange. Deliveries into IRWD's service area would be made through the extension of existing exchange agreements that IRWD has with DRWD and MWD respectively. Approximately 25 percent of the stored Article 21 water, up to 25,000 AF, would be held as SWP system water that would be used for ecosystem benefits purposes. This 25 percent of the water would be made available for ecosystem benefits through 1-for-1 exchanges shown in figure 1-1, which would be facilitated through a Coordinated Operating Agreement that would executed between the project sponsors and DWR. The Project offers exceptional flexibility to better manage available supplies, utilizing the groundwater basin as storage and existing infrastructure for conveyance of water, all of which supports improved operations of the State water system.

The Project will support sustainable water management and offer noteworthy, measurable ecosystem benefits. By storing unallocated Article 21 water when it is available, the Project will be operated to reduce diversions from the Delta during critical, dry years, and provide water for ecosystem pulse flows which will alleviate stress on the sensitive species in the Delta. The 25% share of the Article 21 water stored in Kern County will then be used by project sponsors in lieu of SWP water through the 1-for-1 exchanges described above. The Kern Fan Groundwater Storage Project Alternative Plan will offer opportunities to further improve the operation of the State water system through the integration of operations with other Federal and State projects. For example, Sites Reservoir participants could be offered the opportunity to store water in the Project under mutually beneficial terms that would increase the yield of Sites Reservoir and the Kern Fan Project. Such integration efforts could improve the yield of the State water system, improve water supply reliability, reduce competition for water supplies during dry periods and reduce stresses on ecosystems.

In addition to the Article 21 water that will be available to the Project, IRWD and Rosedale anticipate that they will be able to secure other water supplies for the Project from exchange and transfer programs. These programs will substantially augment the water supplies available for recharge at the Project. The Project benefits established in this Feasibility Study do not consider the availability of these other supplies and are therefore considered to be understated.

3.3.4 Costs

Table 3-2 shows 30% feasibility-level cost estimates for the Kern Fan Project – KWB Alignment Alternative Plan.

Table 3-2 : KWB Alignment Alternative Plan Cost Estimates (Updated)

	KWB Alignment Alternative
Total Project Construction Costs	$204 million
Annual Operation and Maintenance Costs	$1.59 million

3.4 Kern Fan Groundwater Storage Project – Buena Vista Alignment Alternative

The Buena Vista (BV) Alignment Alternative for the Kern Fan Project differs from the Kern Water Bank Alignment Alternative only in terms of the new conveyance constructed as part of the Project. Both the groundwater recharge and recovery facilities are expected to be materially the same. In addition, the overall operation of the project is expected to be similar regardless of the alignment that is ultimately selected. Due to the similarity to the other Project alignment alternatives, only an overall description of the alignment and Project costs will be presented in this section.

3.4.1 Project Conveyance Alignment

The BV Alignment Alternative for the Kern Fan Project involves constructing a 9.0-mile conveyance canal across BV Water Storage District property as shown in **Figure 3-4**. The use of an open canal for the entire length of the conveyance facility will result in the need for constructing three lift stations. Each lift station will have a capacity of 500 cfs at an approximate total dynamic head of 20-ft. A turnout from the California Aqueduct will be constructed with one eleven-foot diameter pipe from the turnout structure, crossing the DWR right-of-way and outlet canal, and then discharging into an open canal parallel to the BV West Side Canal. **The turnout would be located in Pool 28 or Reach 12E of the California Aqueduct just south of the existing Buena Vista – 8 Turnout located near Milepost 233.78.** The new lined canal cross section has been estimated as 20-ft wide at the bottom with an 8-ft depth and 1.5:1 side slopes. The canal will have an undercrossing at Adohr Road and the East Side Canal and will utilize one 10-ft diameter siphon pipe. A 500 cfs – 1,800 hp lift station will be constructed near the Stockdale Highway Crossing. The pipeline crossing Stockdale Highway is a 10-ft diameter pipeline, which discharges into an open canal on the northerly side of Stockdale Highway and then proceeds north and east towards the I-5 Freeway crossing. A 500 cfs – 1,800 hp lift station will be constructed near the I-5 Freeway crossing. The pipeline crossing the I-5 Freeway is a 10-ft diameter pipeline that discharges into the open canal on the easterly side of the I-5 Freeway. A third lift station of similar size and capacity to the first two lift stations will be constructed near the southwest corner of the Rosedale West Basins. The final canal reach delivers water to the east end of the Rosedale West Basins, Goose Lake **Channel**, and the Phase 2 recharge property.

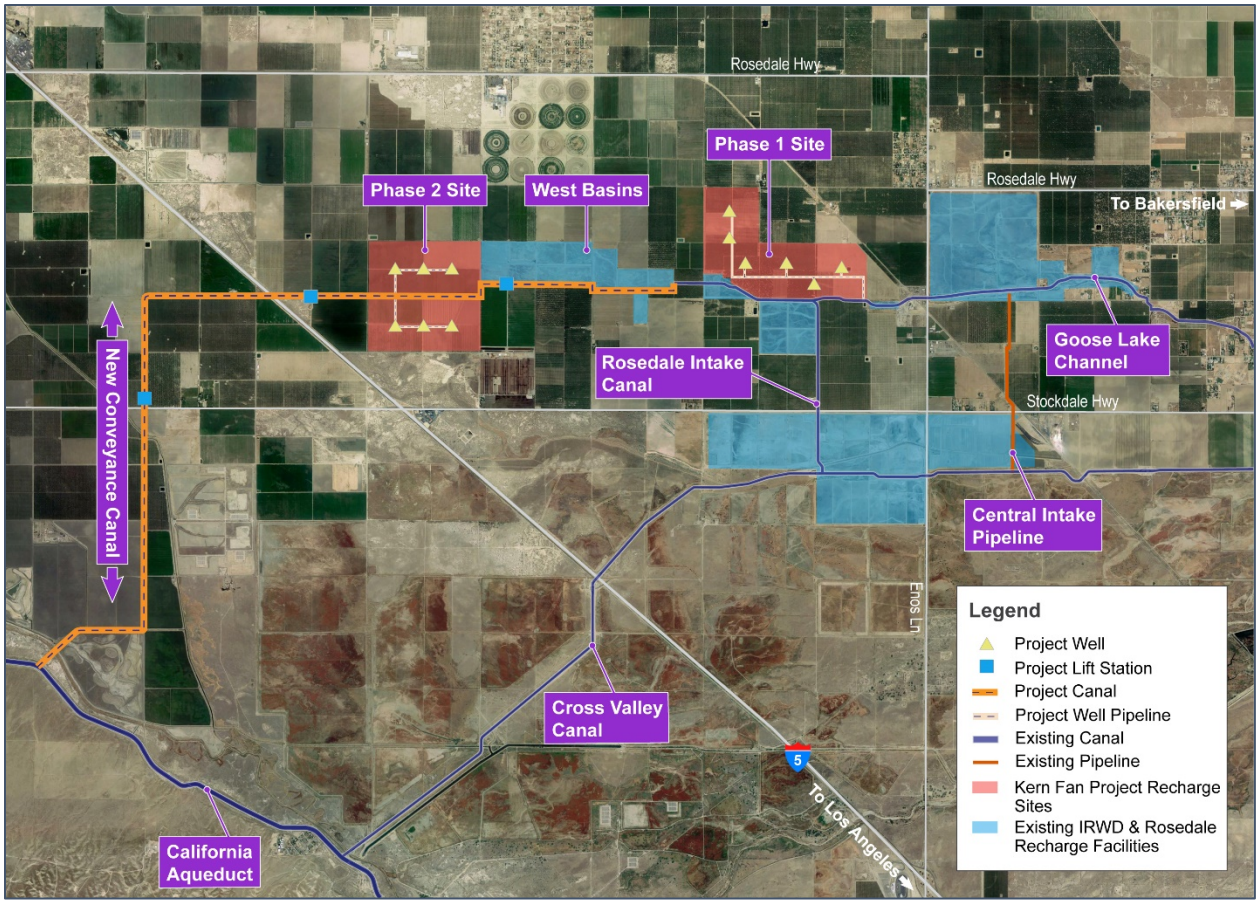


Figure 3-4: Preliminary Location of Kern Fan Groundwater Storage Project Facilities with BV Alignment (Updated)

3.4.2 Costs

Table 3-3 shows 30% feasibility-level cost estimates for the Kern Fan Project – BV Alignment Alternative Plan.

Table 3-3 : BV Alignment Alternative Plan Cost Estimates (Updated)

	BV Alignment Alternative
Total Project Construction Costs	$225 million
Annual Operation and Maintenance Costs	$1.86 million

3.5 Kern Fan Groundwater Storage Project – East Side Canal Alignment Alternative

The East Side Canal (ESC) Alignment Alternative for the Kern Fan Project differs from the KWB and BV Alignment Alternatives only in terms of the new conveyance constructed as part of the Project. Both the groundwater recharge and recovery facilities are expected to be materially the same. In addition, the overall operation of the project is expected to be similar regardless of the alignment that is ultimately selected. Due to the similarity to the other Project

alignment alternatives, only an overall description of the East Side Canal alignment and Project costs will be presented in this section.

3.5.1 Project Conveyance Alignment

The East Side Canal (ESC) Alignment Alternative for the Kern Fan Project involves the use of a 9.0-mile open canal for the entire length, with three lift stations constructed as shown in **Figure 3-5**. Each lift station will have a capacity of 500 cfs at an approximate total dynamic head of 20-ft. The ESC Alignment will make use of the existing West Side and East Side Canals. The turnout from the California Aqueduct is a reinforced concrete structure with one eleven-foot diameter pipe extending from the structure, crossing the outlet canal, and then discharging into the West Side Canal. **The turnout would be located in Pool 28 or Reach 12E of the California Aqueduct just north of the existing Buena Vista – 2 Turnout located near Milepost 235.75.** The West Side Canal will be widened to the south approximately 30-ft and will then feed into the East Side Canal. The East Side Canal will be widened approximately 30-ft to the southwest of Station Road and then widened approximately 30-ft to the northeast of Station Road. A 500 cfs – 1,800 hp lift station will be constructed near the Stockdale Highway crossing. The crossing will consist of a 10-ft diameter pipeline that discharges into an open canal on the northerly side of Stockdale Highway, then proceeding north and east towards the I-5 Freeway crossing. A 500 cfs – 1,800 hp lift station will be constructed near the I-5 Freeway crossing. The pipeline crossing the I-5 Freeway is a 10-ft diameter pipeline that discharges into an open canal on the easterly side of the I-5 Freeway. The third lift station of similar size and capacity to the first two lift stations will be constructed near the southwest corner of the Rosedale West Basins. The final canal reach delivers water to the east end of the Rosedale West Basins, the Goose Lake **Channel**, and the Phase 2 property.

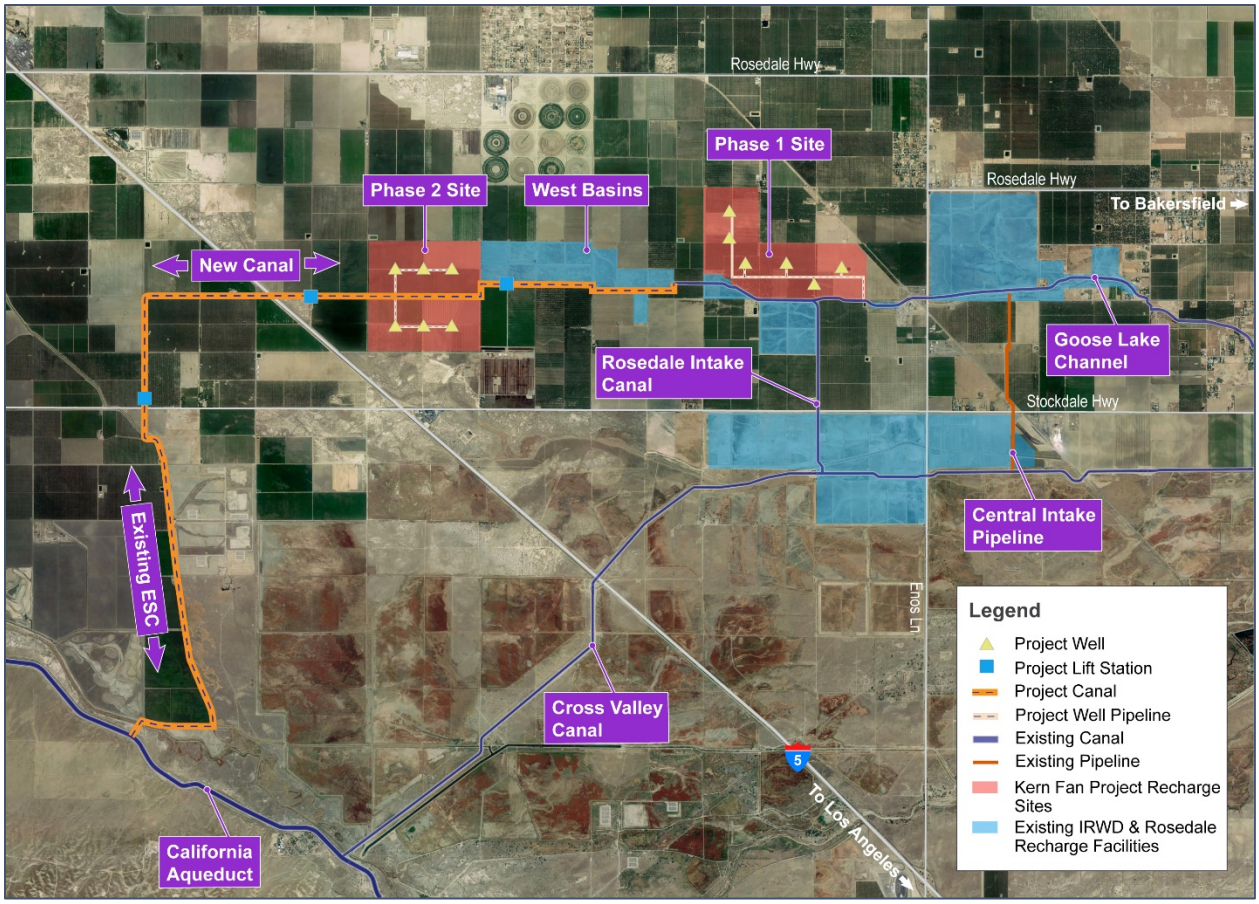


Figure 3-5 : Preliminary Location of Kern Fan Groundwater Storage Project Facilities with ESC Alignment (Updated)

3.5.2 Costs

Table 3-4 shows 30% feasibility-level cost estimates for the Kern Fan Project – ESC Alignment Alternative Plan.

Table 3-4 : ESC Alignment Alternative Plan Cost Estimates (Updated)

	ESC Alignment Alternative
Total Project Construction Costs	$217 million
Annual Operation and Maintenance Costs	$1.82 million

Chapter 4 : Plan Evaluation and Comparison

A critically important element of Federal planning is the evaluation and comparison of alternative plans. This chapter presents the results of this evaluation and a comparison of the No Action/No Project Alternative (No Action Alternative) and the three alternative plans for the Kern Fan Project described in Chapter 3. This chapter also documents the consistency of the alternative plans with other water management programs and regulations. The IG provides guidance on methods to evaluate how benefits of alternatives compared to their costs. Per the ASP Handbook, the level of detail, scope and complexity of analysis is commensurate with the scale, impacts, costs, complexities, uncertainties and risk. The Recommended Plan is identified which provides the maximum net public benefits.

4.1 Alternative Plan Evaluation

Under the feasibility planning process, several alternatives were developed and analyses made. In order to achieve the project objectives, the project sponsors considered participation in an existing water banking project, implementation of a separate water banking program as well as the various project alignments for this alternative, and the No Action Alternative. The sponsors found no nonstructural alternative available that can effectively address the problems and needs identified in Section 1.4.

This Chapter presents the cost of each alternative compared to the value of the benefits. The economic analyses of the alternative plans are consistent with the ASP Handbook and the effects of the alternative plans are shown in terms of public costs and benefits. An evaluation of alternatives under the ongoing CEQA and NEPA process will be completed as part of the alternatives analysis, which will further describe, evaluate, and compare the No Action Alternative and Action Alternatives.

All alternatives were compared utilizing the expected storage accounts associated with the Project. The Project was modeled with an expected storage capacity of 100,000 AF. This storage capacity was allocated into three accounts or groups of Project beneficiaries as follows:

- 25,000 AF to Ecosystem beneficiaries in the Delta
- 37,500 AF to IRWD and DRWD
- 37,500 AF to Rosedale and KCWA

4.1.1 M&I Water Supply Benefits

The incremental change in annual M&I water supply under the alternatives relative to the No Action Alternative is the basis for M&I water supply benefits. The hydrologic modeling results from MBK Engineers (detailed in Appendix C) provide the quantity of water available under the alternatives. The alternative plans would provide additional water to reduce shortages, which is an economic benefit. Table 4-1 shows the average annual incremental differences in water quantity delivered for M&I uses under the alternative plans. In addition, as part of the hydrologic

modeling effort for the Kern Fan Project alternative plans, MBK Engineers conducted an uncertainty analysis on the effects of climate change that reflects future climate and sea level conditions in the year 2070. This information is also presented in Appendix C. For the Existing Water Bank Participation Alternative Plan, a similar analysis was done to assess the WSWB's response to an uncertain future. This information is included in Appendix E.

All of the Kern Fan Project alternatives presented in Chapter 3, as well as the Existing Water Bank Alternative would result in a net increase of M&I water supply due to increased capability to capture and store surplus Article 21 water, as well as non-Article 21 sources such as SWP Table A, Kern River high flow, Kern River flood flows, and Friant Section 215. A caveat with the Existing Water Bank Alternative is that there may be SWP capacity limitations during high flow periods, which may result in a reduced yield of additional M&I supply. Under the No Action Alternative, there are no additional groundwater storage facilities created to capture this surplus water.

Table 4-1 : Additional Water Available for M&I Uses for Each Alternative Plan

Alternative Plan	Average Annual Additional Water Deliveries Relative to No Action Alternative (TAF)
Existing Water Bank Participation[1]	5.6
Kern Fan Project – KWB Alignment	5.6
Kern Fan Project – BV Alignment	5.6
Kern Fan Project – ESC Alignment	5.6

Notes: [1]The average annual M&I yield for the Existing Water Bank Alternative was assumed to be equivalent to the Kern Fan Project. There may be potential SWP capacity limitations south of the KCWA service area during high flow periods, which may result in a reduced yield of additional M&I supply.

To quantify the benefits to M&I water users, M.Cubed performed an analysis utilizing an alternative cost approach to estimate the water supply benefits of the project. This analysis is provided in Appendix F. The water supply from the project is divided between agricultural (75%) and M&I uses (25%), which face different alternative costs of water. While the analysis was performed specifically for the Kern Fan Project alternatives, it is conservatively assumed that the Existing Water Bank Participation alternative plan would yield similar water supply amounts.

For M&I uses by IRWD, the alternative supply cost is the Tier 1 untreated rate from the Metropolitan Water District of Southern California (MWD), which was $676 per AF in 2015. This rate was escalated over time using MWD's forecast of Tier 1 prices as found in their Ten-Year Financial Forecast provided at a February 9, 2016 MWD Board Meeting. According to the forecast of Full Service Untreated Tier 1 water, prices are projected to increase by an average of 5.6% from 2016 to 2026. Over the same period, average CPI inflation is projected to be 2.3%, resulting in an average real price increase of 3.3%. This rate of increase was applied to the MWD Tier 1 rates over the life of the project. Conveyance costs in the SWP were applied using data provided by DRWD, which includes monthly conveyance costs from 2001 to 2017. Conveyance costs average $18.67 per AF in 2018 dollars.

Table 4-2 presents the estimated annual M&I water supply benefits for each alternative plan based on the water supplies delivered and the water unit values. The values represent benefits

that are expected to begin in 2026 and are presented in 2018 dollars. Benefits are based on water supplies presented in Table 4-1.

Table 4-2 : Annual M&I Water Supply Benefits of Alternatives

Alternative Plan	M&I Water Supply Annual Benefits (million $)
Existing Water Bank Participation	2.09
Kern Fan Project – KWB Alignment	2.09
Kern Fan Project – BV Alignment	2.09
Kern Fan Project – ESC Alignment	2.09

4.1.2 Groundwater Benefits

The three Kern Fan Project alternatives would provide local groundwater benefits based on a 2003 Memorandum of Understanding (MOU) between Rosedale and other adjacent water banking entities in Kern County. Per the MOU, a portion of banked groundwater is not recovered by the banking entity and remains in the ground to bolster local groundwater levels. This analysis of benefits to groundwater levels incorporates methods and assumptions used by M.Cubed during the WSIP evaluation. The analysis performed by M.Cubed is included in Appendix F.

For the three Kern Fan Project alternatives, groundwater basin leave-behind percentages vary depending on the water supply account – 9% of water in the M&I account and 4% of water in the agricultural account will be left behind to help recharge local basins, according to groundwater modeling assumptions used by MBK Engineers. These percentages are also consistent with the MOU. For the ecosystem account, an average of these two rates, or 6.5%, was applied. Based on these values, a weighted average leave-behind rate of 6.6% in 2030 conditions and 6.5% in 2070 conditions was utilized to calculate the total groundwater level benefit.

For evaluating groundwater benefits from the project alternative plans, the alternative cost of recharging groundwater was considered to be the cost of purchasing water through a water market, likely north of the Delta. Average costs for purchasing Delta export water on the water market were based on unit values developed by the CWC in the WSIP Technical Reference. These unit values were developed from a statistical analysis based on water transfer prices from 1992 to 2015, the Statewide Agricultural Production Model (SWAP), and assumptions regarding groundwater sustainability requirements in the state by 2045. These unit values were developed for various water year types (wet, above normal, below normal, dry, and critical) for 2030 and 2045, the year it is assumed that groundwater basins will reach sustainable levels. Delta export costs used for the analysis were weighted according to historic water year type frequency according to the San Joaquin River Water Year Index to arrive at benchmark values for 2030 and 2045. SWP conveyance costs were also added to Delta Export costs.

For the Existing Water Bank Alternative Plan, groundwater recharge occurs in the Antelope Valley Groundwater Basin, where the Willow Springs Water Bank is located. Based on the 2018 annual report by the Antelope Valley Watermaster, WSWB participants are required to leave behind ten percent of all water deposited into the water bank to keep the bank viable. Using an analysis approach similar to that for the three Kern Fan Project alternative plan alignments, the economic value and volume of water left behind on an average annual basis was determined.

Table 4-3 shows the average annual incremental differences in groundwater left in the basin under the action alternatives when compared to the No Action alternative.

Table 4-3 : Groundwater Left Behind for Benefit of Groundwater Basin Under Each Alternative

Alternative Plan	Average Annual Groundwater Left Behind Relative to No Action Alternative (TAF)
Existing Water Bank Participation	0.9
Kern Fan Project – KWB Alignment	0.6
Kern Fan Project – BV Alignment	0.6
Kern Fan Project – ESC Alignment	0.6

Table 4-4 shows the estimated economic benefits for groundwater recharge under 2030 future conditions.

Table 4-4 : Annual Benefits of Groundwater Recharge Under 2030 Conditions

Alternative Plan	Annual Groundwater Benefits (million $)
Existing Water Bank Participation	0.52
Kern Fan Project – KWB Alignment	0.37
Kern Fan Project – BV Alignment	0.37
Kern Fan Project – ESC Alignment	0.37

4.1.3 Agricultural Water Supply Benefits

The incremental change in annual agricultural water supply under the alternatives relative to the No Action Alternative is the basis for agricultural water supply benefits. The hydrologic model results from MBK Engineers provide the quantity of water available under the No Action and action alternatives.

Table 4-5 shows the average annual incremental differences related to the No Action Alternative water quantity delivered for agricultural uses under action alternatives. All of the alternatives are expected to increase agricultural water supplies. There is uncertainty related to the Existing Water Bank Participation Alternative in that it is unclear whether there would be exchange capacity available during critically dry years through another SWP Contractor in order for Rosedale and DRWD to reasonably expect to receive stored water when needed.

Table 4-5 : Additional Water for Agricultural Uses for Each Alternative

Alternative Plan	Average Annual Additional Water Quantity Relative to No Action Alternative (TAF)
Existing Water Bank Participation	4.2
Kern Fan Project – KWB Alignment	4.2
Kern Fan Project – BV Alignment	4.2
Kern Fan Project – ESC Alignment	4.2

The alternative cost approach described for the M&I water supply benefits is applied to estimate the benefits of improved agricultural water supply. Delta export unit values are provided for the 2030 and 2045 years, which are re-weighted according to the water year types during which IRWD and Rosedale are expected to recover stored groundwater based on hydrologic modeling by MBK Engineers. Since IRWD and Rosedale are projected to accrue water supplies in different water year types (with Rosedale drawing on their supplies mainly in dry and critically dry years) two different water values are required – one weighted for IRWD's supply and one weighted for Rosedale's supply. These weights are available for the 2030 and 2070 conditions based on MBK's analysis. Therefore, water cost anchor points were used for 2030, 2045, and 2070 – 2030 unit values weighted at 2030 recovery levels, 2045 unit values weighted at 2030 recovery levels, and 2045 unit values weighted at 2070 recovery levels. Unit values for 2026 to 2075 were determined by interpolating between these unit values. The full range of unit values range from $345/AF for IRWD and $353/AF for Rosedale in 2030 to $917/AF for IRWD and $944/AF for Rosedale in 2045, adjusted to 2018 dollars. Conveyance costs in SWP were also applied using data provided by DRWD, which includes monthly conveyance costs from 2001 to 2017. Conveyance costs average $18.67/AF in 2018 dollars. For the Existing Water Bank Participation, due to the location of the site off of the California Aqueduct, the conveyance cost in the SWP includes the additional cost of power to pump available Article 21 and other SWP supplies to the project diversions. Several uncertainties exist with the WSWB Alternative including access to available capacity in the California Aqueduct beyond the Kern County Water Agency's (KCWA) service area. It is expected that additional approvals would be needed from DWR, KCWA, and the SWP Contractors in order to utilize conveyance capacity in the California Aqueduct, when available, to move this water to the WSWB.

Table 4-6 provides a summary of the estimated annual benefits for the alternatives.

Table 4-6 : Annual Benefits of Additional Agricultural Water Supplies for Each Alternative

Alternative Plan	Agricultural Water Supply Annual Benefits (million $)
Existing Water Bank Participation	3.17
Kern Fan Project – KWB Alignment	3.17
Kern Fan Project – BV Alignment	3.17
Kern Fan Project – ESC Alignment	3.17

4.1.4 Ecosystem Enhancement Benefits

The three Kern Fan Project alternative plans would be operated to provide water for ecosystem enhancement in the Feather and Sacramento Rivers, as well as intermittent wetland habitat in Kern County.

For the Existing Water Bank Participation alternative plan, it is uncertain whether there would be sufficient exchange capacity available during critically dry years through another SWP Contractor in order for Rosedale and DRWD to reasonably expect to receive stored water when needed. This exchange would be needed in order to provide the water in Lake Oroville for the pulse flow for the benefit of the ecosystem in the Delta. As described below, it is assumed that additional water purchases, if available, north of the Delta would need to be made to create

similar pulse flow benefits. In addition, because the Existing Water Bank Participation alternative already may include intermittent wetlands during recharge operations, there is no new wetland benefit created by this alternative.

4.1.4.1 Ecosystem Benefit – Fish Species Recovery

The three Kern Fan Project alignment alternative plans would be operated to improve habitat conditions for spring run Chinook, winter run Chinook, steelhead and green sturgeon originating from points upstream in the Sacramento River basin. The operations involve using approximately 25% of the unallocated Article 21 water stored in the Project to provide ecosystem benefits through 1-for-1 exchanges that would occur when the water is extracted from the ground (see Figure 1-1). The 1-for-1 exchanges would result in Table A water that is stored in Lake Oroville being reclassified as SWP system water and water that is being extracted from the ground being reclassified as Table A water. The Table A water would be used to meet DRWD and Rosedale SWP Table A demands either directly or through operational exchanges. The SWP system water left in Lake Oroville would then be used to provide short-term ecosystem pulse flows to generate ecosystem benefits by improving fish habitat in the Feather and Sacramento Rivers and the Delta. The magnitude and duration of the ecosystem pulses will be determined based on the volume of water available in the ecosystem account and expected fisheries benefit. The Project will target making ecosystem pulses in drier years when Lake Oroville will not be able to make flood control releases. The technical memo from MBK Engineers included as Appendix C describes in detail the modeling and impacts of the Project operations with the operations of Oroville and the San Luis Reservoirs.

Estimating the salmon recovery ecosystem benefit was based on two approaches, the willingness to pay approach, based on a per fish benefit value for two runs of Chinook salmon, and the alternative cost approach. The alternative cost approach is based on the cost of procuring a similar volume of water in dry and critical years for environmental flows. Ultimately, the alternative cost approach was selected for the final estimate of the salmon recovery ecosystem benefits. Detailed information on both approaches is included in the M.Cubed technical memo in Appendix F.

The alternative cost approach for estimating the ecosystem benefit relies on unit values for Sacramento Valley agriculture developed by the CWC in their WSIP Technical Reference as the alternative water source for environmental pulse flows, weighted by the years in which pulse flows would be available from the project. Unit values were derived in the same manner as for Delta Exports, described above in the section on agricultural water supply benefits, for the Sacramento Valley, which typically has more water resources available and therefore lower market prices.

To provide these flows in April and May of a Dry or Critically Dry year with a similar amount of certainty as the Kern Fan Storage Project would provide, an option agreement would need to be in place with suppliers in the Sacramento Valley. It is currently uncertain whether 18,000 acre-feet of water would be available for pulse flows in any given critically dry year. In addition, there is an issue of timing, since the water year type is not known with any certainty until March, but pulse flows would provide the greatest benefit in April or May. Meanwhile farmers in the

Sacramento Valley who would be making water available to transfer through fallowing would need to make their planting decisions in February and would incur losses if they make the decision to instead fallow land in the spring. Farmers would need to be compensated for this uncertainty in their planting decisions or would need to plant lower-value crops that require less initial investment. In fact, one of the main benefits of a storage project like the Kern Fan Project is that it provides certainty that water would be available for the environment in dry and critical years, and at any time in the spring when it would be most beneficial.

Information from several historical options contracts in the Sacramento Valley were used to estimate an appropriate option payment. This extra payment compensates farmers for any losses from initial planting. Since pulse flows provided by the three Kern Fan Project alternatives would be made available in April and May, this extension would be necessary to create an equal amount of certainty that flows would actually be available. The estimated option payment of $50.48 was applied to the full pulse flow volume for every year, independent of water year type, since it would have to be paid for the life of the project to deliver an equivalent benefit. Finally, Sacramento Valley unit values from the CWC Technical Reference were used, weighted for the hydrologic year types (dry and critical) when environmental pulses are expected to take place, as the actual cost of transferred water.

Table 4-7 presents the estimated annual salmon recovery ecosystem benefit for each alternative plan in 2018 dollars.

Table 4-7 : Annual Ecosystem Benefits for Each Alternative

Alternative Plan	Ecosystem Improvement – Fish Species Recovery Annual Benefits (million $)
Existing Water Bank Participation	0
Kern Fan Project – KWB Alignment	1.38
Kern Fan Project – BV Alignment	1.38
Kern Fan Project – ESC Alignment	1.38

4.1.4.2 Ecosystem Benefit – Intermittent Wetland Habitat

The three Kern Fan Project alignment alternative plans would provide intermittent wetland habitat for migratory birds during the years that the Kern Fan Project takes and recharges water into storage. During those years, the 1,280 acres that comprise the project will be inundated with water to percolate into the groundwater basin. The ponds will provide temporary habitat to migratory bird species along the Pacific Flyway. The Existing Water Bank Participation alternative plan uses previously constructed groundwater storage facilities and will not provide a new additional intermittent wetland benefit.

To estimate the benefits associated with the creation of intermittent wetland habitat, an alternative cost approach was utilized by M.Cubed, described in detail in Appendix F. Under this approach, it is assumed that IRWD would purchase the land to create an equivalent acreage of wetlands over a similar period of time as those created by the Kern Fan Project alternatives. To estimate the value of land required, the cost of a permanent easement for the wetlands and a long-term easement for constructing water conveyance facilities was determined. Costs were additionally estimated for a canal connection to the California Aqueduct, a conveyance canal to

the site, canal siphons, and lift stations in addition to significant earthwork and interbasin structures to keep water in the basins. Also included were costs of restoring the land to its pre-wetland condition at the end of the project, based on a subset of costs from the project budget. For this approach, since the alternative project would only take excess water in wet years, the Delta Export unit value for wet years provided in the WSIP Technical Reference was utilized, which ranges from $204 in 2030 to $414 in 2045. Conveyance costs were added in from the period from 2001 to 2017 – $17.10 per acre-foot. The annual benefit was estimated by interpolating between these values and leaving prices beyond 2045 at $414/AF to be conservative.

Table 4-8 presents the estimated annual intermittent wetlands ecosystem benefit for each alternative plan in 2018 dollars.

Table 4-8 : Annual Wetland Ecosystem Benefits for Each Alternative

Alternative Plan	Ecosystem Improvement – Intermittent Wetland Annual Benefits (million $)
Existing Water Bank Participation	0
Kern Fan Project – KWB Alignment	5.18
Kern Fan Project – BV Alignment	5.18
Kern Fan Project – ESC Alignment	5.18

4.1.5 Emergency Response Benefits

The alternative plans would provide storage for emergency response actions during Delta levee failure events and extended droughts. This analysis includes methods and assumptions from the WSIP evaluation that was refined during review with the CWC. The detailed analysis is provided in the M.Cubed technical memo included as Appendix F.

4.1.5.1 Emergency Response Benefits – Extended Drought

A major benefit of the alternative plans is that they provide water to IRWD, Rosedale, and Dudley Ridge in the event of extreme drought, when other water resources become cost prohibitive. Groundwater stored as part of the project will be available to call on during a drought emergency or as an alternative supply in the case of a local supply outage. An alternative cost approach was utilized to quantify benefits during an extended drought – defined as a critical dry year that occurs in the third or later year of consecutive dry and critically dry years.

The hydrologic modeling conducted by MBK Engineers provided an estimate of 4,750 acre-feet of drought emergency supply availability in both the 2030 and 2070 future conditions. However, this estimate only considers Article 21 water and no other water sources. Water modeling is not available for the full supply of project water, so this volume is a conservative estimate of the actual drought benefit. The actual benefit is likely higher than these estimates. Using the volume of water available in future conditions, interpolating between them, and extrapolating to the beginning of the project in 2026, the annual volume of water supply available for emergency response was determined.

Alternative costs were based on the lowest cost alternative agricultural water for Rosedale and DRWD and M&I water for IRWD, using documented prices for agricultural water offers and information provided by MWD for urban water rates during declared shortages. The annual emergency supply alternative costs were determined by applying the agricultural emergency supply rate to 75% of the emergency water supply available to Rosedale and DRWD and the urban emergency rate to 20% of the emergency water supply available to IRWD. According to historical hydrologic year data provided by MBK Engineers, a critical year in the third year or later of a multi-year drought has only occurred in 6 of the 82 years on record – a 7% probability of occurrence. This probability was applied to the entire stream of alternative costs to arrive at an adjusted annual emergency supply benefit.

Table 4-9 presents the estimated annual extended drought emergency response benefit for each alternative plan in 2018 dollars.

Table 4-9 : Annual Emergency Drought Response Benefits for Alternatives

Alternative Plan	Emergency Response – Extended Drought Annual Benefits (million $)
Existing Water Bank Participation	0.72
Kern Fan Project – KWB Alignment	0.72
Kern Fan Project – BV Alignment	0.72
Kern Fan Project – ESC Alignment	0.72

4.1.5.2 Emergency Response Benefits – Delta Failure

A separate emergency response benefit of the alternative plans is the emergency water supply that each alternative can supply in the event of a levee failure in the Delta that curtails State Water Project and Central Valley Project deliveries to the Central Valley and Southern California. This benefit was evaluated using an alternative cost approach.

For determination of the Delta failure benefit, it is assumed that a Delta failure occurs once, thirty years into the project operation period – year 2056 for the project alternatives. This is the recommended approach by the CWC for valuing emergency response water supplies in their Technical Reference. Based on the modeling by MBK Engineers, the project is likely to have 23,500 acre-feet of water available for emergency response after thirty years of operation. These modeling results are conservative as they include only Article 21 water and no other sources of supply – the true benefit is likely to be greater.

In the event of interrupted flows through the Delta, IRWD's supply would be water purchases from MWD. The alternative cost analysis used MWD's Tier 1 untreated rate of $676 per acre-foot in addition to a $2,960 penalty for water use over 115% of IRWD's allocation. This analysis, as outlined for the other benefit categories, used an escalation factor based on Metropolitan's projected rates increases over a 10-year period, as presented to the MWD Board in 2016. To be consistent with other benefits, only the Tier 1 rate at the projected rate increase based on MWD's estimates for 2016-2026 was escalated. The $2,960 penalty and all other charges are not escalated. To be conservative, the water costs in the year 2030 were used and

escalated after that point. As with other benefits, the M&I rate was applied to the approximately 25% of the emergency supply that would go to M&I users.

Since normal agricultural water deliveries through the Delta would not be available during a Delta failure scenario, a different approach to value the agricultural benefit was used. The median offer price provided by Dudley Ridge for the 2014-2016 period of $632/AF was used as a unit value on the presumption that a Delta emergency would be interpreted as equivalent to an extended drought. Agricultural users have demonstrated that they are willing to pay this amount in times of a "normal" extended drought. However, a Delta outage will represent unprecedented shortage conditions south of the Delta. Under such conditions, the only alternative supply available to agricultural users is groundwater. Presumably, pumps would be turned on "24/7" to replace lost surface supplies in the San Joaquin Valley. To adjust for the overdraft of groundwater during an unprecedented drought it is assumed that under the Sustainable Groundwater Management Act, which requires all groundwater basins to come to sustainable levels by 2040, users would be required to recharge some portion of the overdraft in subsequent years. To account for this cost, 50% of the average Delta Export unit value to purchase replacement water in subsequent years was added to the agricultural value. As with other benefits, the agricultural rate was applied to the approximately 75% of the emergency supply that would go to agricultural users.

Table 4-10 presents the estimated annual Delta failure emergency response benefit for each alternative plan in 2018 dollars.

Table 4-10 : Annual Delta Levee Failure Emergency Response Benefit for Each Alternative

Alternative Plan	Emergency Response – Delta Failure Annual Benefits (million $)
Existing Water Bank Participation	1.51
Kern Fan Project – KWB Alignment	1.51
Kern Fan Project – BV Alignment	1.51
Kern Fan Project – ESC Alignment	1.51

4.1.6 Agricultural Impact Benefits

The alternative plans would provide a greater degree of reliability for agricultural water supply, which creates benefits to local agriculture that go beyond the value of the water supply itself. It is estimated that the alternative plans would prevent impacts to approximately 600 acres of field crops from being fallowed in critically dry years when supplies are low. With increased reliability, it is estimated that this acreage could instead be converted to higher value permanent crops, such as fruit or nut trees. While the value of agricultural water to the existing mix of crops is already included under the calculation of agricultural water supply benefit, the impact of crop conversion is a separate benefit. The detailed analysis of this benefit is provided in the M.Cubed technical memo included as Appendix F.

IMPLAN data for Kern County was used to estimate the effects of crop conversion. IMPLAN is an input-output modeling software that allows users to estimate how economic changes in particular sectors impact the local economy. The value of cotton and permanent tree crops was

used as an input into the IMPLAN model. The IMPLAN results estimate direct impacts of crop conversion.

It was assumed that since the Existing Water Bank Participation alternative plan uses previously constructed groundwater storage facilities overlying the Antelope Valley Groundwater Basin, which is downstream from the main agricultural portions of Kern County, there would be no additional benefit to local agriculture that goes beyond the value of the water supply itself.

Table 4-11 presents the estimated annual agricultural impact benefit for each alternative plan in 2018 dollars.

Table 4-11 : Annual Agricultural Impact Benefits for Each Alternative

Alternative Plan	Annual Agricultural Impact Benefits (million $)
Existing Water Bank Participation	0
Kern Fan Project – KWB Alignment	0.95
Kern Fan Project – BV Alignment	0.95
Kern Fan Project – ESC Alignment	0.95

4.1.7 Preliminary Cost Estimates

Table 4-12 summarizes preliminary construction and O&M cost estimates for the alternatives. The total cost was amortized over the alternatives' assumed 50-year project life at the 2018 Federal discount rate of 2.875 percent. The Kern Fan Project alternative plans assumes a 5-year construction schedule, while the Existing Water Bank Participation assumes a 0-year construction schedule as the groundwater storage facilities are already available for use. Annual O&M costs would begin after construction is complete.

Table 4-12 : Total Annual Costs of Alternatives (Updated)

Alternative Plan	Total Construction Cost (Million $)[1]	Amortization of Construction Costs, 2.875%, 50 yr (Million $)	Average Annual Replacement Costs (Million $)	Average Annual O&M Cost (Million $)	Total Annual Cost (Million $)
Existing Water Bank Participation	$340.91	$12.94	NA	$7.43	$20.33
Kern Fan Project – KWB Alignment	$204.64	$7.77	$0.54	$1.04	$9.35
Kern Fan Project – BV Alignment	$225.07	$8.54	$0.67	$1.19	$10.40
Kern Fan Project – ESC Alignment	$216.52	$8.22	$0.63	$1.19	$10.04

Notes: [1]Construction cost for the Existing Water Bank Participation Alternative Plan is the cost to acquire 227,273 shares of the water bank to meet storage, recharge, and recovery capacity equivalent to the Kern Fan Project alternative plans.

4.1.8 Preliminary Results

Table 4-13 summarizes the annual economic benefits and costs of the alternatives. The table also presents net annual benefits or costs and a benefit-cost ratio for each alternative. Based on this economic evaluation at the feasibility level, all of the Kern Fan Project alignment alternative plans would have net benefits – the Existing Water Bank Participation Alternative Plan does not have net benefits. **The Kern Fan Project – KWB Alignment Alternative has the greatest benefit cost ratio of 1.64, based on the 30% feasibility level cost estimate and preliminary benefits evaluation. However, as presented in Table 4-20, the BV Alignment was determined to be the preferred alignment due to constructability concerns for the KWB and ESC Alignments.**

Table 4-13 : Annual Economic Benefits and Costs of Alternatives (Updated)

	Existing Water Bank Participation	Kern Fan Project - KWB Alignment	Kern Fan Project - BV Alignment	Kern Fan Project - ESC Alignment
Annual Water Supply Benefits - M&I (Million $)	$2.09	$2.09	$2.09	$2.09
Annual Water Supply Benefits - Agriculture (Million $)	$3.17	$3.17	$3.17	$3.17
Annual Water Supply Benefits - Groundwater (Million $)	$0.52	$0.37	$0.37	$0.37
Annual Ecosystem Benefits - Salmon Recovery (Million $)	NA	$1.38	$1.38	$1.38
Annual Ecosystem Benefits - Intermittent Wetland Habitat (Million $)	NA	$5.18	$5.18	$5.18
Annual Emergency Response Benefits - Extended Drought (Million $)	$0.72	$0.72	$0.72	$0.72
Annual Emergency Response Benefits - Delta Failure (Million $)	$1.51	$1.51	$1.51	$1.51
Annual Agricultural Impact Benefits (Million $)	NA	$0.95	$0.95	$0.95
Total Annual Benefits (Million $)	**$8.01**	**$15.37**	**$15.37**	**$15.37**
Total Construction Cost (Million $)	$340.91	$204.64	$225.07	$216.52
Annual Costs (Million $)[2]	**$20.33**	**$9.35**	**$10.40**	**$10.04**
Net Annual Benefits or Costs (Million $)	($12.32)	$6.02	$4.97	$5.33
Benefit-Cost Ratio	**0.39**	**1.64**	**1.48**	**1.53**

4.2 Mitigation of Unavoidable Adverse Effects

As part of the analysis of the final array of alternatives, the following section describes the mitigation of unavoidable adverse effects associated with each alternative. A Final Environmental Impact Report for the Antelope Valley Water Bank Project also referred to as the Willow Springs Water Bank, was adopted by the Kern County Planning Department in September 2006. The potential impacts and mitigation measures identified in the Antelope Valley Water Bank Project EIR would be applicable to the Existing Water Bank Alternative. A summary of the potential impacts and mitigation measures identified in the Antelope Valley Water Bank Project Final EIR are listed in Appendix E.

A Final Environmental Impact Report was adopted in December 2015 for the Stockdale Integrated Banking Project. The Stockdale Project Final EIR documents the program-level analysis completed for the third project site or Phase 1 of the Kern Fan Project. The Stockdale Project Final EIR assumes that similar species and impacts would occur at most potential sites within the additional site perimeter. Potential impacts and mitigation measures identified in the Stockdale EIR would be similar to those for each of the Kern Fan Groundwater Storage Project Alternatives. A summary of the potential impacts and mitigation measures identified in the Stockdale Project Final EIR are listed in Appendix B.

4.3 Alternative Plan Comparison

Consistent with the standards for formulating and evaluating alternatives for planning and water resource-related projects outlined in the PR&Gs, the evaluation and comparison of alternatives in this Feasibility Report relies on the federal planning criteria of completeness, effectiveness, acceptability, and efficiency. This evaluation presents the relative performance of the alternatives as they are defined in this stage of the study process. This section further describes the Federal criteria and their application in the evaluation and comparison process, and the preliminary results of this comparison.

Figure 4-1 presents the criteria, performance measures, and the rating scales used for the comparison of the alternative plans. Each scale has either three or four levels. To facilitate visual review of a comparison summary, levels are depicted with colors. In all cases, a green rating indicates that the alternative would meet the criterion fully and a yellow rating indicates that the alternative would not meet the criterion.

4.3.1 Completeness

The completeness criterion addresses whether the alternative would account for all investments or other actions necessary to realize the planned effects. This criterion considers how well the alternative plan would achieve the planning objectives. Three performance measures (Full Spectrum of Objectives, Reliability, and Physical Implementation) were developed for the completeness criterion to characterize the degree to which each alternative would provide for the realization of the Kern Fan Project's planned effects.

4.3.1.1 Full Spectrum of Objectives

This performance measure indicates each alternative's capacity to satisfy the eight primary objectives by the degree to which implementation of each alternative would:

- Enhance water supply reliability;
- Reduce imported water demands of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Delta) to benefit spring and winter-run Chinook salmon;
- Provide water supply during drought conditions;
- Provide water supply for emergency response benefits;
- Establish temporary wetlands through intermittent recharge events that will attract migratory and other water birds in Kern County;

- Benefit the water levels in the Kern County Groundwater Sub-basin;
- Manage water in a resilient and sustainable manner, and;
- Be integrated into other water storage projects and storage reservoirs to provide greater statewide benefits.

Screening Criteria		
Planning Criterion	**Performance Measures**	**Rating Scales**
Completeness	Full specrtrum	Fully meets the project objectives
		Partially meets one of the project objectives and fully meets the others
		Partially meets more than one of the project objectives
	Reliability	Provides long-term reliability improvements without increasing operations and maintenance
		Provides long-term reliability improvements with increases to operations and maintenance
		Provides reliability improvements without increasing operations and maintenance
		Provides reliability improvements with increases to operations and maintenance
	Physical implementability	Requires little new construction
		Requires new construction with non-complex construction techniques
		Requires new construction with complex construction techniques
Effectiveness	Creates a more reliable water supply	Creates a brand new facility to recharge and store groundwater for subsequent recovery
		Utilizes an existing facility to recharge and store groundwater for subsequent recovery
		Does not provide additional supply
	Improves habitat conditions of important species	Improves habitat conditions through project facilities that provide new ecosystem benefits
		Improves habitat through the use of existing facilities but may not create new ecosystem benefits
		Does not imrprove habitat conditions of important species
	Contirbutes to a more resilient and sustainably managed water infrastructure	Creates new infrastructure that provides new opportunities for sustainable water management
		Leverages existing infrastructure to expand existing opportunities for sustainable water management
		Does not contribure to a more resilient and sustainably managed water infrastructure
Acceptability	Biological resource impacts of project construction	Benefits biological resources
		Creates no impact or temporary or minor, but mitigable, adverse impacts to biological resources
		Creates moderate, but mitigable, impacts to biological resources
		Creates unmitigable impacts to biological resources
	Physical resouce impacts of project construction	Benefits physical resources
		Creates no impact or temporary or minor, but mitigable, adverse impacts to physical resources
		Creates moderate, but mitigable impacts to physical resources
		Creates unmitigable impacts to physical resources
	Social resource impacts	Benefits social resources
		Creates no impact or temporary or minor, but mitigable, adverse impacts to social resources
		Creates moderate, but mitigable impacts to social resources
		Creates unmitigable impacts to social resources
Efficiency	Net benefit	Has a benefit-cost ratio greater than 1
		Has a benefit-cost ratio between 0.1 and 1
		Has a benefit-cost ratio below 0.1

Figure 4-1 : Criteria, Performance, and Rating Scales

The rating scales correspond to the number of study objectives that the alternative would meet, and to what extent those objectives would be met. An alternative scoring a green rating would fully satisfy the eight objectives. Alternatives scoring blue would fully satisfy at least seven of the objectives and an alternative scoring a yellow ranking would only partially satisfy one or more of the objectives. An orange ranking indicates that the Alternatives would result in un-mitigatable impacts. Table 4-14 shows the rating for each alternative with a brief explanation.

Table 4-14 : Alternative Full Spectrum Ratings

Alternative Plan	Rating	Explanation
Existing Water Bank Participation	Yellow	Buying capacity shares in the Willow Springs Water Bank would meet a number of the full spectrum objectives, but would not provide new ecosystem benefits or establish new temporary wetlands. The WSWB is also in a more remote location in terms of integration with other State and Federal water management facilities.
Kern Fan Project – KWB Alignment	Green	The alternative plan meets all eight of the primary objectives.
Kern Fan Project – BV Alignment	Green	The alternative plan meets all eight of the primary objectives.
Kern Fan Project – ESC Alignment	Green	The alternative plan meets all eight of the primary objectives.

4.3.1.2 Reliability

This performance measure indicates each alternative's capacity to provide long-term water supply reliability improvements and also considers the degree to which they generate new O&M responsibilities for the study partners.

An alternative scoring a green rating would provide long-term reliability improvements without substantially increasing O&M requirements. Alternatives scoring blue would provide long-term reliability improvements with notable increases to O&M requirements and an alternative scoring yellow would provide short-term reliability improvements with notable increases in O&M requirements. An alternative scoring an orange ranking would not increase water supply reliability. Table 4-15 shows the rating for each alternative with a brief explanation. All the alternatives are designed to provide water supply reliability to IRWD and Rosedale.

Table 4-15 : Alternative Reliability Ratings

Alternative Plan	Rating	Explanation
Existing Water Bank Participation	Orange	Buying capacity shares in the Willow Springs Water Bank would not benefit long-term reliability since this alternative relies on utilizing existing infrastructure outside of the Kern County Groundwater Sub-Basin. In addition, there are considerable annual O&M costs associated with this alternative.
Kern Fan Project – KWB Alignment	Blue	The alternative plan creates new centrally located groundwater storage and conveyance facilities to provide long-term water reliability with increases in annual O&M costs.
Kern Fan Project – BV Alignment	Blue	The alternative plan creates new centrally located groundwater storage and conveyance facilities to provide long-term water reliability with increases in annual O&M costs.
Kern Fan Project – ESC Alignment	Blue	The alternative plan creates new centrally located groundwater storage and conveyance facilities to provide long-term water reliability with increases in annual O&M costs.

4.3.1.3 Physical Implementation

This performance measure indicates the relative complexity associated with designing and constructing each alternative.

The rating scales correspond to the amount of new construction that would be required and the relative complexity of necessary design and construction. An alternative scoring a green rating would require little new construction and would instead rely on changes in the operations of existing facilities. Alternatives that score blue would require new construction with non-complex design and construction techniques. Alternatives scoring a yellow rating would require new construction with complex design and construction techniques. For the purpose of this evaluation, non-complex design and construction techniques were considered to be those that would use proven technologies and approaches for which there is a proven track record at the scale proposed by each alternative. Table 4-16 shows the rating for each alternative with a brief explanation.

Table 4-16 : Alternative Physical Implementation Rating

Alternative Plan	Rating	Explanation
Existing Water Bank Participation	Green	Utilizing the existing Willow Springs Water Bank will not require new construction.
Kern Fan Project – KWB Alignment	Blue	The alternative plan creates new groundwater recharge basins, extraction wells, and conveyance – all of which require non-complex construction techniques.
Kern Fan Project – BV Alignment	Blue	The alternative plan creates new groundwater recharge basins, extraction wells, and conveyance – all of which require non-complex construction techniques.
Kern Fan Project – ESC Alignment	Blue	The alternative plan creates new groundwater recharge basins, extraction wells, and conveyance – all of which require non-complex construction techniques.

4.3.2 Effectiveness

The effectiveness criterion addresses how well an alternative would alleviate problems and create new opportunities. Three performance measures were developed for this criterion to compare the extent to which each alternative satisfies this criterion.

4.3.2.1 Creating a More Reliable Water Supply

This performance measure indicates each alternative's capacity to enhance water supply reliability, especially during times of extended drought or Delta failure events. The rating scales examine whether the alternatives would create new opportunities for enhance water reliability. An alternative scoring a green rating would create brand new groundwater storage infrastructure to create new opportunities for increasing water reliability and integrated operations with other existing infrastructure. An alternative scoring a blue rating utilizes existing facilities to enhance water supply reliability but may be constrained in terms of overall groundwater recharge/recovery capacity and the ability to integrate with other existing water management projects at both the local and regional level. An alternative scoring a yellow rating does not

provide any additional water supply reliability. Table 4-17 shows the rating for each alternative with a brief explanation.

Table 4-17 : Alternatives Ratings on Ability to Create More Reliable Water Supply

Alternative Plan	Rating	Explanation
Existing Water Bank Participation	Blue	Utilizing the existing Willow Springs Water Bank relies on using previously constructed infrastructure to enhance water supply reliability – this may limit overall water transfer capacities and the ability to integrate operations with other key water management projects.
Kern Fan Project – KWB Alignment	Green	The alternative plan creates new opportunities for water supply reliability through the creation of new groundwater storage infrastructure.
Kern Fan Project – BV Alignment	Green	The alternative plan creates new opportunities for water supply reliability through the creation of new groundwater storage infrastructure.
Kern Fan Project – ESC Alignment	Green	The alternative plan creates new opportunities for water supply reliability through the creation of new groundwater storage infrastructure.

4.3.2.2 Improving Habitat Conditions of Important Species

This performance measure indicates each alternative's capacity to provide ecosystem benefits to improve the habitat conditions of environmentally sensitive and special status species. The rating scales examine whether the alternatives would create new opportunities for ecosystem benefits. An alternative scoring a green rating would improve habitat conditions by providing new ecosystem benefits. An alternative scoring a blue rating would improve habitat with existing facilities, but new ecosystem benefits would not likely be realized like they would as the result of a completely new project. An alternative scoring a yellow rating does not improve the habitat conditions of important species. Table 4-18 shows the rating for each alternative with a brief explanation.

Table 4-18 : Alternatives Ratings on Improving Habitat Conditions of Important Species

Alternative Plan	Rating	Explanation
Existing Water Bank Participation	Blue	This alternative does not create new ecosystem benefits – may support the creation of existing ecosystem benefits.
Kern Fan Project – KWB Alignment	Green	The alternative plan will create new groundwater storage facilities that will be operated to provide intermitted wetland habitat as well as ecosystem pulse flows to support salmon recovery and green sturgeon.
Kern Fan Project – BV Alignment	Green	The alternative plan will create new groundwater storage facilities that will be operated to provide intermitted wetland habitat as well as ecosystem pulse flows to support salmon recovery and green sturgeon.
Kern Fan Project – ESC Alignment	Green	The alternative plan will create new groundwater storage facilities that will be operated to provide intermitted wetland habitat as well as ecosystem pulse flows to support salmon recovery and green sturgeon.

4.3.2.3 Contributing to a More Resilient and Sustainably Managed Water Infrastructure

This performance measure indicates each alternative's capacity to contribute to the sustainable management of water infrastructure. The rating scales examine whether the alternatives would create new opportunities for water infrastructure management, including integration with other existing or planned projects. An alternative scoring a green rating would create new infrastructure and new opportunities for sustainable water management. An alternative scoring a blue rating would utilize existing infrastructure to expand existing opportunities for sustainable water management. An alternative scoring a yellow rating does not contribute to a more resilient and sustainably managed water infrastructure. Table 4-19 shows the rating for each alternative with a brief explanation.

Table 4-19 : Alternatives Ratings on Contributing to a More Resilient and Sustainable Water Infrastructure

Alternative Plan	Rating	Explanation
Existing Water Bank Participation	Blue	This alternative uses the existing Willow Springs Water Bank to provide water supply benefits. The existing infrastructure provides the opportunity for resiliency and sustainable water management, but there may be capacity constraints with the existing water bank infrastructure that could potentially limit effective water management. In addition, since the WSWB is located downstream on the SWP from Rosedale and IRWD's existing water banking facilities, there may be constraints with water exchanges and transfers out of the WSWB that would further impact resiliency and sustainable water infrastructure management.
Kern Fan Project – KWB Alignment	Green	The alternative plan will create new groundwater storage facilities that would create new opportunities for water resiliency as well as integration with other existing and planned facilities. This alternative is located near other key Kern County groundwater and surface water management infrastructure, which can be leveraged to provide even further sustainable water management.
Kern Fan Project – BV Alignment	Green	The alternative plan will create new groundwater storage facilities that would create new opportunities for water resiliency as well as integration with other existing and planned facilities. This alternative is located near other key Kern County groundwater and surface water management infrastructure, which can be leveraged to provide even further sustainable water management.
Kern Fan Project – ESC Alignment	Green	The alternative plan will create new groundwater storage facilities that would create new opportunities for water resiliency as well as integration with other existing and planned facilities. This alternative is located near other key Kern County groundwater and surface water management infrastructure, which can be leveraged to provide even further sustainable water management.

4.3.3 Acceptability

The acceptability criterion addresses the viability of an alternative with respect to acceptance by State and local entities and compatibility with existing laws. The performance measures for the acceptability criterion focus on potential environmental effects. The performance measures for

this criterion consider the alternatives' potential environmental impacts to biological, physical, and social resources in the study area.

The acceptability planning criterion has three performance measures: impacts to biological resources, impacts to physical resources, and impacts to social resources. The rating scales measure the severity of these impacts and whether they are mitigable. An alternative scoring a green rating would be expected to provide benefits related to the resource. An alternative scoring a blue rating would create no impact or would create temporary or minor mitigable impacts. An alternative scoring a yellow rating would create a moderate but mitigable impacts, and an alternative scoring an orange rating would create un-mitigable impacts. **Table 4-20 shows the rating for each alternative with a brief explanation.**

Table 4-20 : Alternative Ratings for Acceptability (Updated)

Alternative Plan	Biological Impacts[1]	Physical Impacts[2]	Social Impacts[3]	Explanation
Existing Water Bank Participation	Blue	Blue	Blue	The Willow Springs Water Bank is a previously constructed project whose impacts were mitigated under a 2006 Environmental Impact Report. The alternative plan would generate no additional adverse impact above what was contemplated in the EIR.
Kern Fan Project – KWB Alignment	Yellow	Yellow	Blue	The alternative plan has potential moderate biological impacts related to the construction of the project conveyance canal across the California State Parks – Tule Elk Reserve property, which has the heightened potential for moderate biological impacts. These potential impacts are less than significant with appropriate mitigation. The alternative plan has the potential for moderate physical impacts related to the construction of the project conveyance canal adjacent to the existing Cross Valley Canal and associated turnout. The close proximity of these facilities has the potential to result in hydraulic impacts. These potential impacts are less than significant with appropriate mitigation. The alternative plan has the potential to release hazardous materials into the environment during construction. These hazards are less than significant with mitigation. The alternative plan could violate water quality standards or waste discharge requirements during construction or project operation. In addition, recharge operations could result in groundwater mounding that impacts neighboring groundwater banking operations. These impacts can be mitigated to less than significant. The alternative plan could result in substantial temporary or periodic increase in

				ambient noise levels in the project vicinity. These impacts are less than significant with mitigation. The alternative plan could cause a substantial adverse change in the significance of a historical or archaeological/paleontological resource. These impacts can be mitigated to less than significant. The alternative plan could conflict with existing traffic control plans and could result in an increase in traffic hazards due to incompatible uses. These impacts can be mitigated to less than significant.
Kern Fan Project – BV Alignment	Blue	Blue	Blue	The alternative plan has potential biological impacts related to construction of the project resulting in adverse impacts to special status species and sensitive natural communities. All of these potential impacts are less than significant with appropriate mitigation. The alternative plan has the potential to release hazardous materials into the environment during construction. These hazards are less than significant with mitigation. The alternative plan could violate water quality standards or waste discharge requirements during construction or project operation. In addition, recharge operations could result in groundwater mounding that impacts neighboring groundwater banking operations. These impacts can be mitigated to less than significant. The alternative plan could result in substantial temporary or periodic increase in ambient noise levels in the project vicinity. These impacts are less than significant with mitigation. The alternative plan could cause a substantial adverse change in the significance of a historical or archaeological/paleontological resource. These impacts can be mitigated to less than significant. The alternative plan could conflict with existing traffic control plans and could result in an increase in traffic hazards sue to incompatible uses. These impacts can be mitigated to less than significant.
Kern Fan Project – ESC Alignment	Blue	Yellow	Blue	Same impacts as the BV Alignment Alternative Plan with the exception of moderate physical impacts that are created related to the need to widen the existing West Side Canal and East Side Canal. These facilities would be out of service for an extended period during construction significantly limiting conveyance capacity. After construction,

				the widened canals would become conveyance facilities that have to be shared and coordinated with other entities rather than a facility that is owned and operated solely by the Kern Fan Project Groundwater Banking Authority. All of these potential impacts are less than significant with appropriate mitigation.

Notes:
[1] Biological Resources include aquatic and terrestrial resources.
[2] Physical Resources include geology and soils, land use, water quality, groundwater, air quality, noise, climate change, and visual resources
[3] Social Resources include cultural resources, socioeconomics, hazardous materials, traffic, and recreation.

4.3.4 Efficiency

The efficiency criterion addresses how well an alternative would deliver economic benefits from a project cost standpoint, in comparison to the performance measures associated with the completeness and effectiveness criteria, which address each alternative's benefits qualitatively. The performance measure for the efficiency criterion is defined as the alternatives' net benefits.

4.3.4.1 Net Benefits

This performance measure compares each alternative's benefits to its costs to quantify the efficiency of each alternative at securing benefits. An alternative scoring a green rating would provide net benefits based on preliminary benefit and cost estimates, resulting in a benefit-cost ratio over 1. Alternatives scoring a blue rating would generate benefit values that may be nearly equal to, but lower than costs, resulting in a benefit-cost ratio between 1 and 0.1. Alternatives receiving a yellow rating have a benefit-cost ratio of less than 0.1.

Table 4-21 shows the rating for each alternative with a brief explanation. Each of the three Kern Fan Project alignment alternatives have net benefits, with the KWB Alignment Alternative Plan having the greatest net benefit.

Table 4-21 : Alternatives Ratings for Efficiency in Delivering Economic Benefits (Updated)

Alternative Plan	Rating	Explanation
Existing Water Bank Participation	Blue	This alternative has a higher initial buy-in cost for water bank participation shares than the overall capital cost requirement for the other alternative plans. In addition, this alternative generates fewer benefits, resulting in a benefit-cost ratio of 0.39.
Kern Fan Project – KWB Alignment	Green	Construction costs are estimated to be the least expensive compared with the other alternatives. This alternative also delivers significant benefits, resulting in a benefit-cost ratio of 1.64.
Kern Fan Project – BV Alignment	Green	Construction costs are estimated to be the most expensive compared with the other proposed alignment alternatives. This alternative also delivers the same benefits as the KWB Alignment Alternative, resulting in a benefit-cost ratio of 1.48.
Kern Fan Project – ESC Alignment	Green	Construction costs are estimated to be moderate compared with the other proposed alignment

		alternatives. This alternative also delivers the same benefits as the KWB Alignment Alternative, resulting in a benefit-cost ratio of 1.53.

4.4 Summary of Comparisons

Figure 4-2 shows a summary of the alternative plan evaluation and comparison. The Alternative for the Kern Fan Project with the BV Alignment is shown to have the best relative combination of completeness, effectiveness, and acceptability as a method of differentiating the Kern Fan Project Alternatives.

Screening Criteria		Alternatives			
Planning Criterion	**Performance Measures**	**Existing Water Bank Participation**	**Kern Fan Project - KWB Alignment**	**Kern Fan Project - BV Alignment**	**Kern Fan Project - ESC Alignment**
Completeness	Full specrtrum				
	Reliability				
	Physical implementability				
Effectiveness	Creates a more reliable water supply				
	Improves habitat conditions of important species				
	Contirbutes to a more resilient and sustainably managed water infrastructure				
Acceptability	Biological resource impacts of project construction				
	Physical resouce impacts of project construction				
	Social resource impacts				
Efficiency	Net benefit	**B:C = 0.39**	**B:C = 1.64**	**B:C = 1.48**	**B:C = 1.53**

Figure 4-2 : Summary of Alternatives Plan Evaluations and Comparison (Updated)

Chapter 5 : Recommended Plan

Based on the Alternative Plan evaluation and comparison described in chapter 4, the Kern Fan Groundwater Storage Project, including the three alignments, is the only plan with a benefit-cost ratio greater than one. **The Kern Fan Project with the BV Alignment has the best relative combination of completeness, effectiveness, and acceptability scores in the Alternative Plan screening matrix and is therefore the Recommended Plan.**

5.1 Description of Recommended Plan

The Kern Fan Groundwater Storage Project is a proposed groundwater banking project that involves conveying, recharging and storing surface water during wet periods that would otherwise be lost to the ocean, and later recovering the water when needed through groundwater recovery.

The Project facilities would overlie the Kern Sub-unit of the Tulare Lake Basin. Kern County is strategically located in central California near federal, state, and local water supply conveyance facilities and portions of the aquifer are characterized by geologic conditions that are particularly suitable for groundwater infiltration.

5.1.1 Major Components

The major Project components include up to 1,200 acres of spreading basins and up to 12 new extraction wells, each with 5 to 6 cubic feet per second (cfs) of extraction capacity and associated pipelines. Water will be conveyed from the California Aqueduct to and from the Project via a new turnout at the California Aqueduct and a new conveyance canal with up to 500 cfs conveyance capacity. **The BV Alignment Alternative would result in the highest relative cost of construction among the different Kern Fan Project alignment alternatives, but it ranks the highest in constructability due to reduced potential impacts on biological and physical resources as a result of construction. The BV Alignment Alternative would also result in a competitive benefit/cost ratio of 1.48. Should the BV Alignment not be constructible, the KWB and ESC Alignments would be feasible with benefit/cost ratios of 1.64 and 1.53, respectively.**

An updated engineering 30% Design Report was prepared for the Project, which provides more detail of the project facilities and costs, and is included under Appendix D. The Kern Fan Project would be constructed in two phases as described below. A preliminary layout of the project facilities is shown on Figure 5-1 with the BV Alignment.

5.1.1.1 Phase 1

The first phase would be to develop the proposed third project site as contemplated in the Environmental Impact Report for the Stockdale Integrated Water Banking Project, which would include the purchase of approximately 640 acres of land for recharge and recovery facilities

within Rosedale's service area in the Kern Fan area. The first phase would include constructing conveyance facilities, recharge facilities, and 6 recovery wells and pipelines as necessary to develop a fully functioning water banking project.

The existing conveyance system that will supply recharge water to the Phase 1 lands via the Goose Lake **Channel** or from the Cross Valley Canal (CVC) via the Rosedale Intake Canal. A new check structure would be constructed in the Goose Lake **Channel** with a reinforced concrete turnout structure constructed behind it to convey water from the Goose Lake **Channel** to the Phase 1 property. The Goose Lake **Channel** currently has capacity to service Rosedale's existing West Basin recharge area. Therefore an alternative conveyance would be needed to convey water to Rosedale's West Basins which will also be used to convey water to the recharge facilities in Phase 2 of the Kern Fan Project. A new reinforced concrete turnout at the California Aqueduct would be constructed under Phase 1 along with a canal to convey up to 500 cfs approximately ten miles to the easterly end of the Rosedale's existing West Basins and Phase 2 recharge basins. **Three lift stations would be needed for conveyance to the Project and the West Basins using the BV Alignment. The KWB and ESC Alignments would require either 2 or 3 lift stations, respectively.** Each lift station would also include a gravity bypass line with a slide gate to allow the reverse flow of recovery water back to the California Aqueduct.

Phase 1 would also include construction and equipping of six recovery wells with each well having an approximate capacity of 5 to 6 cfs. The Phase 1 recovery wells would be capable of returning water to the new canal, the Goose Lake **Channel** or to the CVC via the Rosedale Intake Canal.

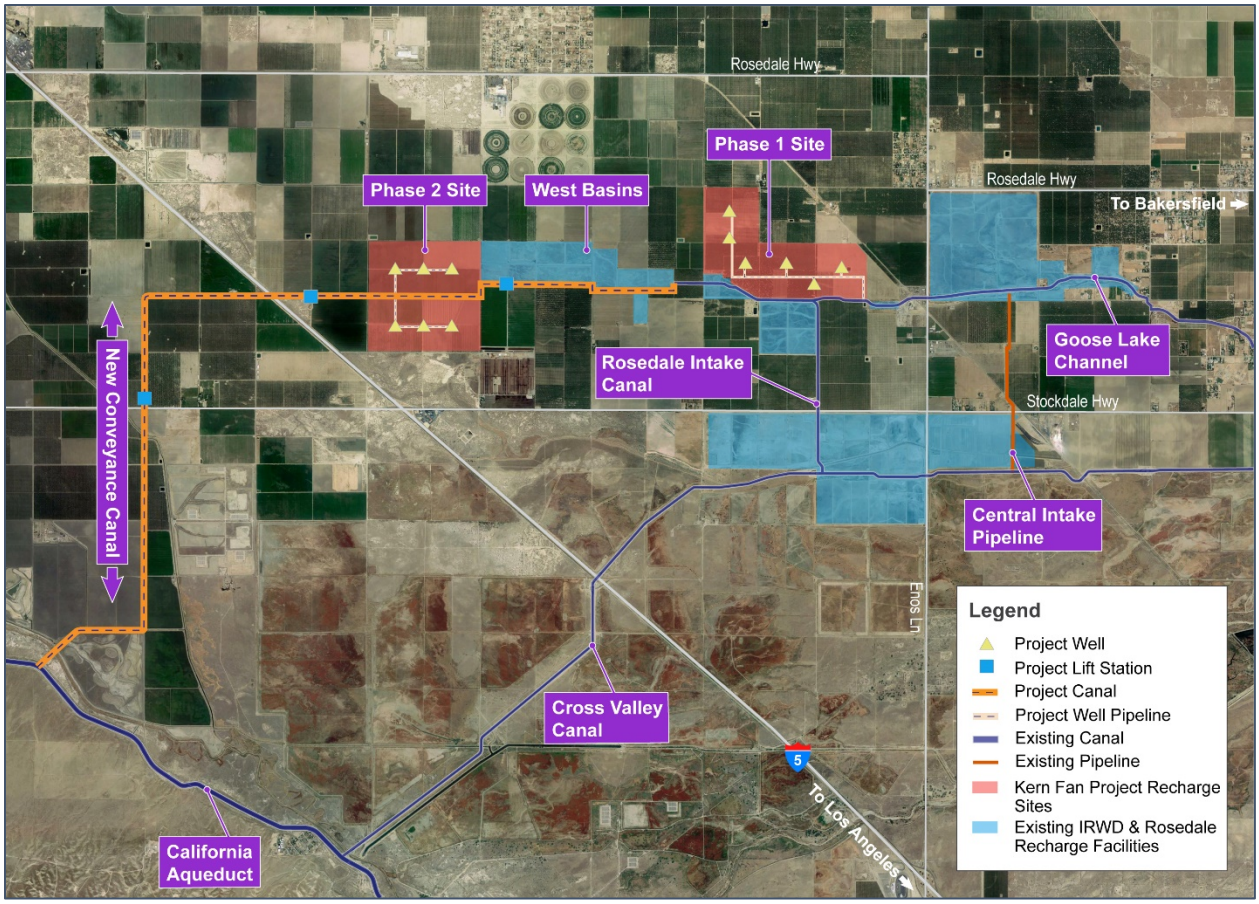


Figure 5-1 : Preliminary Layout of Kern Fan Groundwater Storage Project with BV Alignment (Updated)

5.1.1.2 Phase 2

Phase 2 of the Kern Fan project would involve acquiring an additional 640 acres of land within Rosedale's service area for additional water banking recharge and recovery facilities to achieve the full expected Project capacities. Water would be conveyed to this property from the California Aqueduct using the same Project diversion and canal constructed in Phase 1. The proposed Phase 2 property would be developed for the recharge and recovery of ground water. Phase 2 would include the construction and equipping of six recovery wells and associated conveyance pipelines.

Extraction of previously recharged water from recovery facilities constructed on both the Phase 1 and Phase 2 lands will occur during times of need when other available supplies are short in order to maximize the project's benefits. Up to twelve new extraction wells will be constructed for the Project with a combined expected recovery capacity of up to 70 cfs. Each well will have a discharge capacity of approximately 5 to 6 cfs, and will be operated to minimize significant impacts to neighboring wells. The Phase 1 recovery wells would be designed to be capable of returning or exchanging water to the California Aqueduct by discharging to the Rosedale Intake Canal that flows to the Cross Valley Canal. The Phase 2 recovery wells will be designed to return water to the California Aqueduct using a gravity bypass line that allows reverse flow of the new proposed Project canal.

5.1.2 Project Operations

The Kern Fan Project recharge facilities would be used during periods of excess surface water including when unallocated Article 21 water from the SWP is available, as well as other excess water sources including Kern River high-flow water and Friant-Kern 215 water. Unallocated Article 21 water would be conveyed to the Project recharge basins through the newly constructed canal. Other water would be diverted for recharge through other conveyance facilities within Rosedale's Conjunctive Use Program. These inflows of water would typically occur during February through April or May during wet hydrologic periods. The basins would also be utilized to recharge other water supplies as available throughout the year.

The following key features of the analysis of the Preliminary Operations Plan for the Project are discussed below:

1. Operations Modeling and Analytical Approach
2. Project Water Supply and Integration
3. Beneficiaries of Project

5.1.2.1 Operations Modeling and Analytical Approach

The Project will operate by storing unallocated Article 21 water supplied by the SWP, as well as other surplus water sources. Unallocated Article 21 water is available in accordance with long-term Water Supply Contracts for State Water Contractors who have signed the Monterey Amendment. Unallocated Article 21 water is available when the supply of Article 21 exceeds the SWP Contractor requests, typically in wet years when precipitation and runoff in the Delta watershed exceed long-term averages. This Article 21 water supply will be delivered to the Project utilizing available capacity in the California Aqueduct to a new Project turnout to be constructed near the CVC.

MBK Engineers conducted an analysis based on the computer modeling of the Kern Fan Project and the availability of unallocated Article 21 water supplies. This analysis involved the use of CalSim II model results to depict the without Project (Baseline) scenario. The CalSim II model simulates operations of the Central Valley Project (CVP) and SWP in order to meet existing environmental and regulatory requirements, contract obligations and other system requirements. The model considers the effects of the Project extending to the Delta as a source of water for the Project and upstream on the Feather River for ecosystem benefits. MBK Engineers Technical Memorandum provides additional detail on the analytical approach and is included in Appendix C.

MBK's spreadsheet model of the Kern Fan Project is integrated with CalSim II and calculates the water supply available to the Project as additional Article 21 available from the Delta. The CalSim II Baseline simulation includes existing Article 21 demands and deliveries. The spreadsheet model simulates the additional Article 21 demand of the Project and the associated increase in SWP Delta exports. Additional Article 21 deliveries to the Project are simulated when there is:

1. Available surplus in the Delta in excess of existing regulatory requirements and demands;
2. Available export capacity at the SWP Banks Pumping Plant; and
3. The SWP portion of the San Luis Reservoir is full in the Baseline.

The expected storage capacity associated with the Project that was modeled is 100,000 AF. This storage capacity was allocated into three groups of Project beneficiaries as follows:

- 25,000 AF to Ecosystem Benefits;
- 37,500 AF to IRWD and DRWD; and
- 37,500 AF to Rosedale.

MBK Engineers estimated the Project yield utilizing unallocated Article 21 water supplies using the CalSim II model results that depict the without-Project (Baseline) scenario within the spreadsheet model. The operation of Project was then layered onto the baseline operation of the CalSim II results to simulate the with-Project scenario. Project benefits as a result of the storage of unallocated Article 21 water were then determined and quantified by comparison of the with-Project and without-Project scenarios. The Baseline scenario for this analysis was the 2030 CalSim II model dated November 2, 2016. This model simulation is described as a without-project, 2030 and 2070 future conditions with projected climate and sea-level conditions for a thirty-year period centered at 2030.

Figure 5-2 presents a summary of available Article 21 water supply to the Project diversion from the California Aqueduct by water year type (Sacramento Valley Year Type Index) based on 2030 CalSim II modeling results. This available supply was calculated by considering constraints on available Banks pumping capacity, conveyance capacities in the California Aqueduct, the capacity to convey water from the California Aqueduct to the Project, and conveyance losses. On an average annual basis, available Article 21 supply at the project diversion from the California Aqueduct is 8 thousand acre feet (TAF) with most of the supply available during Wet years. There is no Article 21 supply available during dry and critical years.

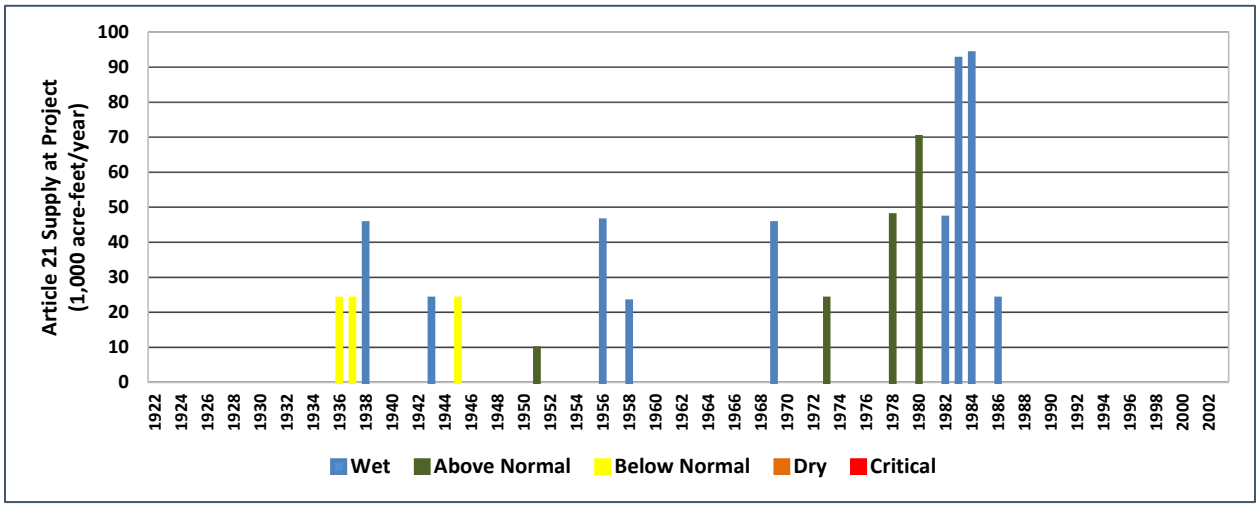


Figure 5-2 : Modeling Estimates of Article 21 Water Available to Project

MBK models include delivery of up to 100,000 AF of unallocated SWP Article 21 water into the Kern Fan Project. These deliveries would be made on behalf of IRWD as a landowner in Dudley Ridge Water District (DRWD) and Rosedale as a sub-unit of the KCWA. During dry years and when needed, IRWD and Rosedale would rely on the stored flows to provide M&I and agricultural water supply benefits that improve water supply reliability.

5.1.2.2 Project Water Supply and Integration

The Project will provide ecosystem and water quality benefits for the Delta and its tributaries by recharging and storing up to 25,000 acre-feet (AF) of unallocated Article 21 water in the Kern County groundwater basin for subsequent extraction and use during periods of need. The remaining 75,000 of Article 21 water would be for water supply purposes by IRWD and Rosedale. Operation of the Project will be coordinated with operations of the SWP to enable the DWR to release pulses of water from Oroville Reservoir when water is needed for fish spawning, rearing, and migration. The pulse flows (Ecosystem Pulses) will provide measurable improvements to environmental habitat in the Feather River downstream of Oroville Dam, and in the Sacramento River, from its confluence with the Feather River through the Delta thus meeting the criteria for ecosystem benefits.

5.1.2.2.1 Orville Reservoir Operations:

The MBK analysis documents how the Project will be integrated with Oroville Reservoir operations. Approximately 25 percent of the stored Article 21 water in the Project would be held as SWP system water that would be used for ecosystem benefits purposes. This 25 percent of the water would be made available for ecosystem benefits through 1-for-1 exchanges as depicted in Figure 5-3. The 1-for-1 exchanges would result in Table A water, that is held in Lake Oroville, being reclassified as SWP system water and the SWP system water stored in the ground, being reclassified as Table A water. The Table A water would be used to meet DRWD and Rosedale SWP Table A demands either directly or through operational exchanges. The SWP system water left in Oroville Reservoir would then be used to provide short-term pulses to generate ecosystem benefits by improving habitat for fish in the Feather and Sacramento Rivers and Delta. The magnitude and duration of the Ecosystem Pulses will be determined based on the volume of water available in the ecosystem account and the expected fisheries benefit. The Project will target making ecosystem pulses in drier years when Oroville Reservoir will not make flood control releases. See MBK's Technical Memorandum provided as Appendix C for more information on the modeling and lack of impacts of the Project operations on the operations of the Oroville and the San Luis Reservoirs.

A coordinated operating agreement with DWR would allow the Project to be integrated with Oroville operations to provide the pulse flow ecosystem benefits. Through the Kern Fan Project, DWR would make releases of pulse flows from Lake Oroville upstream of the Delta, which would then physically improve the ecosystem habitat conditions for rearing and downstream migration of spring and winter-run Chinook salmon and other fish species in the Feather River.

Figure 5-3 presents a schematic of how unallocated Article 21 water will be provided to the Project beneficiaries and how the proposed 1-for-1 exchange for ecosystem benefits would occur.

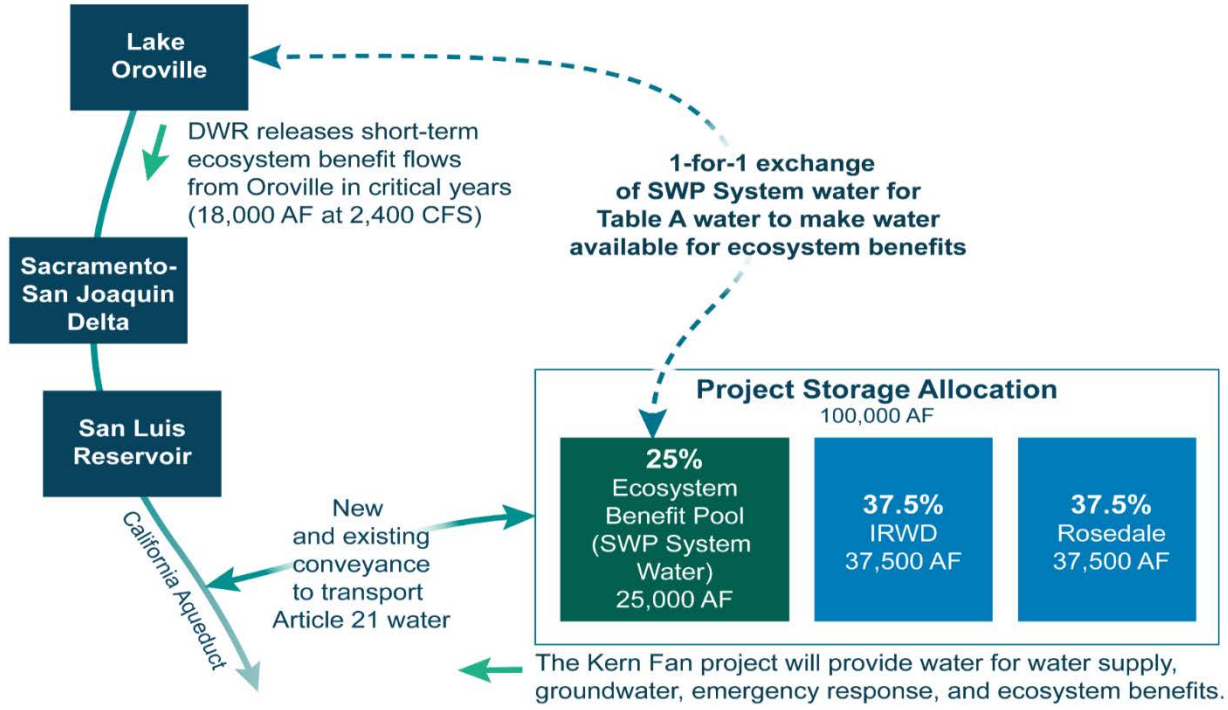


Figure 5-3 : Diagram of Exchanges that will Facilitate Ecosystem Pulse Flows

As shown in Figure 5-3, the remaining 75 percent of the storage capacity would be shared between IRWD and Rosedale. DRWD will receive benefits through IRWD's share of the facilities. Using this 75 percent of the storage, the Kern Fan Project Alternative will be operated to provide emergency supply, agricultural water supply and other water supply benefits.

5.1.3 Beneficiaries of Project

The project will be operated to provide significant benefits. Beneficiaries of the Project and the locations are listed in Table 5-1.

Table 5-1 : Location and Description of Project Benefits

Beneficiary	Location of Benefits	Description of Project Benefit(s)
Environment	Delta, Sacramento River, and Feather River	• Reduces demands on the Delta by recovering stored groundwater to supply local demands in lieu of exporting water from the Delta; • Provides ecosystem benefits in dry and critical years by releasing pulses of water from Lake Oroville for Delta outflow; • Decreases water exported from the Delta and increases river flows during critical periods to support fish spawning; and • Provides an emergency supply in the event of a levee failure in the Delta.
Environment	Kern County	Provides temporary wetlands (recharge basins) that attract water birds.
Rosedale	Kern County	• Provides greater operational flexibility by utilizing contingency groundwater storage to augment supplies during periods when other water sources may be limited or unavailable (emergency response – extended drought); • Provides a firm water supply for the preservation of permanent agricultural crops; and • Provides increased groundwater levels.
IRWD	Orange County	Augments M&I supplies to IRWD during periods when other supply sources may be limited or unavailable (emergency response – extended drought).
DRWD	Kings County	Augments agricultural supplies during periods when other supply sources may be limited or unavailable (emergency response – extended drought).

5.1.3.1 Ecosystem Benefits in Delta

Approximately 25 percent of the unallocated Article 21 water stored by the Project would be held as SWP system water that would be used for ecosystem benefits. The system water would be available for use by DWR through 1-for-1 exchanges that would provide short-term ecosystem pulse flows to generate ecosystem benefits by improving habitat for fish in the Feather and Sacramento Rivers and Delta. This will provide flexibility to DWR by making water available for instream flows when needed in dry and critical dry years.

The pulse flows provided by the Project will be available to improve habitat conditions for in-river rearing and downstream migration of juvenile salmonids. Cramer Fish Sciences (CFS) prepared a quantitative analysis and assessment of the Kern Fan Project's operations for ecosystem benefits. This analysis is provided as Appendix H.

MBK Engineers described the water project operations, river flows and water supply results associated with the Project in Appendix C. Cramer

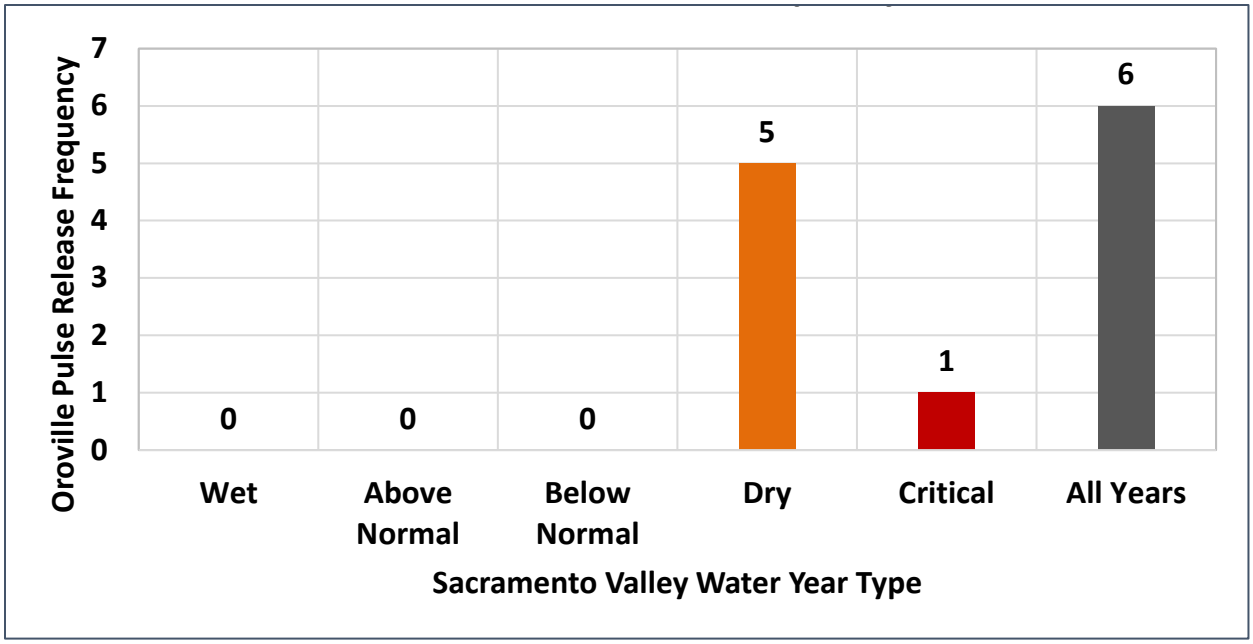


Figure 5-4 : Frequency of Ecosystem Pulses by Water Year Type

Fish Sciences (CFS) working with MBK Engineers utilized these same simulated flows including pulse flows and water project operations and CFS's quantitative analysis shows substantial net benefits to spring-run and winter-run Chinook salmon, steelhead trout and green sturgeon. CFS identifies that optimal pulse releases from Lake Oroville in the month of April provide the greatest benefit for the ecosystem priorities. MBK's modeling looked at an ecosystem pulse released from Oroville in April or May to improve habitat conditions for rearing, downstream migration of spring and winter-run Chinook, and benefits to other fish species. During dry and critical periods, which account for the remaining 6 of 30 years on average, ecosystem pulses would be released from Oroville Reservoir to provide net improvements in ecosystem habitat in the Delta. Per MBK's analysis, it is anticipated that the Project would apply six ecosystem pulses of 18,000 AF over 3.75-day periods in April at 2,400 cfs during dry or critical years. April was selected as a period of high relative abundance for downstream migration and rearing of juvenile salmon, however, the Project offers flexibility to accommodate DWR's operation of Oroville Reservoir and the SWP.

Per the CFS analysis, the ecosystem pulses will improve habitat conditions for in-river rearing and downstream migration of juvenile salmonids. The CFS Technical Memorandum and supporting documentation provides detail on the project operations for ecosystem benefits and methods for quantifying ecosystem benefits and is included in Appendix H.

From MBK's report**,** Figure 5-4 below shows the frequency of the Ecosystem Pulses by water year type. As noted earlier, the pulses are made during Dry and Critical years when Feather River flows are lower and pulses may create a higher potential for benefits to the ecosystem. In this analysis, April was selected as the month for Ecosystem Pulses.

Figure 5-5 shows example changes in Oroville Reservoir releases and storage with the Project. Flows in the Feather River are higher under the Project conditions during April when Ecosystem

Pulses are made from Oroville. The release of Ecosystem Pulses results in lower Oroville storage under the Project conditions after making Ecosystem Pulse releases. Storage in Oroville would be recovered in later months by reducing releases from Oroville when Feather River flows are in excess of the minimum instream flow requirements and Oroville is releasing water to support SWP Delta exports. Oroville Reservoir is typically releasing water to support Delta exports in the July through September period. Oroville releases are reduced in this period to compensate for the Ecosystem Pulses resulting in lower Feather River flows under the Project conditions to recover the volume of the Ecosystem Pulse. Analysis in the spreadsheet model attempts to recover the Ecosystem Pulse volume in Oroville in the same year as when the pulse is made, such that Oroville carryover storage is not affected. MBK's technical memorandum included as Appendix C, provides a similar analysis of changes in San Luis Reservoir releases and storage with the Project. This analysis indicates that storage in San Luis Reservoir will also recover each year as a result of the 1-for-1 exchanges and ecosystem pulses associated with the Operation of the Kern Fan Project.

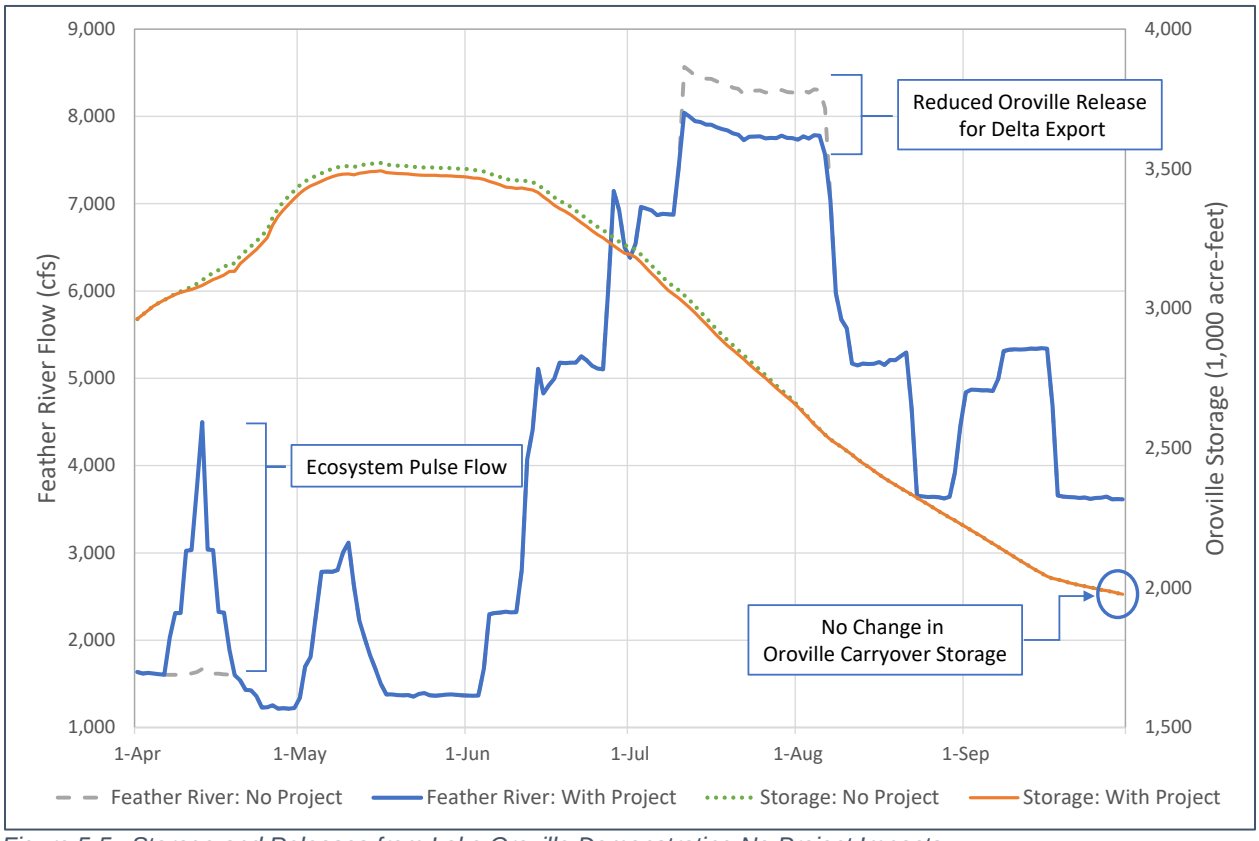


Figure 5-5 : Storage and Releases from Lake Oroville Demonstrating No Project Impacts

Delta outflows are greater during April of Dry and Critical years under the Project condition when Oroville is making Ecosystem Pulses. Ecosystem Pulses in April and May of Dry and Critical years are expected to increase Delta outflow because Delta exports are typically constrained in these months by regulatory requirements such as San Joaquin River inflow-to-export ratio or Old and Middle River flow requirements. Delta outflows can be lower in January through May of Below Normal and wetter years when Delta outflow is diminished either due to

capture of unallocated Article 21 surplus water for the Project or due to a reduction in Oroville releases.

MBK Engineers simulated the project performance under the 2030 scenario and other projected conditions: (1) 2070 climate change, (2) without the California WaterFix, and (3) with the California Water Fix. While the numbers vary, the conclusions generally remain the same – operation of the Project and coordination with the SWP operation will support ecosystem pulse releases from Oroville Reservoir that will yield a net increase in fishery benefits.

5.1.3.2 Intermittent Wetland Habitat Benefits

The Kern Fan Project is expected to provide intermittent wetland habitat along the recharge basins-where marsh-like environments are established during recharge periods and create ideal habitat for waterfowl, shorebirds, raptors, and other native and migrating birds. These conditions will exist whenever recharge activity occurs on the Project sites.

The intermittent wetland habitat that will be provided by the Project will be approximately 1,200 acres in size which is the area of the recharge ponds located on both project sites. Water will be typically recharged during the winter months and will provide temporary habitat during wet, above normal, and normal water years when recharge activity occurs. Under 2030 conditions during wet years when recharge activity occurs, based on only Article 21 supplies, the project can be expected to provide on average approximately 2 months of temporary habitat. In some years when there is a lot of recharge activity, the project may provide temporary habitat for up to 12 months.

Over an 82 year simulation period using historical hydrology, the project is expected to have approximately 125 months of recharge under 2030 conditions assuming that unallocated Article 21 water will be the only supply of water to the Project. Using historical hydrology, it was determined that the project would have at minimum 2 months of intermittent wetland habitat on average annually. Duration of recharge was determined using the approximate area of recharge basins (1,200 acres), recharge rate of land, and amount of water recharged per event.

5.1.3.3 Emergency Response-Extended Drought Benefits

A major benefit of the Project is that it will provide supplemental water to IRWD, Rosedale, and DRWD in the event of extreme drought (three years or more), when other water resources are at their most expensive or may be limited. Groundwater stored as part of the project will be available to call on during a drought emergency or as an alternative supply in the case of a local supply outage.

Per MBK's model, analyzing only the unallocated Article 21 water, IRWD and Rosedale's accounts would receive 2,700 AF per year of water on an average annual basis under 2030 future conditions and 3,000 AF per year would be received on an average annual basis during 2070 future conditions. One-third of the water in the IRWD and Rosedale storage accounts will be dedicated to Emergency Response during extended droughts and two-thirds will be dedicated for water supply during other dry year conditions. The water used for Emergency Response purposes will be physically extracted from the Project utilizing the recovery wells at the third or later year of a multi-year drought.

5.1.3.4 Emergency Response-Delta Failure Benefits

A separate emergency response benefit of the Project is the water supply that the Project could provide in the event of a levee failure in the Delta that curtails water project deliveries. The WSIP Technical Guidance explains that an emergency response to Delta Failure should be assumed to occur once, 30 years into the project operation period—2056 for this project.

According to MBK's analysis, under historical hydrologic conditions, the Project can provide Emergency Response benefits during a Delta levee failure by storing water south of the Delta that can be extracted and made available after a failure event. The probability of water being stored in the Project in any year is one measure of potential Emergency Response benefit. Utilizing only the unallocated Article 21 water amounts, MBK found that the Project is likely to have 23,000 AF of water available for Emergency Response after 30 years of operation.

5.1.3.5 Water Supply Reliability Benefits

Water Supply benefits will accrue to IRWD, Rosedale, and DRWD, and their service area customers. According to modeling by MBK Engineers, looking only at the unallocated Article 21 water supplies recharged, the project will provide an annual expected additional supply of 2,700 acre-feet per year on an average annual basis under 2030 future conditions, and 3,000 acre-feet per year on an average annual basis under 2070 future conditions. Other non-SWP water supplies are assumed to be stored and available for IRWD and Rosedale's use, which would provide additional benefits. However, these supplies have not been factored into the benefit analysis. Accordingly, the water supply benefits of the project are greater than stated herein.

5.1.3.6 Agricultural Impact Water Supply Benefit

The Kern Fan Project will provide improved reliability and redundancy in agricultural supplies for Rosedale. It is expected that Rosedale would receive optimal agricultural water benefit from the Project potentially during times when surface water and/or local supplies are interrupted or curtailed and likely in a dry or critical year.

Not only would the project store water for the benefit of Rosedale's agricultural uses, an additional agricultural benefit from the Kern Fan Project is the preservation of permanent agricultural crops that would be need to be replaced with low-value crops if the water from the Project were not available. Without the Kern Fan Project, Rosedale estimates that about 600

acres of permanent planted crops in its service area would have to be planted in lower value crops (such as alfalfa or cotton) in order to meet the sustainability requirements of the Sustainable Groundwater Management Act (SGMA). Permanent crops cannot be fallowed during dry years, so the probable alternative is to switch to row crops, which may be fallowed. The unallocated Article 21 water supplies that would be stored by the project will help to firm up Rosedale's overall water supplies and allow up to 600 acres of permanent crops to stay in production.

5.1.3.7 Water Supply Benefits to IRWD and DRWD

Water stored in the IRWD account will provide a water supply benefit to both IRWD and DRWD during times of reduced water supply. As presented in Figure 5-6, the Article 21 water stored in the Project for IRWD as a land owner in DRWD would be exchanged for SWP Table A water on a 1-for-1 basis to IRWD. Under the terms of an unbalanced exchange, 50% of this water would be returned to DRWD and 50% recovered for used in IRWD's service area via existing canals, the California Aqueduct, and MWD facilities. IRWD would receive water reliability benefits for M&I uses and DRWD would receive water reliability benefits for agricultural uses.

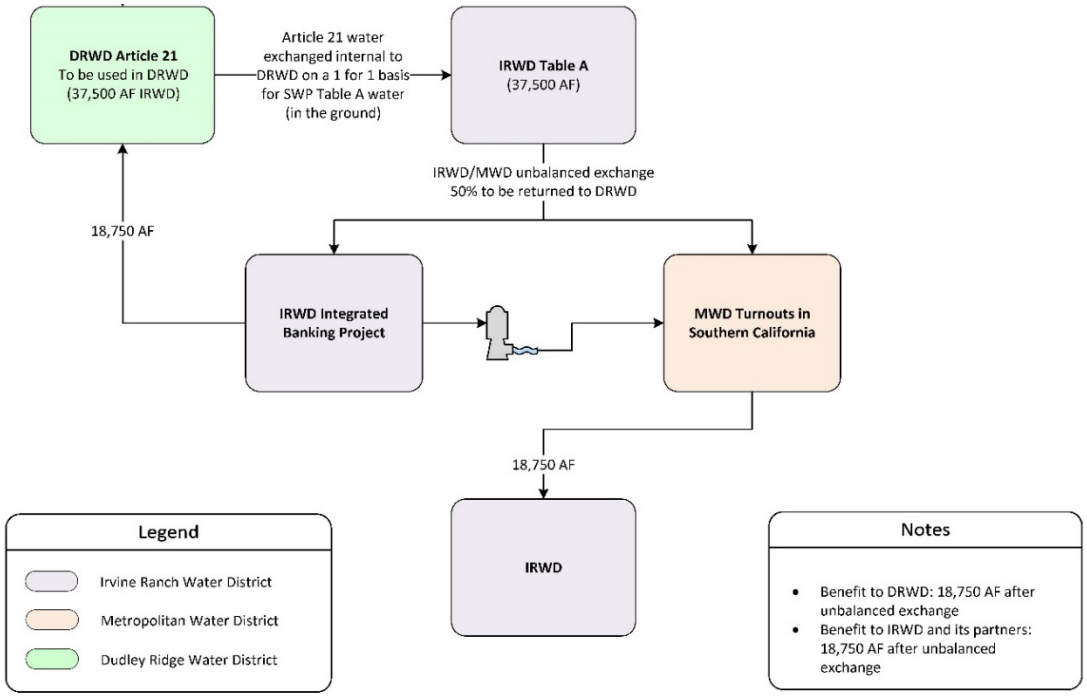


Figure 5-6 : Diagram Depicting Joint Benefits to IRWD and DRWD

5.1.3.8 Increased Groundwater Level Benefits

The additional water stored in Kern County as a result of the proposed project will improve water levels in the Kern Sub-basin and support groundwater sustainability. The groundwater

basin in Kern County is operated such that a portion of Rosedale's and IRWD's banked groundwater is not recovered by the banking entity and remains in the ground to bolster local groundwater levels. The Kern Fan Project would operate within the Rosedale service area overlying the Kern Fan area. Rosedale entered into two Memorandums of Understanding (MOUs) with adjoining entities in the Kern Fan area. The MOUs provide guidelines for operation and monitoring of Rosedale's groundwater banking programs. The Kern Fan Project would be subject to and operated consistent with these MOUs. The MOUs guidelines help to avoid, eliminate or mitigate adverse impacts to the groundwater basin operation of other groundwater banking programs in the Kern Fan area and overlying uses dependent upon the groundwater basin.

Among other things, the MOUs establishes loss factors for water that is recharged in the basin. Surface evaporation losses are assessed at 6%, migration losses are assessed at 4% and water recharged for out-of-County uses is assessed an additional 5%. Water recharged into Rosedale's account incurs a total 10% loss and IRWD water is assessed 15%. The modeling analysis (MBK Engineers, 2017) assumes water is simulated as stored in the Project in each of three "accounts": ecosystem, IRWD, and Rosedale. Water stored in each account is subject to a loss percentage of 10% for Rosedale, 12.5% for Ecosystem, and 15% for IRWD. MBK's model accounted for these losses, so that the estimated water stored in each "account" is net of these losses. These losses are assessed on all water recharged into the basin and except for the surface water loss, which is considered evaporation, all other amounts are considered a benefit to the basin.

To evaluate the groundwater improvement benefits from the project, a model analysis was completed to quantify the potential groundwater level benefits from the project. Hydrogeologists at Thomas Harder & Co. prepared a numerical model to analyze the portion of the Project water that would remain in the basin and the groundwater level benefits over a 50-year project operational scenario as developed by MBK Engineers. The analysis showed the project will result in measurable increases in groundwater elevations and therefore provide a groundwater level benefit to the Kern County groundwater basin. This modeling work is described in a technical memorandum provided as Appendix I.

5.2 Economic Benefits Summary

The Kern Fan Project will be operated to provide benefits including water supply, groundwater improvement, environmental benefits, and emergency response to extended drought and Delta failure scenarios.

Project benefits were determined based on results from MBK's water supply and operations modeling. Further information on how MBK estimated the project yield can be found in their report located in Appendix C. Using the results provided by MBK, Cramer Fish Sciences (CFS) prepared a quantitative analysis and assessment of the project's operations for ecosystem benefits. The CFS report documenting data and methods used is located in Appendix H.

Project benefits quantified by MBK and CFS were then monetized by M.Cubed. The methodological approach for monetizing the project's benefits is documented in the M.Cubed technical memorandum and supporting documentation located in Appendix F.

Based on analysis of the Kern Fan Project, M. Cubed calculated that the Project is anticipated to provide a total benefit net present value of $410 million in 2018 dollars (M. Cubed, 2019). A summary of the estimated value of the project benefits is provided in Table 5-2.

Table 5-2 : Kern Fan Project Benefits Summary

Benefit	Estimated Value (2018$ millions)
Water Supply Benefits M&I	$49.5
Groundwater levels	$9.1
Environmental Benefits – Delta fish species	$37.5
Environmental Benefits – Intermittent Wetland Habitat	$162.6
Emergency Response – Extended Drought	$18.0
Emergency Response – Delta Failure	$29.6
Agricultural Direct Benefits of Crop Substitution	$25.8
Water Supply Benefits Agriculture	$77.8
Total Benefits	**$409.9**

In addition to the water supplies expected to be available to the Project, IRWD and Rosedale anticipate that they will be able to secure other water supplies for the Project from exchange and transfer programs. These programs will substantially augment the water supplies available for recharge at the Project. The Project benefits presented in Table 5-2 do not consider the availability of these other supplies and are therefore considered to be understated. Both Rosedale and IRWD have demonstrated effective water management programs whereby unbalanced exchanges with other water interests, not factored into this analysis, would generate substantial water supply benefits to the respective parties.

5.2.1 Implementation Schedule

The Kern Fan Groundwater Storage Project will require approximately 6 years and 3 months to design, bid and construct. A schedule for the project implementation is presented in Appendix J.

5.2.2 Cost Allocation

An updated project 30% Design Report and engineering Class 3 Level Cost Estimate was developed for the Kern Fan Groundwater Storage Project by Dee Jaspar & Associates, Inc. (DJA) (see Appendix D). DJA's cost estimates are based upon previous project bid prices, actual cost of operations of other Rosedale and IRWD water banking facilities and includes direct and indirect costs such as project overhead, business overhead, profit and bonds. The cost estimates include capital construction costs, operations and maintenance costs consistent with the operations plan, and replacement costs.

Project costs were allocated to beneficiaries in a manner that demonstrates financial and economic feasibility and ability to pay. A simplified allocation method was used that allocates project costs among the benefit categories in proportion to the project purposes and monetized benefits. The total costs allocated to beneficiaries for repayment include construction costs,

interest during construction, annual operations and maintenance costs and replacement costs (OM&R). The detailed cost allocation worksheets are provided in Appendix G.

Table 5-3 provides the estimated costs to be allocated for the Kern Fan Groundwater Storage Project with the BV Alignment.

Table 5-3 : Kern Fan Project – BV Alignment Capital and Annual Costs

	Cost (million $)
Capital Cost	
Construction Cost	$225.1
Interest During Construction (IDC)	$0
Total Capital	**$225.1**
Annual Cost	
Interest & Amortization	$8.5
OM&R	$1.9
Total Annual	**$10.4**

Table 5-4 provides the detail for the construction cost to be allocated to each project purpose and benefit.

Table 5-4 : Construction Cost Allocated to Each Kern Fan Project Purpose and Benefit (Million $)

	Ecosystem Benefit - Salmon	Ecosystem Benefit - Intermittent Wetlands	Emergency Response - Extended Drought	Emergency Response - Delta Failure	Agricultural Direct Benefits - Crop Substitution	Water Supply Benefits - Agriculture	Water Supply Benefits - M&I	Groundwater Benefits	Total[7]
Average Annual Benefits	**$1.4**	**$5.2**	**$0.7**	**$1.5**	**$1.0**	**$3.2**	**$2.1**	**$0.4**	**$15.4**
Justifiable Expenditure[1]	**$1.4**	**$5.2**	**$0.7**	**$1.5**	**$1.0**	**$3.2**	**$2.1**	**$0.4**	**$15.4**
Specific Costs[2]	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Remaining Justifiable Expenditure[3]	$1.4	$5.2	$0.7	$1.5	$1.0	$3.2	$2.1	$0.4	$15.4
Percent Distribution[4]	9%	34%	5%	10%	6%	21%	14%	2%	100%
Remaining Joint Costs (annual)[5]	**$0.9**	**$3.5**	**$0.5**	**$1.0**	**$0.6**	**$2.1**	**$1.4**	**$0.3**	**$10.4**
Construction Costs	$20.2	$75.9	$10.6	$22.1	$13.9	$46.4	$30.6	$5.4	$225.1
Average Annual OM&R	$0.2	$0.6	$0.1	$0.2	$0.1	$0.4	$0.3	$0.0	$1.9
Total Allocation (annual)[6]	**$0.9**	**$3.5**	**$0.5**	**$1.0**	**$0.6**	**$2.1**	**$1.4**	**$0.3**	**$10.4**

Notes:
[1] The cost allocation is based on benefits being equivalent to single purpose alternative costs and that benefits are used as the justifiable expenditure.
[2] Specific costs have not been identified for this preliminary cost allocation.
[3] Remaining justifiable expenditure is justifiable expenditure less specific costs. See note 2, specific costs are assumed to be zero for this initial cost allocation.
[4] Percent distribution is based on proportion of benefits for each project purpose.
[5] Remaining joint costs are the annual interest, capital amortization, and OM&R multiplied by the percent distribution for each benefit category.
[6] Total annual allocation is the annual interest, capital amortization, and OM&R multiplied by the percent distribution for each benefit category.
[7] Values rounded to the nearest tenth of a million dollars.

5.2.2.1 Authority for Federal Financial Participation

Costs allocated to each purpose are assigned to federal taxpayers (non-reimbursable) and project beneficiaries (reimbursable) based on the specific project authorization, existing Federal law, existing cost sharing requirements, and laws and objectives of non-Federal entities. Non-Federal partners are seeking Federal funding for the implementation of this project. Table 5-5 summarizes the federal authority that informs the cost allocation.

Table 5-5 : Federal Authority for Cost Allocations

Purpose	Pertinent Federal Legislation	Description
Federal Cost Share for a State-Led Project (Fish Habitat Enhancement and Intermittent Wetland)	Water Infrastructure Improvements for the Nation Act (Public Law 114-322)	Provides authorization for Federal funding in storage projects led by public agencies organized pursuant to State law and limits Federal participation to not more than 25% of the total cost of a State-led storage project.

The assignment of percentages used as the basis for assigning costs are based on existing Federal authorities and are summarized in Table 5-6. In accordance with the Water Infrastructure Improvements for the Nation Act (WIIN) for State-Led Storage Projects, the Secretary of the Interior may participate in a State-led storage project in an amount equal to not more than 25 percent of the total cost to the State-led storage project.

Table 5-6 : Percentages for Assigning Federal and Non-Federal Costs

Cost Category	Construction		OM&R	
	Federal Non-Reimbursable Costs	Non-Federal Costs	Federal Non-Reimbursable Costs	Non-Federal Costs
Ecosystem Benefit - Salmon	21%	79%	0%	100%
Ecosystem Benefit - Intermittent Wetlands	61%	39%	0%	100%
Emergency Response - Extended Drought	0%	100%	0%	100%
Emergency Response - Delta Failure	0%	100%	0%	100%
Agricultural Direct Benefits - Crop Substitution	0%	100%	0%	100%
Water Supply Benefits - Agriculture	0%	100%	0%	100%
Water Supply Benefits - M&I	0%	100%	0%	100%
Groundwater Benefits	0%	100%	0%	100%

The percentages for the ecosystem benefits in Table 5-6 have been calculated to account for public benefits that are expected to be paid for by WSIP funds in order to distinguish cost

share responsibilities between the CWC and others. State funding secured through the CWC under the WSIP will not increase the Federal cost share and there is no overlap or double counting.

Table 5-7 shows an estimate of cost assigned to beneficiaries for each project purpose for the Kern Fan Groundwater Storage Project.

Table 5-7 : Kern Fan Project Costs Assigned to Beneficiaries (Updated)

Cost Category	Construction		OM&R	
	Federal Non-Reimbursable Costs	Non-Federal Costs	Federal Non-Reimbursable Costs	Non-Federal Costs
Ecosystem Benefit - Salmon	$4.2	$16.0	$0.0	$0.2
Ecosystem Benefit - Intermittent Wetlands	$46.0	$29.9	$0.0	$0.6
Emergency Response - Extended Drought	$0.0	$10.6	$0.0	$0.1
Emergency Response - Delta Failure	$0.0	$22.1	$0.0	$0.2
Agricultural Direct Benefits - Crop Substitution	$0.0	$13.9	$0.0	$0.1
Water Supply Benefits - Agriculture	$0.0	$46.4	$0.0	$0.4
Water Supply Benefits - M&I	$0.0	$30.6	$0.0	$0.3
Groundwater Benefits	$0.0	$5.4	$0.0	$0.0
Total	**$50.2**	**$174.9**	**$0.0**	**$1.9**

5.2.3 Ability to Pay

Based on costs allocated to various project purposes, an assessment of the financial repayment capability of the project beneficiaries was completed for the Recommended Plan. The Assessment of the M&I beneficiaries' ability to pay confirmed that M&I beneficiaries would have the ability to pay the allocated costs through water rates. The analysis of agricultural beneficiaries' ability to pay confirmed the ability to pay primarily through fees levied on water management programs with third parties.

In accordance with the WIIN Act for State-Led Storage Projects, the State or local sponsor must determine, and the Secretary of the Interior must concur, that the State-led storage project non-Federal sponsors are financially solvent. Through the application process under the CWC's Prop 1 Water Storage Investment Program funding, the project sponsors, Rosedale and IRWD, provided information regarding the project sponsors' financial solvency, which is summarized in this section.

Through the formation of the **Groundwater Banking Authority**, IRWD and Rosedale will partner to implement the Kern Fan Project. **An agreement Between Rosedale and IRWD creating the Groundwater Banking Authority (a Joint Powers Authority) to develop and**

implement the Project was approved by both the Boards of Directors of Rosedale and IRWD and was executed on April 8, 2020. IRWD and Rosedale share a ten-year history of implementing successful water banking projects in Kern County. Due to the importance of the project with respect to managing water supplies, IRWD and Rosedale have planned to construct water banking facilities on a third site within its approved Stockdale Integrated Banking Project. This proposed third site effectively is Phase 1 of the proposed Kern Fan Groundwater Storage Project. The estimated capital costs for the project in 2018 dollars is $225.1 million. IRWD and Rosedale expect that a portion of the project capital costs will be funded through the CWC, which has granted a conditional funding award of $67,537,315.

IRWD and Rosedale, as project sponsors, understand each agency is responsible for providing the difference between the grant amount and the total project cost to ensure a fully funded project. IRWD and Rosedale are committed to jointly identifying and acquiring the property necessary to construct the water banking facilities, with each paying for its share of capital costs and the full operation, maintenance and replacement costs for the proposed Kern Fan Groundwater Storage Project over the planning horizon. Following is a description of funding plans for the remaining capital construction costs and the ongoing OM&R costs over the project life.

5.2.3.1 Irvine Ranch Water District Funding Plan for Capital Costs

Each year, the IRWD Board of Directors reviews IRWD's long term capital program that extends out to final development to identify infrastructure requirements for new development, enhancement and replacement projects. The capital budget that is approved represents those facilities that will begin construction during the current fiscal year. The objectives of the long term capital program are to enhance reliability, provide sufficient redundancy, and reduce operating costs by utilizing industry-leading forecasting modules that update water, sewer and recycled master plans.

In addition, the District reviews the funding requirements necessary to meet the identified capital needs. The District's policy shares the cost of new development equally between the developer and the homeowner through connection fees and property taxes. Connection fees, general obligation (GO) property taxes, and one percent property taxes are considered the primary funding sources for new capital. The connection fees and GO property tax rates are reviewed and set annually to meet ultimate water and recycled water demands for the District's current and future customer base. This includes:

- Water and recycled water capacity;
- Sewer treatment capacity;
- Natural treatment system facilities; and
- Water and sewer system enhancements.

Current construction and capital funds will provide initial funding for the Project. IRWD usually funds the construction of major projects and then issues bonds that reimburse the capital funds.

IRWD's regional facilities are ultimately funded through the sale of bonds and uses three primary sources of revenue to pay the debt service. These sources are IRWD's allocation of one percent property tax revenue, connection fees that are funded from new development and GO property taxes that are paid by the homeowners for the sole purpose of funding District debt service.

In addition, IRWD has sufficient capital funds without having to issue bonds if it chooses. The four-year average for cash and investments for IRWD exceeds $300M. Each year IRWD publishes its Comprehensive Annual Financial Report, with the most recent for fiscal year ended June 30, **2019**, a copy of which is available upon request.

5.2.3.2 Irvine Ranch Water District Funding Plan for Operation, Maintenance and Replacement Costs

Each year, the IRWD Board of Directors approves an annual operating budget. The goal of the District's operating budget process is to appropriately fund the resources required to provide excellent service to IRWD customers as cost-efficiently as possible.

IRWD's user rates and charges are primarily used for funding IRWD's operation and maintenance expenses. IRWD separates the cost of constructing water and sewer infrastructure from the cost of daily operations and maintenance. User rates are billed to customers on a monthly basis and include a component for the inevitable replacement of existing infrastructure.

5.2.3.3 Rosedale's Proposed Project Funding Plan for Capital Costs

Each year, the Rosedale Board of Directors reviews Rosedale's short and long-term budgets, including the Rosedale long term capital program that identifies and estimates the acquisition and /or construction of new capital facilities as well as the rehabilitation and/or replacement of existing. The capital budget that is approved represents those facilities that will begin construction during the current fiscal year. The objectives of the long term capital program are to ensure continuing Rosedale operational capacity, anticipate and address swings in revenues as required to address both operational and capital cash-flow variability, and ensure the reliability of Rosedale's water supply.

In addition, Rosedale annually reviews the funding requirements necessary to meet the identified capital needs. Rosedale has adopted a Financial Plan, which provides for the escalation of revenues through cost recovery of its various water management programs, adjustments to user fees to reflect value of service provided and a landowner assessment, collected through property taxes. One principal source of revenue for Rosedale is through user fees levied on water management programs with third parties. The other primary source of revenues for Rosedale is the collection of assessments on each acre of land within Rosedale, collected through the property tax rolls.

Funding for the Project will occur through revenue bonds. Rosedale uses two primary sources of revenue to pay the debt service. These sources are the Rosedale's user fees and the landowner assessments, collected through the property tax rolls.

Each year Rosedale publishes its Annual Audit, with the most recent for fiscal year ended December 31, 2018, a copy of which is available upon request.

5.2.3.4 Rosedale's Funding Plan for Operation, Maintenance and Replacement Costs

Each year, the Rosedale Board of Directors approves an annual operating budget. The goal of the operating budget process is to appropriately fund the resources required to acquire and manage the water supplies necessary to maintain groundwater levels within the Rosedale service area. Revenues from user fees are established by Agreement with various third parties and are adjusted annually based upon an agreed upon escalation factor. Rosedale seeks to minimize fluctuations in its user charges through the establishment of a reserve fund. The reserve fund is drawn upon to address variations in annual expenditures, which are primarily driven by the variability in hydrology.

Rosedale will adjust its user charges and the reserve fund to address any adjustments to annual operating costs as a result of the Project.

5.3 Determination of Feasibility of the Recommended Plan

The feasibility of the Recommended Plan, the Kern Fan Groundwater Storage Project, has been evaluated and is summarized below.

5.3.1 Technical Feasibility

The proposed Kern Fan Groundwater Storage Project will be constructed using existing, well-established, efficient and reliable engineering techniques. The construction of the Project facilities will be similar to previous water banking projects constructed by the Project proponents that include Rosedale's Allen Basins, West Basins, Superior Basins, the Drought Relief Project, IRWD's Strand Ranch Project and IRWD's Stockdale West Project, a component of the joint Stockdale Integrated Banking Project. These previously constructed facilities are shown in Figure 5-8. Rosedale and IRWD have significant prior experience designing and constructing water banking projects. Experience includes environmental review, design of well construction, well equipping, recharge basins, conveyance pipelines, and turnout structures. Project facilities have been designed, located and constructed to minimize potential impacts, as will the proposed Project.

An engineering **30%** Design Report of the Project provides a description of the proposed Project facilities, how the Project facilities would be integrated with existing water banking facilities, capital and operations cost estimates, and replacement cost estimates. This report provides additional detail on the Project facilities design and construction materials and is included in Appendix D.

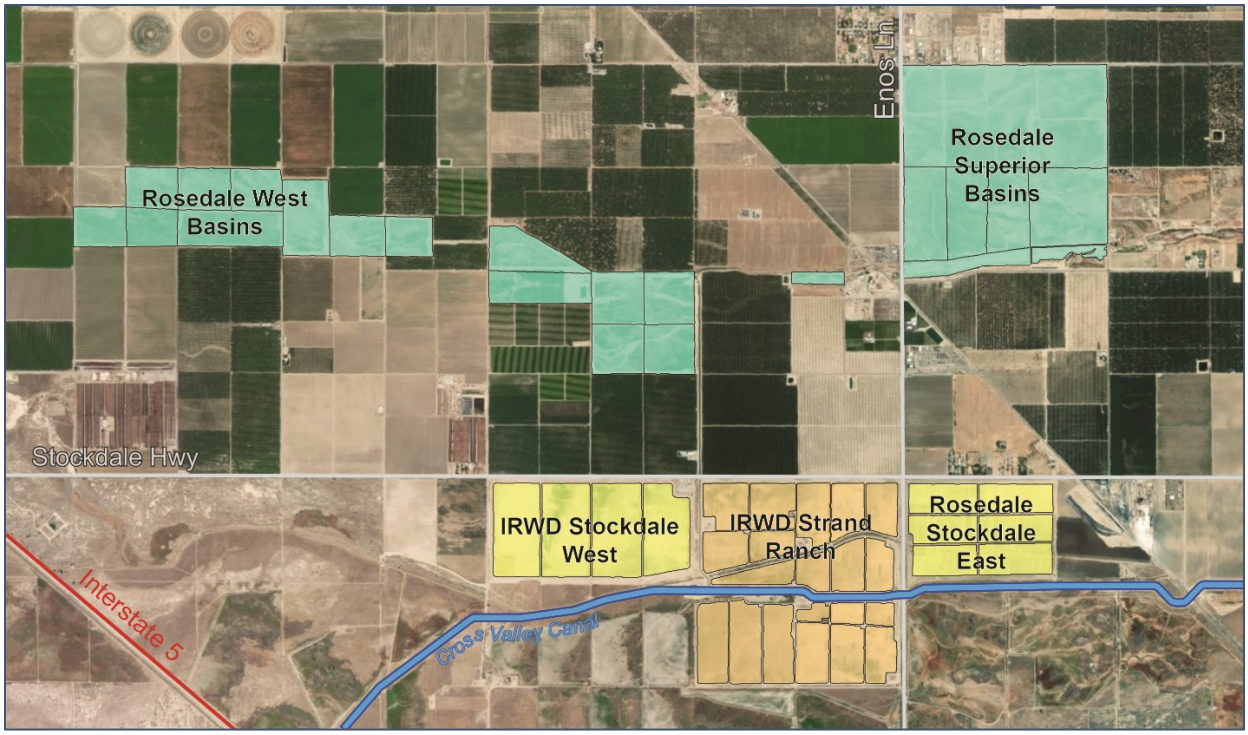


Figure 5-7 : IRWD and Rosedale Previously Constructed Water Banking Projects

5.3.2 Environmental Feasibility

The Kern Fan Groundwater Storage Project is subject to the environmental review process established in the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) to receive Federal funding.

Environmental analyses conducted to date suggests that the Kern Fan Groundwater Storage Project Alternative Plan would be environmentally feasible for all three potential canal alignments. A Final EIR was prepared, certified, and approved in December 2015 for the Stockdale Integrated Banking Project (see Appendix B). The Stockdale Project Final EIR documents the program-level analysis completed for the third project site or Phase 1 of the Kern Fan Project. The Stockdale Project Final EIR assumes that similar species and impacts would occur at most potential sites within the additional site perimeter. Impacts identified would occur during the construction and operation of the project. Most construction impacts would be short term and are either considered less than significant or are reduced to less than significant levels with appropriate mitigation measures. Operational impacts either are considered less than significant or are reduced to less than significant levels with appropriate mitigation measures. The Stockdale Project Final EIR concludes that the project, which includes programmatic review of Phase 1 of the Kern Fan Project, would not result in any significant and unavoidable impacts. IRWD and Rosedale anticipate that upon further project-level analysis, the Kern Fan Project will not result in significant or unavoidable impacts.

5.3.3 Economic Feasibility

The Kern Fan Groundwater Storage Project for all three potential canal alignments, at the **30% feasibility study** level of design, is projected to be economically feasible, because the estimated annual benefits exceed the estimated annual costs, resulting in positive net benefits greater than or equal to **$5.0 million** annually, and a benefit cost ratio of greater than or equal to **1.48.** The Kern Fan Groundwater Storage Project has the highest net benefits of the alternatives evaluated in the Feasibility Report and is the only alternative with positive net benefits.

5.3.4 Financial Feasibility

Financial feasibility was determined by comparing the beneficiaries' payment capacity with the annualized costs for the Recommended Plan. The estimated average annual ability to pay of project beneficiaries is large compared to the estimate total annual costs, which indicates that project beneficiaries would benefit from the project and will be able to pay the allocated annualized costs.

5.4 Risk and Uncertainty

Per CMP 09-02, Feasibility Studies will account for the uncertainty of future conditions by incorporating risk and uncertainty analysis into the formulation, evaluation, and comparison of alternatives. The following section describes areas of risk and uncertainty identified during development of the Project.

5.4.1 Project Operations

MBK performed uncertainty analyses related to the potential future (2070) climate change, including Project performance during critical droughts and the California WaterFix. Environmental uncertainties relevant to the benefits provided by the Project include climate change, variation in snow pack and periods of multi-year drought because the project benefits depend on unallocated Article 21 water supply available for recharge and storage in the Project. MBK Engineers performed uncertainty analyses related to the potential future (2070) climate change, including Project performance during critical droughts and the California WaterFix. This uncertainty analysis is included in the MBK Engineers Technical Memorandum and associated model (See Appendix C). Results from the uncertainty analyses would be taken into consideration upon development of the adaptive management and monitoring program for the project.

5.4.1.1 Climate Change

MBK Engineers performed the climate change analysis using the 2070 dataset that reflects future climate and sea level conditions in the year 2070 (see Appendix C). MBK concludes that although project performance changes with climate conditions, 2070 is similar to the expected performance in 2030. The Project is still able to provide ecosystem benefits in the Delta and water supply benefits under the assumed, future climate change.

5.4.1.2 California Water Fix

The existing Delta is a vulnerable to climate change and earthquake risk. As sea levels continue to rise, the water quality in the Delta will be impacted and the supply to 26 million Californians across the state could be at risk. The California WaterFix was a proposal in 2017 to modify the point of diversion for the SWP and CVP in the Delta to improve conveyance of water through the Delta to avoid impacts to ecosystems and to reduce risks from climate change and earthquakes. This proposed plan is currently being revised and potentially reduced in size, however, MBK Engineers performed analysis and included a model with and without California WaterFix conditions using the CalSim II model developed by DWR and Reclamation for the Biological Assessment for California WaterFix. The California WaterFix CalSim II model includes the 2025 Early Long Term climate change assumptions that are different from the 2030 climate change assumptions. Results indicate an increase in Project yields with the California WaterFix when compared to without the California WaterFix (see Appendix C).

5.4.2 Project Design and Cost Estimates

The project design for the Recommended Plan, the Kern Fan Project, are presented at a **30%** design level. Additional design work is planned to inform the civil design and reduce uncertainties with the cost estimates during a future phase. The more detailed design level will further reduce the risk and uncertainty for the project. All cost estimates have uncertainties including labor and material costs, materials availability, competitive bidding environments, unidentified field conditions or changing regulatory environments. Appropriate contingencies have been applied to account for these uncertainties.

An updated, detailed feasibility level cost estimate for the Project is included in Appendix D based on a Class 3 level estimate. Class 3 estimates are generally prepared based on planning level estimates and are used for feasibility studies. This method of cost estimating complies with FAC 09-01. Included in the cost estimate is an estimate for unlisted items which include minor items required to construct a project for which it is not practical to develop designs and quantities during early states of a project. The allowance for design contingency is 20% which is consistent with FAC 09-01.

5.4.3 Project Schedule

The pre-construction and construction schedule and associated costs for the Recommended Plan are based on requirements of the funding expected to be received under the WSIP. An extended schedule could risk the WSIP funding and would likely increase the costs, construction, field and non-contract costs. The proposed Project schedule is provided as Appendix J.

5.4.4 Monetizing Project Benefits

Estimating economic (monetized) benefits of potential project benefits is critical to establishing economic feasibility and supporting the Recommended Plan. Valuation methods and assumptions for each of the benefit categories is included in Appendix F and summarized in Chapter 4. Any uncertainties associated with each of the valuation methods are noted. The

modeling performed by MBK provides a sensitivity analysis on emergency storage and water supply available for a Delta levee failure response (see Appendix C).

5.5 Unresolved Issues and Special Considerations

5.5.1 Agreements

Several agreements are needed with the DWR for the new turnout from the California Aqueduct and the exchange of banked water in Kern County for system water in Lake Oroville. Project sponsors have been working closely with the DWR on terms of these agreements and expect to have agreements in place in accordance with the project schedule.

Chapter 6 : Coordination and Public Involvement

6.1 Stakeholder and Public Outreach

Stakeholder and public outreach for the Kern Fan Project began during development of the Stockdale Integrated Banking Project Environmental Impact Report (Stockdale EIR). The Stockdale EIR includes program-level analysis of a third project site. The third project site accounted for in the Stockdale Project EIR is now designated to be Phase 1 of the Kern Fan Project. IRWD and Rosedale conducted two public scoping meetings in October 2013 to receive public comments on the Notice of Preparation (NOP). Additional public scoping meetings were held in May 2015 to receive public comments on the Draft EIR. The Final EIR was certified and approved in December 2015.

In August 2017, IRWD and Rosedale submitted a joint grant application for the Kern Fan Project to the CWC for the Proposition 1 WSIP. A copy of the grant application, which includes a detailed description of the project, was made available on the CWC website. During the application review process, opportunities for public comment were made available following presentations by IRWD and Rosedale during numerous public meetings of the CWC.

6.2 Agency Coordination

Construction and operation of the Kern Fan Project will require coordination with various State and Local agencies. IRWD and Rosedale will work with all the agencies described in the following sections to obtain the necessary permits, approvals, and agreements.

6.2.1 California Department of Water Resources

IRWD and Rosedale are working with DWR to secure the necessary approvals and agreements needed to implement key components of the Kern Fan Project. The following agreements will need to be executed with DWR:

- California Aqueduct Turnout Agreement: This agreement will authorize the construction and operation of a new turnout on the California Aqueduct consistent the existing Water Supply Contracts Between DWR, KCWA and DRWD.
- Operational Exchange Agreement: This agreement will facilitate the 1-for-1 exchanges of Table A water held in Lake Oroville for system water held in the Kern Fan Project as described in Figure 1-1.
- Water Supply Public Benefits Agreement: This agreement will coordinate the emergency response benefits associated with the Water Storage Investment Program.

6.2.2 California Department of Fish and Wildlife

IRWD and Rosedale will work with CDFW to develop Adaptive Management Plans for the Ecosystem benefits. An Ecosystem Public Benefits Agreement will also need to be executed with CDFW.

6.2.3 California Water Commission

The CWC has conditionally awarded the Kern Fan Project grant funding through the Proposition 1 Water Storage Investment Program. IRWD and Rosedale are working with the CWC to ensure that the project meets program requirements. As part of the program requirements, IRWD and Rosedale will execute a funding agreement with the CWC.

6.2.4 Dudley Ridge Water District

Dudley Ridge Water District (DRWD) is a SWP State Water Contractor located in southern Kings County along Interstate 5 (I-5) and the California Aqueduct. IRWD owns 884 acres of property within DRWD's service area that includes the associated rights to use of 1,748 AF of SWP Table A water. IRWD also receives other SWP water supplies secured by DRWD and made available to land owners when available including, but not limited to, unallocated Article 21 water and Turn-Back Pool water. IRWD has obtained approvals from DWR, DRWD, KCWA, and MWD to store its SWP water at its Strand Ranch banking project on a 2-for-1unbalanced exchange basis. Although the water belongs to IRWD, one half of all SWP supplies that are stored at the Strand Ranch are returned to and used on IRWD's lands in DRWD. IRWD will utilize its unallocated Article 21 water acquired through DRWD as program water for the Project. IRWD will work with DRWD to develop any necessary program terms for the Project.

6.2.5 Kern County Water Agency

The Kern County Water Agency (KCWA) is a SWP State Water Contractor. KCWA has long-term contracts with 13 local water districts, called member units. Rosedale, as one of the Member Units, receives SWP water for its Conjunctive Use Program through a water supply contract with KCWA. Rosedale will acquire unallocated Article 21 water for use in the Project through its water supply contract with KCWA. IRWD and Rosedale will work with KCWA to develop any necessary program terms for the Project.

6.2.6 Metropolitan Water District

The Metropolitan Water District (Metropolitan) is SWP State Water Contractor. IRWD receives imported water supplies for its service area from Metropolitan. Water is provided to IRWD through the Municipal Water District of Orange County (MWDOC), the regional wholesale member agency of Metropolitan. IRWD and Metropolitan have a Coordinated Operating, Water Storage, Exchange and Delivery Agreement (Metropolitan/IRWD Agreement) that allows IRWD to take delivery of banked SWP water into IRWD's service area in Southern California. The

Metropolitan/IRWD Agreement will facilitate Metropolitan's consenting to delivering, exchanging, and conveying program water for the Project.

6.2.7 State Water Resources Control Board

The State Water Resources Control Board (SWRCB) will need to approve Storm Water Pollution Prevention Plans for the construction of the Project.

6.2.8 Kern Groundwater Authority

The Kern Groundwater Authority (KGA) is a Groundwater Sustainability Agency (GSA) made up of 13 local agencies, including Rosedale. In accordance with the Sustainable Groundwater Management Act (SGMA), Rosedale is preparing a chapter of the KGA's Groundwater Sustainability Plan (GSP). IRWD and Rosedale will work with the KGA to ensure that the Project is covered by the GSP and is therefore in compliance with SGMA.

6.2.9 Kern County and Other Agencies

Prior to construction of the wells, IRWD and Rosedale will need to obtain well permits from the County of Kern Environmental Health Division. IRWD and Rosedale will also need to obtain easements for canal crossings from the Kern County Roads Department prior to construction.

The construction of the Kern Fan Project using any one of the three canal alignments will require permits for the construction of a siphon under I-5. The construction of the syphon will require an encroachment permit from the California Department of Transportation (Caltrans). IRWD and Rosedale will work and coordinate with both Caltrans and any other necessary agency to secure the permit.

The **30%** Design Report included as Appendix D includes a list of other permitting requirements for each of the three alignments for the Kern Fan Project. IRWD and Rosedale will work and coordinate with each of the agencies needed to secure the required permits to implement the Project.

Chapter 7 : Findings and Considerations

7.1 Need for Project

Every year, California experiences highly variable hydrology and water supply conditions. During wet years there are surplus supplies in excess of demands and existing storage capacities that are often lost to the ocean. During dry years and extreme drought conditions there are insufficient surface water supplies to meet demands. Additional storage is needed to maximize the management of water by capturing and storing water in wet years for use during dry years. Groundwater storage projects allow the coordinated management of surface water and groundwater resources to cost effectively maximize the availability and reliability of water supplies.

The summary of the Kern Fan Groundwater Storage Project objectives is to cost-effectively recharge and store groundwater for subsequent recovery during dry years to address the following:

- Enhance water supply reliability;
- Reduce imported water demands on the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Delta) to benefit spring and winter-run Chinook salmon, steelhead trout and green sturgeon;
- Provide water supply during drought conditions;
- Provide water supply for emergency response benefits;
- Establish temporary wetlands through intermittent recharge events that will attract migratory and other water birds in Kern County;
- Benefit the water levels in the Kern County Groundwater Sub-basin;
- Provide sustainable water supply for local agricultural use; and
- Be integrated into other water storage projects and storage reservoirs to provide greater statewide benefits.

7.2 Summary of Recommended Plan

The Kern Fan Groundwater Storage Project - BV Alignment Alternative is identified as the Recommended Plan by the project sponsors, IRWD and Rosedale. **This alternative plan would achieve the highest level of benefits at the most reasonable level of constructability, and is found to be technically, environmentally, economically, and financially feasible.**

7.2.1 Preliminary Costs and Benefits

Table 7-1 below summarizes the benefit-cost analysis for the Kern Fan Groundwater Storage Project - BV Alignment Alternative.

Table 7-1 : Summary of Preliminary Costs and Benefits (Updated)

	Kern Fan Project - BV Alignment
Annual Water Supply Benefits - M&I (Million $)	$2.09
Annual Water Supply Benefits - Agriculture (Million $)	$3.17
Annual Water Supply Benefits - Groundwater (Million $)	$0.37
Annual Ecosystem Benefits - Salmon Recovery (Million $)	$1.38
Annual Ecosystem Benefits - Intermittent Wetland Habitat (Million $)	$5.18
Annual Emergency Response Benefits - Extended Drought (Million $)	$0.72
Annual Emergency Response Benefits - Delta Failure (Million $)	$1.51
Annual Agricultural Impact Benefits (Million $)	$0.95
Total Annual Benefits (Million $)	**$15.37**
Total Construction Cost (Million $)	$225.07
Annual Costs (Million $)	**$10.40**
Net Annual Benefits or Costs (Million $)	$4.97
Benefit-Cost Ratio	**$1.48**

7.2.2 Feasibility

The Recommended Plan is determined to be technically, environmentally, economically, and financially feasible at the 30% feasibility design level of detail.

7.2.2.1 Technical Feasibility

An engineering **30%** Design Report in included as Appendix D that provides an analysis of Project alternatives, description of the proposed facilities, how the Project facilities would be integrated with existing water banking facilities, construction methods, capital and operations cost estimates, and replacement cost estimates. Based on the analyses performed, the proposed Kern Fan Groundwater Storage Project is considered to be technically feasible, constructible and can be cost-effectively operated and maintained.

The construction of the Kern Fan Project- **BV Alignment Alternative** will be similar to previous water banking projects constructed by the Project proponents. As result of previous water banking experience and information presented in this report, IRWD and Rosedale also find the Recommended Plan to be technically feasible and constructible.

7.2.2.2 Environmental Feasibility

The Kern Fan Groundwater Storage Project is subject to the environmental review process established in the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) to be considered for federal funding. Based on a programmatic environmental review performed previously, IRWD and Rosedale anticipate that upon further project-level analysis, the Kern Fan Project will not result in significant or unavoidable impacts. A Supplemental EIR is being prepared in compliance with the CEQA and

NEPA requirements for the construction and operation of the facilities contemplated in the Kern Fan Project.

7.2.2.3 Economic Feasibility

The estimated annual benefits for the Kern Fan Project – BV Alignment Alternative exceed the estimated annual costs resulting in a benefit-cost ratio of 1.48. In consideration of all benefits and costs, the Kern Fan Project- BV Alignment Alternative is determined to be economically feasible.

7.2.2.4 Financial Feasibility

The evaluation of financial feasibility of the Project includes a cost allocation and determination of the financial capability of the beneficiaries' ability to pay their allocated costs, including capital and operating costs. IRWD and Rosedale have demonstrated their ability to pay for the Project by providing funding plans for capital costs and operation, maintenance, and replacement costs.

7.2.3 Risk and Uncertainty

Uncertainties of future conditions as well as the uncertainties associated with key supporting data were taken into account when assessing the feasibility of the Project. Risks and uncertainties for the following areas are described in detail in Chapter 5:

- Project Operations
    - Climate Change
    - California Water Fix
- Project Design and Cost Estimates
- Project Schedule
- Monetizing Project Benefits

7.3 Policy Compliance

7.3.1 Federal Objective

Per the PR&G, the Federal Objective specifies the fundamental goal of Federal investments in water resources. The Federal Objective, as set forth in the Water Resources Development Act of 2007, specifies that Federal water resources investments shall reflect national priorities, encourage economic development, and protect the environment. The information presented in this feasibility study demonstrates the Project's ability to achieve the Federal Objective.

7.3.2 Achievement of Guiding Principles

The PR&G Guiding Principles constitute the overarching concepts the Federal government seeks to promote through Federal investments in water resources. The Guiding Principles focus on:

- Healthy and Resilient Ecosystems;
- Sustainable Economic Development;
- Floodplains
- Public Safety;
- Environmental Justice; and
- Watershed Approach.

The following table 7-2 demonstrates the extent to which the Kern Fan Groundwater Storage Project meets those Guiding Principles.

Table 7-2 : Kern Fan Groundwater Storage Project and PR&G Guiding Principles

Guiding Principle	Explanation
Healthy and Resilient Ecosystems	The Project will protect and restore the functions of ecosystems by improving habitat for fish in the Delta as well as the Feather and Sacramento Rivers during critical periods by supporting fish spawning. Project operations will contribute to a resilient ecosystem by providing water managers the flexibility to initiate Ecosystem Pulses during critically dry years. The Project will also provide temporary wetlands during recharge events that attract migratory and other water birds.
Sustainable Economic Development	The Project will manage water in a resilient and sustainable manner by banking surplus water supplies during wet years for use during dry years when supplies are severely limited. The water supplies captured will be used to provide measurable ecosystem benefits while also providing IRWD and Rosedale customers increased supply reliability. The Project will help minimize future economic impacts of climate change and unpredictable natural events on agricultural and M&I communities by providing the Project proponents with high quality and highly reliable water supplies. In addition, the Project will increase the sustainability of existing and future agricultural investments by lessening the impacts of the implementation of the Sustainable Groundwater Management Act and the corresponding need to fallow farmland.
Floodplains	Project recharge facilities would be used during periods of excessive surface water availability, including Kern River high-flow and flood-flow conditions. The diversion of such flows to the Project recharge facilities, that would otherwise contribute to flooding, would increase the ability to manage floodplain areas and avoid economic losses due to flooding.
Public Safety	The Project would provide emergency supplies of water in response to natural events such as extended droughts and levee failures in the Delta expected to occur as a result of an earthquake. The project protects public safety by providing a high quality and reliable water supply in response to unpredictable natural events.
Environmental Justice	The Project is subject to the environmental review process established in the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) to receive Federal funding. During the environmental review process, IRWD and Rosedale will hold public scoping meetings to receive public comments and suggestions on the project. Any impacts identified during construction or operation of the Project would be addressed by implementing the appropriate mitigation measures. Adherence to the requirements of NEPA will ensure that the Project has no disproportionate adverse effects on minority, Tribal, or low-income populations.

Watershed Approach	This Guiding Principle asserts that assessments evaluate the interaction of a potential Federal investment with other water resources projects and programs within a region or watershed. During the assessment of the feasibility of the Project, analyses were conducted that modeled Project operations in conjunction with operations of the SWP and CVP to ensure that existing environmental and regulatory requirements, contract obligations and other system requirements were met. These analyses resulted in the identification of ecosystem benefits that will be realized in several watersheds. The CEQA and NEPA environmental review processes will require the evaluation of the cumulative effects of Project with other past, present and reasonably foreseeable future actions within the affected watersheds.

7.4 Implementation

IRWD and Rosedale jointly submitted a grant application to the CWC for the Kern Fan Groundwater Storage Project to compete for Proposition 1 funding available through the Water Storage Investment Program. In July 2018, the CWC conditionally awarded the Kern Fan Project $67.5 million. Funding is contingent upon projects meeting CWC requirements by certain deadlines. In order to meet these requirements IRWD and Rosedale are currently working on the following project tasks:

- Development of Agreements with State Agencies;
- Identifying optimal Location of Aqueduct Turnout and Canal Facilities;
- Land Acquisition, and;
- Environmental Documentation.

The pre-construction and construction schedule and associated costs for the Recommended Plan are based on requirements of the funding expected to be received under the Water Storage Investment Program. The proposed Project schedule is provided as Appendix J. IRWD and Rosedale will continue to advance the project and coordinate with Reclamation as necessary.

Through the formation of the **Groundwater Banking Authority (a Joint Powers Authority)** , IRWD and Rosedale will partner to implement the Kern Fan Project. IRWD and Rosedale share a ten-year history of implementing successful water banking projects in Kern County.

7.5 Federal Funding Request

The Project sponsors, IRWD and Rosedale, consulted with the Bureau of Reclamation on the feasibility investigation and the guidelines for this Report. This investigation and Feasibility Report were prepared to meet the eligibility requirements of the Water Infrastructure for Improvements to the Nation (WIIN) Act Sec. 4007. It was prepared in accordance with the Department of the Interior's Agency Specific Procedures for Implementing the Council on Environmental Quality's, Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies dated November 10, 2015, which provides guidance to Federal agencies for planning and water resource-related projects.

In accordance with the WIIN Act, the Secretary of the Interior may participate in a State-led storage project in an amount equal to not more than 25 percent of the total cost to the State-led

storage project. **In Chapter 5 of this Feasibility Report, the project sponsors have established an authority for Federal financial participation in the Kern Fan Groundwater Storage Project in the amount of $50.2 million for construction costs. Accordingly, the Project Sponsors seek Federal participation in the Project in the amount of $50.2 million based on 25% of eligible construction costs.**

References

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