

Appendix H.

CalSim II and DSM2 Model Descriptions and Assumptions

Appendix H

H.1 Introduction

The results of model simulations are provided for informational purposes. Please do not use any information contained in these products for any purpose other than this EIR process. If there are any questions regarding the results of these model simulations, please contact DWR.

Any use of results of model simulations should observe limitations of the models used as well as the limitations to the modeled alternatives. These results should only be used for comparative purposes. More information regarding limitations of the models used as well as the limitations to the modeled alternatives is included Appendix H Attachment 1-7 Model Limitations.

The FEIR provides complete modeling analyses for Refined Alternative 2b. Therefore, additional model assumptions and callout tables for the Refined Alternative 2b scenario are provided, Appendix H Attachment 1-4, "Scenario Related Changes to CalSim II and DSM2," and Attachment 1-5, "SWP Contribution," are updated, and documentation of post-processing methodology for Alternatives 2a, 3 and 4 are included. All additional attachments are listed in the next section. Throughout this appendix the terms Alternative 2b and Refined Alternative 2b are used interchangeably.

This appendix also provides an attachment discussing information on and findings from a sensitivity analysis of potential effects on model assumption updates to the Proposed Project. Revised model assumptions were incorporated into the Revised Proposed Project model to better reflect Proposed Project description.

H.2 Modeled Alternatives

The following alternatives were prepared:

- Existing Conditions (EX)
- Proposed Project (PP)
- Refined Alternative 2b (Alt 2b)

The assumptions used for each the Existing Conditions and Proposed Project alternatives and each model listed ~~above~~ below are documented in the following attachments:

- Appendix H Attachment 1-1 Model Assumptions
- Appendix H Attachment 1-2 CalSim II Model Assumptions Callouts

- Appendix ~~H~~C Attachment 1-3 DSM2 Model Assumptions Callouts
- The following attachments contain documentation of model assumptions and limitations:
- Appendix ~~H~~C Attachment 1-4 Scenario Related Changes to CalSim II and DSM2
- Appendix ~~H~~C Attachment 1-5 SWP Contribution
- Appendix ~~H~~C Attachment 1-6 DSM2-PTM
- Appendix ~~H~~C Attachment 1-7 Model Limitations
- Appendix ~~H~~C Attachment 1-8 CalSim II Assumptions and Real Time Operations
- Appendix H Attachment 1-9 Example of Proportionate Share

The following attachments contain assumptions and documentation used for each alternative (including Refined Alternative 2b) and each model listed below:

- Appendix H Attachment 2-1 Model Assumptions
- Appendix H Attachment 2-2 CalSim II Model Assumptions Callouts
- Appendix H Attachment 2-3 DSM2 Model Assumptions Callouts

The following attachment is a sensitivity analysis of the Revised Proposed Project:

- Appendix H Attachment 2-4 CalSim II Sensitivity Analysis for the Revised Proposed Project

The following attachments describe assumptions for Alternatives 2a, 3, and 4:

- Appendix H Attachment 2-5 Alternatives 2a and 3 Hydrology Analysis
- Appendix H Attachment 2-6 Alternative 4 Hydrology Analysis

The following is a summary of the alternatives and the models used.

Existing Conditions

The Existing Conditions represents CVP and SWP operations to comply with the “current” regulatory environment as of (April 22, 2019). The Existing Conditions assumptions include existing facilities and ongoing programs that existed as of April 22, 2019- publication date of the Notice of Preparation (NOP). The Existing Conditions assumptions also include facilities and programs that received approvals and permits by April 2019 because those programs were consistent with existing management direction as of the NOP.

Proposed Project

The proposed project is the DWR on-going long-term operation of the State Water Project (SWP) consistent with existing regulatory requirements that address water rights, water quality, and the protection and conservation of designated species in compliance with California Endangered Species Act (CESA). The goal of the proposed project is to continue the long-term operation of the SWP for water supply and power generation, consistent with applicable laws, contractual obligations, and agreements, and to increase operational flexibility by focusing on nonoperational measures to avoid significant adverse effects. DWR proposes to store, divert, and convey water in accordance with existing water contracts and agreements up to full contract amounts and other deliveries, consistent with water rights and applicable laws and regulations.

Refined Alternative 2b

Refined Alternative 2b includes elements of the operations described in the Proposed Project, but also consists of SWP export curtailments by operating to Spring Maintenance Flow and a dedicated “block” of water for summer or fall Delta outflow and additional Wet year water for use in summer-fall period of subsequent years in addition to the Summer/Fall Delta Smelt Habitat Action in the Proposed Project. The additional spring through fall water dedicated for Delta outflow would be used to test hypotheses through scientific studies and narrow the uncertainty surrounding the effect of Delta outflow on spring Longfin Smelt abundance and summer-fall Delta Smelt habitat. The details of the scientific studies will be developed by DWR in coordination with CDFW and SWC as described in Chapter 5.3.2, “Adaptive Management Plan.”

Although refinements to Alternative 2b occurred between publication of the DEIR and the FEIR, these refinements do not affect the modeling. Modeling assumptions reflect the description of the Refined Alternative 2b presented in Chapter 5.3 of the FEIR. Throughout this appendix the terms Alternative 2b and Refined Alternative 2b are used interchangeably.

The following model simulations were prepared for each alternative:

- CalSim II
- DSM2

H.3 CalSim II

Reclamation / DWR CalSim II planning model was used to simulate the coordinated operation of the CVP and SWP over a range of hydrologic conditions. CalSim II is a generalized reservoir-river basin simulation model that allows for specification and achievement of user-specified

allocation targets, or goals (Draper et al. 2004). CalSim II represents the best available planning model for CVP and SWP system operations and has been used in previous system-wide evaluations of CVP and SWP operations (U.S. Bureau of Reclamation 2015).

Salinity in the Sacramento-San Joaquin Delta is critical to project and ecosystem management. Operation of CVP/SWP facilities and management of Delta flows often depends on salinity standards. An Artificial Neural Network (ANN) was developed (Sandhu et al. 1999) to estimate flow – salinity relationships modeled by DSM2 (described below). The ANN is utilized in CalSim II to ensure upstream reservoir operations and Delta exports meet select D1641 salinity requirements in the Delta. More details regarding the ANN and its implementation in CalSim II can be found in Wilbur and Munévar (2001).

H.4 DSM2

DSM2 is a one-dimensional hydrodynamic and water quality simulation model used to simulate hydrodynamics, water quality, and particle tracking in the Sacramento-San Joaquin Delta (DWR, 2019). DSM2 represents the best available planning model for Delta tidal hydraulic and salinity modeling. It is appropriate for describing the existing conditions in the Delta, as well as performing simulations for the assessment of incremental environmental impacts caused by future facilities and operations (U.S. Bureau of Reclamation 2015).

H.5 References

Anderson, James. (2018). Using river temperature to optimize fish incubation metabolism and survival: a case for mechanistic models. 10.1101/257154.

California Department of Water Resources, DSM2:Delta Simulation Model 2 Web Page Last updated September 2019. Site accessed October 2019. URL = <https://water.ca.gov/Library/Modeling-and-Analysis/Bay-Delta-Region-models-and-tools/Delta-Simulation-Model-II>

Draper, A.J., Munévar, A., Arora, S.K., Reyes, E., Parker, N 1 .L., Chung, F.I., and Peterson, L.E. 2004. CalSim: Generalized Model for Reservoir System Analysis. American Society of Civil Engineers, Journal of Water Resources Planning and Management, Vol. 130, No. 6.

Sandhu, N. and D. Wilson, R. Finch, and F. Chung. (1999). “Modeling Flow-Salinity Relationships in the Sacramento-San Joaquin Delta Using Artificial Neural Networks”. Technical Information Record OSP-99-1, Sacramento: California Department of Water Resources

U. S. Bureau of Reclamation, 2015. Coordinated Long Term Operation of the CVP and SWP EIS, Appendix 5A CalSim II and DSM2 Modeling.

Wilbur, Ryan & Munevar, Armin. (2001). Chapter 7: Integration of CALSIM and Artificial Neural Networks Models for Sacramento-San Joaquin Delta Flow-Salinity Relationships.

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