KERN FAN GROUNDWATER STORAGE PROJECT
PROJECT DESCRIPTION

1. OVERVIEW

The Kern Fan Groundwater Storage Project (Kern Fan Project or Project) will recharge and store up to 100,000 acre-feet (AF) of water, primarily during wet periods, in the Kern County Groundwater Sub-basin of the San Joaquin Valley Groundwater Basin for subsequent recovery and use for public and non-public benefits. Building upon a successful track record of water banking, the Project is co-sponsored by the Irvine Ranch Water District (IRWD) and Rosedale Rio-Bravo Water Storage District (Rosedale). This Project Description is prepared in support of the application submitted by IRWD and Rosedale for Proposition 1 funding under the Water Storage Investment Program (WSIP) administered by the California Water Commission (CWC).

IRWD and Rosedale propose to develop a regional water bank in the Kern Fan area that would capture, recharge and store water during conditions when surface water is abundant and extract water when needed to provide ecosystem, emergency supply, and water supply benefits. The water would be used at a later date through use of groundwater wells and subsequent direct or exchange delivery. Operations of the project will be coordinated with the State Water Project (SWP) through the California Department of Water Resources (DWR).

The Kern Fan Project could be operated such that in wet years, IRWD and Rosedale would divert unallocated SWP Article 21 supplies to store in the Project. IRWD and Rosedale would share first priority rights to 75 percent of the water delivered into storage for use in their respective water banking and supply reliability programs. The remaining 25 percent of the stored water 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 that would occur when the water is extracted from the ground. 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 being extracted from the ground, being reclassified as Table A water. The Table A water would be used to meet demands either directly or through operational exchanges. The SWP system water left in Oroville Reservoir would then be used to provide short-term ecosystem pulse flows to generate ecosystem benefits by improving habitat for fish in the Feather and Sacramento Rivers and Delta.

The Kern Fan Project will significantly contribute to attainment of the three objectives of the California Water Action Plan: (1) more reliable water supplies; (2) improved habitat conditions of important species, and (3) more resilient and sustainably managed water infrastructure.

Specifically, the Kern Fan Project will cost-effectively recharge and store groundwater for subsequent recovery to 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;
• 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.

The Kern Fan Groundwater Storage Project will offer 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, Sites Reservoir participants could be offered the opportunity to store water in the Project under mutually beneficial terms that would avoid reservoir spills. 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 Kern Fan Project will provide additional operating flexibility for Rosedale’s existing and future programs, and will be a critical element of the IRWD water supply reliability portfolio that supports groundwater recharge and recovery for regional partnerships involving conjunctive use and groundwater banking.

The estimated capital cost of the entire Kern Fan Project is approximately $172 million. A discussion of the estimated cost is presented in Section 9. In comparison, the economic value of the benefits provided by the Project is estimated at $177.8 million.

2. PROJECT SPONSORS

IRWD and Rosedale will partner to implement the Kern Fan Project. As the local co-sponsor, Rosedale will be the Project operator. IRWD and Rosedale share a ten-year history of implementing successful water banking projects. 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. Rosedale and IRWD will share in the costs and benefits of the proposed Kern Fan Project. The Kern Fan Project will be the third water banking effort between Rosedale and IRWD.

2.1 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 115,531-acre service area in Orange County, California. IRWD serves the City of Irvine and portions of the Cities of Costa Mesa, Lake Forest, Newport Beach, Tustin, Santa Ana, and Orange, and unincorporated areas of Orange County.

In the last decade 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 recharge and recovery facilities. 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. 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 Dudley Ridge Water District (DRWD) and has the rights to the use of SWP Table A water. IRWD has successfully implemented unbalanced exchange agreements, with the approval of MWD and DWR that facilitates the use of portions of this water in IRWD’s service area.

2.2 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 County Groundwater Sub-basin of the San Joaquin Valley Groundwater Basin.

Operation of the Kern Fan Project will be integrated with Rosedale’s existing Groundwater Storage, Banking, Exchange, Extraction & Conjunctive Use Program (Conjunctive Use Program). Rosedale’s Conjunctive Use Program currently manages approximately 470,000 AF of stored groundwater in the underlying basin, which has an estimated total storage capacity in excess of 1.7 million AF (Sierra Scientific Services, 2009). The Conjunctive Use Program benefits Rosedale’s landowners through better management of groundwater resources, integrating and incorporating all of Rosedale’s available facilities.

Rosedale has groundwater banking agreements with several participants as part of its Conjunctive Use Program requiring that all recharge must occur in advance of extraction. Water supplies for the Conjunctive Use Program are supplied by the participating water agencies and include, but are not limited to, high-flow Kern River water and supplies from the SWP and the Central Valley Project (CVP). Currently, the infrastructure for the Conjunctive Use Program includes over 1,000 acres of recharge basins and multiple recovery wells. The current Program provides for maximum annual recharge of approximately 252,000 AF per year (AFY) and maximum annual recovery of approximately 62,500 AFY.
IRWD is one of the participating agencies in Rosedale’s Conjunctive Use Program through its Strand Ranch and Stockdale West Projects, which are described in Section 10. Fulfilling its mission of providing an adequate and reliable water supply for its service area, Rosedale has multiple water supplies that are recharged and stored in the groundwater aquifer and are then available for later extraction. Rosedale replenishes the aquifer using canals and recharge basins (ponds) to maintain groundwater levels and minimize pumping costs of recovery wells.

Rosedale’s groundwater banking programs, including IRWD’s integrated projects, are subject to a Memorandum of Understanding (MOU) with adjacent water districts that, among other things, specifies loss factors to be applied to gross deliveries for banking. Rosedale has groundwater banking programs with Buena Vista Water Storage District, IRWD, and Castaic Lake Water Agency for which the return obligation is equal to gross banking values less the loss factors. These programs result in increased available funds that enable Rosedale to purchase additional water supplies, which increase groundwater levels while the water is stored for the banking partners.
**Figure 1** shows the locations of IRWD, Rosedale, and the proposed Kern Fan Project within California.

![Map of California with IRWD, Rosedale, and Kern Fan Groundwater Storage Project Locations](image)

**Figure 1. Map of California with IRWD, Rosedale, and Kern Fan Groundwater Storage Project Locations**

2.3 Other Project Partners
Through existing agreements, IRWD and Rosedale will coordinate the operations of the Kern Fan Project with other agencies. Background information about these agencies is provided below.

2.3.1 Dudley Ridge Water District
DRWD is a SWP Contractor and is located in southern Kings County along Interstate 5 (I-5) and the California Aqueduct. DRWD’s primary water source is SWP water; local groundwater is not used due to low yields and poor quality. The majority of the SWP water is used for agricultural irrigation, which is delivered to landowners via turnouts and canals from the California Aqueduct. In addition to SWP supplies, other water sources are available through off-site groundwater basins.
through banking programs and from purchases, transfers, and unbalanced exchanges from other water agencies.

DRWD and IRWD already have a working relationship that will be further enhanced for the Kern Fan Project. 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-1 unbalanced 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. A similar arrangement is envisioned for the Kern Fan Project.

2.3.2 Kern County Water Agency
Created in 1961, KCWA is a SWP State Water Contractor. KCWA manages a variety of water activities in Kern County, including groundwater operations to preserve and enhance the local water supply, flood control, and water quality.

KCWA has long-term contracts with 13 local water districts, called Member Units, and KCWA Improvement District No. 4. Rosedale, as one of the Member Units, receives SWP water for its Conjunctive Use Program through a water supply contract with KCWA. Improvement District No. 4 provides a supplemental water supply for the Bakersfield area by importing SWP water that is conveyed to the area via the CVC and used to recharge and replenish the groundwater aquifer.

Groundwater banking is an important resource in Kern County, and nearly all of the local groundwater districts operate banking projects in their service areas. Rosedale and KCWA Improvement District No. 4 operate the associated Joint Groundwater Recovery Project.

2.3.3 Metropolitan Water District of Southern California
IRWD receives imported water supplies for its service area from the MWD. Water is provided to IRWD through the Municipal Water District of Orange County (MWDOC), the regional wholesale member agency of MWD. MWD sells water under a two-tier structure. MWD’s Tier 1 rate recovers its cost of developing and maintaining a reliable water supply. MWD’s Tier 2 rate is set at a higher rate reflecting MWD’s cost of purchasing water transfers north of the Delta. IRWD can purchase imported water as either treated potable water or untreated raw water.

MWD has also entered into the Coordinated Operating, Water Storage, Exchange and Delivery Agreement (MWD/IRWD Agreement) with IRWD and MWDOC related to IRWD’s Strand Ranch and Stockdale West, which are described in Section 10. Under the MWD/IRWD Agreement, IRWD can take delivery of banked SWP water into IRWD’s service area in Southern California with MWD’s consent. Recovery of SWP water from the Kern Fan Project for delivery to IRWD’s service area would be subject to MWD’s consent consistent with the MWD/IRWD Agreement.
3. KERN FAN GROUNDWATER STORAGE PROJECT

Water banking is a transaction involving storing surplus water in groundwater basins that is then available for recovery at a later date. The operations of many water banks involve exchanges where water banked underground is returned to the banking party from surface supplies depending on where the banking party is located in relation to the groundwater basin. Other water banks are operated with recovery wells allowing the parties to physically extract the stored water. Some water banks require a quantity of water to be left behind as part of the recharge program for the benefit of the groundwater basin. Water banks typically factor in losses due to percolation or conveyance. The Kern County groundwater banking programs benefit overlying agricultural users and local water districts and also provide reliability benefits for water agencies throughout California. This state-wide perspective is the foundation upon which the Kern Fan Project will be constructed and operated.

The Kern Fan Project is a water banking project that will enhance water supply reliability for IRWD, DRWD and Rosedale, and manage available water resources to benefit other agencies, the public, and the environment. This Project would serve to develop a regional water bank in the Kern Fan to capture and store unallocated Article 21 SWP water during conditions when surface water is abundant. The total expected 100,000 AF storage capacity of the Project would be split between accounts for public ecosystem benefits (25,000 AF) (25% of total storage) and non-public water supply benefits (75,000 AF) (75% of the total storage). IRWD and Rosedale would share equally the 75,000 AF of storage for their respective water supply reliability programs. As water is used for public and non-public benefits from the Project, storage capacity would be freed up for future unallocated Article 21 recharge events. It is expected that water would be cycled in and out of storage in the Kern Fan Project numerous times over the life of the project.

3.1 Project Location

The proposed Kern Fan Project is located in western Kern County, about six miles west of the City of Bakersfield, as shown in Figure 2. Portions of the Kern Fan area are characterized by geologic conditions that are particularly suitable for groundwater recharge operations. Kern County is also strategically located in central California near federal, state, and local water supply conveyance facilities. The Kern Fan Project will recharge and bank unallocated Article 21 water for recovery either by extraction or exchange to serve the dry year demands of Rosedale, DRWD and IRWD as well as make water available to benefit ecosystems in the Delta, Sacramento and Feather Rivers, and extending as far north as Lake Oroville.
3.2 Water Storage Capacity

The Project overlies the Kern County Groundwater Sub-basin of the San Joaquin Valley Groundwater Basin. This area is known as the Tulare Lake Hydrologic Region, which is the southernmost part of California’s Central Valley.

The Kern Fan Project would utilize available storage capacity in the San Joaquin Valley Groundwater Basin by developing groundwater banking facilities in western Kern County. More specifically, the Project will implement water banking facilities in the Kern County Groundwater Sub-basin (DWR Basin No. 5-022.14) of the San Joaquin Valley Groundwater Basin. Figure 3 shows the Tulare Lake Hydrologic Region and Kern County Groundwater Sub-basin. The Kern County Groundwater Sub-basin covers a surface area of approximately 1,945,000 acres (3,040 square miles) generally west of Fresno and Bakersfield.
Summarized in Table 1, Rosedale’s Conjunctive Use Program currently manages approximately 470,000 AF of stored groundwater in the underlying basin, which has an estimated total storage capacity in excess of 1.7 million AF (Stockdale Integrated Banking Project Final EIR, 2015). The Kern County Water Agency estimates the total water in storage to be 40,000,000 AF and dewatered aquifer storage to be 10,000,000 (California’s Groundwater Bulletin 118, San Joaquin Valley Groundwater Basin, 2006).
### Table 1. Total and Active Water Storage Capacity In the Kern County Groundwater Sub-basin

<table>
<thead>
<tr>
<th></th>
<th>Kern County Groundwater Sub-basin (No. 5-22.14)¹</th>
<th>Rosedale Conjunctive Use Program</th>
<th>Kern Fan Project Storage Volume</th>
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</thead>
<tbody>
<tr>
<td>Total capacity (AF)</td>
<td>40,000,000</td>
<td>1,700,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Active capacity (AF)</td>
<td>470,000²</td>
<td>100,000</td>
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</tbody>
</table>

² Existing Rosedale-Rio Bravo Water Storage District Conjunctive Use Program (without Stockdale Integrated Water Banking Project or Kern Fan Project) from EIR (ESA, 2015).

### 3.3 Proposed Project Facilities and Capacities

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 4** shows the boundary radius within Rosedale’s service area for the proposed third site in the Stockdale Integrated Banking Project.

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 4**. 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.
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 (bgs). 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 Slough or to the CVC via the Rosedale Intake Canal.

Appurtenant facilities will include flow control gates, flow meters, access roads and other site work, as well as instrumentation and controls. The Project will install a Supervisory Control and Data Acquisition (SCADA) system to aid in the operation of the California Aqueduct turnout, canal lift stations, and turnout facilities to the Phase 1 and Phase 2 sites. This would include programmable logic controllers (PLCs), radio communications, computer station at a central headquarters, and controls software programming. For more detailed information on the project facilities see Feasibility and Implementation Risk Tab, Attachment 1, Appendix A of the WSIP funding application.

The recovery wells will be designed and constructed similar to the extraction wells at the IRWD-Rosedale Strand Ranch Project, which is pictured on Figure 5.
4. SOURCES OF WATER SUPPLY

The Project will receive, recharge, and store unallocated Article 21 water, which is surplus supply from the California SWP managed by DWR. Unallocated Article 21 water is available in accordance with long-term Water Supply Contracts for State Water Contractors that have signed the Monterey Agreement and is expected to be available when there is water in excess of SWP “Table A” needs. SWP Table A water is the volume of water annually allocated to be delivered to each SWP State Water Contractor based on its long-term Water Supply Contract. Absent adequate storage venues, such as that offered by the Project, the surplus supply during wet periods would otherwise be lost to the ocean.

In accordance with Article 21 of the long-term Water Supply Contracts, surplus water known as Article 21 water may be available to State Water Contractors when: (1) the San Luis Reservoir is full, (2) the Delta has a surplus, and (3) available conveyance capacity exists. This Delta surplus water can be pumped and conveyed to the Kern Fan Project. The DWR administers the Article 21 Program in years when Article 21 water is available. Deliveries of unallocated Article 21 water would be made available to the Project on behalf of IRWD as a landowner in DRWD and Rosedale as a sub-unit of the KCWA. Unallocated Article 21 water will be delivered to the Project utilizing existing capacity in the California Aqueduct to a new turnout and canal located near the CVC. During drought or for emergency response as needed, the stored groundwater will be recovered from the Project and conveyed to points of use by Rosedale, DRWD, and IRWD.

Approximately 25 percent of the stored water would be held as SWP system water that would be used for ecosystem benefit purposes. This 25 percent water would be made available for ecosystem through 1-for-1 exchanges that would occur when the water is extracted from the ground. The 1-for-1 exchanges would result in Table A water, which is held in Lake Oroville,
being reclassified as SWP system water and the SWP system water being extracted from the
ground, being reclassified as Table A water. The Table A water would be used to meet DRWD
and Rosedale’s 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 ecosystem pulse
flows to generate ecosystem benefits by improving habitat for fish in the Feather and Sacramento
Rivers and Delta. The 1-for-1 exchanges would result in the water extracted from the ground and
used by DRWD and Rosedale being classified as Table A water and the water left in Oroville
Reservoir being classified as SWP system water.

The DWR State Water Project Analysis Office (SWPAO) and SWP operations staff have been
consulted with respect to the proposed 1-for-1 exchanges that would make water available for the
public ecosystem benefits that would be derived from the pulse flows. SWPAO has identified that
uncertainties and contractual issues would need to be worked through with the project partners.
This work would begin immediately should the Project be selected by the CWC for funding under
the WSIP. It is expected that these efforts would result in a Coordinated Operating Agreement
that would be executed between the Project partners and DWR. Furthermore, the Project would
not require any changes in water rights or SWP contracts. The storage and recovery of water stored
in the Project would not impact groundwater rights or entitlements.

To achieve sustainability at the Basin level, Rosedale and IRWD would seek to develop both state
wide and local partnerships to leverage the use of the Project facilities when not needed for Project
purposes. Examples include partnerships with local water interests with access to Kern River
water. The Project facilities, when not used to meet the primary Project objectives, could be made
available for the recharge and storage of Kern River water which may have otherwise left the
county. Kern River water recharged and stored in the Project would improve and address Basin
overdraft, subsidence as well as water quality conditions. Additionally, the Project facilities may
be used to help re-regulate other SWP supplies, such as carry-over water at risk of spill. Rosedale
and IRWD may develop unbalanced exchange agreements with other SWP contractors for access
to Project facilities to capture and reregulate SWP water supplies which may otherwise be lost.
These unbalanced exchange agreements, typical of both Rosedale and IRWD water management
programs, require that for every two (2) AF of water banked that only one is obligated for future
return. As a result of these unbalanced exchange programs, the Basin benefits and overdraft and
subsidence impacts are mitigated.

5. KERN FAN PROJECT CONCEPTUAL PROJECT OPERATION

Operation of the Kern Fan Project will provide flexibility in maximizing the storage of unallocated
Article 21 water, managing its recovery to provide ecosystem benefits and to meet IRWD, DRWD
and Rosedale’s water management objectives. The Kern Fan Project would be operated such that
in wet years, IRWD and Rosedale would receive surplus unallocated Article 21 supplies to store
in the Project. Approximately 100,000 AF of water would be delivered in each wet period to the
Project for IRWD as a landowner in DRWD and for Rosedale as a member unit of KCWA. IRWD
and Rosedale would equally share 75 percent of the water delivered into storage for use in their respective water banking and exchange programs. The remaining 25 percent of the stored water would be held as SWP system water that would be used for ecosystem benefit purposes. This 25 percent of the water would be made available for ecosystem benefits through 1-for-1 exchanges that would occur when the water is extracted from the ground. The 1-for-1 exchanges would result in Table A water, which is held in Lake Oroville, being reclassified as SWP system water and the SWP system water 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 Oroville Reservoir would then be used to provide short-term ecosystem pulse flows to generate ecosystem benefits by improving habitat for fish in the Feather and Sacramento Rivers and Delta. A statewide perspective of the operations of the Kern Fan Groundwater Storage Project is illustrated on Figure 6.

![Figure 6. Kern Fan Groundwater Storage Statewide Operational Schematic](image)

MBK Engineers prepared an analysis based on computer modeling for the Kern Fan Project operations using the CalSim II model. MBK Engineers analysis is included in the Feasibility and Implementation Risk Tab, Attachment 1, Appendix B of the WSIP funding application.
Figure 7 presents a conceptual diagram of how unallocated Article 21 water will be provided to the Project beneficiaries and how the Project yields system water for ecosystem benefits through 1-for-1 exchanges. The unallocated Article 21 water supplies recharged and stored in the Kern Fan Project would be allocated in separate accounts to derive Project benefits as follows:

- 25% for public ecosystem benefits
- 37.5% for IRWD/DRWD non-public and public benefits
- 37.5% for Rosedale non-public benefits

A detailed Preliminary Operations Plan for the Kern Fan Project including an overview of how the public and non-public benefits are derived from Project operations is provided under the Benefit Calculation, Monetization and Resiliency Tab, Attachment 2.
Figure 7. Project Preliminary Operations Plan
6. WATER STORAGE EVAPORATION LOSS

Minor water losses would occur during the conveyance of Article 21 water to the recharge sites. It is anticipated that losses as the water is transported from the Delta to the Project diversion on the California Aqueduct will be approximately 3%. As the water is being recharged at the spreading basins, the evaporation losses are estimated at 6%.

The modeling analysis (MBK Engineers, 2017) assumes water is stored in the Project in each of three accounts described above. Per the MOU described in Section 2.2, water stored in each account is subject to a loss percentage modeled at 10% for Rosedale, 12.5% for ecosystem, and 15% for IRWD. MBK Engineers’ model accounts for these losses, such that the estimated water stored in each account is net of these losses.

7. PROJECT BENEFITS

Through the Kern Fan Project, DWR would have the flexibility to make releases of pulse flows from Lake Oroville upstream of the Delta which would then improve the ecosystem habitat condition for spring and winter-run Chinook salmon and other fish species in the Feather River. To provide the greatest benefit to ecosystem priorities, water would be released in short-term pulse flows from Oroville Reservoir, in April. This will physically improve habitat conditions for rearing, downstream migration of spring and winter-run Chinook salmon, and benefits to other fish species. Figure 8 shows Chinook salmon in the Sacramento River.

![Figure 8. Sacramento River Winter-Run Chinook Salmon](Photos from National Oceanic and Atmospheric Administration (NOAA))

Pulse flows are expected to improve conditions in the Feather River, downstream from Oroville Dam, and the Sacramento River, from the confluence with the Feather River through the Delta. Operation of the Project will be coordinated with DWR’s operation of the SWP to make system water available for the pulse flows from Oroville Reservoir operations.
During dry and critical periods, ecosystem pulses would be released from Oroville Reservoir to provide net improvements in ecosystem and water quality in the Delta and its upstream tributaries. Each of the recommended releases of 18,000 AF would be made in the month of April and such pulse deliveries could occur at a rate of up to 2,400 cfs over a 3.75-day period. Modeling results by MBK Engineers, indicate that the Project could, based on 1922-2003 hydrology, provide for six April flow pulses of 18,000 AF each in dry or critically dry years (MBK Engineers, 2017) over an 82-year period. April was selected as the ideal period for the ecosystem pulses due to the high relative abundance for downstream migration and rearing of juvenile salmon. However, the Project operation also offers flexibility to accommodate DWR’s operation of Oroville Reservoir and the SWP.

**Figure 9** illustrates the Projects effects on Lake Oroville storage and flows in the Feather River for an example year, beginning in April when the ecosystem pulses would be made and continuing through September. No changes in Lake Oroville carryover storage would occur as a result of the coordinated operations with the Project (MBK Engineers, 2017).

![Graph showing Lake Oroville storage and Feather River flows](image)

**Figure 9. Example of Project Public Benefits through Integration with Lake Oroville**

Though April flow pulses are expected to benefit multiple fish species and life stages, the quantitative analysis focuses on assessing benefits to out-migrating juvenile spring-run and winter-run Chinook salmon. Per Cramer Fish Sciences, over 50 years of operations with the project (2030 conditions) these April flow pulses are expected to provide a net benefit of 586 additional adult Central Valley spring-run Chinook salmon and 41 additional Adult Sacramento River winter-run...
Chinook salmon. Cramer Fish Sciences’ report is included in the Physical Benefits Tab, Attachment 2 of the WSIP funding application.

While not analyzed in detail in this evaluation, it is estimated that other fish species may also benefit from the Project’s ecosystem pulses. For example, increased flows in the Feather River may improve passage and eliminate barriers for upstream migration of adult green sturgeon. Downstream at the Delta, higher freshwater flows from the pulse releases could reduce salinity and improve conditions in the freshwater-saltwater mixing zone of the estuary, benefitting the Delta smelt during its spring spawning season.

Project performance was also simulated under other projected conditions: (1) 2070 climate change, (2) without the California WaterFix (CWF), and (3) with the CWF. 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 will yield a net increase in adult salmon survival benefits.

7.1 Public Benefit - Ecosystem Priorities

The Kern Fan Project provides benefit to three California Department of Fish and Wildlife (CDFW) ecosystem priorities as presented in the WSIP. Ecosystem Priority 2 calls for “flows to improve habitat conditions for in-river rearing and downstream migration of juvenile salmonids”. Per Cramer Fish Sciences’ assessment of ecosystem benefits resulting from the Kern Fan Project, April is a period of “high” relative abundance for downstream migration and rearing of juvenile spring Chinook and juvenile steelhead in the Feather River. (Cramer Fish Sciences, August 2017). The Project also provides benefits to Ecosystem Priority 12 which calls for enhanced “access to fish spawning, rearing and holding habitat by eliminating barriers to migration”. Upstream migration of adult green sturgeon in Feather Rivers is high for the month of April and upstream passage for green sturgeon appears to be positively influenced by river flow (Cramer Fish Sciences, August 2017). Figure 10 shows the location of the ecosystem benefits, Priority 2 and Priority 12. Additional maps showing more details the location of the ecosystem benefits are provided in the Physical Benefits Tab, Attachment 2.

The Project also provides benefit for CDFW Ecosystem Priority 14 which calls for “water to enhance seasonal wetlands, permanent wetlands, and riparian habitat for aquatic and terrestrial species”. The project will construct recharge basins over approximately 1,200 acres in the Kern Fan area which will be operated to maximize the use of available water supplies. During Project recharge activities, the recharge basins would be flooded for recharge purposes and would establish intermittent wetland habitat along the recharge basins for waterfowl, shorebirds, raptors and other native and migrating birds.
Figure 10. Location of Ecosystem Benefits
7.2 Public Benefits – Emergency Response – Extended Drought

A major benefit of the Project is that it provides water to IRWD, Rosedale, and DRWD in the event of extreme drought, when other water resources are short and are most costly. 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.

IRWD and Rosedale will dedicate one-third of the non-ecosystem water supply created by the Project to emergency response. The water supply that is expected to be available for emergency response in an extended drought would be 4,500 AF per year in 2030 future conditions and 4,100 AF per year in the 2070 future conditions. This water will be available for recovery after the third year or later of a multi-year drought.

7.3 Public Benefits – Emergency Response – Delta Failure

A separate emergency response benefit of the Project is that the stored water supply could be recovered from the Project in the event of levee failures in the Delta. It is expected that should an earthquake cause major levees failures in the Delta, that SWP deliveries could be curtailed for an extended period of time. The WSIP Technical Guidance explains that an emergency response to Delta failure should be assumed to occur once, 30 years into the project operations period, or 2056 for the Kern Fan Project. Per MBK Engineers’ analysis, according to historical hydrology, the project is likely to have approximately 20,000 AF of water available for emergency response after 30 years of operation. IRWD, Rosedale and DRWD could use the supplies stored in the Project as an emergency response during the curtailment period.

7.4 Non-Public Benefits – Water Supply

Water supply benefits are non-public benefits that will accrue to IRWD, Rosedale and DRWD. IRWD and Rosedale estimate that approximately two-thirds of all their stored water will be used for non-emergency water supply and will be recovered in below normal, dry and critical water years.

7.5 Non-Public Benefits – Groundwater

The Project will also provide a water supply benefit to the Kern County groundwater basin. A portion of banked groundwater will accrue to losses that benefit the groundwater basin. Per the MOU discussed in Section 2.2, loss factors are applied to gross water deliveries into the Kern groundwater basin. This portion of the water will not be recovered and that will remain in the ground to bolster local groundwater levels. For the Kern Fan Project, an average 12.5% of the groundwater stored in the Project on behalf of IRWD and Rosedale will not be recovered and 60%
of that amount is estimated to be recharged, net of evaporative losses. This amount would benefit groundwater levels in the Kern County Groundwater Sub-basin.

7.6 Value of the Project Benefits

Based on analysis of the project benefits, M.Cubed calculates that the Kern Fan Project is anticipated to provide a total of $52 million in non-public benefits, and $125.8 million in public benefits, for a total benefit value of $177.8 million (M.Cubed, 2017). A summary of the estimated value of the non-public and public project benefits is provided in Table 2.

Table 2. Estimated Value of Project Benefits

<table>
<thead>
<tr>
<th>Benefit Category</th>
<th>Benefit Type</th>
<th>Estimated Value (2015 $ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-public Benefits</td>
<td>Water Supply Benefits</td>
<td>$47.7</td>
</tr>
<tr>
<td></td>
<td>Groundwater</td>
<td>$4.3</td>
</tr>
<tr>
<td>Public Benefits</td>
<td>Environmental Benefits – Chinook Salmon</td>
<td>$21.0</td>
</tr>
<tr>
<td></td>
<td>Environmental Benefits – Incidental Wetland Habitat</td>
<td>$39.8</td>
</tr>
<tr>
<td></td>
<td>Emergency Response – Extended Drought</td>
<td>$5.1</td>
</tr>
<tr>
<td></td>
<td>Emergency Response – Delta Failure</td>
<td>$59.9</td>
</tr>
<tr>
<td></td>
<td><strong>Total Benefits</strong></td>
<td><strong>$177.8</strong></td>
</tr>
</tbody>
</table>

7.7 Other Project Benefits

The Project will manage available surplus water supplies to serve dry year demands, for emergency response, and ecosystem benefits including improved habit conditions, enhanced access to fish spawning and rearing in the Feather River downstream of Oroville Dam. In addition to these public and non-public benefits, the Project will provide flexible water storage and recovery facilities that will improve the State’s water system in a cost-effective manner. The Project will make use of existing infrastructure (canals and lift stations) and construct new conveyance facilities, recharge basins and extraction wells for an estimated capital cost of approximately $172 million. The Project’s water banking facilities will build upon the success of other groundwater storage/recovery projects, demonstrating that collaboration with DWR can provide public benefits, namely environmental improvements for habitat and fish at the Delta as well as water supply during emergency situations (long-term drought or Delta failure).

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 on a statewide basis and offer noteworthy, measurable ecosystem benefits. By banking unallocated Article 21 water, the Project will be operated to alleviate stress on the sensitive species in the Delta, while providing increased supply reliability.

The Kern Fan Groundwater Storage Project will offer opportunities to further improve the operation of the State water system through the integration of operations with other projects funded through the WSIP. For example, Sites Reservoir participants could be offered the opportunity to store water in the Project under mutually beneficial terms that would avoid reservoir spills. 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.

8. BENEFICIARIES AND LOCATIONS OF BENEFITS

Beneficiaries of the Project and their locations are listed in Table 3.

Table 3. Beneficiaries of the Project

<table>
<thead>
<tr>
<th>Beneficiary</th>
<th>Location of Benefits</th>
<th>Description of Project Benefit(s)</th>
</tr>
</thead>
</table>
| Public      | 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  
• Provides an emergency supply in the event of a levee failure in the Delta |
| Public      | 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 |
| IRWD        | Orange County        | • Augments supplies to IRWD during periods when other supply sources may be limited or unavailable. |
| DRWD        | Kings County         | • Augments supplies during periods when other supply sources may be limited or unavailable. |
9. ESTIMATED PROJECT COSTS

A project concept and engineering Class 4 Feasibility Level Cost Estimate was developed for the Kern Fan Groundwater Storage Project by Dee Jaspar & Associates, Inc. (DJA). DJA’s Draft Concept Study for the Kern Fan Groundwater Storage Project provides detailed information on the estimated project costs and is included in Feasibility and Implementation Risk Tab, Attachment 1, Appendix A of the WSIP application. The total capital costs are estimated to be $171,321,859. Table 4 shows the breakdown of the estimated project costs.

Table 4. Estimated Cost of Kern Fan Project

<table>
<thead>
<tr>
<th>Description</th>
<th>Estimated Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqueduct Turnout</td>
<td>1,185,000</td>
</tr>
<tr>
<td>Lift Stations</td>
<td>11,917,500</td>
</tr>
<tr>
<td>Phase 1 Recharge &amp; Recovery Facilities</td>
<td>13,861,108</td>
</tr>
<tr>
<td>Phase 2 Recharge &amp; Recovery Facilities</td>
<td>14,019,608</td>
</tr>
<tr>
<td>Conveyance Facilities</td>
<td>56,195,000</td>
</tr>
<tr>
<td>Turnout Facilities</td>
<td>5,582,500</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>2,120,000</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>104,880,716</strong></td>
</tr>
<tr>
<td>20% Contingency</td>
<td>20,976,143</td>
</tr>
<tr>
<td>Land, Easements, R/W, habitat credit purchase</td>
<td>36,600,000</td>
</tr>
<tr>
<td><strong>Total Field Costs</strong></td>
<td><strong>162,456,859</strong></td>
</tr>
<tr>
<td>Non-Contract Costs</td>
<td></td>
</tr>
<tr>
<td>Engineering &amp; Design</td>
<td>5,315,000</td>
</tr>
<tr>
<td>Environmental &amp; Permitting</td>
<td>550,000</td>
</tr>
<tr>
<td>Construction Management</td>
<td>3,000,000</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>8,865,000</strong></td>
</tr>
<tr>
<td><strong>Total Construction Costs</strong></td>
<td><strong>171,321,859</strong></td>
</tr>
</tbody>
</table>

The Draft Concept Study describes the project facilities to be constructed and the operations consistent with the Project operations plan. 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.

DJA’s cost estimate also includes the expected environmental compliance costs for the project. This cost estimate was provided by environmental consultants at ESA, and a copy of ESA’s scope of work, schedule and cost estimate to prepare the Project environmental review documents are...
included under **Feasibility and Implementation Risk Tab, Attachment 4** under Environmental Document of the WSIP funding application.

A proposed conveyance canal will be constructed as part of the project. Construction of the canal will require obtaining conveyance easement and habitat conservation plan (HCP) mitigation credit for approximately 100 acres within the Kern Water Bank Authority (KWBA) Permit Area. The cost of the mitigation credit needed for the proposed Project is included in the cost estimate.

The estimated capital, operations and maintenance and replacement costs from the Concept Study are used in the present value calculations for the Benefit Cost analysis of the Project. See **Benefit Calculation, Monetization and Resiliency Tab, Attachment 9** of the WSIP funding application.

### 10. RELATIONSHIPS TO EXISTING WATER PROJECT FACILITIES

The Kern Fan Project’s relationship to the other existing water projects is described below. The Kern Fan Project will be operated in coordination with DWR’s management of the SWP to make water available for ecosystem benefits.

The Kern Fan Project is based on the success of other water banking and conjunctive use projects implemented by IRWD and Rosedale which include the:

- Strand Ranch Integrated Banking Project, and
- Stockdale Integrated Banking Project.

#### 10.1 Existing SWP Water Conveyance Facilities

The CVC, Kern County’s primary conduit for water deliveries to and from the California Aqueduct, was originally constructed in 1975 and expanded in 2012. Shown in **Figure 11**, the CVC conveys supplemental water from the California Aqueduct to the Bakersfield area. An intertie between the Friant-Kern and increased CVC capacity have enabled CVC Contractors to move Central Valley Project water supplies from the west side of the valley to the east. The California Aqueduct will provide for delivery of banked supplies by exchange to DRWD and directly to IRWD’s service area through the existing MWD system.
MWD is the State Water Contractor that imports water to IRWD’s service area. MWD would access Project water from the California Aqueduct at Lake Perris where it would be conveyed to MWD’s Diemer Filtration Plant located in Orange County. The two major pipelines that deliver treated, potable water to IRWD’s service area are the Allen McCulloch Pipeline and the East Orange County Feeder No. 2.

Imported water is provided to IRWD through MWDOC, the regional wholesale member agency of MWD. In 2011, IRWD, MWD, and MWDOC entered into the MWD/IRWD Agreement to facilitate delivery of SWP water banked at Strand Ranch to IRWD’s service area. The Agreement was amended to include the Stockdale Recovery Facilities Project. Under the Agreement and with MWD’s consent, IRWD will provide banked water to MWD at a Kern County delivery point into the California Aqueduct (via the CVC). In exchange, MWD would provide IRWD with an equal amount of imported SWP water in its service area and other allowed areas.

10.2 Existing Strand Ranch Project

Since 2008 IRWD, in partnership with Rosedale, has participated in Rosedale’s Conjunctive Use Program through the Strand Ranch Integrated Banking Project. Strand Ranch is located in western Kern County and borders Rosedale’s service area as shown in Figure 4.

The Strand Ranch Project includes approximately 502 acres of groundwater recharge basins, seven on-site production (recovery) wells, and off-site joint-use wells constructed by Rosedale. Figure 12 shows the Strand Ranch recharge basins during a recharge event. With the Strand Ranch Project, IRWD has the ability to store up to 50,000 AF and recover up to 17,500 AFY in accordance with its banking project agreement with Rosedale. Recovered water is delivered to
IRWD’s service area via the CVC, California Aqueduct, and MWD facilities through existing agreements with MWD.

![Figure 12. Strand Ranch recharge basins during recharge](image)

IRWD has the priority rights to use the recharge basins on the Strand Ranch when Rosedale is not recharging Kern River floodwaters and has first priority rights to the use of the recovery facilities. Rosedale has secondary priority use of Strand Ranch facilities. The water that Rosedale stores on its own behalf does not count against the 50,000 AF of storage dedicated to IRWD. Rosedale manages operation of the Strand Ranch Project on behalf of IRWD.

The Phase 1 Kern Fan Project site will be located in the vicinity of the Strand Ranch Project. The Phase 2 Kern Fan Project site will be in this same vicinity. The Kern Fan Project will be similar to the Strand Ranch Project in that both are water banking projects located in Rosedale’s service area and near the CVC. Recharged water is stored in the groundwater basin for later extraction.

### 10.3 Existing Stockdale Integrated Banking Project

In 2011, IRWD acquired a neighboring property known as Stockdale West Ranch (Stockdale West) with the intent of expanding its water banking opportunities. The Stockdale West property is the initial component of the Stockdale Integrated Banking Project, and is located west of and adjacent to the Strand Ranch Project in western Kern County. IRWD constructed recharge basins on the 323-acre Stockdale West site, which is located north of the Pioneer Canal and the CVC.
IRWD began recharging water on the Stockdale West site in 2011. The recharge capacity of the Stockdale West site was estimated at up to 27,100 AFY based on infiltration pilot tests. IRWD has constructed three extraction wells to recover up to 11,250 AF per year of stored groundwater. The recovered groundwater is conveyed via pipelines to the existing CVC for transport to the California Aqueduct, points of use and/or exchange with partnering agencies. Rosedale is developing water banking facilities on its Stockdale East property, also a component of the Stockdale Integrated Banking Project.

Phase 1 of the Kern Fan Project will be located within the Stockdale Integrated Banking Project boundary as shown on Figure 4. The Phase 2 Kern Fan Project will be in this same vicinity. The IRWD-Rosedale partnership of the Strand Ranch and Stockdale Integrated Banking Projects will be expanded by the Kern Fan Project.

11. FUTURE CONDITIONS WITH AND WITHOUT THE PROJECT

The Project yield was estimated using the CalSim II model results that depict the without-Project (Baseline) scenario within a spreadsheet model (MBK Engineers, 2017). 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. Following is a summary of the CalSim-II model’s application to estimate the project yield that is described in more detail in the Feasibility and Implementation Risk Tab, Attachment 1, Appendix B of the WSIP application.

11.1 Baseline Scenario

The Baseline scenario for this analysis is the WSIP 2030 CalSim II model dated November 2, 2016. This model simulation is described as a without-project, 2030 future condition with projected climate and sea-level conditions for a thirty-year period centered at 2030 (WSIP 2030).

Figure 13 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 WSIP 2030 CalSim II modeling results. This available supply is 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 unallocated Article 21 supply at the project diversion from the California Aqueduct is 8 TAF with most of the supply available during wet years. There is no Article 21 supply during dry and critical years.
Figure 13. Article 21 Supply at Project Diversion

Table 5 presents a summary of the Project performance on an average annual basis with the 2030 WISP conditions. Of the 8 TAF available to the project diversion approximately 6.1 TAF is able to be conveyed in the project facilities for recharge on an average annual basis. This water is stored and then extracted to provide public and non-public benefits. Actual deliveries and recharge in any one year would be substantially greater. Presenting the modeling results on an average annual basis is done for comparison purposes. Actual recharge at the Project would range from 10,000 AF to 70,000 AF per year in years when water is available under 2030 future conditions. Under 2070 conditions, recharge would range from 3,000 AF per year to 70,000 AF per year when water is available. MBK Engineers’ modeling results indicate that 500,000 AF of unallocated Article 21 water would be recharged at the Project, over the 82-year modeling period, under 2030 conditions. A total of 25 percent of these recharged amounts would be dedicated to an ecosystem account to provide water for ecosystem benefits.

Table 5. Summary of Project Performance (WSIP 2030) on Average Annual Basis

<table>
<thead>
<tr>
<th>Year Type</th>
<th>Project Recharge (TAF)</th>
<th>Number of Pulses (Years)</th>
<th>Ecosystem Water Supply (TAF)</th>
<th>IRWD Water Supply (TAF)</th>
<th>Rosedale Water Supply (TAF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Above Normal</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Below Normal</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Dry</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Critical</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>All Years</td>
<td>6.1</td>
<td>6</td>
<td>1.3</td>
<td>2</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Under 2030 conditions, the Project could provide six pulse releases from Oroville Reservoir over the 82-year period analyzed and provide an average annual ecosystem water supply of 1.3 TAF. The ecosystem supply of 1.3 TAF includes 0.84 TAF of Project release, a 23% savings in carriage losses for releases above the Delta and 0.2 TAF of reduced flood control releases. Local water supply benefits are 4.5 TAF annually, with 2.0 TAF for IRWD and 2.5 TAF for Rosedale.

11.2 Uncertainty Analysis

In addition to analyzing the project performance with the 2030 WSIP conditions an uncertainty analysis of potential future climate change and the California WaterFix was modeled. Following is a summary of the uncertainty analysis that is described in more detail in the Feasibility and Implementation Risk Tab, Attachment 1, Appendix B of the WSIP funding application.

11.2.1 Climate Change

The climate change analysis was performed using the WSIP 2070 dataset that reflects future climate and sea level conditions for a 30 year period centered at year 2070. As summarized in Table 6, the Project benefits diminish slightly due to a reduction in available water supply when the 2070 WSIP results are compared to the 2030 WSIP results. Average annual recharge is reduced by 0.4 TAF or approximately 7% as compared to 2030 conditions. The frequency of ecosystem pulses is reduced from six years under 2030 conditions, to five years under 2070 climate conditions. Water supply benefits also diminish slightly by approximately 0.3 TAF (7%) on an average annual basis. Though the Project performance is reduced with WISP 2070 climate conditions, they are similar to the WISP 2030 baseline.

<table>
<thead>
<tr>
<th>Model</th>
<th>Alternative</th>
<th>Project Recharge (TAF)</th>
<th>Number of Pulses (Years)</th>
<th>Ecosystem Water Supply (TAF)</th>
<th>IRWD Water Supply (TAF)</th>
<th>Rosedale Water Supply (TAF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CalSim II (1)</td>
<td>WSIP 2030</td>
<td>6.1</td>
<td>6</td>
<td>1.3</td>
<td>2.0</td>
<td>2.5</td>
</tr>
<tr>
<td>CalSim II (1)</td>
<td>WSIP 2070</td>
<td>5.7</td>
<td>5</td>
<td>1.1</td>
<td>1.9</td>
<td>2.2</td>
</tr>
<tr>
<td>CalSim II (1)</td>
<td>Change WISP 2070 - WISP 2030</td>
<td>0.4</td>
<td>1.0</td>
<td>0.2</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>CalSim II ELT (2)</td>
<td>Without California Fix</td>
<td>5.2</td>
<td>4</td>
<td>0.9</td>
<td>1.8</td>
<td>1.9</td>
</tr>
<tr>
<td>CalSim II ELT (2)</td>
<td>With California Fix</td>
<td>10.7</td>
<td>7</td>
<td>1.5</td>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td>CalSim II ELT (2)</td>
<td>Change (With - Without California Fix)</td>
<td>5.5</td>
<td>3.0</td>
<td>0.6</td>
<td>2.1</td>
<td>2.0</td>
</tr>
</tbody>
</table>

(1) Water Storage Investment Program (WSIP) CalSim II model (11/2/16)
(2) Division of Water Resources and Bureau of Reclamation for Biological Assessment with 2025 Early Long Term climate change.

11.2.2 California Water Fix

The California WaterFix (CWF) analysis was performed using the CalSim II model developed by DWR and Reclamation for the Biological Assessment for the CWF. The CWF CalSim II model
includes the 2025 Early Long Term (ELT) climate change assumptions that are different from the WSIP 2030 climate change assumptions. Results, summarized in Table 6, indicate a substantial increase in Project yields with the CWF when compared to without the CWF. Average annual Project recharge is approximately 11 TAF with CWF, nearly 6 TAF greater than DWR ELT without CWF. Increases in the ability to recharge water with CWF increase the frequency of ecosystem pulses from four years to seven and Project yields to IRWD and Rosedale are increased by approximately 4 TAF.

12. ENVIRONMENTAL COMPLIANCE:

Environmental compliance, on a program-level, has already been completed for Phase 1 recharge and recovery facilities of the Kern Fan Project. Phase 1 of the Kern Fan Project is the proposed third site in the Stockdale Integrated Banking Project. The existing Stockdale West and Stockdale East properties plus a general area for a future third site were identified in the Final EIR for the Stockdale Integrated Banking Project. Various water banking facilities have been completed or are currently under construction on the Stockdale West and Stockdale East properties.

A Final EIR for the Stockdale Integrated Banking Project was prepared, certified and approved in compliance with the California Environmental Quality Act (CEQA) of 1970 (as amended), codified at California Public Resources Code Sections 21000 et. seq., and the State CEQA Guidelines in the Code of Regulations, Title 14, Division 6, Chapter 3. Rosedale, as lead agency, filed a Notice of Determination for the Stockdale Integrated Banking Projects with the County of Kern (ESA, 2015). IRWD, as a responsible agency, filed Notice of Determinations with the County of Orange and with the County of Kern. The Final EIR for Stockdale Integrated Banking Project is included in the Feasibility and Implementation Risk Tab, Attachment 4 of the WSIP application.

The EIR includes a program-level analysis of impacts of a third site because the location of the site had not been identified at the time the document was prepared. The third site will be implemented as Phase 1 of the Kern Fan Project. When the Phase 1 site is identified, subsequent project-level environmental review would need to be conducted prior to implementation of project facilities. It is expected that a Supplemental EIR would be prepared for the construction and operation of the Phase 2 facilities contemplated in the Kern Fan Project.

In summary, the Kern Fan Project will be implemented in two phases. Phase 1 includes the acquisition of approximately 640 acres of land within Rosedale’s boundary and within the boundaries of Stockdale Integrated Banking Project Final EIR for which environmental compliance has been completed on a programmatic basis. Groundwater recharge facilities including levees, inter-basin structures, conveyance facilities, and six groundwater recovery wells would be located on this property. Phase 1 recharge and recovery project components have a completed program-level environmental review and will require a project-level Supplemental EIR.
Another component of Phase 1 includes the construction of a new canal, three lift stations, and a reinforced concrete turnout at the California Aqueduct to convey up to 500 cfs of water in a new Project canal to the Phase 1 and 2 sites. Phase 2 includes the construction and operation of groundwater recharge and recovery facilities and the purchase of an additional 640 acres of land within the Rosedale but outside of the limits of the Stockdale Project Final EIR. Phase 2 would consist of the construction of levees, inter-basin structures, conveyance facilities and six groundwater recovery wells. Phase 2 would utilize the Phase 1 canal to convey water to and from the Phase 2 site. The Supplemental EIR would include review of the Phase 2 facilities.

More information about environmental compliance for the Kern Fan Project is located in Feasibility and Implementation Risk Tab, Attachments 4 and 5 of the WSIP application.
13. REFERENCES


