February 1, 2018

Kellie Welch, Water Resources Manager
Kern Fan Groundwater Storage Project

VIA EMAIL
Welch@irwd.com

Subject: Public Benefit Ratio Review

Dear Ms. Welch,

As you know, the Water Storage Investment Program is an important opportunity to invest in California’s water future. Staff from the California Water Commission, the California Department of Fish and Wildlife, the California Department of Water Resources and the State Water Resources Control Board are working diligently to meet the statutory requirements of Proposition 1 and move forward with funding projects that provide the best return on the public’s investment.

The enclosed packet includes the results of the initial technical review of information supplied in your application to quantify the public benefits associated with your proposed project. Please note that this represents the initial reviewer assessment and does not represent a Commission decision.

In many cases, technical reviewers found that additional supporting information is needed from applicants to properly verify the Public Benefit Ratio associated with their projects. Applicants have the opportunity over the next three weeks to provide additional clarifying information and address specific comments from the review process. It is anticipated that many recommendations from the technical staff review will change once the additional information is received and evaluated. The additional information must be received by 5 p.m. February 23. Specifics on how to submit the additional information can be found in the transmittal email to this packet.

In addition, Commission staff will be scheduling individual one-hour meetings with applicants on February 7 and 8 to answer clarifying questions related to the initial technical review. This step has been added in response to feedback received from many applicants and engaged stakeholders. These meetings will be open to the public. To schedule a meeting with Commission staff and technical reviewers on February 7 or 8, please consult the information included in the transmittal email to this packet.

This program is the first of its kind in California. In many respects, Commission staff, technical reviewers and applicants are navigating the rules and regulations together. We appreciate your continued participation and consider it critical to the success of the program.
Sincerely,

Joe Yun
Executive Officer, California Water Commission
Public Benefit Ratio Review Summary: Kern Fan Groundwater Storage Project

Overview

This Public Benefit Ratio (PBR) review is the first component of the California Water Commission’s (Commission’s) technical assessment of applications for Water Storage Investment Program (WSIP) funding. This review serves as official notification to the applicant, and begins the appeal process. The reviewer-adjusted PBR indicates the need for additional information or clarification, which the applicant may submit in an appeal following the process described in the Commission’s regulations section 6008(a)(2)1 (also described below). The applicant may appeal any adjustments described in this review.

The reviewer-adjusted PBR does not reflect a Commission decision on this project’s PBR; it is the result of the Commission’s technical review team’s assessment of the information provided in the application. The review team consists of Commission staff and consultants as well as agency staff from the California Department of Fish and Wildlife (CDFW), the California Department of Water Resources (DWR), and the State Water Resources Control Board (State Water Board). Commission staff ensured that reviews adhered to WSIP standards, as expressed in Proposition 1, Commission regulations, and the WSIP Technical Reference Document. Commission staff also coordinated independent agency reviews.

Applicants must submit their appeal to the Commission by 5:00 pm on February 23, 2018.

All appeals must:

• Include a written rebuttal that refers to the specific adjustments described in this PBR review; and
• Identify the PBR that the applicant believes to be correct or an alternative value or calculation with any new supporting information.

The Commission will not accept any revised or new information not directly related to the changes made by a reviewer, including changes to the project description and benefits claimed. The appeal may not exceed 20 pages in 12-point font (per regulations section 6008(a)(2)) and any referenced supporting information. The written rebuttal may refer to information that was submitted in the original application or additional information provided with the appeal. When citing information to support its rebuttal, the appeal should refer specifically to the location of the supporting information. All supporting information must be included with the appeal or in the application. If the applicant recalculates the PBR, the denominator must be the amount of funding requested in the application. Please refer to regulations section 6008 for complete details of what may be included in the appeal.

1 Unless otherwise noted, all references to “regulation” are to the California Code of Regulations, Title 23, Section 6000 et seq.
The applicant should consult the Technical Reference (TR) for additional information regarding the reviews conducted by CDFW, DWR, and the State Water Board (as applicable) regarding the requirements to substantiate the physical changes claimed in the application or questions regarding modeling. For questions related to calculating physical changes and water operations generally, see Chapter 4 of the TR. Specifically:

Section 4.2          General Project Analysis
Section 4.3          Surface Water Operations Analysis
Section 4.4          Groundwater Analysis
Section 4.5          Riverine Hydrologic/Hydraulic Analysis
Section 4.6          Delta Hydrodynamics/Hydraulic Analysis
Section 4.7          Ecosystem Analysis
Section 4.8          Water Quality Analysis
Section 4.9          Flood Risk Reduction Analysis
Section 4.10         Recreation Analysis
Section 4.11        Emergency Response Analysis
Section 4.12        Water Supply Analysis
Section 4.13        Hydropower Analysis

Similarly, if reviewers have adjusted the monetization of public benefits, the applicant should consult the TR and sections 6000(a)(4)(F) and (G) of the regulations. The TR contains information about monetization methods in Chapter 5 and Appendices D-F. Descriptions of the three approaches to monetizing a benefit – avoided cost, alternative cost, and willingness to pay – are provided in section 5.3.1 of the TR.

The reviewers will evaluate each applicant’s appeal and prepare a response. The response may include new recommendations based on the information in the appeal. The reviewers’ response will include a recommended PBR for the Commission to consider at the May 1-3, 2018 Commission meeting.

Once the Commission has determined the PBR for each application, reviewers will prepare the initial application scores. Changes in the magnitude of physical public benefits or monetized value resulting from the Commission-determined PBRs will be incorporated, as applicable, into all review elements, and will be reflected in the initial application scores. Initial scores and staff comments will be released on May 25, 2018 for public review. The Commission will decide on application scores at the June 27-29, 2018 Commission meeting.

Summary

Reviewers have evaluated the WSIP application submitted by the Irvine Ranch Water District (IRWD) for the Kern Fan Groundwater Storage Project (Kern Fan), and adjusted the applicant’s PBR, as shown in Table 1. This document and its attachments explain the reasons for the adjustments.
### Table 1. Summary of Adjustments to Public Benefit Ratio

<table>
<thead>
<tr>
<th>PBR Summary</th>
<th>As Submitted</th>
<th>As Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Public Benefit</td>
<td>$125.8</td>
<td>$49.7</td>
</tr>
<tr>
<td>($ millions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program Funding Request</td>
<td>$85.7</td>
<td></td>
</tr>
<tr>
<td>($ millions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Benefit Ratio</td>
<td>1.47</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Note: This table includes monetized benefits. Non-monetized benefits contained in the application were not evaluated to calculate the PBR but will be evaluated as part of the full technical review.

This review summary incorporates the reviews conducted by the Commission’s economics consultants and water operations consultants, DWR, and CDFW. DWR made no adjustments to the claimed emergency response physical benefits; therefore, no DWR review is attached. The following three reviews are attached to this summary:

- California Water Commission, Economics Review for Public Benefits Ratio (Economics Review)
- California Department Fish and Wildlife, Kern Fan Groundwater Storage Project Monetized Ecosystem Benefits (CDFW Review)

The water operations and economics evaluations were conducted by teams of subject matter experts. Each team implemented careful internal review and quality control. The reviewers used standard checklists and templates to verify assumptions and results. Teams met weekly for four months to discuss preliminary findings, assure consistency, and identify issues for further evaluation. Each individual reviewer’s findings were discussed by the broader review team and specifically double-checked by a designated senior reviewer.

Some team members were excluded from reviewing certain applications due to potential conflict of interest. In these cases, review and quality control were assigned to others.

Adjustments to the PBR may have resulted from one or more of the following: adjustments to the physical benefits, adjustments to the monetization of those benefits, or adjustments to costs or a cost allocation. The attached reviews describe the specific reasons for changes to the benefits and monetized values based on the reviewers’ evaluation of supporting models, data, analytical methods, and/or calculated results.

The applicant should note that more than one adjustment may have been made to the same benefit or monetized value.
Monetized Public Benefits Summary

Table 2 shows the value of the benefits as submitted by the applicant and as adjusted by reviewers.

<table>
<thead>
<tr>
<th>Public Benefits</th>
<th>As Submitted ($ millions)</th>
<th>As Adjusted ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecosystem</td>
<td>$60.8</td>
<td>$34.6</td>
</tr>
<tr>
<td>Water Quality</td>
<td>$0.0</td>
<td>$0.0</td>
</tr>
<tr>
<td>Flood Control</td>
<td>$0.0</td>
<td>$0.0</td>
</tr>
<tr>
<td>Emergency Response</td>
<td>$65.0</td>
<td>$15.1</td>
</tr>
<tr>
<td>Recreation</td>
<td>$0.0</td>
<td>$0.0</td>
</tr>
<tr>
<td>Total Public Benefits</td>
<td>$125.8</td>
<td>$49.7</td>
</tr>
</tbody>
</table>

Physical and Monetized Benefits

Below are some overarching water operations issues identified in the application, which are further explained in the attached water operations review:

- The applicant used the September 9, 2016 version of CalSim II, however the WSIP regulations require use of the November 2, 2016 version of CalSim II;
- Reviewers found that the availability of water in years with extremely low water conditions at Oroville was uncertain; and
- Reviewers cannot verify groundwater improvements.

Table 3 summarizes reviewers’ adjustments to claimed physical benefits and/or the economic valuation of those benefits, and refers to the applicable attached review.
### Table 3. Physical Benefits and Economic Issues

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Physical Benefit</th>
<th>Economics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecosystem – Spring-run and Winter-run Chinook Salmon Survival *</td>
<td>CDFW recommends removal from PBR calculation. See CDFW Review Pages 1-2.</td>
<td>Value Reduced:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Unsupported escalation of unit values.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Applicant must consider feasible least-cost alternative to calculate benefit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduced using TR unit water values for Sacramento Valley.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Economic Review Page 3.</td>
</tr>
<tr>
<td>Ecosystem – Incidental Wetland Habitat</td>
<td>No adjustments to the physical benefit.</td>
<td>Value Reduced:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Land purchase not required for the least cost alternative.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduced using TR unit water values.</td>
</tr>
<tr>
<td>Emergency Response – Drought Emergency Water Supply</td>
<td>No adjustments to the physical benefit.</td>
<td>Value Reduced:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Unsupported escalation of M&amp;I unit value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Unsupported unit value of water.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduced using TR unit water values and to remove escalation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Economic Review Page 5.</td>
</tr>
<tr>
<td>Emergency Response – Delta Failure</td>
<td>No adjustments to the physical benefit.</td>
<td>Value Reduced:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Unsupported escalation of M&amp;I unit value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Unsupported unit value of water.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduced using TR unit water values and to remove escalation.</td>
</tr>
</tbody>
</table>

Note: This table includes monetized benefits. Non-monetized benefits contained in the application were not evaluated to calculate the PBR but will be evaluated later as part of the full technical review that will be released on May 25.
*The applicant should note that the ecosystem benefit for spring-run and winter-run Chinook salmon survival is the project’s measurable improvement to the Delta ecosystem or to a tributary to the Delta, which is required by Water Code section 79752. The remaining ecosystem benefit for incidental wetland habitat is not located in the Delta or on a Delta tributary. If the applicant does not address the removal of this benefit through the appeal, staff will recommend that the Commission make an eligibility determination at the May 1-3, 2018 meeting.

Eligible Program Funding

Per regulations section 6007(b)(1)(B), Table 4 shows eligible WSIP funding based on all adjustments to benefits and costs. Other changes affecting capital costs eligible for WSIP funding (e.g., changes to cost estimates, cost allocation, and other related calculations) are described on page 8 of the Economics Review.

<table>
<thead>
<tr>
<th>Eligible Costs ($ millions)</th>
<th>As Submitted ($ millions)</th>
<th>As Adjusted ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Cost</td>
<td>$90.4</td>
<td>$171.3</td>
</tr>
<tr>
<td>Program Funding Request</td>
<td>$85.7</td>
<td></td>
</tr>
<tr>
<td>Adjusted Program Cost Share*</td>
<td></td>
<td>$49.7</td>
</tr>
</tbody>
</table>

The applicant should address both the ecosystem physical benefit and monetization issues in its appeal to change the adjusted PBR and eligible funding amounts presented in this review.
Economics Review for Public Benefit Ratio: Kern Fan Groundwater Storage Project

This technical review describes the public benefit ratio (PBR) results for the Kern Fan Groundwater Storage Project (Kern Fan Project), and adjusts the physical and monetary benefits and cost analysis. Changes to physical benefits show how all reviewer adjustments — to physical benefits, monetized benefits, and costs — affect benefits, PBR, and eligible funding.

Adjusted PBR and Eligible Funding

After review, the adjusted PBR is 0.58 and adjusted eligible funding is $49.7 million. Reviewer adjustments may be modified through the appeal process described in the review summary and in regulation section 6008(a).

Summary of Application and Reviewer Adjustments

Table 1 summarizes the applicant’s cost and benefits analysis. The column titled “As Submitted” lists the applicant’s benefits, costs, and PBR. The applicant estimates the present value of total benefits (in 2015 dollars) is $177.8 million, of which $125.8 million are public benefits eligible for funding and $60.8 million of the public benefits are ecosystem benefits. The present value of project costs is $119.6 million, of which $90.4 million are capital costs. The applicant requests $85.7 million in Water Storage Investment Program (WSIP) funding. The PBR, which is the ratio of public benefits to WSIP requested funds, is 1.47.

In Table 1, the column titled “As Adjusted” summarizes the results of all adjustments to physical benefits, monetized value of benefits, costs, and PBR. Economics reviewers adjusted the applicant’s capital and total cost estimates to be consistent with the requirements of the regulation and the WSIP Technical Reference Document (TR). Economics reviewers also adjusted the monetization of benefits. In addition, the California Department of Fish and Wildlife (CDFW) recommended that the physical benefits associated with spring-run and winter-run chinook salmon survival were not supported by the application, so those physical benefits were removed. Economics reviewers also reduced the incidental wetland habitat monetized benefit and emergency response benefits, for the reasons discussed below.

As a result of these adjustments, total public benefits are $49.7 million, and the PBR is 0.58.

---

1 Access the TR online at https://cwc.ca.gov/Documents/2017/WSIP/TechnicalReference.pdf
Monetized Benefits

This section documents reviewer adjustments to the applicant’s ecosystem, emergency response, and non-public monetized and physical benefits. The following discussion about benefits monetization provides economics reviewers’ conclusions regarding monetization even if other reviewing agencies recommended removal of the physical benefits.

Ecosystem

Benefits as Provided by the Applicant

The applicant monetizes two separate ecosystem public benefits: spring-run and winter-run Chinook salmon survival, and incidental wetland habitat. Monetized benefits are documented in the applicant’s submitted files named “Tab 6_A3_IRWD_MCubed_WSIP Project Economic Benefits Techmemo.pdf” and “Tab 6-A5 IRWD_WSIP_Econ Benefits_081117_FINAL.xlsx.”

For spring-run and winter-run Chinook salmon survival, the applicant uses TR benefit values of $100,000 per fish for spring- and winter-run Chinook, which results in a monetized present value of $23.1 million. The applicant also uses an alternative cost method based on the cost of procuring a similar volume of water in dry and critical years for environmental flows. Consistent with the regulation, the applicant...
uses the lesser-valued alternative cost method, $21 million in present value for the spring-run and winter-run Chinook salmon survival monetized benefit.

The Kern Fan Project would provide incidental wetland habitat for migratory birds during years that the applicant, Irvine Ranch Water District (IRWD), takes and stores Article 21 water. The applicant uses the alternative cost approach to monetize this benefit.

**Benefits as Adjusted by Reviewers**

**Physical Benefits**

CDFW considered the monetized ecosystem benefit for spring-run and winter-run Chinook salmon survival insufficiently supported by the information in the application (see CDFW Review, attached). Therefore, these physical benefits were removed.

CDFW did not recommend any adjustment to the physical benefit associated with incidental wetland habitat.

The discussion about benefits monetization below provides adjustments from economics reviewers regarding monetization regardless of whether CDFW recommended removal of the physical benefits associated with spring-run and winter-run Chinook salmon survival.

**Monetization**

Economics reviewers adjusted the monetization of the physical benefit associated with spring-run and winter-run Chinook salmon survival. The applicant monetizes spring-run and winter-run Chinook salmon survival benefits using the alternative cost approach, using a combination of TR Delta export unit values and Metropolitan Water District of Southern California (MWDSC) Tier 1 rate of $676 per acre-foot (AF) escalated at the same rate that the TR unit values increase between 2030 and 2045 (i.e., $360 per AF to $1,056 per AF). No justification is provided for why MWDSC rates would escalate in real terms at the same rate that the TR unit values escalate. The TR values escalate because of the implementation of the Sustainable Groundwater Management Act (SGMA) in the San Joaquin Valley.

Furthermore, water should be valued where it is provided for pulse flows in the Feather River. The applicant states:

"In order to provide similar environmental flows in the absence of the project, IRWD and Rosedale would need to purchase replacement water for urban and agricultural use, respectively, to exchange for State Water Project (SWP) Table A water."

Economics reviewers found that voluntary water transfers in the Sacramento Valley could be used to provide the same timing and amount of water as provided by the Kern Fan Project at a lower cost. Therefore, there is no need to purchase replacement Table A water, and the average ecosystem benefits can be estimated based on the north-of-Delta alternative cost of water in the TR, the water provided by year type as shown in the application, and the frequency of water year types. Economics reviewers calculated the adjusted present value of monetized benefits using the Sacramento Valley TR unit water values. Economics reviewers concluded that purchase of water in the Sacramento Valley would likely provide the same flow (and therefore benefit) at lower alternative cost than the benefit based on unit fish values. If the physical benefit were not removed, the present value of the spring-run and winter-run...
Chinook salmon survival benefit would be $8.14 million. However, CDFW’s recommended removal of the physical benefit results in zero monetary benefit.

Economics reviewers adjusted the monetization of the physical benefit associated with incidental wetland habitat. The applicant includes the cost of purchasing 1,280 acres of cropland (at about $6 million) to establish the incidental wetland habitat. However, the land purchase cost is not necessary for a feasible alternative cost. The wetland benefit provided by the Kern Fan Project includes only 24 total months of inundation over the 82-year period. For only 24 months in 82 years, land could be flooded that is either already dedicated to groundwater recharge, or a limited easement could be acquired at much lower cost. The inundation would not necessarily need to occur during the same years and months as the project recharge. Therefore, an outright land purchase is not the lowest-cost feasible alternative. Economics reviewers adjusted the benefit to include only the alternative cost of water as provided by the applicant in the file named “Tab 6-A5 IRWD_WSIP_Econ Benefits_081117_FINAL.xlsx.” The adjusted present value of wetland habitat benefit is $34.6 million.

Water Quality
No water quality benefits are monetized.

Flood Control
No flood control benefits are monetized.

Emergency Response: Drought Emergency Water Supply

Benefits as Provided by the Applicant
The applicant states that two-thirds of the additional water provided by the project (i.e., about 3,100 AF per year) is for water supply or groundwater recharge (see “Monetized Non-Public Benefits,” below) and the remaining one-third (about 1,400 AF per year) is for emergency response. The applicant calculates that the additional water supply provided for drought emergencies equals one third of the annual expected water quantity provided by the Kern Fan Project and that this water would be used in 7 percent of years on average (i.e., the percent of critical years occurring in the third or later year of drought during the hydrologic period from 1922 to 2003).

The applicant uses unit values for municipal and industrial (M&I) supply (for 25 percent of the emergency supply) and agricultural supply (for 75 percent of the emergency supply). The applicant uses the MWDSC Tier 1 untreated rate of $676 per AF plus a penalty cost of $1,480 per AF as the value for M&I emergency supply. The penalty cost is an additional charge that could be levied by MWDSC for water use at 100 to 115 percent of a user’s allocation. The applicant escalates the MWDSC Tier 1 rate at the same rate that the TR unit value for Delta export water in a critical year escalates between 2030 and 2045. The penalty cost is then added to the escalated MWDSC Tier 1 rate.

For agricultural water supplies, the applicant uses recent drought values for unspecified spot market water purchases in Kern County. The buyer, seller, transaction costs, and other details of the exchange are not documented. The applicant states that agricultural water costs equaled $800 per AF in the recent drought, and the applicant inflates these costs to future years using the increase in the 2030 and 2045 TR Delta export unit water values in critical years.
Benefits as Adjusted by Reviewers

Physical Benefits
The California Department of Water Resources (DWR) did not recommend any adjustments to the drought emergency water supply physical benefit.

Monetization
Economics reviewers adjusted the monetization of the drought emergency water supply physical benefit. For drought emergencies, the agricultural spot-market transfer price of $800 per AF cited by the applicant represents a single observation during the third year of a severe drought characterized by unusually large cutbacks of surface water supply. Economics reviewers did not accept valuing future water supplies based on a single or a few observations from an exceptional year because this observation does not represent the range of water supply conditions and other factors affecting value. The TR presents current and future unit values for water that reflect different water year conditions and the future implementation of groundwater management. Economics reviewers applied TR unit values for critical years equal to $360 AF in 2030 and $1,056 per AF in 2045. Economics reviewers also added $12.07 per AF for SWP conveyance costs to the Rosedale Rio Bravo and Dudley Ridge service areas.2

The TR unit values are estimates of the unit value of water in the Central Valley. The 2045 TR unit values are projections that reflect potential water market conditions once SGMA is fully implemented. The applicant provides no documentation or rationale that M&I rates in southern California will escalate in real terms at the same rate that the TR unit values escalate due to SGMA. A projected real escalation rate might be available from MWDSC or another M&I provider, but the applicant does not provide one. Without this information, economics reviewers adjusted the unit values to reflect the cost of MWDSC supply (i.e., $676 per AF) plus the applicant-provided penalty charge of $1,480 per AF. The adjusted present value of the drought emergency water supply benefit is $2.91 million.

Emergency Response: Delta Failure

Benefits as Provided by the Applicant
The applicant states that two-thirds of the additional water provided by the project (about 3,100 AF per year) is for water supply or groundwater recharge (see “Monetized Non-Public Benefits: Water Supply,” below) and the remaining one-third (about 1,400 AF per year) is for emergency response. The applicant includes the value of emergency water supply (20,000 AF) that is available as a result of the Kern Fan Project for use in a Delta failure emergency, occurring once in 2056. The applicant applies a unit value of $8,410 per AF for M&I (25 percent of total supply) and agricultural water (75 percent of total supply). This is stated to be the cost of MWDSC Tier 1 water (at $676 per AF) plus the penalty cost for water use over 115 percent of allocation (i.e., $2,960 per AF), both of which are escalated to 2056 values using the TR escalation rate for Delta export water. This differs from the procedure used for drought emergencies in which only the MWDSC Tier 1 rate is escalated, and then an un-escalated penalty cost is added. The applicant sets agricultural water unit value equal to the M&I water unit value by the applicant because “…agricultural users would need to outbid urban suppliers for available agricultural water.”

---

Benefits as Adjusted by Reviewers

Physical Benefits
DWR did not recommend any adjustments to the Delta failure water supply physical benefit.

Monetization
Economics reviewers adjusted the monetization of the Delta failure physical benefit. The applicant does not show that agricultural users would be willing to pay $8,410 per AF in 2015 dollars. The unit values in the TR provide estimates of the marginal value (i.e., the unit value of a change in supply) of agricultural water supply in critical years, and include the future effect of SGMA. Economics reviewers concluded that the TR unit value of $1,056 per AF is appropriate for the Delta emergency benefits for agricultural water supply (i.e., 75 percent of supply), plus $12.07 per AF for SWP conveyance costs to the Rosedale Rio Bravo and Dudley Ridge service areas (see footnote 2).

Economics reviewers also adjusted the M&I unit values for the same reasons as described above for the drought emergency water supply benefit. Reviewers adjusted unit values to reflect the cost of MWDSC supply (i.e., $676 per AF) plus a penalty charge of $2,960 per AF. The adjusted present value of Delta failure benefit is $12.19 million.

Recreation
No recreation benefits are monetized.

Monetized Non-Public Benefits: Water Supply

Benefits as Provided by the Applicant
The applicant estimates the Kern Fan Project would provide an average of 4,500 AF per year in 2030 and 4,100 AF per year in 2070. Of these amounts, the applicant estimates that non-emergency water supply is two-thirds of the total water supply and is available in wet, above normal, below normal, dry, and critical year types. The average annual water supply is split: 75 percent for agricultural use (to Rosedale Rio Bravo Water Storage District and Dudley Ridge Water District) and 25 percent for M&I use (for IRWD).

The applicant establishes agricultural water unit values using the TR Delta export region unit values for 2030 and 2045. The unit values are weighted by the Kern Fan Project water supply that would be available under each water year type under 2030, 2045, and 2070 conditions. The applicant generates unit values for all years by interpolating between 2030 and 2045, and holds the unit value constant thereafter.

The applicant establishes M&I water unit values using an alternative cost approach. The applicant sets M&I water supply unit values equal to the Tier 1 untreated water cost from MWDSC in 2015, which was $676 per AF. The applicant then escalates the M&I rate at the same implied rate that TR Delta export unit values escalate between 2030 and 2045.

Benefits as Adjusted by Reviewers

Physical Benefits
Water operations reviewers did not recommend any adjustments to the water supply physical benefit.
Monetization
Economics reviewers adjusted monetization of the M&I water supply physical benefit for the same reasons as described above for the drought emergency water supply benefit. Reviewers adjusted the M&I unit values to reflect the MWSC rate of $676 per AF to IRWD, but removed the escalation factor. After these adjustments, the present value of non-public water supply benefit is $46.56 million.

Monetized Non-Public Benefits: Groundwater Level Improvement

Benefits as Provided by the Applicant
To evaluate the groundwater benefit, the applicant uses the alternative cost approach to estimate how much it would cost to purchase the same volume of water for groundwater recharge in Kern County as that provided by the Kern Fan Project. The applicant states that, according to groundwater policy in Kern County, a portion of banked groundwater is not recovered by the banking entity, but remains in the ground and bolsters local groundwater levels. In Kern County, 12.5 percent of groundwater stored is not recovered, and 60 percent of that amount is estimated to be net recharge after accounting for evaporative losses (see page 2 of the file named “Tab 6-A3_IRWD_MCubed_WSIP Project Economic Benefits Techmemo.pdf”). For the alternative cost of water for recharging groundwater, the applicant uses Delta export unit values provided in the TR. The applicant weights those costs according to water year type frequency using to the San Joaquin River Water Year Index to calculate 2030 and 2070 future condition values. The applicant estimates a net present value of $4.3 million in 2015 dollars.

Benefits as Adjusted by Reviewers

Physical Benefits
Water operations reviewers did not recommend any adjustments to the physical benefit associated with groundwater level improvement.

Monetization
Economics reviewers adjusted the monetization of the groundwater level improvement physical benefit. For agricultural water supply and groundwater recharge unit values, reviewers have added $12.07 per AF for SWP conveyance costs to the Rosedale Rio Bravo Water Storage District and Dudley Ridge Water District service areas (see footnote 2). The adjusted present value of groundwater level improvement benefit is $5.35 million.

Project Costs

Costs as Provided by Applicant
Detailed costs are provided in the applicant’s file named “Tab 6-A9-A10_IRWD_Benefit-Cost Analysis_Cost-Allocation.xlsx.” Costs include about $171.3 million of eligible capital costs to be incurred from 2019 through 2025, $18.8 million of future operation and maintenance (O&M) based on 2030 conditions, and $10.6 million of future replacement costs, for a total of about $206.7 million in present value. Future O&M costs include DWR conveyance costs of $24 per AF for Article 21 supplies.

The applicant reduces capital costs for purposes of the benefit-cost analysis as follows:

- The applicant states: “Since the capital costs would occur over a 6-year construction period, a present value of capital at year one was calculated. This was incorporated into the benefit-cost ratio calculation to accurately reflect the time value of capital costs incurred” (see the file named
“Capital_Cost_PV tab in file “Tab 6-A9-A10_IRWD_Benefit-Cost_Analysis_Cost_Allocation.xlsx”). Reviewers noted two effects of this present value calculation: it lowers capital costs from $171.3 million to $152.9 million, and it excludes interest during construction.

- The applicant further reduces the present value of capital costs by subtracting the present value of residual value of land and facilities at the end of the 50-year operating horizon. The applicant states: “IRWD and Rosedale believe these adjustments are justified due to the high potential for land appreciation in the Kern County-Bakersfield area and the value of site improvements at the end of project operations” (see the file named “Benefit_Ratios tab in file “Tab 6-A9-A10_IRWD_Benefit-Cost_Analysis_Cost_Allocation.xlsx”). The effects of this residual land value adjustment are to lower applicant-submitted capital costs further to $90.4 million, the value shown in Table 1.

Although the applicant reduces capital costs for the purposes of the benefit-cost analysis, it uses the full $171.3 million capital cost estimate for cost allocation and funding request purposes. For example, the $85.7 million applicant public funding request in Table 1 is 50 percent of the total $171.3 million capital cost estimate, which is the maximum allowable share permitted by the statute for a groundwater storage project.

**Costs as Adjusted by Reviewers**

Economics reviewers adjusted capital costs. Section 7.1 of the TR states “The applicant shall display and compare the present value of monetized benefits and total discounted project costs of the proposed project, all shown in 2015 dollars as of the start of project operations.” The applicant provided information (see the file named “Tab 6-A9-A10_IRWD_Benefit-Cost_Analysis_Cost_Allocation/Dashboard.xls”) that 2025 is the final year of construction with Phase 2 online in 2025 (Phase 1 is online in 2024). Thus, economics reviewers used 2025 as the basis for the present value calculations and adjusted costs accordingly.

Concerning the residual value of land and facilities after the 50-year operation period, the regulation and TR do not provide for subtracting future residual values in this way. Regulation section 6001(a)(11) and Section 6.0 of the TR define the components and calculation of costs eligible for WSIP funding. Economics reviewers removed the residual value of Kern Fan Project land and facilities from the calculation of eligible capital costs. The adjusted total capital cost is $171.3 million as shown in Table 1.

**Other Monetization Assumptions**

**As Provided by Applicant**

Other than the specific capital cost adjustments and monetization adjustments described above, the applicant has generally monetized costs, discounted costs and benefits, and conducted cost allocation consistently as per the direction of both the regulation and TR.
Water Operations Review for Public Benefits Ratio: Kern Fan Groundwater Storage Project

Applicant: Irvine Ranch Water District (IRWD)

Review of Water Operations Analysis Methodology

The Kern Fan Groundwater Storage Project (Kern Fan Project) would recharge and store up to 100 thousand acre-feet (TAF) of unallocated Article 21 water 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.

The applicant uses a spreadsheet model (see file named “IRWD_Attach 1_MBK_Model_KernFan.xlsm”) that post-processes without-project 2030 and 2070 condition CalSim II model results as provided by the Water Storage Investment Program (WSIP). The spreadsheet calculates surplus Delta outflow available for diversion and simulates Kern Fan Project operations.

Based on information included in the application, reviewers have identified the following limitations of the applicant’s analysis.

CalSim II Model Version

CalSim II models and results used in the spreadsheet model are the September 9, 2016 versions provided by WSIP. Updated CalSim II models were provided by WSIP on November 2, 2016. Section 6004(a)(1) of the regulations requires applicants to “use the CalSim II and DSM2 model products provided by the Program on November 2, 2016.”

Recharge Losses

The applicant states (see file named “Tab3- A3 IRWD_Project Description_FINAL.pdf”) that evaporation losses during recharge are estimated to be 6 percent. The spreadsheet model does not include this loss rate.

Availability of Lake Oroville Pulse Flows

The application and the spreadsheet model show that IRWD and Dudley Ridge Water District could have access to 17.9 TAF of water during dry and critical years. During water years with extremely low State Water Project (SWP) Table A allocations, this water supply may not be available.
**Water Operations Review Conclusions Related to Benefits**

**Spring-Run and Winter-Run Chinook Salmon Survival**

The applicant states the Kern Fan Project will provide ecosystem benefits in dry and critical years by releasing pulses of water from Lake Oroville for Delta outflow. The applicant's spreadsheet model results show that pulse flows, with a magnitude of 17.9 TAF each, occur in 5 of the 18 dry years and 1 of the 12 critical years under the 2030 conditions, and 5 of the 18 dry years under the 2070 conditions.

**Groundwater Level Improvement**

The applicant relies on inferred qualitative assessments of the benefits to the groundwater system that would result from implementation of the Kern Fan Project. The applicant does not provide the groundwater model used to assess groundwater level changes. The reviewers were not able to verify groundwater level improvements resulting from the Kern Fan Project.

**Water Supply**

The application and the spreadsheet model are consistent in showing that the Kern Fan Project will provide an average of 4.5 TAF per year of additional water supply under the 2030 conditions, and 4.1 TAF under the 2070 conditions.
January 29, 2018

Joseph Yun
Executive Officer
California Water Commission
P.O. Box 942836
Sacramento, CA 94236-0001

Dear Mr. Yun:

ANALYSIS OF MONETIZED ECOSYSTEM BENEFITS IN WATER STORAGE INVESTMENT PROGRAM PROJECTS' PUBLIC BENEFIT RATIOS

The California Department of Fish and Wildlife (Department) acknowledges the complexity of the task before the California Water Commission (Commission). The Department also appreciates that applicants to the Water Storage Investment Program (WSIP) are navigating rules and regulations for the evaluation of unique program aspects such as ecosystem benefits and public benefit ratios. The same is true for our Department.

Commission staff requested recommendations from the Department as to whether ecosystem benefits are sufficiently supported to factor into public benefit ratios calculated by applicants. (Cal. Code Regs., tit. 23, § 6007, subd. (b)(1)). Attached to this letter are concise summaries of the Department’s analysis for monetized ecosystem benefits per proposed project. In addition, this cover letter provides: (a) a description of applicant responsibilities; (b) a summary of the analysis; (c) an acknowledgment of the iterative nature of this effort; and, (d) a commitment for next steps.

This cover letter is longer than a typical one because it is important to identify precisely what the Department is and is not doing at this moment in time pursuant to the Commission’s WSIP process. First, the Department is not denying or rejecting any project. That is not the Department’s role. Nor should anyone conflate the Department’s analysis of benefits at this stage of your process with a denial or rejection of a project. It is simply not the case.

Instead, the Department conducted a technical review of the ecosystem benefits proposed by applicants requesting funding under the WSIP. Proposition 1, as set out in the Water Code, and the Commission’s regulations require the Department to provide this review.
Applicant Responsibilities:
The WSIP regulations set forth the requirements for the quantification of physical changes and resulting ecosystem benefits of proposed projects. (Cal. Code Regs. tit. 23, § 6000 to 6015.) The Department reviewed the applicants' analyses using the standards established in the WSIP regulations. Section 6004, subdivision (a) requires an applicant to quantify the magnitude of the net public benefit using either an appropriate method identified in the Technical Reference, or an alternative method that is scientifically sound, appropriate for the project, and adequately documented. Further, Section 6004, subdivision (a)(3)(B) requires that an applicant shall disclose and quantify, where possible, any impacts or negative effects the proposed project would impose on the ecosystem to the extent that those impacts are less than fully mitigated.

Under Section 6007, staff shall rely on information supplied by the applicant. If an applicant claimed a benefit but did not supply information in the application to support the claim, then the Department's analysis was hindered. The application information controlled the Department's analysis related to reasonableness of assumptions, completeness and quality of analysis, and appropriate use of data and analytical methods to calculate public benefits.

Summary of Analysis:
The Department took each application and completed technical review under Section 6007. The Department identified the following general areas of concern across the applications: potentially unmitigated environmental impacts that were not disclosed or quantified in the "net benefit" determination; missing quantification or analysis of the proposed ecosystem benefits; and absence of supporting documentation.

Based on the information provided as well as separate independent calculations from the Commission's Water Operations Review, the attached project-specific summaries identify two basic results. The first basic result occurs where the application provided insufficient information or the supporting documentation is absent to support a claimed benefit at all at this time.

This outcome of absent supporting documentation is most pronounced where the Department received detailed input from the Water Operations Review, which is an expert modeling review facilitated by the Commission staff. In some instances, the Water Operations Review could not verify modeling results. As an example, if an application claimed to increase coldwater in a reservoir, but the water model experts could not identify any support in the application for that increase, the Department was simply unable to make assessments about ecosystem benefits.

In this situation, the WSIP regulations state that where staff could not adjust the public benefit ratio because of a lack of support, it must remove the benefit at this moment in the process. This occurred nine times across five of the eleven projects. The
Department believes the applicants may be able to cure these defects. For example, proposed delivery of wildlife refuge water could provide ecosystem benefit. However, failure of the application information to establish that water deliveries can and would occur as proposed means the Department cannot verify the refuge benefit. The Department points out that the appeals process can facilitate such corrections.

The other major result from the analysis is the possible overestimation of a claimed benefit. In most of the Department’s analysis, this is more the situation than the scenario described above. Here, for example, an application’s information may utilize models with a population figure for salmon that is many fold higher than actual data indicate is accurate. There are other examples of model discrepancies, data input inconsistencies, and other information in applications that create uncertainty about claimed benefits and possible overstatement of such benefits. However, there is not information in the application with which the Department could identify a recommended adjustment to the public benefit ratio. The Department’s response to this situation is to acknowledge for Commission staff and the applicants those concerns that may cause a need for a benefit to be adjusted downwards but not removed. This second category is the majority of the Department’s assessments.

**Iterative Nature of Process:**
Over a two-year period with extensive input from stakeholders and a broad spectrum of water interests, the Commission developed this process and these regulations to implement a voter-approved statute. All of this effort directs the Department to look closely at the information submitted by applicants. Ecosystem improvements are a key component of project applications because of statutory requirements that projects must provide ecosystem benefits. At the subsequent “additional eligibility” phase, the projects must also measurably improve the ecosystem of the Delta or its tributaries.

The Department’s analytical summaries are the first step in the initial technical review of the applications, focused on quantifying the public benefits associated with proposed projects. No projects are out of the running because of this step. The Commission’s frequently asked questions’ document indicates they anticipate public benefit ratios will change based on the additional information. The appeals process provides the opportunity for applicants to underscore or add to the information in their applications, with another round of staff review and recommendations. The next step includes the opportunity for reinstatement or adjustment of public benefit values. The Commission anticipates holding hearings to consider revisions to the public benefit ratios in May.

In recognition of the iterative nature for the WSIP process, Commission staff scheduled a two-hour meeting with each project applicant and Department staff before the release of the full analysis so that no applicant team would be surprised by the Department’s preliminary conclusions. Now with the submission of this cover letter and the release of the summaries, each applicant will have the opportunity over the following weeks to
provide additional supporting information and address specific comments from the review process. The Department could only judge the information submitted previously in the applications. With additional information, the Department may be able to confirm a benefit should be added or that a benefit's value be increased.

Commitment for Next Steps:
The Department understands that some parties and the general public may be quick to judge this analysis as too focused on technical details at the expense of the bigger policy objective of improved storage in California. The Department knows that the WSIP represents an important opportunity to invest in California’s water future.

The Department recognizes the value and importance of additional surface water and groundwater storage in California. As called for in the California Water Action Plan, water storage is needed for environmental benefits as well as water supply. The Department is hopeful that the explanations contained in the enclosed assessments will assist applicants in providing the necessary information to demonstrate to that the proposed projects will provide net ecosystem improvements.

The WSIP is complex and unique in that it is an investment program wherein, early in the application review process, the Department shares its assessments and uncertainties about anticipated ecosystem outcomes with the applicants. The Department is hopeful that sharing this information will ultimately resolve those uncertainties during the appeal process. With that in mind, the Department looks forward to continuing to work with the Commission in the evaluation of projects applying for funding under the WSIP.

Sincerely,

Charlton H. Bonham
Director

Enclosures: Public Benefit Ratio Assessments

ec: California Department of Fish and Wildlife

Kevin Hunting, Chief Deputy Director
Kevin.Hunting@wildlife.ca.gov

Tina Bartlett, Acting Deputy Director
Ecosystem Conservation Division
Tina.Bartlett@wildlife.ca.gov
Kern Fan Groundwater Storage Project Monetized Ecosystem Benefits

In conducting the review as required by California Code of Regulations, title 23, section 6007, subdivision (b)(1), the California Department of Fish and Wildlife (Department) was unable to identify sufficient support in the methods used or values supplied in the application for certain monetized ecosystem benefits as discussed below. (Cal. Code Regs., tit. 23, § 6007, subd. (b)(1)(B).)

The discussion below identifies areas of concern regarding the application and information that was either not found in the application or did not have sufficient support.

The Department finds the monetized ecosystem benefit for spring-run and winter-run Chinook salmon survival insufficiently supported by the information in the application to establish this benefit for the Kern Fan Groundwater Storage Project. Additional or modified information may enable the Department to recommend accepting or adjusting the magnitude of an ecosystem benefit.

Areas of concern regarding the application are as follows:

**Spring-run and Winter-run Chinook Salmon Survival Monetized Ecosystem Benefit**

- Pulse flows are a commonly utilized tool for fishery management. The applicant provided an analysis to quantify the magnitude of pulse flow benefits to salmonid survival. However, conclusions presented from the analysis are beyond the level of precision that the methods are capable of delivering. Table 4-10 in the Technical Reference provides examples of commonly used metrics for quantifying the ecosystem improvement from flows to improve conditions for downstream migration of juvenile salmonids.

- The following are concerns regarding the application of the Delta Passage Model (DPM):
  - The DPM is not intended to be used to predict survival to adulthood. A 2011 DPM model description states, “Survival estimates generated by the DPM are not intended to predict future outcomes or to predict actual survival. Rather, DPM provides an estimate of relative survival (or survival index) which is useful for making comparisons between proposed operation alternatives.” The analysis generated adult survival estimates using the model despite this limitation and presented results as a single point estimate. As seen in other project planning documents, typical outputs from a DPM analysis present juvenile survival (total or route specific) for different project alternatives and also include a range of survival estimates as opposed to a point estimate.

  - Figure 1 of the Cramer Fish Sciences Technical Memorandum was used to estimate the fraction of natural origin spring-run smolts entering the Sacramento River from the Feather River. The source of the figure notes the curves are Delta entry distribution of Chinook salmon smolts applied in the DPM. These curves were developed using USFWS trawl data from a Sacramento River location that is downstream of the Feather River. It may not be appropriate to use these Delta entry distributions to calculate a number of spring-run smolts entering the Sacramento River from the Feather River, as this increases uncertainty in the conclusions of the analysis. No justification was provided for utilizing the Delta entry distribution of Chinook salmon smolts as a proxy for distribution in the Feather River, nor was the increased uncertainty from this assumption discussed.
The derivation of the model parameter for smolt survival in the Feather River is unclear. The application did not include a description of how the survival values identified in the reference led to the model input. Because there are different release locations on the Feather River with different associated survival rates, using a constant value for survival may not be representative of actual population dynamics.

The derivation and justification of model inputs for the annual number of winter-run and spring-run smolts is unclear. The references cited for calculating Sacramento River basin smolt abundance are inconsistent between the application documents: IRWD_Tab 4-A2-Ecosystem_CFS_TechMemo_FINAL.pdf and Smolt_Surv_to_Bay.xlsx. In addition, the applicant did not describe how the value for natural origin spring-run smolt production from the Feather River was derived from the cited references. The Department is unable to verify model inputs, which increases uncertainty in the conclusions about the change in adult abundance.

Therefore, the information in the application insufficiently supports establishing this benefit at this time.

Incidental Wetland Habitat Monetized Ecosystem Benefit

The Department did not identify significant areas of concern for the incidental wetland habitat monetized ecosystem benefit.