

# Kern Fan Groundwater Storage Project

## FEASIBILITY REPORT

### Attachment 3: M.Cubed Technical Memorandum (2020)

October 21, 2019  
Updated April 13, 2020





**April 8, 2020**

**To: Kellie Welch, Irvine Ranch Water District**

**From: Richard McCann, Partner**

**RE: Estimate of Benefits and Assumptions for the Wetland Ecosystem Benefit of the Kern Fan Groundwater Storage Project for the Water Infrastructure Improvement for the Nation Program (WIIN)**

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## **Introduction**

This supplemental memo outlines the data, assumptions, and methodological approaches for calculating the wetland ecosystem benefit of Irvine Ranch Water District's (IRWD) and Rosedale Rio Bravo Water Storage District's (Rosedale) proposed Kern Fan Groundwater Storage Project (Storage Project) under two scenarios. Both estimates use an alternative cost approach, which values the wetlands at the amount that it would cost to construct an alternative project that provides the same ecosystem benefit as the Storage Project.

## **Overview**

The Kern Fan Integrated Groundwater Storage Project (Project) will provide ecosystem benefits and other public and non-public benefits by recharging and storing up to 100,000 acre-feet (AF) of unallocated State Water Project (SWP) Article 21 water, unallocated Kern River floodwater, and other available water supplies, as available, in the Kern County groundwater basin. Water would be stored for subsequent extraction and recovery to offset surface water demands during periods of need. The project will provide a variety of benefits, including water supply, groundwater improvement, ecosystem, agriculture, and emergency response benefits, estimates of which have been detailed in previous memos based on project information provided by IRWD, Rosedale, Cramer Fish Sciences and MBK Engineers.

This memo focuses on the wetland ecosystem benefit, providing detailed assumptions used by M.Cubed to estimate benefits under (1) a long-term acquisition scenario, and (2) a temporary acquisition scenario. Under the long-term scenario, the Project uses a long-term permanent easement to create a wetlands in wet years only, mimicking the pattern of wetlands creation that is projected to take place with the Storage Project over a total of 33 months. An alternative approach is to assume that wetlands creation can take place at any time, not just in wet years, as long as the period of inundation is equivalent to that under the Storage Project. Under this temporary scenario, the Project leases agricultural land and creates a wetlands during the three winter months over 11 years, or a total wetlands creation of 33 months. Estimates of the net present value (NPV) of total benefits under both of these scenarios in 2018 dollars are outlined in Table 1.

**Table 1. Summary of Benefits for Two Wetland Benefit Scenarios**

Scenario	NPV of Benefits (2.875%)
Long-term Acquisition	\$162.6
Temporary Acquisition	\$203.7

Project benefits are expected to begin in 2026 and continue throughout the 50-year life of the project, through 2075 in the case of the long-term scenario, and 11 years, in the case of the temporary scenario. We calculate net present value at the project start in 2026. The net present value calculation uses a discount rate of 2.875%, which is the rate Federal agencies use in water resources planning.<sup>1</sup> All cost estimates are presented in 2018 dollars.

Throughout this analysis we rely on work already produced for the Kern Fan Project to apply for funding under California’s Water Storage Investment Program (WSIP).

### Scenario Details

The Project will provide ecosystem benefits by creating wetlands habitat for migratory birds during the years that it takes and recharges into groundwater aquifers Article 21 water and other excess flows. During those years, the 1,280 acres that comprise the project will be inundated with water to percolate into the groundwater basin. The inundated lands will provide temporary habitat to migratory bird species along the Pacific Flyway.

In the original analysis undertaken in support of the WSIP funding process, only Article 21 water was considered in the calculation of benefits. Considering only Article 21 water, based on historical hydrologic conditions, we expect recharge to take place in 21 months over the 50 year life of the project.<sup>2</sup> Additional modelling was carried out to consider the impact of added non-Article 21 water sources, and a hydrologic analysis found that tapping these sources would result in recharge occurring in an extra 12 months over the project lifetime, or a total of 33 months. For the purposes of this analysis, we assume that the project takes advantage of all available water recharge supplies, and uses the 33 months of recharge. During these 33 months a volume of approximately 461,000 AF would be spread over the 1,280 acres to provide wetland habitat.

**Long-Term Scenario**--Under the permanent scenario, we use an alternative cost approach for a project that would create equivalent wetland habitat in Kern County. Under this scenario, we assume the Project would acquire a permanent easement on 1,280 acres, build the infrastructure to inundate the property, and provide the same volume of water to flood the fields in wet years for 33 months out of the project life.

To estimate the cost of acquiring a long-term permanent easement on the 1,280 acres of land suitable for inundation we use easement costs from the Project Sponsors’ project cost estimates developed in funding applications of \$11,100 in 2018 dollars.<sup>3</sup> The alternative source of water for providing temporary wetland habitat in the area is Delta export water, so we estimate construction costs to include a connection to the

<sup>1</sup> U.S. Bureau of Reclamation, “Change in Discount Rate for Water Resources Planning,” <https://www.federalregister.gov/documents/2018/12/18/2018-27331/change-in-discount-rate-for-water-resources-planning>, December 18, 2018.

<sup>2</sup> Based on hydrologic analysis from MBK Engineers.

<sup>3</sup> Note that the cost of purchasing land outright is estimated at \$24,000 per acre.

California Aqueduct, the only way to obtain water transfers originating north of the Delta. We estimate wetland construction costs to include earthwork and interbasin structures, lift stations, conveyance infrastructure, and a canal connection to the California Aqueduct, as well as the canal easements, compliance costs, and habitat credits necessary to carry out construction. Based on the Project's construction cost estimates the cost of constructing a wetlands project is \$52.7 million in 2018 dollars. We assume that the entire 461,000 to 465,000 AF of water will be applied to the wetlands over the 50 year easement. For the purpose of estimating a stream of costs, we use an expected annual application of 9,200 to 9,300 AF of water over the 50 years of potential wetland creation. Since the project would only create wetlands in wet years, we use the Delta Export unit value estimates for wet years provided in the WSIP Technical Guidance, which ranges from \$220 in 2030 to \$450 in 2045 in 2018 dollars, as well as a per AF conveyance cost of \$19. We interpolate between these values and leave prices beyond 2045 set at \$450 to be conservative. Since we do not know the exact timing of wet years over the project lifetime, we use the expected value of flood water volumes to create a stream of expected costs over the 50-year project lifetime. Taking the net present value of this stream of costs results in a total alternative cost of **\$162.6 million**.

**Temporary Scenario**— Under the Temporary scenario, we use an alternative cost approach for a project that would provide equivalent wetland habitat in Kern County, assuming that habitat provision could happen in any 33 months with equal ecosystem benefit, not just in wet years when the Storage Project would take flood flows. Under this scenario, we assume the Project would acquire a temporary easement on 1,280 acres, build the infrastructure to inundate the property over the 3 winter months of the first 11 years of the project, and provide the same volume of water to flood the fields for these 33 months. We assume wetland creation would only occur in winter months, with benefits spanning winter and spring months when stopovers on the Pacific Flyway are of greatest use, so that the benefits to migrating waterfowl are comparable to the benefits created under the Storage Project.

To estimate the cost of acquiring a temporary easement on the 1,280 acres of land suitable for inundation we use an estimate of the price of an agricultural lease in Kern County. The Project Sponsors' assessors confirmed that the only land available within a reasonable 5-10 mile distance of the California Aqueduct is agricultural land for lease for an average of \$310 per acre in 2018 dollars. The alternative source of water for providing temporary wetland habitat in the area is Delta export water, so we estimate construction costs in the same way as for the permanent scenario, including a connection to the California Aqueduct. Construction costs are the same as the permanent scenario, \$52.7 million in 2018 dollars. However, the temporary scenario includes an additional cost in the 11<sup>th</sup> year of the project to remove the wetland construction and return the land to its original state. This includes removal of embankments, walls and interbasin structures, with a total cost of \$799,000 in 2018 dollars. We assume that the entire 461,000 AF will be applied to the wetlands over the 11 years, or an average of 42,000 AF annually. We use the Delta Export unit value estimates from the WSIP Technical Guidance, weighted by the occurrence rate of each type of hydrologic year, since there is no way to know what type of water years will occur over the 11 years of wetland creation. These weighted unit values range from \$290 in 2030 to \$690 in 2045 in 2018 dollars, as well as a per AF conveyance cost of \$19. We interpolate between these values to arrive at price estimates over the 11 years of wetland creation. Taking the net present value of this stream of costs over 11 years results in a total alternative cost of **\$203.6 million**.

## Scenario Selection

While we did examine both a long-term easement and a temporary easement scenario in order to explore all potential alternatives, we determine that a short-term easement or land lease for an alternative wetland creation project would not be appropriate. Because creating an inundated wetlands would

require significant construction and changes to land use to create a containment basin or a free-standing wetland, it would not be appropriate to lease existing productive agricultural land. Orchards and irrigated agriculture using water-efficient modern irrigation methods are not appropriate for temporary wetlands creation on the scale of three or more months, nor are petroleum-production lands, because of existing infrastructure. Considering that all of the land within a reasonable 5 to 10 mile distance of the California Aqueduct is occupied as productive agriculture, the temporary scenario presents a barrier. Because the long-term scenario is also the least cost between the two alternatives, we determine the long-term scenario to be the most appropriate in calculating the benefit cost ratio of the Project.

Other alternatives explored included using existing recharge basins rather than leasing or procuring an easement to create wetlands. However, existing recharge basins are already in use during winter months. The wetland benefit is particular to winter and spring months when migratory birds would be present, and existing water banking recharge basins would typically be in use during the remainder of the year, recharging sources of water other than excess flows during years of normal hydrology. During dry and critical dry years when surface water is reduced, water banking entities are typically recovering previously stored water. Operationally, when water banking entities are recovering water through extraction wells they would not also be delivering water for recharge. They would use the surface recharge water in-lieu of groundwater. During dry years, the recharge basins would typically remain dry and used for livestock grazing.