Common Response 6.1 Sacramento Water Allocation Model and Changes in Hydrology and Water Supply

Introduction

This introduction provides important context to this common response. A similar introduction is provided in each common response to ensure that the reader has the appropriate context when reviewing common responses. For ease of reference, a table of contents is included after this introduction to guide readers to specific subject areas.

Protecting the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) watershed and its many beneficial uses of water is one of the State Water Resource Control Board's (State Water Board) primary responsibilities and top priorities. In response to declines of several native aquatic species since the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Watershed (Bay-Delta Plan or Plan) was last comprehensively updated, the State Water Board commenced a process to update the Bay-Delta Plan for the Sacramento River and its tributaries, Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne Rivers), and Delta for the reasonable protection of fish and wildlife beneficial uses, referred to as the Sacramento/Delta Update to the Bay-Delta Plan. The Bay-Delta Plan identifies beneficial uses of water to be protected in the Bay-Delta watershed, water quality objectives and program of implementation to achieve the reasonable protection of those beneficial uses, monitoring, evaluation, and special study provisions. The State Water Board's proposed action to update the Bay-Delta Plan is supported by a Staff Report/Substitute Environmental Document (Staff Report), which provides an evaluation of the environmental impacts and economic effects in support of consideration of different alternatives to update the Bay-Delta Plan to achieve reasonable protection of fish and wildlife beneficial uses in the Sacramento/Delta. The Staff Report is functionally equivalent to an Environmental Impact Report under the California Environmental Quality Act (CEQA) but also provides the additional analyses that support the State Water Board's consideration of the action under the Clean Water Act and Porter-Cologne Water Quality Control Act (Porter-Cologne Act).

Development of the final Staff Report and final draft Bay-Delta Plan were informed by several opportunities for public comment over multiple years. This common response may address issues that were raised during any of those public comment periods. In September 2023, the State Water Board released the 2023 draft Staff Report evaluating different alternatives for the Sacramento/Delta Update to the Bay-Delta Plan for public review and comment. Following release of the 2023 draft Staff Report, the State Water Board released draft amendments to the Bay-Delta Plan in October 2024 (2024 draft Plan) for public review and comment that incorporated alternatives identified in the 2023 draft Staff Report with revisions based on public comments. The State Water Board released revised draft Plan updates in July 2025 (July 2025 revised draft Plan) but delayed public comment on that version of the Plan pending further updates, though some parties did submit public comments on the July 2025 draft that are part of the State Water Board's response to comments. In December 2025, the State Water Board released Chapter 13, *Revised Proposed Plan Amendments*, as a limited recirculation of the 2023 draft Staff Report (2025 partially recirculated draft Staff Report) together with the December 2025 revised draft Plan for public review and comment. These documents reflect the updated proposed project, referred to as the revised proposed Plan amendments, which brings together in the Bay-Delta Plan program of implementation a voluntary agreement (VA) pathway that incorporates commitments identified in the Healthy Rivers and Landscapes (HRL) proposal and would apply to specified HRL water rights, and a regulatory pathway based on the proposed Plan amendments that would apply to other water rights and to any HRL water rights no longer covered under the VA pathway. In August 2026, the State Water Board released a final draft Bay-Delta Plan that included refinements to the revised proposed Plan amendments based on public comments received on the December 2025 revised draft Plan. At the same time, the State Water Board released this final Staff Report, including responses to comments previously received on the draft Staff Report. The final Staff Report informs the State Water Board's consideration of adoption of the Sacramento/Delta updates to the Bay-Delta Plan.

With respect to the CEQA impact conclusions, it is important that they be understood in the context of the overall nature of the proposed project, which is intended to be an environmental restoration action. CEQA only considers changes that could negatively impact the existing environment and does not recognize or offset negative changes with improvements that could result from an environmentally beneficial project. Here, the impacts that could potentially result from implementation of the restoration action occur in a system that has been highly altered, and the project would be expected to improve conditions for native fish and wildlife in the Sacramento/Delta watershed over time. However, the project will also result in changes in hydrology and changes in water supply that could result in some potentially significant adverse environmental impacts at certain times and locations that must be analyzed under CEQA. These potentially significant environmental impacts should be viewed in light of the overall purpose and goals of the Sacramento/Delta update to the Bay-Delta Plan.

Staff Report Chapter 6, *Changes in Hydrology and Water Supply*, describes the changes in hydrology and water supply that may occur under the proposed Plan amendments described in Staff Report Chapter 5, *Proposed Changes to the Bay-Delta Plan for the Sacramento/Delta*. The overall conclusions presented in Chapter 6 remain valid, but there have been some minor updates to modeling. Changes in hydrology and water supply associated with the revised proposed Plan amendments are described in Chapter 13, *Revised Proposed Plan Amendments*, and updated modeling methods and results are presented in Appendices H1a, *Sacramento Water Allocation Model Methods*, and H1a2 through H1a7. In general, the proposed project would increase spring streamflows, and increase carryover storage volumes in reservoirs, which would result in reduced water supply for diversion and use. The tool used to evaluate the changes in streamflow, reservoir storage, and water supply for the Staff Report is the Sacramento Water Allocation Model (SacWAM or model). The State Water Board reviewed all comments related to surface water hydrology and modeling and developed this common response to address recurring comments and common themes. This common response addresses, but is not limited to, the following topics:

- Purpose of modeling, the appropriate use of models, and the scale of model results in the Staff Report
- Reasonableness of SacWAM assumptions and the use of best available information to develop model logic
- Reservoir operations constraints and carryover storage guidelines in SacWAM

- Questions or comments regarding the data or methods of analysis used to determine the effects associated with the proposed project and alternatives
- Comments that the effects would be more severe than modeled or otherwise disputing the analyses' conclusions

Analyzing the potential benefits, significant environmental impacts, and economic effects of the proposed Plan amendments requires a reasonable representation of the complex water system involved. The water system in the plan area includes the natural stream network and estuary, as well as water infrastructure such as dams, canals, and diversions. This common response clarifies the operational assumptions used in the Staff Report and provides more context for these assumptions. The SacWAM results presented in Chapter 6, *Changes in Hydrology and Water Supply,* were also used as inputs to temperature models, a hydrodynamic and water quality model, hydropower analysis, and economic models described in Chapter 7, *Environmental Analysis*, and Chapter 8, *Economic Analysis and Other Considerations* of the Staff Report.

The model results in the Staff Report present a range of potential operations that are generalized but sufficient in detail to evaluate water supply and other effects of the project from a regional perspective. This common response describes how model operations, by necessity, must include assumptions that constrain the reservoirs (e.g., do not allow them to be drained dry) to provide a reasonable set of water operations for comparison. This common response also explains how numeric constraints that are used for modeling are not numeric regulatory requirements, and explains that while SacWAM assumptions are representative of system responses to regulatory conditions, these are not the only possible methods of operating under the Plan amendments.

Some commenters asserted that the model does not fully analyze water supply impacts because it lacks sufficient granularity to determine the precise effects of Plan amendments on specific water diverters. The required degree of specificity in an environmental document corresponds to the degree of specificity involved in the examined underlying activity being analyzed. (Cal. Code Regs., tit. 14, § 15146.) As acknowledged by the State CEQA Guidelines, an environmental document disclosing the impacts of a construction project, for example, will necessarily be more detailed than an environmental document evaluating a broad regulatory plan because the effects of a construction project can be predicted with much greater accuracy, as a construction project is comparatively narrowly-focused and smaller in scale than a regulatory plan. (*Id.*, § 15146(a).) An environmental document need not be exhaustive; it need only be prepared with a sufficient degree of analysis to provide commenters with sufficient information to comment on the analysis and to provide decision makers with sufficient information to make an intelligent, informed decision. (*Id.*, § 15151.) Due to the scope and complexity of Sacramento/Delta water use, the environmental analyses of the Staff Report are necessarily broad. Specific and detailed discussion for every water district or diverter is neither feasible nor required. This common response is intended to respond to comments raising perceived issues with the scope of the SacWAM and its analysis. For further discussion on the level and scope of the Board's environmental analysis in general, please see Common Response 7.1, *General CEQA and Approach to the Analysis.*

SacWAM is a comparative simulation model, meaning that it is designed to be used to compare alternative scenarios rather than forecast specific outcomes. Due to the large scale of the project being analyzed, and the size and complexity of Sacramento/Delta water supply and use, the model's scope and representation of implementation-specific operational details are necessarily broad to cover the wide range of foreseeable compliance measures and responses that may result from the proposed Plan amendments. A wide range of responses and associated environmental effects could occur as a result of the project due to the degree of flexibility included in the revised proposed Plan amendments and the scope and complexity of Sacramento/Delta water use. For example, SacWAM shows that the proposed unimpaired flow requirements would reduce water diversions for agricultural and municipal uses. Water project operators subject to these requirements will likely optimize operational plans by conjunctively managing surface and groundwater supplies and implementing active recharge of groundwater during times of excess supply for future withdrawal through local projects and programs. However, it is difficult to predict with certainty the ultimate mixture of surface and groundwater conjunctive use, and any attempt to determine these details would be speculative due to the many local decisions and approvals factored in. For this reason, in SacWAM it was assumed that groundwater pumping could not be increased to replace reduced surface water supplies. The analysis in the Staff Report does not, and cannot, attempt to show exactly how water system operators will respond because, as illustrated by the previous example, a complex water-storage and water-delivery system can be operated in many different ways. Reservoir operators and water users must consider, among other factors, variable hydrology, water supply demands, the risk of future shortage, groundwater pumping capacity, groundwater availability, hydroelectric power, and existing regulations. Specific future responses will depend on many unknown and unpredictable factors. Nevertheless, the modeling analyses in the Staff Report provide a reasonable representation of system operations that fully disclose the potential ranges of effects of additional flow requirements.

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SacWAM Scope, Scale, and Application

SacWAM is a systems operation model developed by Stantec, Stockholm Environment Institute, and State Water Board staff to assess the potential effects of revisions to instream flow and other requirements in the Bay-Delta watershed, including potential changes resulting from the Sacramento/Delta update to the Bay-Delta Plan. SacWAM is built on the Water Evaluation and Adaptation Planning (WEAP) software platform, which is widely used throughout California and internationally. SacWAM is thoroughly documented, has been publicly peer reviewed, and is publicly available. State Water Board staff held multiple public workshops and trainings on the model, and while it is necessarily complex, every effort has been made to make it as accessible as possible to the public. Since its first public release in 2016, SacWAM has gone through many revisions based on input from stakeholders to improve the model's representation of the Sacramento/Delta watershed and the operations of the various water projects in the Plan area.

SacWAM is a water balance model that describes the amounts of water entering and leaving a defined system (in this case, the plan area). A water balance model is based on a specific period of time (e.g., daily, monthly, annually) and accounts for the movement of water within the defined system. Water *sources,* where water enters the domain, are unimpaired inflows from upstream watersheds and rainfall in the Sacramento Valley and Delta. Water *sinks* are sites where, or processes through which, water leaves the system, such as evaporation, evapotranspiration, downstream Delta outflow, and diversions for consumptive use south of the Delta. Sources and sinks are connected in the model by a network of storage nodes representing reservoirs, non-storage nodes representing an intersection of flow paths, and conveyance channels between nodes. Values in each node or flow path represent the volume of impounded water or flow rate corresponding to hydrologic conditions at defined points in space and time. Values for each node or flow path are calculated for a series of points in a designated study period at a time interval known as a *time step*. SacWAM uses a monthly time step, in which values represent a monthly average storage volume or monthly average flow.

SacWAM results are used to estimate changes in surface water availability by comparing baseline and scenario conditions. Since SacWAM is a water balance model and the inflows to the system are the same in all scenarios, each scenario represents different operations of reservoirs and diversions. In SacWAM, water is allocated between demands in each time step (which can be for consumptive use, instream flow requirements, or diversion to storage) based on a system of priorities. In SacWAM, the model priorities define which demand receives water first. Demands for water can be flow requirements, reservoir storage, or diversions for consumptive use. The priorities in the model represent general groupings of operations and water right priorities but do not explicitly represent the individual details (including specific priority date) of each water right. While actual operations may differ from the model, SacWAM is a useful tool for comparing the relative impacts of different scenarios on water supply and hydrology. It is not meant for real-time prediction of hydrology and operations, but rather for evaluating the general effects of incremental changes in system operations.

The level of detail of SacWAM is on par with the finest level of detail of any model that represents the entire Sacramento/Delta watershed. While individual models that represent only specific tributaries may be more detailed, they would not be applicable for a project of this scale, covering the entire Sacramento/Delta watershed. Every effort has been made to represent the detailed operations of Sacramento/Delta surface water supply projects ; however, the results should not be interpreted at the water district or water right holder scale. Rather, the results should be interpreted at a larger scale appropriate for broader analyses, as presented in Staff Report Chapter 6, *Changes in Hydrology and Water Supply*.

The SacWAM simulation period originally ran from water year 1923 through 2015 on a monthly time step.[1] Based on comments received, the simulation period for the updated voluntary agreements and unimpaired flow scenarios (including the 55 w/WSAs scenario) described in Staff Report Chapter 13, *Revised Proposed Plan Amendments,* was extended to run through 2021, as presented in Appendix H1a3, *Sacramento Water Allocation Model Results for Updated Unimpaired Flow Scenarios*. Some commenters asserted that the monthly time step is not appropriate for the analysis. However, technical and computational limitations preclude the simulation of the Sacramento/Delta system on a shorter time step than one month. While some reservoir operations such as hourly hydropower peaking and flood control releases occur at smaller time steps, the comparative approach to the analysis using a monthly time step provides a useful comparison of streamflow volumes and monthly reservoir operations between the baseline and alternatives. More detailed modeling of stream temperatures and Delta hydrodynamics takes into consideration hourly temperature fluctuations and tidal information to represent these systems in more detail. See Staff Report Chapter 7, *Environmental Analysis*, and Appendices A2, *Delta Simulation Model II (DSM2) Methods and Results*, and A6, *Water Temperature Modeling and Fish Assessment for the Sacramento, Feather, and American Rivers*, for more information on these analyses.

The model results presented in the Staff Report represent one way that the Plan could be implemented. As discussed in Staff Report Chapter 5, *Proposed Changes to the Bay-Delta Plan for the Sacramento/Delta,* there are alternative ways that the Plan could be implemented, which could result in reduced impacts to water users. The assumptions used in SacWAM and described in the next section, *SacWAM Assumptions*, represent a conservative, worst case scenario of Plan implementation. Actual implementation of the Plan would likely involve fewer and less severe actual impacts because the Plan allows for flexible implementation for water users. The program of implementation's regulatory pathway provides for adjustments to flow requirements with the adaptive range between 45 and 65 percent of unimpaired flow and allows for water users on two or more tributaries to work together to meet the flow requirements downstream, as long as narrative objectives are met on the upstream reaches. Utilizing these flexibilities can help minimize water supply impacts, particularly in upper watersheds with interbasin diversions.

The modeling results are not intended to represent detailed, year-specific operational outcomes, such as the exact manner in which a reservoir would be managed during a particular year or a particular drought sequence. This is consistent with the nature of the proposed Plan amendments, which do not prescribe specific operations or dictate management of individual reservoirs. Instead, the model uses generalized operational rules designed to respond to hydrologic variability. While this approach involves certain trade-offs, it provides a reasonable depiction of the overall range of likely project outcomes rather than replicating individual operational decisions. This level of analysis appropriately supports the findings and conclusions in the Staff Report. Appropriate statistical summaries of these likely outcomes are presented in Staff Report Chapter 6, *Changes in Hydrology and Water Supply,* and Appendix A1, *Sacramento Water Allocation Model Methods and Results.* While the general changes in streamflows, diversions and reservoir operations presented in

[1] While the period of simulation also includes water year 1922, it is labeled the "Current Accounts" year in SacWAM and is identical across all scenarios. Thus, it has been excluded from the analysis, as explained in Staff Report Appendix H1a, *Sacramento Water Allocation Model Methods*.

Chapter 6 are the primary basis of the analyses in the Staff Report, more detailed model results, including cumulative distributions, are presented in Appendices A1, G3a, *Sacramento Water Allocation Model Methods and Results for the Proposed Voluntary Agreements*, and H1, *Modeling for the Revised Proposed Plan Amendments*, to illustrate variations that may not be fully captured by averages alone.

SacWAM Assumptions

Model assumptions are the user-specified inputs, conditions, simplifications and rules that the model follows, and are crucial to understanding the scope and limitations of the results. The assumptions for the baseline conditions are discussed in detail in Staff Report Chapter 6, *Changes in Hydrology and Water Supply,* and Common Response 6.2, *Baseline and No Project Alternative*. Assumptions for the alternative scenarios are detailed in Appendix A1, *Sacramento Water Allocation Model Methods and Results*, of the Staff Report.

SacWAM Flow Scenario Assumptions

The flow scenarios, especially those with higher unimpaired flow percentages, represent instream flow and reservoir requirements that at times are very different than what has been experienced since development of the Central Valley Project (CVP) and State Water Project (SWP) (collectively "the Projects"), the major water projects in the Sacramento/Delta watershed. Increased flow and reservoir requirements typically reduce the water supply available for diversion. When demand for water is greater than the supply available, SacWAM prioritizes allocations of available water based on generalized groups of water rights. Some commenters expressed concern that the 2023 draft Staff Report did not adequately examine or explain how individual diverters would be curtailed or how relative priority would be determined among individual water right holders. Specific water rights for each diversion and their associated priority dates are not considered at the scale of the analysis for the Staff Report. Generally, upper watershed demands have the highest priority, followed by demands and storage on non-CVP/SWP tributaries, and the lowest priority, or most junior demands, are diversions by the Projects. For a more detailed discussion on model priorities, see the SacWAM documentation (^SacWAM 2026). Even though the flow scenarios represent water supply conditions and requirements that differ from what has been experienced historically in the Sacramento/Delta watershed, it is assumed that the water right priority system would function as it did during the 2014 through 2016 and 2021 through 2022 droughts, during which available water supply was estimated, demand was reported, and curtailment orders were issued, with exceptions granted to maintain human health and safety needs.

It is impossible to predict exactly how each individual water district will respond to meet the new flow and temperature requirements and how they may allocate less total water among their users, especially during dry periods. However, every attempt was made to adhere to existing rules and contracts when setting up modeling assumptions. As discussed below, in some scenarios and at certain times, it is not possible to maintain current minimum contract allocations and operations agreements while meeting the increased flow requirements and maintaining carryover storage for cold releases and for delivery in future dry years.

CVP Allocations and Obligations

As presented in Staff Report Appendix A1, *Sacramento Water Allocation Model Methods and Results*, minimum CVP allocations in the 65 and 75 percent unimpaired flow scenarios are assumed to be able to be reduced below existing contract minimums to achieve the objectives of higher spring streamflows and sufficient carryover storage for cold water fisheries habitat. As noted by some commenters, this leads to instances where modeling is not perfectly consistent with existing U.S. Bureau of Reclamation and California Department of Water Resources (Reclamation and DWR, respectively) operations and contract terms. The SacWAM assumptions reflect the likely outcome that if the water supplies available to DWR and Reclamation are greatly reduced, as is estimated in the higher flow scenarios, the agreements between the two projects and between the Projects and their contractors would likely have to be renegotiated.

In the flow scenarios, when CVP supplies are limited, settlement and exchange contractor allocations are at times reduced below 75 percent. Before such a reduction, agricultural service contract allocations are fully reduced to 0 percent and municipal contract allocations are reduced to 25 percent, which is an assumed amount for maintaining health and safety requirements. Some comments stated that Reclamation has never allocated more water to south-of-Delta (SOD) contractors than to north-of-Delta (NOD) contractors. However, in the alternative scenarios, there is more water available for diversion in the Delta than upstream in some years. This is because water from large winter storms can be exported when the Delta inflows are above the unimpaired flow requirement, but existing flood control requirements in combination with increased spring flow requirements and carryover storage targets limit the ability of the Projects to deliver water north of the Delta from storage in the following summer. In these cases, the model assumes that greater allocations to SOD contractors than NOD contractors could occur to prevent water from remaining in San Luis Reservoir without being delivered.

In SacWAM, SOD CVP exchange contractors, water service contractors, and refuge contractors receive different allocations based on annual water supply availability. However, all of the demand units in the model that represent the different contract types had the same priority within the WEAP software. In SacWAM, there are some years in which the full allocation volumes are not able to be delivered to each of the SOD CVP demands, especially in the higher unimpaired flow scenarios. When less water is delivered than allocated, it is considered a *shortage*. Some commenters noted that SacWAM results showed water was sometimes being delivered to SOD CVP water service contractors in years when there was a shortage to the exchange contract demands. Under Reclamation's contracts and historical operations of the CVP, Reclamation first allocates water up to the full contract volume to exchange and refuge contractors and then allocates any remaining water available to SOD water service contractors. The results presented in Chapter 6*, Changes in Hydrology and Water Supply,* and Chapter 7, *Environmental Analysis*, of the Staff Report include a post-processing of SacWAM results to more accurately reflect this historic tendency, shifting any water that was delivered to SOD water service contractors to instead be delivered to exchange and refuge contractors in order to minimize shortages to exchange and refuge contractors. The results presented in Staff Report Appendix A1, *Sacramento Water Allocation Model Methods and Results*, are direct outputs from SacWAM and do not reflect the post-processing. In most scenarios, the volumes shifted from the water service contract demands to the exchange and refuge demands during post-processing were relatively small. However, in some cases in the higher unimpaired flow scenarios, the annual volumes were over 100 thousand acre-feet (TAF). The results used in the impact analysis in the Staff Report all incorporate this additional step of post-processing of the SacWAM results to better conform with Reclamation's historical operations and contracts. Since the release of the 2023 draft Staff Report, SacWAM has been updated such that the relative priorities of the SOD CVP contractors now reflect Reclamation's contracts, thereby eliminating the need for future post-processing. Please see Staff Report Appendix H1, *Modeling for the Revised Proposed Plan Amendments*, for more information on updates to SacWAM.

Some commenters pointed out that the SacWAM results show deliveries of water on occasion to NOD CVP water contractors when deliveries to CVP settlement contractors are reduced. This can occur when less water is available for delivery than is allocated. The model indicates that early in the irrigation season, water may be available for diversion by agricultural service contractors and settlement contractors, but when the storage drops below the buffer pool (described in the *Carryover Storage Targets and SacWAM Reservoir Buffer Pools* section of this common response), agricultural service contract diversions cease, and settlement contractor diversions are reduced. This may result in some water being delivered to NOD agricultural service contractors in years when settlement contract deliveries are less than allocated. While this rarely occurring pattern of deliveries may conflict with current Reclamation policies, it does not affect the impact analyses that occur at the Sacramento River watershed scale, because both the agricultural service contractors and the settlement contractors divert for agricultural use within the same region in the analysis.

The Board also received multiple comments from parties concerned that the modeled flow scenarios in the 2023 draft Staff Report indicate that refuge contractors could receive severely reduced allocations and deliveries that could cause lasting, irreversible harm to critical wildlife habitat. In response to these comments, the revised proposed Plan amendments were modified to include a wildlife refuge provision that limits reductions in deliveries to refuges. SacWAM assumptions have also been updated such that minimum refuge contract allocations are 75 percent. These changes are reflected in the 55 percent unimpaired flow with water supply adjustments (55 w/WSAs) scenario, which is described in Chapter 13, *Revised Proposed Plan Amendments*, and Appendix H1, *Modeling for the Revised Proposed Plan Amendments*. Finally, as identified in Mitigation Measure MM-TER-a, a wildlife refuge provision included in the revised proposed Plan amendments would allow the Board's Executive Director to approve exceptions to curtailment for Central Valley Project Improvement Act and other wildlife refuges when implementing the numeric flow requirements, thereby reducing impacts associated with changes in water supply to wildlife refuges.

Urban Water Supply Impacts

As described in Staff Report Chapter 2, *Hydrology and Water Supply*, some non-Project tributaries such as the Mokelumne, Calaveras, and Putah Creek are significantly impaired under existing conditions. In these tributaries, the 45-65 percent unimpaired flow scenarios result in large increases in spring streamflows and large reductions in diversions, as described in Chapter 6, *Changes in Hydrology and Water Supply*. These tributaries also happen to be the primary source of water for major urban areas in the East Bay, Stockton, and Solano County. In some unimpaired flow scenarios, SacWAM results sometimes show reductions below minimum human health and safety levels. Based in part on comments by East Bay Municipal Utility District (EBMUD), Solano County Water Agency, and Stockton East Water District, "water supply adjustments," including tributary-specific adjustments for the Mokelumne River, Calaveras River, and Putah Creek, were added to the refined 55 percent unimpaired flow scenario (55 scenario), thereby creating the 55 w/WSAs scenario, to address these impacts. Please see Chapter 13, *Revised Proposed Plan Amendments,* and Appendix H1, *Modeling for the Revised Proposed Plan Amendments*, of the Staff Report and Common Response 1.3, *Revised Proposed Plan Amendments,* for more information regarding the 55 w/WSAs scenario.

Suisun-Solano Water Authority (SSWA) asserts in comments that their independent evaluations of the modeling assumptions in Chapter 13, *Revised Proposed Plan Amendments*, demonstrated that the 55 w/WSAs scenario would result in zero water deliveries to SSWA in 10 percent of years under the low carryover storage requirement. SSWA did not provide any details on how their analysis was performed, however SacWAM results show much smaller reductions in water supply in the 55 w/WSAs scenario. Figure CR 6.1-1 shows that there are no years when the supply is reduced below 125 TAF per year under the 55 w/WSAs scenario and Table CR 6.1-1 shows that the average annual reduction for the 55 w/WSAs scenario is 20 TAF or 10 percent from baseline. The maximum reduction appears to occur most often in below normal water year types when the relaxation to the flow requirements may not have triggered. These reductions are dispersed throughout the time period, not all occurring in sequence and thus there are periods of recovery between periods of intermittent delivery reductions. Considering the lower magnitude in delivery reductions and the dispersed nature of the reductions, it is likely member agencies could work cooperatively together to reduce the impacts to any one city. There are also provisions in the revised proposed Plan amendments for development of curtailment exceptions for human health and safety needs to reduce impacts from extreme conditions.

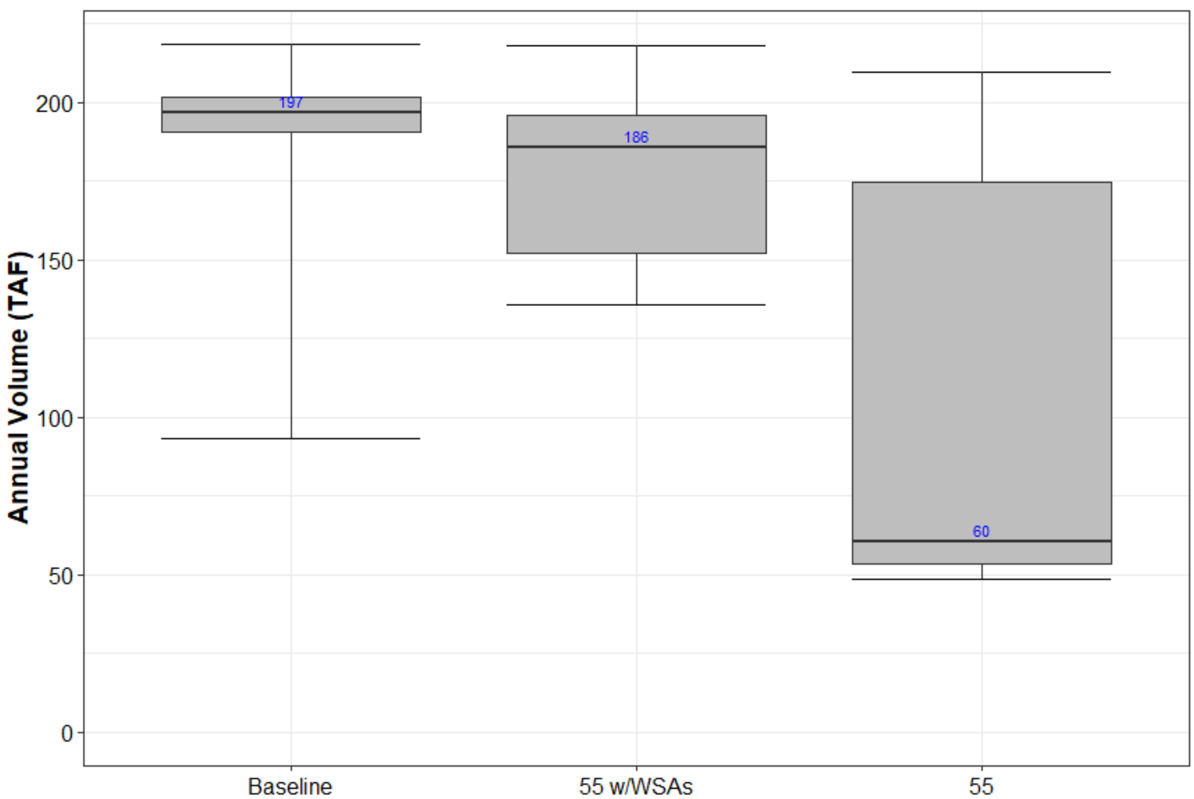

Figure CR 6.1-1. Annual Total Supply from Putah Creek for Baseline, 55 w/WSAs and 55 Scenarios

Table CR 6.1-1. Average Annual Supply from Putah Creek by Water Year Type for Baseline, 55 w/WSAs and 55 Scenarios

Water Year Type	Baseline (TAF/yr)	55 w/WSAs: Change from Baseline (TAF/yr)	55: Change from Baseline (TAF/yr)
Critical	191	-23 (-12%)	-134 (-70%)
Dry	198	-13 (-7%)	-122 (-62%)
Below Normal	197	-35 (-18%)	-119 (-60%)
Above Normal	196	-23 (-12%)	-99 (-51%)
Wet	193	-12 (-6%)	-37 (-19%)
All	195	-20 (-10%)	-95 (-49%)

SacWAM results show similarly moderate reductions in diversions from the Mokelumne River in the 55 w/WSAs scenario. In the 55 scenario, total Mokelumne River diversions are reduced by 34 percent on average; with the water supply adjustments, however, diversions are reduced by 6 percent on average as compared to baseline (Figure CR 6.1-2 and Table CR 6.1-2).

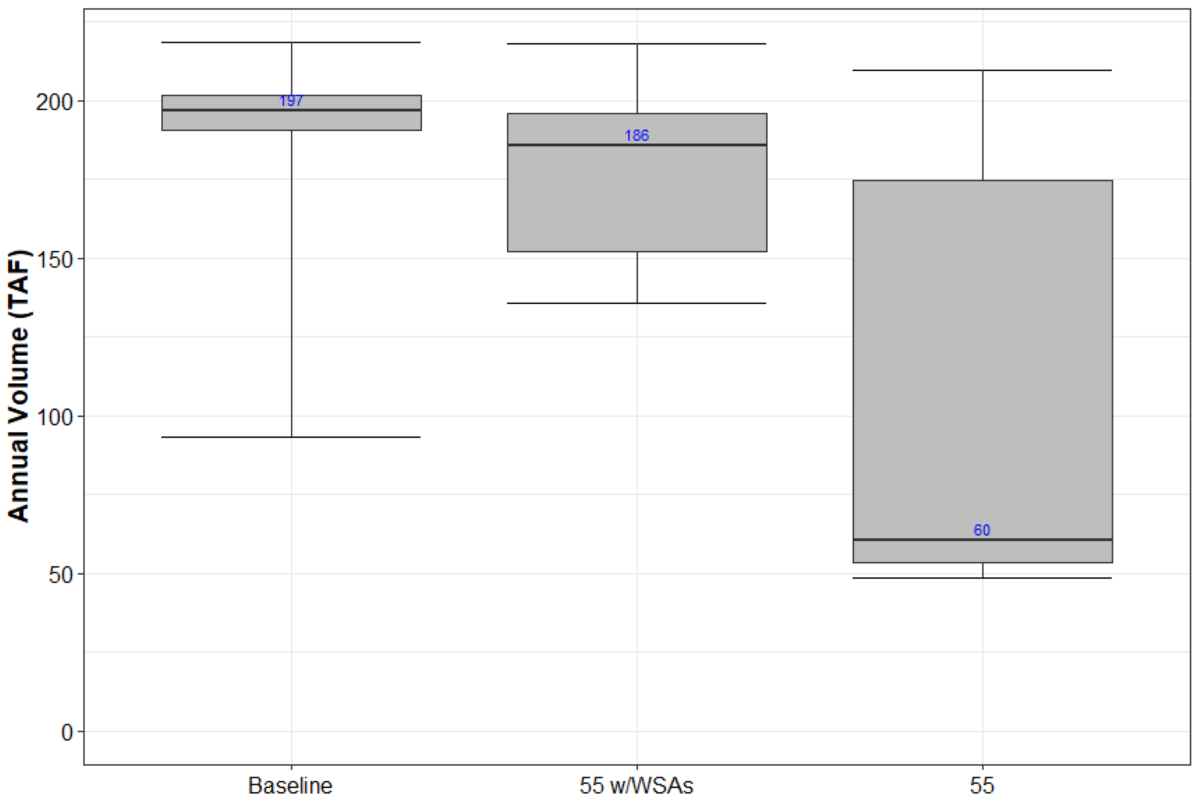

Figure CR 6.1-2. Annual Supply from Mokelumne River for Baseline, 55 w/WSAs and 55 Scenarios

Table CR 6.1-2. Average Annual Supply from Mokelumne River by Water Year Type for Baseline, 55 w/WSAs and 55 Scenarios

Water Year Type	Baseline (TAF/yr)	55 w/WSAs: Change from Baseline (TAF/yr)	55: Change from Baseline (TAF/yr)
Critical	273	-26 (-10%)	-144 (-53%)
Dry	302	-34 (-11%)	-129 (-43%)
Below Normal	313	-20 (-6%)	-115 (-37%)
Above Normal	314	-10 (-3%)	-91 (-29%)
Wet	318	-5 (-2%)	-64 (-20%)
All	306	-18 (-6%)	-104 (-34%)

Water supply adjustments on the Calaveras River reduce the water supply impacts by about 11 TAF per year on average from a 48 percent reduction in the 55 scenario to a 29 percent reduction in the 55 w/WSAs scenario (Table CR 6.1-3). Figure CR 6.1-3 and Table CR 6.1-3 show that the water supply adjustments improve the water supply availability from the Calaveras River primarily in dry through wet year types.

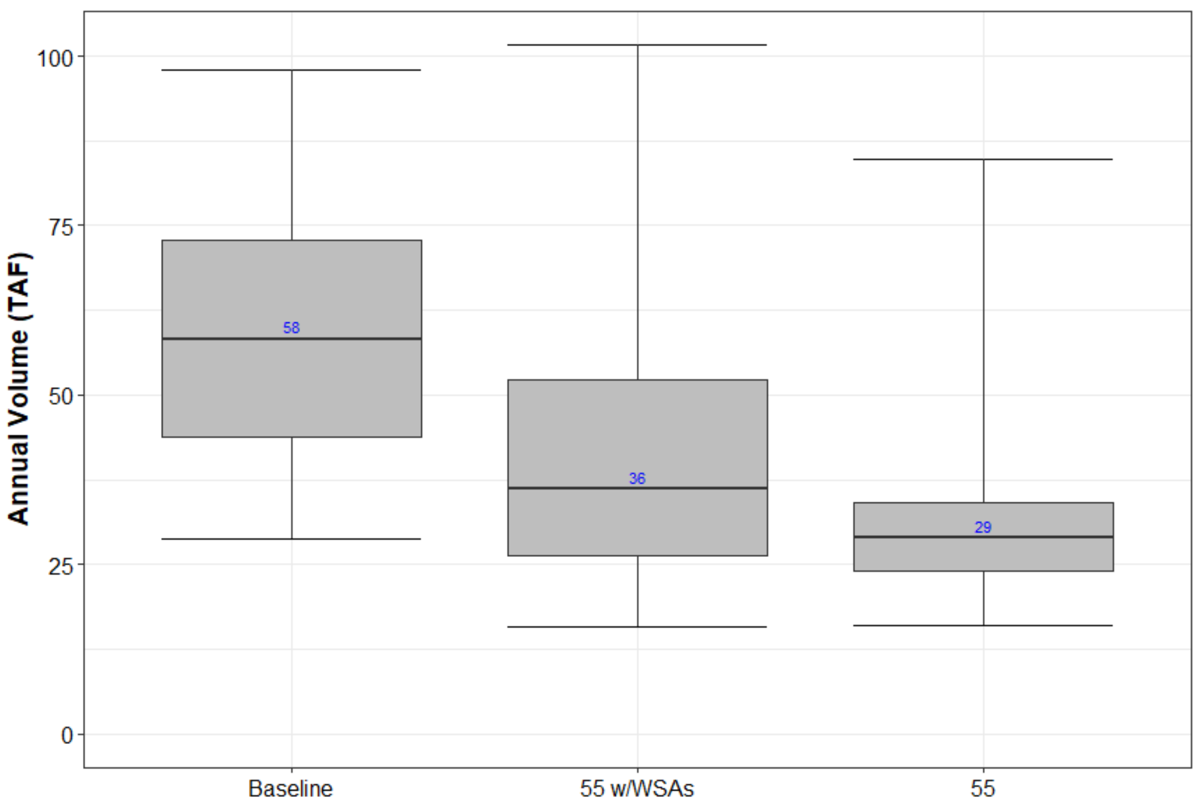

Figure CR 6.1-3. Annual Supply from Calaveras River for Baseline, 55 w/WSAs and 55 Scenarios

Table CR 6.1-3. Average Annual Supply from Calaveras River by Water Year Type for Baseline, 55 w/WSAs and 55 Scenarios

Water Year Type	Baseline (TAF/yr)	55 w/WSAs: Change from Baseline (TAF/yr)	55: Change from Baseline (TAF/yr)
Critical	35	-15 (-43%)	-16 (-46%)
Dry	48	-16 (-33%)	-23 (-48%)
Below Normal	58	-22 (-38%)	-31 (-53%)
Above Normal	66	-19 (-29%)	-35 (-53%)
Wet	76	-16 (-21%)	-32 (-42%)
All	58	-17 (-29%)	-28 (-48%)

Carryover Storage Targets and SacWAM Reservoir Buffer Pools

As included in both the July and December 2025 revised draft Bay-Delta Plan Updates, the revised proposed Plan amendments list carryover storage target ranges and alternative protection measures to ensure that fish below reservoirs are kept in good condition, as first contemplated in Section 5.4.3, *Cold Water Habitat*, of the 2023 draft Staff Report and as required under Fish and Game Code section 5937. The carryover storage target ranges are intended to ensure that some accessible cold water remains at the bottom of each reservoir to maintain adequate temperatures for cold water fish species of concern and an adequate volume of water to release to maintain cold water temperatures downstream until the water temperatures naturally drop in the fall. Additionally, carryover storage target ranges would help keep some stored water in reserve in case the following water year is critically dry, thereby serving a water supply purpose as well.

The carryover storage targets were developed using historical observed data presented in Appendix A1c, *Preliminary Assessment of Effect of Reservoir Storage on Reservoir Release Temperatures*, and refined in Appendix H1a1, *Assessment of Effect of Reservoir Storage on Reservoir Release Temperatures*, of the Staff Report. In SacWAM, the top of buffer parameters were adjusted in the 55 w/WSAs scenario based both on comments and updated temperature thresholds presented in Appendix H1a1. In some cases, such as for New Bullards Bar Reservoir, the carryover storage target and the SacWAM buffers were greatly reduced based on the refinements presented in Appendix H1a1.

The carryover storage targets are implemented in SacWAM using different constraints based on the local project operational logic in the model. By far the most common method in the model is to use "reservoir buffers." Some commenters raised concerns that the 2023 draft Staff Report did not adequately explain analyses surrounding carryover storage targets and reservoir buffer pools. A reservoir buffer in SacWAM is generally represented as a reservoir rule curve that places a particular priority value on storage above the buffer level and a higher priority on storage below the buffer level. Rule curves, in contrast to static values, allow the reservoir buffer to change from month to month, peaking at the end of the spring and drawing down throughout the irrigation season. Through the use of reservoir buffers, the model prioritizes maintaining storage over delivering water to lower priority uses in the watershed when storage is below the buffer level. As discussed in Appendix A1, *Sacramento Water Allocation Model Methods and Results*, the carryover storage targets presented in Appendices A1c, *Preliminary Assessment of Effect of Reservoir Storage on Reservoir Release Temperatures*, and H1a1, *Assessment of Effect of Reservoir Storage on Reservoir Release Temperatures*, do not directly correspond to the end-of-September buffer pool level in

SacWAM. This is because the water in the buffer pool can still be released based on downstream demand priorities even when the storage is below the buffer pool volume. Although the buffer pool has a relatively high priority, some demands—such as instream flow requirements—take precedence, and releases continue to meet the highest priority downstream demands. Therefore, to achieve an end-of-season carryover target like those in Appendices A1 and H1a1, the buffer pool level may need to exceed the storage target.

Even though many buffer pools may be set higher than the carryover storage targets, SacWAM modeling still results in some years where September storage is lower than the carryover storage target. The buffers in the model are set such that the frequency of water levels decreasing below the carryover storage target are minimized and only occur in extreme drought years with approximately the same frequency in the scenarios as occurs in the baseline simulation.

SacWAM is a fixed land use model where the annual cropping is static throughout the simulation period whether it is a dry year, when supplies are limited, or a wet year, when supplies may be more plentiful. In dry conditions, when the storage level drops below the buffer pool, supply to downstream diversions is reduced. As noted by some commenters, when this happens midway through the irrigation season, it occasionally results in modeled monthly water delivery patterns that do not match the crop demand pattern (i.e., the amount of water needed at different times throughout a crop's cultivation process). When reductions in diversions occur, the resulting modeled soil moisture deficit can be made up for in future months. In reality, farmers may adjust cropping patterns at the start of the irrigation season to adapt to the available supply or they may pump additional groundwater to adapt to reductions in surface supply. For the unimpaired flow scenarios in SacWAM, it is assumed that groundwater pumping cannot increase above baseline levels to replace reduced surface supply, as described in Staff Report Section 6.2.2, *Unimpaired Flow Scenario Assumptions*. This model assumption was designed to present a worst-case scenario of the impacts to water supply. In Staff Report Section 7.4, *Agriculture and Forest Resources*, a "bookend" approach was taken in the agricultural impact analysis to provide a range of potential impacts by considering scenarios in which (1) groundwater is not allowed to replace reduced surface supplies, and (2) maximum groundwater pumping is allowed. Actual implementation of the proposed project would result in annual deliveries that would match the monthly crop demand pattern (albeit at potentially reduced annual volume), and the annual diversions are expected to be as presented in Chapter 6, *Changes in Hydrology and Water Supply*, and Chapter 7, *Environmental Analysis*, of the Staff Report.

Yuba River Model Representation and Operations

The Yuba River system has very complex water development infrastructure to serve hydropower, flood control, water supply, and recreation needs. As described in Staff Report Chapter 2, *Hydrology and Water Supply*, in the upper watershed there are a series of dams and canals on Fordyce Creek, Canyon Creek, Slate Creek, Middle Fork Yuba, and South Fork Yuba operated by Nevada Irrigation District (NID), Pacific Gas and Electric (PG&E), and South Feather Water and Power. Downstream, Yuba Water Agency (YWA) operates the Yuba River Development Project which incorporates the largest infrastructure on the Yuba including New Bullards Bar Reservoir, Colgate Powerhouse, and Englebright Reservoir. Generally, the upstream users on the Yuba claim senior water rights to downstream users, and some of the upstream users divert water out of the Yuba watershed to the Feather and Bear Rivers.

SacWAM includes the major infrastructure and general operational rules for the upper and lower Yuba watersheds. As explained in Section A1.2.2, *Locations of New Instream Flow Requirements in Each Scenario,* of Staff Report Appendix A1, *Sacramento Water Allocation Model Methods and Results*, unimpaired flow compliance points were added in SacWAM above and below rim dams and at the mouths of major tributaries on the Yuba using the same approach taken in all other watersheds. This general approach applied to the Yuba led to unimpaired flow requirements in the upper watershed on the North Fork Yuba above New Bullards Bar Reservoir, on the South Fork Yuba above Englebright Reservoir, and the Middle Fork Yuba above the confluence with the North Yuba. These three flow requirements ensure that diverters in the upper watershed bypass the unimpaired flow to protect water quality in each reach and contribute to outflow. In the lower watershed, SacWAM includes flow requirements on the North Fork Yuba above and below Englebright Reservoir (which is below Colgate Powerhouse from New Bullards Bar Reservoir) and at the mouth of the Yuba above the Feather River. The unimpaired flow requirements on the lower river ensure that the unimpaired flow from the upper watersheds is bypassed at New Bullards Bar and Englebright and is not diverted for consumptive use in the valley floor.

In the Staff Report analysis, when a specified percentage of unimpaired flow is required to remain instream, the remaining portion is available for diversion, including diversion to storage. For example, when 55 percent of unimpaired flow is required to stay instream in a given month, 45 percent of unimpaired flow is available for diversion that month. The water that is available for diversion is allocated based on the relative priority of users in the model. In many watersheds in the Sacramento/Delta region, the users that cause the largest impairment to the natural flow regime are users in the lower watershed who are typically junior in priority to the smaller diverters in the upper watershed. Under the percent of unimpaired flow scenarios, the users that see the largest impacts are typically those that are also causing the largest impairments under baseline conditions.

The Board received multiple comments from YWA incorrectly claiming that the SacWAM results shows “discriminate” impacts to YWA while diverters in the upper watershed experience less of an impact. Impacts to Yuba Water Agency may include those to hydropower production, recreation, and diversion to agriculture and urban uses. The impacts to each of these uses is described in Chapter 7, *Environmental Analysis*, Chapter 9, *Proposed Voluntary Agreements*, and Chapter 13, *Revised Proposed Plan Amendments*, of the Staff Report. Diversions at the individual water district scale are more granular than what is analyzed in the Staff Report, as explained in the *Introduction* section, above. However, Appendix A1, *Sacramento Water Allocation Model Methods and Results*, does include results that show larger reductions in diversions from the upper watershed than to YWA contrary to the general trend that lower watershed diverters tend to see greater reductions in diversions. For example, the largest diversion from the Upper Yuba watershed is via the Drum Canal, which diverts water from the Yuba watershed to the Bear watershed for consumptive use and hydropower production. SacWAM results in Appendix A1 for flows through the Drum Canal show a reduction of 74 TAF per year on average, a 20 percent reduction relative to baseline. As described in the SacWAM documentation, water budget areas (WBAs) 12&13, 14&15N, and 15S all contain lands serviced by YWA. Appendix A1 shows that in the 55 scenario, there is a total reduction of 24 TAF per year to these WBAs, which is about a 4 percent reduction in water supply for the WBAs that encompass YWA’s service area.

YWA also submitted comments that appear to confuse the bypass of unimpaired flow with the bypass of reservoir inflow. Bypass of unimpaired flow refers to requirements and practices that restrict water diversions in order to maintain a percentage of natural flow in the river. Bypass of reservoir inflow, however, refers to requirements and practices that prevent water that has entered a reservoir from being stored in the reservoir. SacWAM modeling in the Staff Report represents alternatives that require a bypass of a certain percentage of unimpaired flow at rim dams such as New Bullards Bar. Just because a reservoir has to bypass more reservoir inflow than another reservoir does not mean that it is somehow being unfairly modeled. How much water a reservoir needs to release and actually bypass is based on many factors, most of which are not related to this project, such as the storage capacity of the reservoir, flood control requirements, existing instream flow requirements, and downstream water needs.

The Board also received multiple comments from YWA expressing concerns related to the location of the unimpaired flow requirements and the relative priorities of diverters and flow requirements in the model. The priority scheme implemented in SacWAM follows the general priorities of users in the system, as described above; in the model, upper watershed diversions generally have a higher relative priority for available water than those in the lower watersheds. The Yuba watershed follows this scheme, both in the model and in reality; the upper watershed diverters of NID and PG&E have senior water rights relative to the rights under which YWA diverts and stores water downstream.

While the model and the results presented in the Staff Report accurately represent potential impacts to users in the Yuba watershed, the actual impacts would likely be much smaller due to flexibility afforded through project implementation. Project implementation includes flexibility first described in Section 5.4.2.4, *Implementation*, and further developed in Section 13.3.3, *Regulatory Pathway*, of the Staff Report, including the opportunity for local cooperative solutions and flow shaping. For example, this flexibility could reduce the impacts on YWA associated with the flow requirement on the Middle Fork Yuba above the confluence with the North Fork Yuba. A local cooperative solution could be developed to route the water through the Lohman Ridge and Camptonville tunnels to New Bullards Bar which would not affect the flow requirements downstream, but could potentially provide benefits to hydropower, recreation, water supply, and fisheries. Additionally, as discussed in Staff Report Section 13.3.3.2, *Sacramento/Delta Tributary Inflows*, the unimpaired flow requirements may not be required at each location included in the model if it can be demonstrated that fewer compliance locations can provide equal benefit to fisheries.

The Board received multiple comments from YWA regarding concerns that SacWAM does not include flow fluctuation requirements on the lower Yuba River in the flow scenarios. Additional flows required under the Bay-Delta Plan are not intended to trigger unrelated flow requirements such as the ramping rate requirements on the lower Yuba River. As described in Section 4.4.2.2, *Narrative Inflow Objective for Sacramento/Delta Tributaries*, of the revised proposed Plan amendments, adaptive implementation provisions are expected to be used to integrate flow requirements in the Bay-Delta Plan for the reasonable protection of fish and wildlife and other beneficial uses with related flow requirements in water right orders, water quality certifications, or other existing environmental requirements. Adaptive implementation may be used to avoid impacts to aquatic species and increased water supply costs due to the potential interaction of these requirements.

Diversions from the upper Yuba watershed at Spaulding Reservoir support hydropower generation by PG&E, supply water to NID, and provide recreational and other beneficial uses. NID provided many comments on the 2023 draft Staff Report based on analyses performed by their consultants, Western Hydrologics, interpreting the Plan update's possible effects within NID's service area. These comments rely on support from the modeling presented in technical memoranda prepared by Western Hydrologics to defend various claims that the Plan would cause significant and irreversible impacts to NID's service area. However, NID draws these conclusions based on modeling and analyses that overstate the effects of the proposed Plan amendments on NID's operations. The NID modeling and analysis is inadequate in part because the effects of climate change and changing demand are not distinguished from the effects of complying with a 55 percent of unimpaired flow requirement. Additionally, NID's modeling assumes unimpaired flow requirements below every reservoir which can greatly inflate the required amount of water to be bypassed at some locations. As a result, the NID comment letter presents modeling results that exaggerate the perceived impacts of the 55 scenario on water supply.

The modeling included as Exhibit B in the NID comment letter confounds the water supply analysis by including two additional independent variables that obscure the effects of the 55 scenario on the system. The modeling compares a baseline condition of historical hydrology, operations, and demand with three climate change scenarios (wet, median, and dry) where NID is operating to comply with a strict 55 percent of unimpaired flow requirement with median projected demand (see Table 1 of Exhibit B in Comment Letter 324). The modeling does not include climate change hydrology in the control scenario, which makes it impossible to distinguish between the effects of climate change and the effects of meeting the flow requirement. Additionally, the water demand used in the NID baseline modeling differs from the demand used in the three 55 percent of unimpaired flow climate change scenarios. The baseline scenario uses current historical demand, while the three 55 percent of unimpaired flow scenarios use a median projected demand. This adds another layer of confusion to the analysis because it is unclear if results are due to higher demands, climate change, or the flow requirement. If the technical memorandum is intended to evaluate the effects of the 55 scenario on the system, the only difference between the baseline scenario and the other scenarios should be the addition of a 55 percent of unimpaired flow requirement. Every figure in the technical memorandum, including those purporting to show the effects of the Plan on diversions, river flows, water deliveries, storage, and power generation is therefore misleading. The modeling referenced in the NID comment letter is further impaired by removing the NID drought contingency plan to allow "the model to use all available storage to meet demands as much as feasible." The decision not to consider its own drought contingency plan results in figures that mischaracterize NID's response to drought conditions and results in outputs that are unlikely to occur given NID protocols.

Some of NID's comments assert that the proposed flow objectives would cause many of its reservoirs to reach dead pool in multi-year drought periods, and that reductions in Sacramento/Delta surface water supply available would have irreversible impacts on the NID service area. These assertions are based on their independent modeling, which suffers from the problems described above. Historically observed operations of many of NID's reservoirs show that they are often drawn down near dead pool during dry periods, regardless of any unimpaired flow requirements, and the SacWAM assumptions under baseline conditions reflect this reality. As presented in Chapter 6, *Changes in Hydrology and Water Supply*, and Appendix A1, *Sacramento Water Allocation Model Methods and Results*, the SacWAM results for the flow scenarios show substantial reductions in interbasin diversions, which affect the water supply available to NID. However, SacWAM results also show that reductions in interbasin diversions from the Yuba River would likely only cause small changes in end-of-September storage and would not cause "irreversible impacts" to the NID service area.

Tables CR 6.1-4 and CR 6.1-5 present the dead pool volume and the SacWAM-estimated average and minimum end-of-September storage volumes under the baseline condition, along with the change from baseline under the 55 scenario and the 55 w/WSAs scenario for the four largest reservoirs owned by NID. Negative values represent reductions in storage volume (in TAF) for each scenario compared to the baseline, and positive values represent increases in storage volume compared to baseline. The two scenarios produce similar outcomes, and both show only very small changes in end-of-September storage relative to the baseline. With the exception of Jackson Meadows, the minimum storage (i.e., the smallest end-of-September storage result from SacWAM) shown in Table CR 6.1-5 indicates that end-of-September storage would not reach dead pool in any year over the SacWAM modeling period (1923–2021), which includes numerous multi-year drought sequences in the Sacramento/Delta. As discussed above, historical operations show that NID-owned reservoirs have been drawn down to dead pool during droughts which is reflected in the baseline modeling, as indicated in Table CR 6.1-5, where the baseline minimum end-of-September storage at Jackson Meadows is very close to dead pool conditions. Therefore, the findings presented in Tables CR 6.1-4 and CR 6.1-5 support the conclusion that water supplies to NID would generally remain available under both the 55 scenario and the 55 w/WSAs scenario.

Table CR 6.1-4. Dead Pool Volume and SacWAM-estimated Average End-of-September storage (TAF) under Baseline Conditions, and Changes (TAF) from Baseline under the 55 and 55 w/WSAs Scenarios

		Average End-of-September Storage		
Reservoir	Dead Pool	Baseline	55	55 w/WSAs
Jackson Meadows	21	42	0	0
Bowman Lake	3.4	50	-4	-3
Rollins	7.2	61	-1	0
Scotts Flat	5	32	0	0

Source: SacWAM Table H1a3-145, Table H1a3-205, Table H1a3-277, Table H1a3-285

Table CR 6.1-5. Dead Pool Volume and SacWAM-estimated Minimum End-of-September storage (TAF) under Baseline Conditions, and Changes (TAF) from Baseline under the 55 and 55 w/WSAs Scenarios

		Minimum End-of-September Elevation		
Reservoir	Dead Pool	Baseline	55	55 w/WSAs
Jackson Meadows	21	22	1	0
Bowman Lake	3.4	6	1	0
Rollins	7.2	46	0	0
Scotts Flat	5	31	0	0

Source: SacWAM Table H1a3-145, Table H1a3-205, Table H1a3-277, Table H1a3-285

In 2024, during multiple outages that limited NID's ability to divert water through the South Yuba Canal, NID was able to adapt to the reduced water supply and meet demands without drawing reservoirs to dead pool. These outages demonstrated NID's ability to adapt to reduced water supply, meet demands, and avoid drawing reservoirs to dead pool. In water year 2024, the total diversion through the South Yuba Canal was about 27 TAF, which is nearly a 50 percent reduction from the average annual diversion, and with reasonable conservation efforts by NID customers, water levels in Scotts Flat Reservoir never dropped below 50 percent capacity or as low as they did in 2021 during the most recent drought. In contrast, the SacWAM results indicate that diversions through the South Yuba Canal are reduced by about 10 TAF on average, with diversions greater than 40 TAF occurring even in years with the smallest diversions in the 55 scenario.

Mokelumne River Operations

As described in Staff Report Chapter 2, *Hydrology and Water Supply*, the Mokelumne River is a tributary of the Delta with hydrology that is highly impaired by hydropower operations in the upper section, diversion to storage and use in the Bay Area in the middle section, and diversion for agricultural use in the lower section. A 1998 Joint Settlement Agreement (JSA) established as part of EBMUD's Federal Energy Regulatory Commission licensing process governs the distribution of water between the different users and environmental flow requirements and has been incorporated into Revised Water Right Decision 1641. SacWAM incorporates all major diversions and infrastructure on the Mokelumne River, including a representation of Pardee, Camanche, and EBMUD terminal reservoirs, the Mokelumne Aqueduct, Freeport diversion from the Sacramento River, and the intertie with the Contra Costa Canal. Additionally, SacWAM incorporates upstream hydropower infrastructure and operations, and downstream diversions to Woodbridge Irrigation District and smaller riparian diversions. SacWAM includes detailed logic for the operation of Pardee and Camanche Reservoirs and the JSA flow requirements on the Lower Mokelumne River. Despite the thorough model representation of the Mokelumne watershed and its operations, the Board received comments from EBMUD stating that SacWAM is a "flawed" model that should not be used for analyzing this update to the Bay-Delta Plan.

When the simulation results of existing conditions are compared with recent historical observations for reservoir storage and streamflow, the results confirm that SacWAM accurately represents the hydrology and diversions and is well-suited for an environmental analysis of a project of this scale. Perhaps more importantly, the model is capable of estimating the amount by which diversions could be reduced if a percent of unimpaired flow was required to be bypassed while maintaining sufficient reservoir storage for cold water habitat.

The Board received multiple comments by EBMUD contending that because SacWAM does not match their model, EBMUDSIM, SacWAM is flawed, and that the Staff Report should rely on EBMUDSIM instead. Comments asserting that inter-model comparisons show SacWAM poorly representing historical operations do not hold merit because such arguments assume that EBMUDSIM perfectly represents historical operations, yet EBMUD did not provide any comparisons of EBMUDSIM or SacWAM to historical observations to support this assertion. As referenced above, when SacWAM is compared with recent historical observations, its simulation results align well with historical reservoir storage, diversions and streamflows (see below for an example of recent historical storage and modeled baseline storage for Camanche Reservoir using SacWAM). The Nash-Sutcliff model efficiency metric for the Camanche Reservoir storage shown in Figure CR 6.1-4 is 0.79 (out of a maximum value of 1.0), which indicates a very strong match between SacWAM results and observed historical data. Differences in model results between SacWAM and EBMUDSIM could be explained by differences in model assumptions (EBMUDSIM's assumptions were not provided) or inaccuracies in EBMUDSIM. Regardless, the fact that SacWAM results depicting existing conditions do not match EBMUDSIM results does not mean SacWAM is flawed or that it is an inappropriate tool to analyze the impacts of the update of the Bay-Delta Plan.

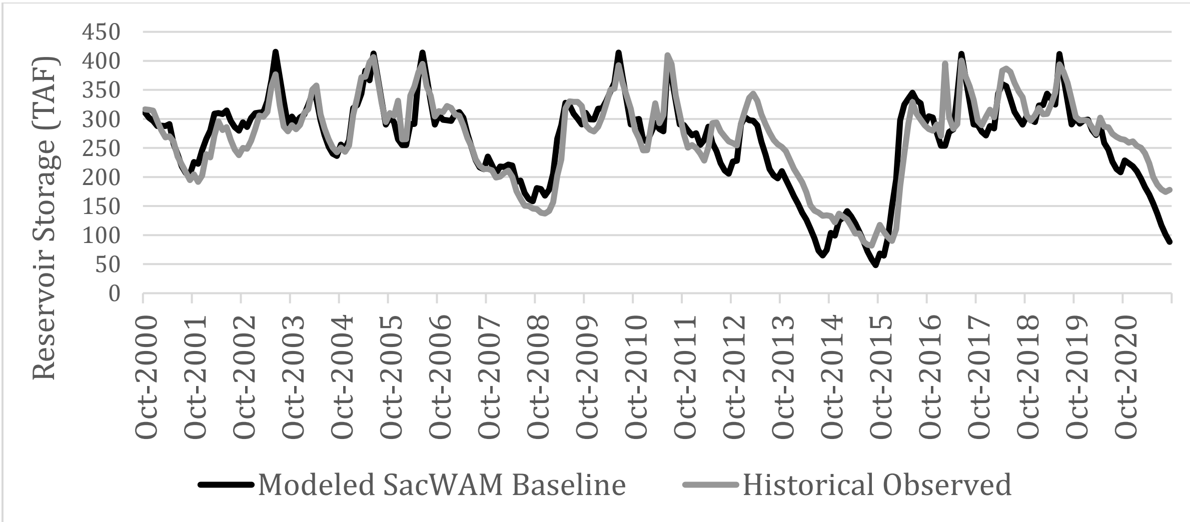

Figure CR 6.1-4. Comparison of SacWAM Existing Conditions Simulated Storage and Historical Observed Storage for Camanche Reservoir. Source: SacWAM version 2025.08.28 and CDEC 2026.

Even if EBMUDSIM were found to outperform SacWAM by more accurately representing the details of the EBMUD system, EBMUDSIM would not be an appropriate tool for use in the Staff Report, as it only simulates EBMUD's water delivery system and a portion of the Mokelumne River. The study area for the Bay-Delta Plan update covers a large portion of California (see Figure 1-1c in Chapter 1, *Executive Summary*, of the Staff Report). As discussed earlier in this common response, State Water Board staff and consultants developed SacWAM to be a flexible model capable of representing a range of alternatives and analyzing impacts in the plan area and to inform analyses throughout the entire study area.

The Board also received comments from EBMUD alleging minor inconsistencies between model inputs and what is described in the SacWAM documentation, and in Appendix A1, *Sacramento Water Allocation Model Methods and Results*, and Chapter 2, *Hydrology and Water Supply*, of the Staff Report. Many times, these "inconsistencies" or "inaccuracies" were simply instances where the commenter did not fully understand the context surrounding the information presented, and the language was not inconsistent but rather provided different information for different purposes. Nevertheless, Appendix A1 and Chapter 2 have been clarified to reduce confusion in such instances. Other times, EBMUD correctly identified minor instances where values in the Staff Report and SacWAM documentation needed to be updated to conform with the latest version of the model that was used in the Staff Report. The Staff Report and SacWAM documentation have been updated to correct these minor inaccuracies. After careful investigation by State Water Board staff, none of the comments by EBMUD on the descriptions of the baseline or flow scenarios indicated a problem with the SacWAM analysis; they only resulted in minor changes to the description of the model inputs.

SacWAM VA Scenario Assumptions

The VA scenario was initially evaluated in Staff Report Chapter 9, *Proposed Voluntary Agreements*. As discussed in Staff Report Section 9.5.2, *VA Modeling Approach,* and Appendix G3a, *Sacramento Water Allocation Model Methods and Results for the Proposed Voluntary Agreements*, modeling the VA scenario presents challenges because the HRL proposal is to add flow commitments on top of a set of hypothetical reference conditions rather than to add instream flow requirements. Simulating the effects of the proposed HRL flow commitments requires first simulating the VA reference condition (referred to as the *2019 BiOps condition*), which is different from the project baseline. Section 9.5.2 of the Staff Report and Common Response 6.2, *Baseline and No Project Alternative*, describe the reference condition in more detail. Additionally, some of the details of the HRL proposal were not clear at the time that the SacWAM modeling scenario was developed, and the additional HRL flows to be provided are relatively small compared to existing flows in the system. Since the release of the 2023 draft Staff Report, additional details have been clarified by HRL parties, and the VA scenario has been updated based on updates to HRL documents, VA pathway accounting, and comments received. Updates to the SacWAM VA scenario are discussed in Appendix H1a, *Sacramento Water Allocation Model Methods,* and results are presented in Chapter 13, *Revised Proposed Plan Amendments*, and Appendix H1a2, *Sacramento Water Allocation Model Results for Revised Proposed Plan Amendments*.

Some commenters questioned the SacWAM VA results at a high level when compared with DWR's modeling of the VAs in CalSim 3. The changes in Delta outflow and SOD exports compared with baseline are different between DWR's modeling and the 2023 draft Staff Report primarily because of the different baselines each analysis assumes. DWR assumes a baseline that includes the 2019 Biological Opinions, while the project baseline for the 2023 draft Staff Report included in SacWAM is based on the 2020 Incidental Take Permit. For further discussion on the project baseline in SacWAM, see Staff Report Chapter 6, *Changes in Hydrology and Water Supply,* and Common Response 6.2, *Baseline and No Project Alternative*. The largest difference between the two model baselines is the exclusion of the San Joaquin inflow-to-export ratio requirement for the CVP in DWR's modeling. This results in greater exports and lower Delta outflow in DWR's baseline than in the Staff Report baseline. When both VA models are compared with their respective baselines, there is a smaller increase in Delta outflow in the 2023 draft Staff Report SacWAM results due to the baseline assumptions. For more discussion about the project baseline please see Common Response 6.2, *Baseline and No Project Alternative*.

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^SacWAM. 2026. State Water Resources Control Board (SWRCB). 2026. Sacramento Water Allocation Model (SacWAM) Documentation.