Permit 21112 Change Petition

Quantitative Assessment Modeling

Prepared for

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Section 1 – Introduction

Computer simulation modeling plays a critical role in evaluating water projects, offering a robust and quantitative framework to assess potential impacts. This is particularly valuable in complying with regulatory requirements such as the California Environmental Quality Act (CEQA). CEQA mandates a comprehensive environmental review to determine the effects of proposed projects, including the evaluation of various alternatives and their environmental implications.

In water resource management, simulation models are used to forecast and quantify the potential effects of a project on key parameters such as water supply, quality, and ecosystem health. These models simulate project operations under different conditions, generating outputs that can be analyzed to assess the project's potential impact. The simulation typically involves running a baseline scenario, which represents conditions without the project, and then running the project scenario as well as any alternatives.

Each project's output is compared to the baseline scenario to evaluate how conditions will change. By analyzing differences in streamflow, reservoir levels, water supply, or other relevant factors between the project scenario and the baseline, stakeholders can identify and quantify both positive and negative effects. Additionally, each alternative is compared to the same baseline, allowing decision-makers to assess how well each alternative meets the project's objectives while minimizing potential environmental impacts.

This process not only provides a quantitative basis for determining the direct effects of a proposed project, it also facilitates an objective comparison of project alternatives. The data-driven approach ensures that all project impacts are measured against a consistent reference point (the baseline), providing clarity and transparency in the environmental review process under CEQA. The use of modeling enables a thorough evaluation of potential outcomes.

1.1 Computer Modeling Approach

Our approach employs computer models HEC-ResSim, CalSim 3 and CE-Qual-W2 to evaluate project operations across multiple scales. HEC-ResSim focuses on streamflow and reservoir operations upstream of Folsom Reservoir, providing detailed insights into how changes in water operations affect streamflow, reservoir storage, water supply, and hydropower generation. This allows us to understand localized impacts on water levels and streamflow dynamics.

CalSim 3 provides a broader analysis by simulating the downstream effects, including potential impacts across the Central Valley Project (CVP) and State Water Project (SWP) systems. By modeling changes in water deliveries, river flows, and operational constraints, CalSim 3 helps us assess the wider effects on the state's interconnected water infrastructure.

CE-QUAL-W2 is a two-dimensional hydrodynamic and water quality model designed to simulate water temperature, flow dynamics, and other key parameters in rivers, reservoirs, and estuaries. This model uses hydrologic data output from Calsim 3 as its input. For the proposed Project, CE-QUAL-W2 modeling is employed to assess the potential impacts of project activities on water temperature in relation to Folsom Reservoir, Lower American River (LAR) and downstream water bodies.

By comparing model outputs to baseline conditions, we can quantify the potential environmental impacts of the proposed Modification of Water Right Permit 21112 Project (Project) and its alternatives, ensuring that the decision-making process is guided by comprehensive, data-driven insights. This integrated approach enables more informed and responsible project planning.

1.2 Modeling of Lake Levels, Streamflow, Recreational Opportunities, Water Temperature, and Hydropower Generation

In assessing the proposed Project's potential impacts, we employed a suite of models to simulate key hydrological, recreational, and operational parameters, including lake levels, streamflow, boatable days and whitewater boating opportunities, water temperature, and hydropower generation. Each model was selected for its ability to provide accurate data relevant to specific areas of interest.

The following models were utilized:

HEC-ResSim Model:

Purpose: To simulate streamflow, lake levels, recreational boating opportunities, and hydropower generation.

Application: The HEC-ResSim model was applied to evaluate streamflow, lake levels and hydropower generation above Folsom Reservoir. It was also used to estimate boatable days and whitewater boating opportunities based on flow conditions in upstream areas.

CalSim 3 Model:

Purpose: To assess storage, water supply operations, and broader system impacts.

Application: CalSim 3 was used to model water storage at Folsom Reservoir and its downstream impacts on the Lower American River. The model was also employed to evaluate the effects on the CVP and SWP operations, providing a system-wide understanding of the Project's potential influence. Data output from Calsim 3 was also used as data input for CE-QUAL-W2 model.

CE-QUAL-W2 Model:

Purpose: To simulate water temperature and thermal effects.

Application: The CE-QUAL-W2 model was used to analyze water temperature changes within Folsom Reservoir and downstream, including the Lower American River. This was critical for evaluating the potential thermal impacts of the proposed Project, particularly concerning aquatic habitats.

1.2.1 Summary of Model Applications

The table below summarizes the specific parameters modeled and the corresponding models used for data development:

Table 1 – Computer Models Utilized

Parameter	Model	Application Area
Streamflow	HEC-ResSim	Above Folsom Reservoir
Lake Levels	HEC-ResSim	Above Folsom Reservoir
Boatable Days	HEC-ResSim	Above Folsom Reservoir
Water Storage	HEC-ResSim	Above Folsom Reservoir
CVP and SWP Operation Impacts	CalSim 3	Folsom Reservoir Storage, LAR Streamflow and CVP/SWP System-Wide Analysis
Water Temperature	CE-QUAL-W2	Folsom Reservoir and Lower American River

This integrated modeling approach allowed for a comprehensive analysis of the Project's potential effects, ensuring that potential impacts on water resources, recreational opportunities, and operational systems were thoroughly evaluated. Each model provided critical insights into specific components of the system, helping inform decision-making and the development of mitigation strategies where necessary.

Section 2 – Conclusion

The use of comprehensive computer simulation modeling has been essential in evaluating the potential impacts of the proposed Project on the South Fork American River, Folsom Reservoir, the Lower American River, and the broader CVP and SWP systems. Through the application of HEC-ResSim, CalSim 3, and CE-QUAL-W2 models, we have been able to assess key parameters such as streamflow, lake levels, boatable days, hydropower generation, water storage, and water temperature.

HEC-ResSim provided critical insights into upstream operations, allowing us to evaluate potential impacts on streamflow, reservoir levels, and recreational opportunities. CalSim 3 extended this analysis downstream, quantifying the potential effects on water storage at Folsom Reservoir and the interconnected CVP/SWP systems, offering a holistic view of how the project interacts with California's water infrastructure. CE-QUAL-W2 added further depth by modeling potential water temperature impacts within Folsom Reservoir and the Lower American River.

By comparing these model outputs to baseline conditions, we are able to quantify the potential environmental and operational impacts of the proposed Project and its alternatives. This integrated, data-driven approach ensures a thorough evaluation of project effects, supporting informed decision-making. This modeling work provides an analytical foundation for ensuring that all project impacts are transparently assessed and considered in the environmental review process.