

The State Water Project

Final Delivery Capability Report 2021

September 2022



State of California
Natural Resources Agency
Department of Water Resources

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List of Acronyms

ANN (Artificial Neural Network)

BiOps (Biological Opinions)

CEQA (California Environmental Quality Act)

CESA (California Endangered Species Act)

CDEC (California Data Exchange Center)

CCWD (Contra Costa Water District)

CDFW (California Department of Fish and Wildlife)

CII (Commercial, Industrial, Institutional)

COA (Coordinated Operation Agreement)

CVP (Central Valley Project)

CY (Calendar/Contract Year)

D-1641 (State Water Board's Water Right Decision 1641 (D-1641), issued in December 1999 and updated in March 2000)

DCD (Delta Channel Depletion)

DCP (Delta Conveyance Project)

DCR (Delivery Capability Report)

DSC (Delta Stewardship Council)

DLL (Dynamic link library)

DO (Dissolved oxygen)

DSM2 (Delta Simulation Model 2)

E/I (Delta Exports to Inflow ratio)

EcoRestore (Governor Brown's Delta habitat restoration plan)

EIR (Environmental Impact Report)

EIS (Environmental Impact Statement)

ESA (Endangered Species Act)

FCWCD (Flood Control and Water Conservation District)

ID (Irrigation District)

ITP (Incidental Take Permit for Long-Term Operation of the State Water Project)

KCWA (Kern County Water Agency)

MAF (million acre-feet)

M&I (Municipal and Industrial)

MWDSC (Metropolitan Water District of Southern California)

NDOI (Net Delta Outflow Index)

NEPA (National Environmental Policy Act)

NMFS (National Marine Fisheries Service)

NOD (Notice of Determination)

NOP (Notice of Preparation)

OAL (The State Office of Administrative Law)

ROC on LTO (Re-initiation of Consultation on the Long-Term Operations of the Central Valley Project and State Water Project)

ROD (Record of Decision)

RPA (Reasonable and Prudent Alternative)

SED (Substitute Environmental Document)

SJRRP (San Joaquin River Restoration Program)

SMSCG (Suisun Marsh Salinity Control Gate)

SVI (Sacramento Valley Index)

SWP (State Water Project)

SWPAO (State Water Project Analysis Office)

SWRCB (State Water Resources Control Board)

TAF (thousand acre-feet)

USBR (United States Bureau of Reclamation)

USFWS (United States Fish and Wildlife Service)

UWMP (Urban Water Management Plan)

VA (Voluntary Agreements)

WaterFix (Water transfer component of the Bay Delta Conservation Plan)

WD (Water District)

WSD (Water Storage District)

WSI-DI (Water Supply Index vs. Demand Index Relationship)

WQCP (Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta)

WY (Water Year)

WYT (Water Year Type)

X2 (Distance in kilometers from Golden Gate, where salinity concentration in the Delta is 2 parts per thousand)

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Summary

This Delivery Capability Report presents California Department of Water Resources (DWR) analysis of the State Water Project (SWP) system and provides important planning information for users of SWP water. The analysis provides information about how changing climate, regulatory, and operational considerations impact SWP delivery capability.

DWR has authority under state law to construct, operate, and maintain the SWP to manage, store and deliver water for the benefit of the State. This report is intended to provide information about the key factors affecting the operation of the SWP in California, its long-term capability as a source of water for beneficial use, and an estimate of its current delivery capability. This report meets the requirements of Attachment B to the Monterey Plus Settlement Agreement of May 2003.

Water provided by the SWP is a major source of the water supplies available to many SWP contractors. SWP contractors consist of 29 public entities that include cities, counties, urban water agencies, and agricultural irrigation districts. SWP contractors' local/regional water users have long-term contracts with the DWR for all, or a portion of their water supply needs. Thus, the delivery capability of water from the SWP system is an important component in the water supply planning of its recipients, and ultimately affects the amount of water available for beneficial use in California.

The availability of these water supplies may be highly variable. A sequence of relatively wet water years¹ may be followed by a varying sequence of dry or critically dry years. Having good and reliable estimates on how much water each contractor will receive each year—whether it be a wet water year, a critical year, or somewhere in between—gives contractors a better sense of the degree to which they may need to implement increased conservation measures, or plan for new facilities or back up sources of water to meet their needs.

The geography of California and the infrastructure of water transfer from the source areas, located in the Sierra Mountain Range, to areas of demand for water, makes the

¹ Water years start on October 1 and end on September 30 of the next year.

Sacramento-San Joaquin Delta a key feature of the SWP's ability to deliver water to its agricultural and urban contractors in the North Bay, the South Bay, California Central Valley, Central Coast, and Southern California. All but five of the 29 SWP contractors receive water deliveries by diversions from the Delta. These water diversions are pumped by either the Harvey O. Banks or Barker Slough pumping plants.

DWR and the United States Bureau of Reclamation (USBR), the managing entities of the two statewide systems of water transfer in California, face numerous challenges in the operation of their diversion facilities in the Delta, and are regulated by several state and federal agencies to maintain, and enhance the Delta's long-term sustainability.

Maintaining suitable quality of water flowing in the channels of the Delta for the numerous in-basin beneficial uses, and the protection of endangered and threatened fish species are important factors of concern for the operators of the Delta export diversion facilities. Ongoing regulatory requirements, such as those aimed at protecting the estuary's resident and migratory fish species, are major challenges to a reliable and sustainable water delivery capability of both, SWP and the Central Valley Project (CVP) systems.

Complications induced by climate change also pose the risk of increased variability in the frequency and magnitude of floods and droughts. The projected sea level rise caused by the increase in average temperature complicate efforts to manage salinity levels in the channels affected by tides. Additionally, higher ocean levels could result in more frequent water quality degradation in the Delta channels requiring additional Delta outflow to maintain water quality objectives. This report provides estimates of both current and future (2040) delivery capability to help inform water users and guide their climate change adaptation efforts.

Operationalizing climate change adaptation requires that we continuously evaluate conditions and respond to new trends. In the time since the climate change assumptions for this report were developed, California has witnessed extreme conditions that are outside of the range of historical experience and that illustrate the need to elevate our consideration of climate change in projections of long-term SWP deliverability capability. While this report serves as an important update to the 2019 report, DWR is undertaking work to substantially expand the climate change analysis and planning information that will be included in the 2023 report. These improvements will move future delivery capability reports toward a greater acknowledgement of climate uncertainties and the

need to manage risks to water supply reliability—including greater understanding that important climate changes have already occurred and are affecting water supply reliability today. Adapting to climate change will require improved planning at both the state and local levels. This improved planning must include a consideration of multiple scenarios of future climate conditions to help examine the resiliency of water supply portfolios.

Other challenges include continued subsidence of Delta islands, many of which are already below sea level and supported by levee systems. Thus, the threat of a catastrophic levee failure becomes more significant as water pressure increases against the levees. The risk of catastrophic levee failure also becomes more significant with seismic events and extreme flood events.

The analyses in this report factor in all the current regulations governing SWP and CVP operations in the Delta and assumptions about water uses upstream in the Sacramento River and San Joaquin River watersheds. Analyses were conducted that determined the amounts of water that SWP contractors receive and the amounts of water they choose to hold for use in a subsequent year.

SWP Delta exports have decreased since 2005, although the bulk of the change occurred between 2005 and 2009 and in 2019. The former reduction is due to the Delta regulations which constrained exports that culminated in the federal Biological Opinions (BiOps) which went into effect in 2008-2009. These BiOps modified operations of the CVP and SWP diversion pumps. The later reduction is due to two main factors: 1) the amended Coordinated Operation Agreement (COA) with accompanying project operation changes which reduced SWP exports and increased CVP exports, and (2) a more conservative operation of Lake Oroville by the SWP.

Many of the same assumptions of SWP operations described in the 2019 Report remain the same in this 2021 update, however, there are a few notable changes which include the transition from CalSim II to CalSim 3 and CVP and SWP operational refinements. As a result, the differences between the 2019 and 2021 Reports can be attributed primarily to differences in hydrology, spatial and temporal expansion, more explicit groundwater and surface water interaction representation, and operational refinements.

The most salient findings in this report are:

- Under existing conditions, the estimated average annual delivery of Table A water for this 2021 Report is 2,321 thousand acre-feet (TAF)/year, 93 TAF less than the 2,414 TAF/year estimated for the 2019 Report (Table 5-2).
- The likelihood of existing condition SWP Article 21 deliveries (supplemental deliveries to Table A water) being greater than 20 TAF/year has decreased by 21% relative to the likelihood presented in the 2019 Report (Figure 5-8).
- Under 2040 conditions, the estimated average annual delivery of Table A water (2,111 TAF) is projected to be 9% lower than under existing conditions. This finding is for a median or most likely future condition. Significant uncertainty exists about future conditions, actual future conditions could end up being considerably worse. A 9% reduction in water supply is also consistent with the conditions projected in the recent [California Water Supply Strategy](#).

Section 1: Reasons to Assess State Water

Project Water Delivery Capability

Three major factors underscore the importance of assessing the SWP's water delivery capability: the effects of population growth on California's balance of water supply and demand, State legislation intended to help maintain a reliable water supply, and impact of potential climate change-driven shifts in hydrologic conditions.

Population Growth, Land Use, and Water Supply

California's population has grown rapidly in recent years, with resulting changes in land use. This growth is expected to continue. From 1990 to 2005, California's population increased from about 30 million to about 36 million. Based on this trend, California's population has been projected to be more than 43 million by 2030. The [California Water Plan 2018](#) (CWP 2018) indicates that for year 2060 conditions, based on the California Department of Finance's projections of 2010 U.S. Census data, the population is projected to be nearly 51 million—a 70% increase compared to the 1990 population.

The amount of water available in California can vary greatly from year to year. Some areas may receive 2 inches of rain a year, while others are deluged with 100 inches or more. As land uses have changed, population centers have emerged in many locations without enough local water supplies. Thus, Californians have always been faced with the problem of how best to conserve, control, and move water from areas of abundant water to areas of water need and use.

The CWP Update 2023 public review draft will be released in early 2023 according to the Update 2023 brochure. The final plan is scheduled to be released for the end of 2023. For more information on the CWP Update 2023, the link is as follows: <https://water.ca.gov/Programs/California-Water-Plan/Update-2023>.

Legislation on Ensuring a Reliable Water Supply

The laws described below impose specific requirements on both urban and agricultural water suppliers. These laws increase the importance of SWP water delivery capability estimates to local and regional water purveyors.

Urban Water Management Planning Act

The Urban Water Management Planning Act was enacted in 1983 (California Water Code, Sections 10610–10656). As amended, this law requires all public urban water purveyors to adopt Urban Water Management Plans (UWMPs) every 5 years and submit those plans to DWR. DWR reviews the submitted plans to report to the legislature on the status of these plans and for the purposes of grant eligibility requirements.

UWMPs must include an estimate of water supply and demand for a 20-year planning horizon and three water-year types, normal, single dry year and a drought lasting 5 consecutive years. SWP contractors use SWP delivery capability to estimate their long-term water supply needs from other sources available to them. DWR publishes a guidebook to assist water suppliers prepare their urban water management plans.

Further information is available at:

<https://water.ca.gov/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/Urban-Water-Management-Plans>

Water Conservation Act of 2009: SB X7-7

California became the first state to adopt urban water use efficiency targets with the enactment of the Water Conservation Act of 2009 (SB X7-7, Steinberg, 2009). This Act mandated the State achieve a 20% reduction in urban per capita water use by 2020. It directed urban water suppliers to develop individual targets based on a historical per capita baseline, and to report interim progress in their 2015 urban water management plans (UWMPs) and full compliance of their 2020 plans.

In addition, the Act requires agricultural water suppliers serving more than 25,000 irrigated acres (excluding recycled water deliveries) to adopt and submit to DWR an Agricultural Water Management Plan (AWMP). These plans must include reports on the

implementation status of specific Efficient Water Management Practices (EWMPs) including the measurement and volumetric pricing of water deliveries. Agricultural water suppliers can submit individual plans or collaborate and submit regional plans, if the plans meet the requirements of SB X7-7. Agricultural water suppliers that provide water to between 10,000 and up to 25,000 irrigated acres (excluding recycled water) are not required to prepare or submit AWMPs under SB X7-7 unless state funds are made available to support this.

Water Conservation Legislation of 2018: AB 1668 and SB 606

In 2018, new landmark water conservation legislation was signed into law. Together, AB 1668 (Friedman, 2018) and SB 606 (Hertzberg, 2018), lay out a new long-term water conservation framework for California. This new framework is far-reaching for both the urban and agricultural sectors of California and represents a major shift in focus. Programs and initiatives are organized around four primary goals: (1) use water more wisely, (2) eliminate water waste, (3) strengthen local drought resilience, and (4) improve agricultural water use efficiency and drought planning.

The 2018 legislation defined a process to establish new, standards-based, urban water use objectives (targets) that go beyond the 2020 targets set in the Water Conservation Act of 2009. It also calls for the establishment of performance measures for Commercial, Industrial, Institutional (CII) water use, methods to strengthen local drought resilience including more robust water shortage contingency plans, a new five-year Drought Risk Assessment, and an annual water supply and demand assessment by urban water suppliers. DWR is required to prepare an annual report to the Water Board summarizing the annual assessment results, water shortage conditions, and a regional and statewide analysis of water supply conditions. To improve countywide drought planning, the code requires DWR to conduct a water shortage vulnerability study of rural and small communities and report back to the legislature with recommendations on implementation of drought contingency plans for rural small water systems.

Measures to improve agricultural water use efficiency include strengthened or new agricultural water management planning requirements include annual water budgets, water management objectives, the quantification of agricultural water use efficiency within an agricultural water supplier's service area, and new drought planning for periods of

limited supply.

To fully plan, develop and implement the new framework, DWR is responsible for numerous studies and investigations over the next three years which include the development of the following:

- Standards
- Guidelines and methodologies
- Performance measures
- Web-based tools and calculators
- Data and data platforms
- Reports
- Recommendations to the State Water Resources Control Board (Water Board) for adoption of new regulations.

A detailed outline of the key authorities, requirements, timeline, roles, and responsibilities of State agencies, water suppliers, and other entities during implementation of actions described in the 2018 water conservation legislation, can be found in the summary report [“Making Water Conservation a California Way of Life – Primer of 2018 Legislation on Water Conservation and Drought Planning, Senate Bill 606 \(Hertzberg\) and Assembly Bill 1668 \(Friedman\)”](#) prepared by DWR and the Water Board.

Additional information on agricultural water use efficiency, water management plans, and supplier compliance can be found in the [Agricultural Water Use Efficiency webpage](#) maintained by DWR’s Water Use and Efficiency Branch.

Potential Climate Change Driven Shifts in Hydrologic Conditions

DWR constantly reviews and analyzes hydrologic conditions in California and has been monitoring potential shifts in hydrology. The recent hydrologic conditions have been notable for warmer average temperatures, more extreme precipitation (larger storms and drier periods), a change in the form of precipitation to more rain and less snow, and a decreasing Sierra Nevada snowpack which impacts the timing and magnitude of snowmelt runoff volumes. WY 2021 was also atypical in that actual runoff fell short of forecast expectations. DWR has multiple efforts underway to compare and evaluate recent and long-term hydrologic characteristics. These studies have identified several trends in hydrologic conditions that have shifted the distributions of these conditions outside of the long-term historical distribution. Upcoming DCRs will include adjustments to account for these changes.

In addition, DWR recognizes the risk posed by climate change to future hydrologic and water supply conditions. DWR will continue to work with State Water Contractors and the scientific community to improve and expand the information in future DCRs to provide contractors with decision relevant information for their climate change adaptation planning needs.

Section 2: Regulatory Restrictions on State Water Project Delta Exports

Multiple objectives converge in the Delta: to protect a fragile ecosystem, to support Delta recreation and farming, and to provide water for agricultural and urban needs throughout most of California. Various regulatory requirements are placed on the SWP's Delta operations to protect special-status species such as delta smelt and spring- and winter-run Chinook salmon. As a result, restrictions on SWP operations imposed by State and federal fish and wildlife agencies contribute substantially to the challenge of accurately determining the SWP's water delivery capability in any given year.

Biological Opinions on Effects of Coordinated SWP and CVP Operations

Several fish species listed under the federal Endangered Species Act (ESA) as threatened or endangered are found in the Delta. The health and the viability of their populations are impacted by various factors, including SWP and CVP operations, nonnative species, predation, Delta salinity, water quality and contaminants, sediment supply, physical alterations to the Delta, land subsidence, pelagic organism decline, methylmercury and selenium, invasive aquatic vegetation, low dissolved oxygen (DO) levels and illegal harvest.

Because of the decline of these species, the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) have issued several Biological Opinions (BiOps) since the 1990s on the effects of coordinated SWP/CVP operations on several listed species. Examples are the USFWS BiOp for Delta smelt protection and NMFS BiOp for salmonids, green sturgeon, and Southern Resident killer whales.

These BiOps affect the SWP's water delivery capability in two ways. Most notably, they include terms that restrict SWP exports in the Delta to specific amounts at certain times under certain conditions. The BiOps also include Delta outflow requirements during certain times of the year thus reducing the available supply for export or storage.

The first BiOp on the effects of SWP (and CVP) operations was issued in February 1993

(NMFS BiOp) on effects of project operations on winter-run Chinook salmon and in March 1995 (USFWS BiOp) on project effects on delta smelt and splittail. Among other requirements, the BiOps contained requirements for Delta inflow, Delta outflow, and export pumping restrictions to protect listed species. These requirements imposed substantial constraints on Delta water supply operations. Many were incorporated into the 1995 *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta*² (1995 WQCP), as described in the “Water Quality Objectives” section, below.

The terms of the USFWS and NMFS BiOps have become increasingly restrictive over the years. In 2004 the USBR sought a new BiOp from USFWS regarding the operation of the CVP and the SWP (referred to collectively as Projects). USFWS issued the opinion in 2005, finding that the proposed coordinated operations of the Projects were not likely to jeopardize the continued existence of the delta smelt or result in the destruction or adverse modification of its critical habitat. After judicial review, the 2005 BiOp was vacated and USFWS was ordered to prepare a new one. USFWS found that the proposed operations of the Project would result in jeopardy to the delta smelt and in December 2008 issued a Jeopardy BiOp which included a Reasonable and Prudent Alternative (RPA) with more protective export restrictions and other actions intended to protect the delta smelt.

Similarly, in 2004 NMFS issued a BiOp on the effects of the coordinated operation of the Projects on salmonids, green sturgeon, and Southern Resident killer whales and found that the proposed operations of the Projects were not likely to jeopardize the continued existence of the listed species or result in the destruction or adverse modification of their critical habitat. After judicial review, the 2004 BiOp was rescinded, and NMFS was ordered to prepare a new one. In June 2009, NMFS issued a Jeopardy BiOp covering effects on winter-run and spring-run Chinook salmon, steelhead, green sturgeon, and killer whales. Like the 2008 smelt BiOp, the salmon BiOp included an RPA with more protective export restrictions and other actions intended to protect listed species.

The USFWS BiOp includes requirements on operations in all but 2 months of the year. The BiOp calls for “adaptively managed” (adjusted as necessary based on the results of monitoring) flow restrictions in the Delta intended to protect delta smelt at various life

² The SWRCB is currently updating the WQCP.

stages. USFWS determines the required target flow with the reductions accomplished primarily by reducing SWP and CVP exports. Because this flow restriction is determined based on fish location and decisions by USFWS staff, predicting the flow restriction and corresponding effects on export pumping with any great certainty poses a challenge.

The USFWS BiOp also includes an additional salinity requirement in the Delta for September and October in wet and above-normal water years, calling for increased releases from SWP and CVP reservoirs to reduce salinity. Among other provisions included in the NMFS BiOp, limits on total Delta exports have been established for the months of April and May. These limits are mandated for all but extremely wet years.

The 2008 and 2009 BiOps were respectively issued shortly before and after Governor Arnold Schwarzenegger proclaimed a statewide water shortage state of emergency in February 2009, amid the threat of a third consecutive dry year. NMFS calculated that implementing its BiOp would reduce SWP and CVP Delta exports by a combined 5% to 7%, but DWR's initial estimates showed an impact on exports closer to 10% in average years, combined with the effects of pumping restrictions imposed by the BiOps to protect delta smelt and other species. The California Department of Fish and Wildlife (CDFW) issued consistency determinations under Section 2080.1 of the California Fish and Game Code for these BiOps. The consistency determinations stated that the USFWS and the NMFS BiOps would be consistent with the California Endangered Species Act (CESA). Thus, CDFW allowed incidental take of species listed under both the federal ESA and CESA to occur during SWP and CVP operations without requiring DWR or the USBR to obtain a separate State-issued permit.³

³ However, CDFW stated in an October 2017 response letter to DWR that according to the evidence, the USFWS memorandum (2017 Memorandum), authorizing a change to the required location of X2 in September and October of Wet Years, would not be consistent with the California Endangered Species Act (CESA) requirements.

Reinitiation of Consultation for Long-Term Operations

In August 2016, the USBR and DWR requested Reinitiation of Consultation for Long-term Operations (RoC on LTO) of the CVP and SWP with NMFS and USFWS due to new information and science on declining listed fish species populations. On October 21, 2019, the [U.S. Fish and Wildlife Service and the National Marine Fisheries Service released their BiOps](#). USBR released a final EIS on the RoC on LTO on December 19, 2019 and approved a [Record of Decision](#) that finalized environmental review on February 18, 2020. The USBR began to operate according to the new operations plan in early 2020.

On September 30, 2021, the USBR requested RoC on LTO. The reinitiation is warranted based on anticipated modifications to the Proposed Action that may cause effects to listed species or designated critical habitats not analyzed in the USFWS and NMFS BiOps, dated October 21, 2019. The USBR and DWR anticipate new BiOps for the CVP and SWP. DWR will also be an applicant in the consultation and that CDFW will facilitate the process of DWR updating their Incidental Take Permit for SWP operations.

Incidental Take Permit

The 2008 USFWS and 2009 NMFS BiOps were consistent with CESA requirements. As such, further authorizations with respect to species listed under both ESA and CESA were not required. Under section 2081 of the California Fish and Wildlife Code, DWR held an ITP from the CDFW related to Longfin smelt.

With the expiration of the Incidental Take Permit (ITP) at the end of December 2019 and the decision to pursue a separate state permit to ensure the SWP's compliance with CESA rather than relying on a consistency determination with Federal permits, DWR pursued a new ITP.

The ITP covers species listed under CESA subject to incidental take through long-term operation of the SWP, including Delta smelt, Longfin smelt, winter-run Chinook salmon and spring-run Chinook salmon. An EIR on the new ITP was issued in November 2019, an ITP application was submitted to CDFW in December 2019, and the new ITP was issued on March 31, 2020. DWR began to operate according to the ITP from April 2020.

The key elements of DWR's long-term operations of the SWP through the ITP include:

- Stronger species protections
- Water dedicated for delta outflow
- Innovative use of facilities for fish management
- Decision-making authority for CDFW
- New protections for migrating salmon
- Operational clarity and flexibility
- Real-time operations
- Adaptive management plan
- Enhanced studies, monitoring, and financial commitments
- SWP exports similar to existing conditions

For more information, see the Final EIR for the SWP Long-Term Operations:

<https://water.ca.gov/News/Public-Notices/2020/March-2020/Final-EIR-for-SWP-Operations>.

Delta Inflows

Delta inflows vary considerably from season to season, and from year to year. For example, in an above-normal year, nearly 85% of the total Delta inflow comes from the Sacramento River, more than 10% comes from the San Joaquin River, and the rest comes from the three eastside streams (the Mokelumne, Cosumnes, and Calaveras Rivers).

The type of water year (WY) is an important factor depicting the relative volume of Delta inflows compared to other years. One of the widely used water year type (WYT) indices used in California is the Sacramento Valley Index (SVI)⁴; It is calculated using the sum of unimpaired flow in million acre-feet (MAF) at the following locations:

- Sacramento River Above Bend Bridge
- Feather River at Oroville (aka inflow to Lake Oroville)
- Yuba River near Smartville
- American River below Folsom Lake

SVI WYTs are designated by DWR as “wet” (W), “above normal” (AN), “below normal” (BN), “dry” (D), or “critical” (C). The thresholds are shown in Table 2-1 below:

Table 2-1. Sacramento Valley Index Year Type Classification Thresholds in MAF

Year type classification	Threshold criteria (MAF)
Wet	Equal to or greater than 9.2
Above Normal	Greater than 7.8, and less than 9.2
Below Normal	Greater than 6.5, and equal to or less than 7.8
Dry	Greater than 5.4, and equal to or less than 6.5
Critical	Equal to or less than 5.4

All other factors (such as upstream level of development) being equal, much less water

⁴ The equation is: $SVI = (0.4 \times \text{current April-July runoff}) + (0.3 \times \text{current October-March runoff}) + (0.3 \times \text{previous year's index})$

will flow into the Delta during a dry or critical water year (that is, during a drought) than during a wet or above-normal water year. Fluctuations in inflows are a substantial overall concern for the Delta, and a specific concern for the SWP; such fluctuations affect Delta water quality and fish habitat, which in turn trigger regulatory requirements that constrain SWP Delta exports.

Delta inflows will also vary by time of year as the amount of precipitation varies by season. About 80% of annual precipitation occurs between November and March, and very little rain typically falls from June through September. Upstream reservoirs regulate this variability by reducing flood flows during the rainy season and storing water to be released later in the year to meet regulatory requirements and water demands.

Water Quality Objectives

Because the Delta is an estuary, salinity is a concern. In the 1995 Bay-Delta Water Quality Control Plan (WQCP), the State Water Board set water quality objectives to protect beneficial uses of water in the Delta and Suisun Bay. The objectives must be met by the SWP and federal CVP as specified in the water right permits issued to DWR and the USBR. These objectives— minimum Delta outflows, limits on SWP and CVP Delta exports, and maximum allowable salinity levels—are enforced through the provisions of the [State Water Board's Water Right D-1641](#), issued in December 1999 and updated in March 2000, which officially instated the 1995 WQCP.

Both DWR and the USBR must monitor the effects of their respective diversions and project operations to ensure compliance with existing water quality objectives.

Among the objectives established in the 1995 WQCP and D-1641 are the “X2” objectives. X2 is defined as the distance in kilometers from the Golden Gate, where salinity concentration in the Delta is 2 parts per thousand. The location of X2 is used as a surrogate measure of Delta ecosystem health.

For the X2 objective to be achieved, the X2 position must remain downstream of Collinsville in the Delta, February through June, and downstream of other specific locations in the Delta on a certain number of days each month from February through June. This means that Delta outflow, which among other factors controls the location of X2 must be at certain specified levels at certain times. This can limit the amount of water the SWP may pump at those times at its Harvey O. Banks Pumping Plant in the Delta.

Because of the relationship between seawater intrusion and interior Delta water quality, meeting the X2 objective can also improve water quality at Delta drinking water intakes; however, meeting the X2 objectives can require a relatively large volume of water for outflow during dry months that follow months with large storms.

The 1995 WQCP and D-1641 also established an export/inflow (E/I) ratio. The E/I ratio is designed to provide protection for the fish and wildlife beneficial uses in the Bay Delta estuary. The E/I ratio limits the fraction of Delta inflows that are exported. When other restrictions are not controlling, Delta exports are limited to 35% of total Delta inflow from March through June and 65% of inflow from July through January. The February E/I ratio can vary from 35% to 45% depending on the January Eight River Index (8RI). The 8RI is

the sum of the Sacramento River and San Joaquin River Runoff. This index is used from December through May to set flow objectives as implemented in SWRCB D-1641.

In December 2018 the State Water Board updated the WQCP for the San Joaquin River flows and southern Delta Salinity. The State Water Board is in the process of updating the WQCP for Sacramento/Delta Flows and Cold Water, Delta Outflows, and Interior Delta Flows. (Formally these processes were referred to Phase 1 and Phase 2 respectively). A primary focus of the WQCP update is on additional flows for the beneficial use of fish and wildlife. Based on the environmental documentation that has been produced up to this date by the State Water Board, it is likely that the implementation of these flow requirements will affect SWP contractor deliveries.

The San Joaquin River (SJR) portion of the WQCP update was approved in December 2018 but not implemented. There also needs to be a Decision (like Decision-1641) that amends the water rights license and permits for the SWP and CVP (the Projects collectively) to require the Projects and others to meet the Bay-Delta Plan before the SWP operates to the approved SJR portion of the update. As a result, the 2021 Report assumes the existing Decision-1641 in its modeling.

Voluntary Agreements

DWR and CDFW are working to establish the Voluntary Agreements (VAs) with participating water users following adoption by SWRCB of the San Joaquin River/southern Delta salinity WQCP update. The VAs involve the development of projects that provide flow augmentation, modified storage releases and non-flow actions such as floodplain inundation to enhance Delta conditions. Both departments are continuing the effort to develop and evaluate proposed voluntary agreements. On March 1, 2019, DWR and DFW submitted documents to the State Water Resources Control Board that reflect progress on the previously submitted framework. The objectives are to improve conditions for fish through targeted river flows and a suite of habitat-enhancing projects including floodplain inundation and physical improvement of spawning and rearing areas. Further work and analysis are needed to determine whether the agreements can meet environmental objectives required by law and identified in the State Water Board's update to the Bay-Delta Water Quality Control Plan.

As stated under the Water Quality Objectives background, the WQCP San Joaquin River/southern Delta salinity portion was approved but has not been implemented. This spanned from 2018 until early 2020, as there was debate regarding the forward progress of the WQCP update.

On March 29, 2022, a "Memorandum of Understanding" (MOU) advancing a term for the VAs was released that outlined the terms of an eight-year program. The program would provide new flows for the environment above existing regulatory requirements, create new and restored habitat for fish and wildlife, provide funding for environmental improvements and water purchases, and start a collaborative science program for monitoring and adaptive management. However, the VAs have not been officially finalized. Therefore, 2021 Report assumes the existing Decision-1641.

2018 Coordinated Operation Agreement Addendum

Originally negotiated and signed in 1986, the Coordinated Operation Agreement (COA) establishes the shared responsibility for each of the SWP and CVP to meet water quality and regulatory standards. Between 1986 and 2018, the State Water Resources Control Board imposed additional restrictions, including new Delta outflow requirements, which further restricted Delta exports and affect CVP and SWP operations. In response to these changes, a joint review of the 1986 agreement was conducted by both projects. At the conclusion, DWR and the USBR agreed to the COA Addendum to reflect the current regulatory environment and operations of the projects. The 2018 agreement addendum is included in the CalSim modeling analysis in this document.

Section 3: Ongoing Environmental and Policy Planning Efforts

It is hard to overstate the Delta's importance to California's economy and natural heritage. The Delta supplies a large share of the water used in the state. California would not be the same without that water — hundreds of billions of dollars of economic activity depend upon it. Southern California, with half of the state's population, gets almost a quarter of its average water supply from the Delta; Kern County, which produces about \$7 billion annually in grapes, almonds, pistachios, milk, citrus, and other agricultural products, depends on the Delta for about a fifth of its irrigation supply. The west side of the San Joaquin Valley also produces billions of dollars' worth of food and depends on the Delta for about three-quarters of its irrigation supply; and the San Francisco Bay Area, including the innovation hub of Silicon Valley, takes about half of its water supply from the Delta and its tributaries.

At the same time, the hundreds of miles of river channels that crisscross the Delta's farmed islands provide a migratory pathway for Chinook salmon, which support an important West Coast fishing industry. Other native fish species depend upon the complex mix of fresh and saltwater in the Delta estuary. Multiple stressors have impaired the ecological functions of the Delta, and concerns have been growing over the ability to balance the many needs of both people and the ecosystem.

To respond to these concerns, considerable effort by government agencies and California water community has been spent during the past several decades to study ways that the problems in the Delta can be addressed, and the more recent attention to the effects of climate change has helped the water community to realize the urgency of addressing these problems. The essential part of all these efforts has been to find a comprehensive solution that brings various, sometimes competing, interests together in a coordinated and concerted set of actions. The Delta Plan, Delta Conveyance Project (DCP), and California EcoRestore are three large-scale statewide efforts. Since 2010, the Delta Stewardship Council (DSC) has developed, amended, and begun implementing the Delta Plan. The DCP, on the other hand, is currently under development. Lastly, California EcoRestore celebrated its first five years in 2020 and was on track to exceed initial targets.

Delta Plan

After years of concern about the Delta amid rising water demand and habitat degradation, the DSC was created in legislation to achieve State-mandated coequal goals for the Delta. As specified in Section 85054 of the California Water Code:

“Coequal goals” means the two goals of providing more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. These goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.

The Council is required to review the Delta Plan at least every five years. The first Delta Plan was adopted by the Council on May 16, 2013. The State Office of Administrative Law (OAL) approved the 14 regulations to implement the Delta Plan, which became effective with legally enforceable regulations on September 1, 2013.

To be responsive to changing circumstances and in accordance with commitments made in the 2013 Plan, the Council amended the Delta Plan twice in 2016. The latest Delta Plan was released last April 2018 and amended July 2019. The Delta Plan contains a set of 14 regulatory policies as well as 95 recommendations, which are non-regulatory but identify actions essential to achieving the coequal goals.

Delta Conveyance Project

On May 2, 2019, Governor Gavin Newsom ended California WaterFix and announced a new approach to modernize Delta Conveyance through a single tunnel alternative. Governor Newsom also released Executive Order 10-19 which directed state agencies to inventory and assess the new planning for the single tunnel project. DWR then withdrew all project approvals and permit applications for California WaterFix, thus, effectively ending the twin tunnels project.

A progress report highlighting Delta Conveyance Project (DCP) activities, actions, and milestones from 2019 through 2021 is now available. Please click the following link to see a summary of planning, public outreach and information, and design and engineering activities conducted over the past three years: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Delta-Conveyance/Public-Information/DCP_ProgressReport_2019-2021_Final.pdf

of July 27, 2022, the Draft Environmental Impact Report (EIR) for public review and comment was released. Everyone is invited to visit the [Draft EIR website](#) to access the document and accompanying informational materials and learn more about the proposed project and the public review process, including public hearing details and commenting opportunities.

What: Public comment period for the Delta Conveyance Project Draft EIR

When: 90-day comment period from July 27, 2022, through October 27, 2022

Where: Review Online at www.deltaconveyanceproject.com

Review In-Person: A digital copy of the Draft EIR is available at the following locations:

- **DWR Office:** 3500 Industrial Blvd., Room 117, West Sacramento, CA 95691
- **Libraries:** A full list of libraries across the state where the public can access the Draft EIR can be found

How: Members of the public can submit comments on the Draft EIR in the following ways:

- **Email:** deltaconveyancecomments@water.ca.gov
- **Online:** deltaconveyanceproject.com
- **Mail:** Department of Water Resources, Attn: Delta Conveyance Office, P.O. Box

942836, Sacramento, CA 94236-0001

- **Virtual Public Hearing:** Provide verbal public comment at a virtual public hearing
 - Tuesday, September 13, 2022, 9:00 a.m. to 11:00 a.m.
 - Thursday, September 22, 2022, 12:00 p.m. to 2:00 p.m.
 - Wednesday, September 28, 2022, 5:30 p.m. to 7:30 p.m.

For more information on the DCP, please visit the following website:

<https://www.deltaconveyanceproject.com/>

EcoRestore

Governor Brown announced the creation of the California EcoRestore program in April 2015, committing to restore more than 30,000 acres of Delta habitat by 2020. This comprehensive suite of habitat restoration actions under the California EcoRestore program includes specific targets for floodplain, tidal and sub-tidal, managed wetlands, and fish passage improvements to benefit native fish species and a commitment to adaptive management. As of January 2021, more than 38,000 acres have been restored from the EcoRestore program.

For more information, visit <https://water.ca.gov/Programs/All-Programs/EcoRestore>.

Section 4: State Water Project Historical Deliveries (2011-2020)

Section 4 and Section 6 present the SWP Historical Deliveries from 2011-2020 (Calendar year). Section 4 focuses on the annual minimum, maximum, and average total contractor combined deliveries during this 10-year (2011-2020) period. Section 6 includes tables of annual historical deliveries by various water classifications for each SWP Contractor for 2011–2020.

Contractor deliveries are presented as four different delivery types - Table A delivery, Article 21 delivery, carryover delivery, or turnback delivery. These delivery types are briefly described below.

“Table A” Water is an exhibit to the SWP’s water supply contracts. The maximum Table A amount is the basis for apportioning water supply and costs to the SWP contractors.

Once the total amount of water to be delivered is determined for the year, all available water is allocated in proportion to each contractor’s annual maximum SWP Table A amount.

Article 21 Water (it is described in Article 21 of the water contracts) is water that SWP contractors may receive on a short-term basis in addition to their Table A water, if they request it. Article 21 water is used by many SWP contractors to help meet demands when allocations are less than 100%. The availability and delivery of Article 21 water cannot interfere with normal SWP operations.

Carryover Water is SWP water that is allocated to an SWP contractor and approved for delivery to that contractor each year, but not used by the end of the year. This water is exported from the Delta by the Banks Pumping Plant, but instead of being delivered to the contractor, it is stored in the SWP’s share of San Luis Reservoir, when space is available, for the contractor to use in the following year.

Turnback Pool Water SWP contractors may offer a portion of their Table A water that has been allocated in the current year and exceeds their needs to a “turnback pool,” where another contractor may purchase it. Contractors that sell their extra Table A water in a turnback pool receive payments from contractors that buy this water.

Table 4-1 lists the 2021 maximum annual SWP Table A water contract amounts for SWP contractors. Figure 4-1 shows that the historical deliveries from 2011-2020 of SWP Table A water including the carryover water deliveries range from a minimum of 474 TAF (2014) to a maximum of 3,094 TAF (2017), with an average 1,880 TAF/year. Total historical SWP deliveries, including Table A, Article 21, turnback pool, and carryover water, range from 476 to 3,404 TAF/year, with an average of 1,994 TAF/year in the same 2011-2020 period (Figure 4-2).

Table 4-1. 2021 Maximum Annual SWP Table A Water Contract Amounts for SWP Contractors

Contractor	Maximum Table A Delivery Amounts (acre-feet)
Feather River Area Contractors	
Butte County	27,500
Yuba City	9,600
Plumas County Flood Control and Water Conservation District	2,700
Subtotal	39,800
North Bay Area Contractors	
Napa County Flood Control and Water Conservation District	29,025
Solano County Water Agency	47,756
Subtotal	76,781
South Bay Area Contractors	
Alameda County Flood Control and Water Conservation District, Zone 7	80,619
Alameda County Water District	42,000
Valley Water (also known as Santa Clara Valley Water District)	100,000
Subtotal	222,619
San Joaquin Valley Area Contractors	
Dudley Ridge Water District	41,350
Empire West Side Irrigation District	3,000
Kern County Water Agency	982,730
Kings County	9,305
Oak Flat Water District	5,700
Tulare Lake Basin Water Storage District	87,471
Subtotal	1,129,556
Central Coastal Area Contractors	
San Luis Obispo County Flood Control and Water Conservation District	25,000
Santa Barbara County Flood Control and Water Conservation District	45,486
Subtotal	70,486
Southern California Area Contractors	
Antelope Valley–East Kern Water Agency	144,844
Santa Clarita Valley Water Agency	95,200
Coachella Valley Water District	138,350
Crestline–Lake Arrowhead Water Agency	5,800
Desert Water Agency	55,750
Littlerock Creek Irrigation District	2,300
Metropolitan Water District of Southern California	1,911,500
Mojave Water Agency	89,800
Palmdale Water District	21,300
San Bernardino Valley Municipal Water District	102,600
San Gabriel Valley Municipal Water District	28,800
San Geronio Pass Water Agency	17,300
Ventura County Watershed Protection District	20,000
Subtotal	2,633,544
TOTAL TABLE A AMOUNTS	4,172,786

Source: [California State Water Project Bulletin 132-18 Appendix B \(Table B-4\)](#).

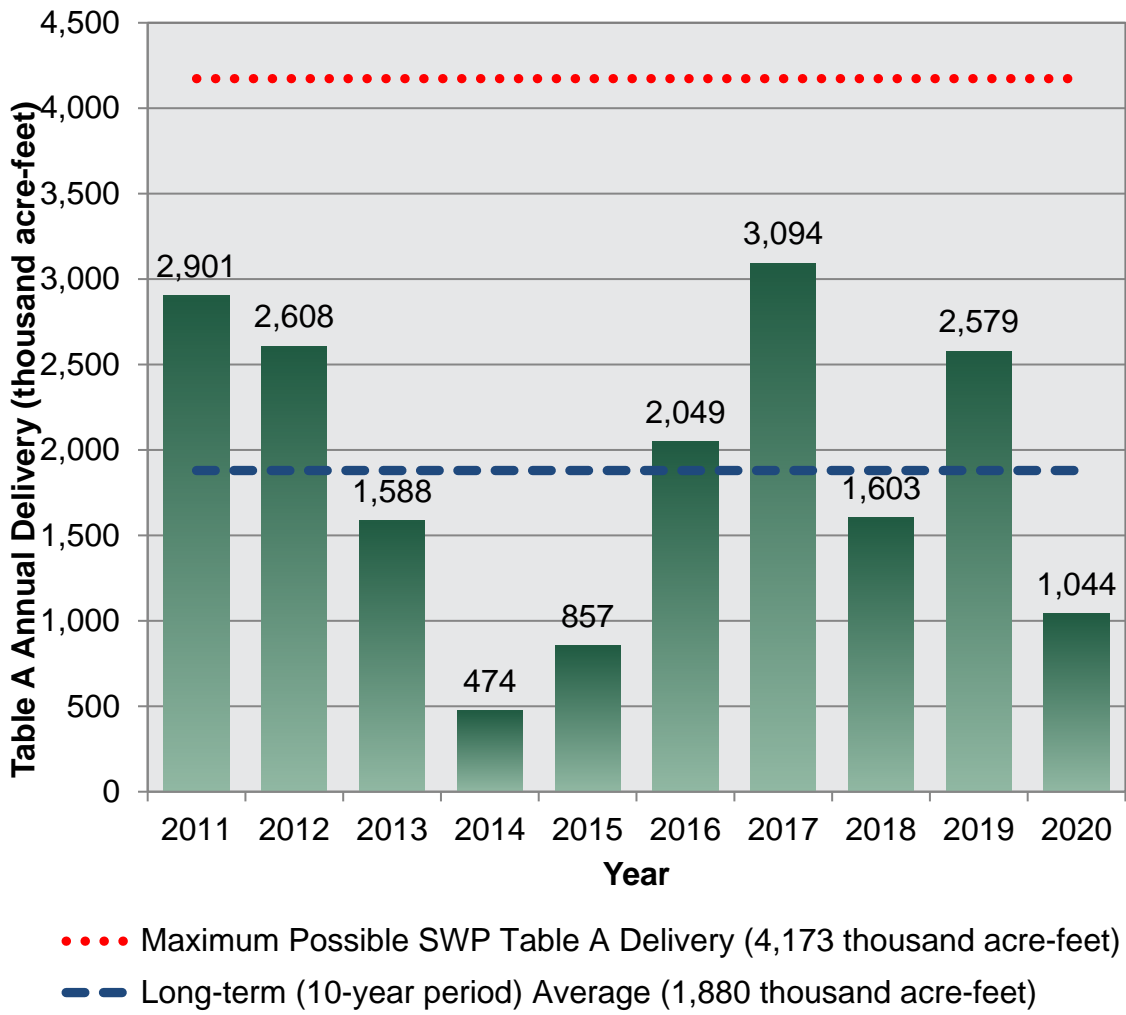


Figure 4-1. Historical Deliveries of SWP Table A and Carryover Water, 2011-2020

Note: The differences in historical deliveries from the 2019 Report are due to the State Water Project Analysis Office (SWPAO) reclassification of the various components of water delivered to the SWP contractors.

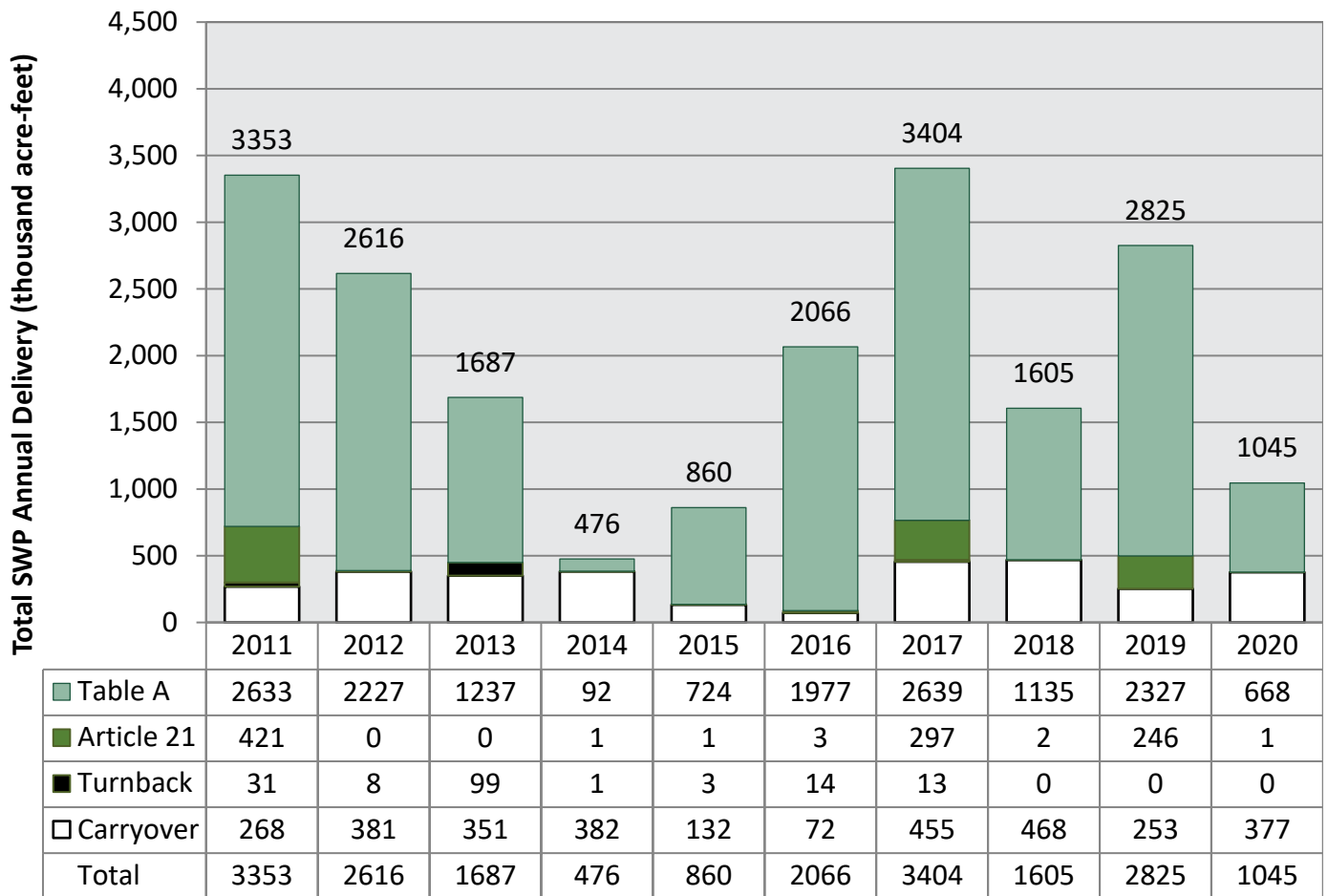


Figure 4-2. Total Historical SWP Deliveries, 2011–2020 (by Delivery Type)

Note: The differences in historical deliveries from the 2019 Report are due to reclassification of the various components of water delivered to SWP contractors.

Section 5: Existing State Water Project Water Delivery Capability

Model Choice – CalSim 3

An improved water resources planning model, CalSim 3, is the model of choice for 2021 Report. CalSim 3 is an attempt to advance the science of DWR and the USBR modeling of the SWP, CVP, and the hydraulically connected parts of those joint systems. In comparison to CalSim II, the model used in the 2019 Report, the CalSim 3 model incorporates the following updates/features:

- Extended spatial domain. CalSim 3 expanded its geographic coverage into the upper watersheds of the Sacramento and San Joaquin River basins.
- Extended simulation period. CalSim II's simulation period is from WY 1922-2003 while CalSim 3's is from WY 1922-2015, adding twelve more years to the period of record.
- Improved hydrological inputs into the model. Input hydrological time series in CalSim 3 better match historical records.
- Linkage to a finite element distributed groundwater model through a dynamic link library that more explicitly simulates groundwater flows, elevation, and stream-groundwater interaction.
- Updated model parameters such as: Net Delta Outflow Index (NDOI), Delta Channel Depletion (DCD), Old-Middle River (OMR) index, and SWP San Luis rule curve.
- Refinements of model implementation of ITP actions proposed by Contra Costa Water District (CCWD). The actions modified include the Spring Outflow Block, Additional 100 TAF of Delta outflow, and Suisun Marsh Salinity Control Gate (SMSCG) Operations.
- Inclusion of the Recapture component of the San Joaquin River Restoration Program (SJRRP) at the Lower San Joaquin River.

- Updated reservoir initial conditions
- Updated CVP allocation and SWP dry year allocation logic

Hydrologic Sequence

SWP delivery amounts are estimated in this 2021 Report for existing conditions using computer modeling that incorporates the historic range of hydrologic conditions (i.e., precipitation and runoff) that occurred from WY 1922 through 2015. This is the period of record used in the CalSim 3 model. The historic hydrologic conditions are adjusted to account for land-use changes (i.e., the current level of development) and upstream flow regulations as existed in 2021, and current sea levels reflecting sea level rise. By using this 94-year historical flow record, the delivery estimates modeled for existing conditions reflect a reasonable range of potential hydrologic conditions from wet years to critically dry years.

Existing Demand for Delta Water

Demand levels for the SWP water users in this report are derived from historical data and information from the SWP contractors themselves. The amount of water that the SWP contractors request each year is related to:

- The magnitude (maximum contracted amount)
- The extent of water conservation measures in place
- Local weather patterns
- Water costs

The existing level of development (i.e., the level of water use in the source areas from which the water supply originates) is based on recent land uses and is assumed to be representative of existing conditions for the purposes of this 2021 Report.

SWP Table A and Article 56 Water Demands

The current combined maximum Table A amount is 4,173 TAF/year. See Table 4-1 in Section 4, "State Water Project Historical Delivery Capability (2011-2020)". Of the combined maximum Table A amount, 4,133 TAF/year is the SWP's maximum Table A water available for delivery from the Delta. The estimated demands by SWP contractors for deliveries of Table A water from the Delta under existing conditions are assumed to be the maximum SWP Table A delivery amount for the 2021 Report (Table 5-1), which is the same as in the 2019 Report.

Table 5-1. Comparison of Estimated Average, Maximum, and Minimum Demands for SWP Table A Water, Excluding Feather River Area Contractors (Existing Conditions, in TAF/year)

Statistics	2019 Report	2021 Report
Average	4,133	4,133
Maximum	4,133	4,133
Minimum	4,133	4,133

The Maximum Contractual Table A amount was updated according to Bulletin 132-18 for the 2021 Report. Dudley Ridge Water District's contract decreased from 45,350 acre-feet to 41,350 acre-feet in 2020. On the other hand, Mojave Water Agency's contract increased from 85,800 acre-feet to 89,800 acre-feet in 2020.

SWP Article 21 Water Demands

Under Article 21 of the SWP's long-term water supply contracts, contractors may receive additional water deliveries only under the following specific conditions:

- Such deliveries do not interfere with SWP Table A allocations and SWP operations
- Excess water is available in the Delta
- Capacity is not being used for SWP purposes or scheduled SWP deliveries
- Contractors can use the SWP Article 21 water directly or can store it in their own system (i.e., the water cannot be stored in the SWP system).

The demand for SWP Article 21 water by SWP contractors is assumed to vary depending on the month and weather conditions (i.e., amounts of precipitation and runoff). SWP Article 21 water demands used in the 2021 Report vary depending on whether it is a Kern River wet year. A Kern River wet year is defined as a year when the annual Kern River flow is projected to be greater than 1,500 TAF. There are nine Kern River wet years in the simulation period of 1922 – 2015 (1941, 1952, 1969, 1978, 1980, 1983, 1986, 1995, and 1998). Kern River inflows are important because they are a major component of the local water supply for Kern County Water Agency (KCWA), which is the second largest SWP Contractor and possesses significant local groundwater recharge capability. During Kern River wet years, KCWA uses more Kern River flows to recharge its groundwater storage and reduce its demand for Article 21 water.

As shown in Figure 5-1, existing demands for SWP Article 21 water estimated for this 2021 Report are assumed to be higher during the late fall, winter, and spring (November-June) in Kern River non-wet years (166-377 TAF/month) than in Kern River wet years (6-201 TAF). In non-wet years, most of the irrigation districts in the Kern service area cannot rely as heavily on the Kern River flows to recharge their groundwater basins. Demands are assumed to be lower (6-48 TAF/month) from July through October in both Kern River wet and non-wet years.

The Article 21 demand patterns were not changed and are the same with those from the 2019 Report.

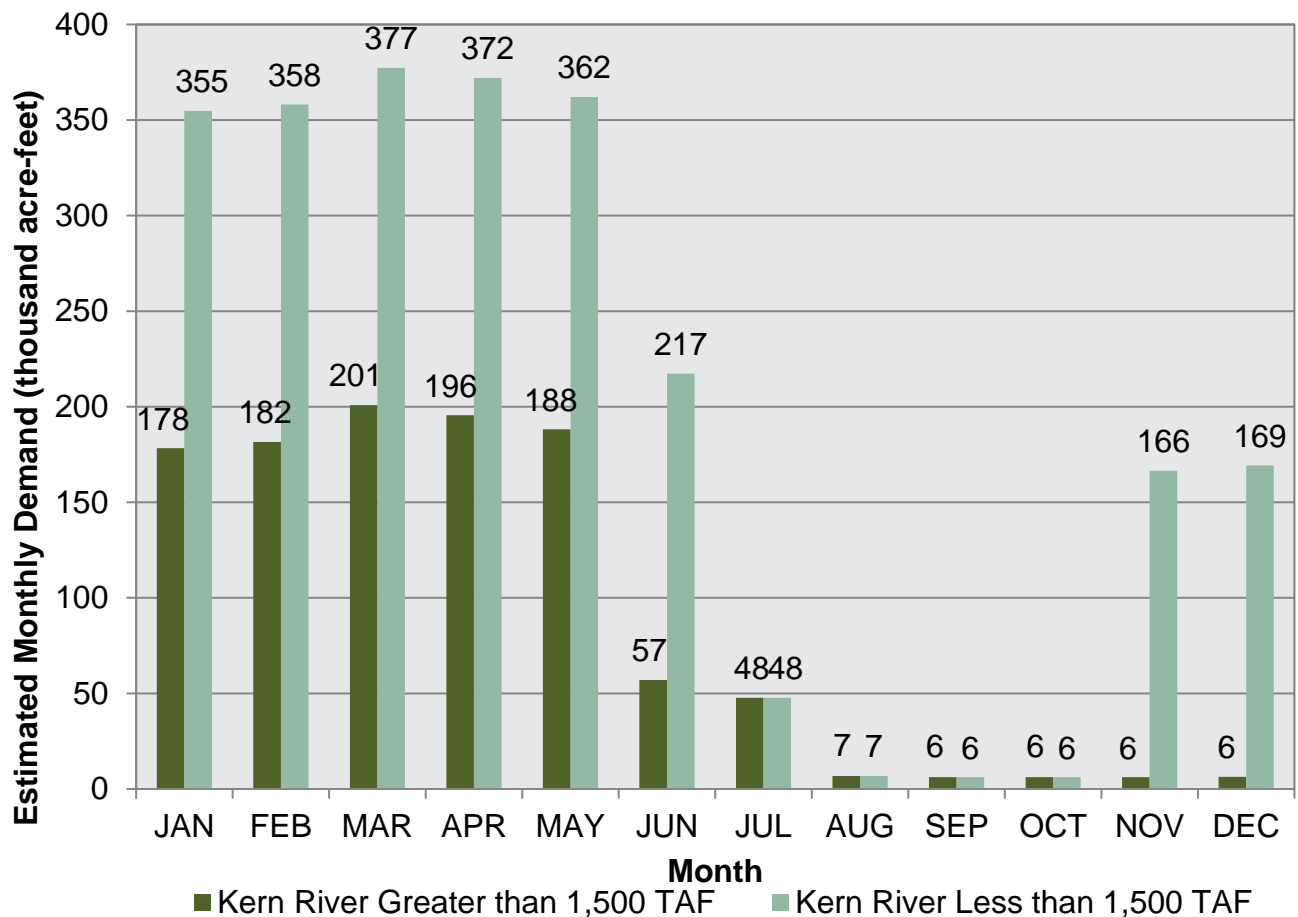


Figure 5-1. SWP Article 21 Demands during Kern River Wet Years and Non-Wet Years (Existing Conditions)

Note: Values shown are the maximum amount that can be delivered monthly. However, the actual capability of SWP water contractors to take this amount of SWP Article 21 water is not the sum of these maximum monthly values.

Estimates of SWP Table A Water Deliveries

Table 5-2 presents the annual average, maximum, and minimum estimates of SWP Table A deliveries from the Delta for existing conditions for the 2019 and 2021 Reports within an SWP contract year⁵. Average long-term Table A deliveries decreased in the 2021 Report compared to 2019 by 93 TAF. Note that the simulation periods in both studies are different. The 2021 Report’s simulation period now spans WY 1922-2015 while that of the 2019 Report only spans WY 1922-2003.

The average annual SWP Table A delivery in the 2021 Report during the WY 1922–2003 simulation period is 2,342 TAF/year. When comparing the WY 1922-2003 period between 2019 and 2021 Report, the average Table A deliveries decreased by 72 TAF (in contrast to 93 TAF as indicated earlier).

From this point forward (unless otherwise mentioned), the long-term period of record for 2019 Report spans from WY 1922-2003 and 2021 Report’s from WY 1922-2015.

Table 5-2. Estimated Long-Term Annual Average, Maximum, and Minimum Deliveries of SWP Table A Water, Excluding Feather River Area Contractors (Existing Conditions, in TAF/year)

Statistic	2019 Report (1922-2003)	2021 Report (1922-2015)
Average	2,414	2,321
Maximum	4,008	4,004
Minimum	288	230

Figure 5-2 shows the average annual SWP exports and Table A deliveries from the 2005 through 2021 Reports. Exports and deliveries decreased from 2005 to 2009 due to Delta regulations which constrained exports, culminating in the 2008-2009 BiOps. Average annual exports and deliveries were then relatively stable through 2017, before decreasing again in 2019 due to changes described in the 2019 Report. In the 2021 Report, annual exports and deliveries decreased due to several factors. These include changes in hydrology, extended simulation period, more explicit representation of groundwater and surface water interactions, and other updates as highlighted in the beginning of this chapter. Aside from the model switch from CalSim II to CalSim 3, incorporation of the

⁵ A contract year begins in January and ends in December (same as a calendar year).

Recapture component in the San Joaquin River Restoration Program which reduces Vernalis inflow to Delta and refinement of the SWP San Luis rule curve representation play a role in lower Table A deliveries in the 2021 Report.

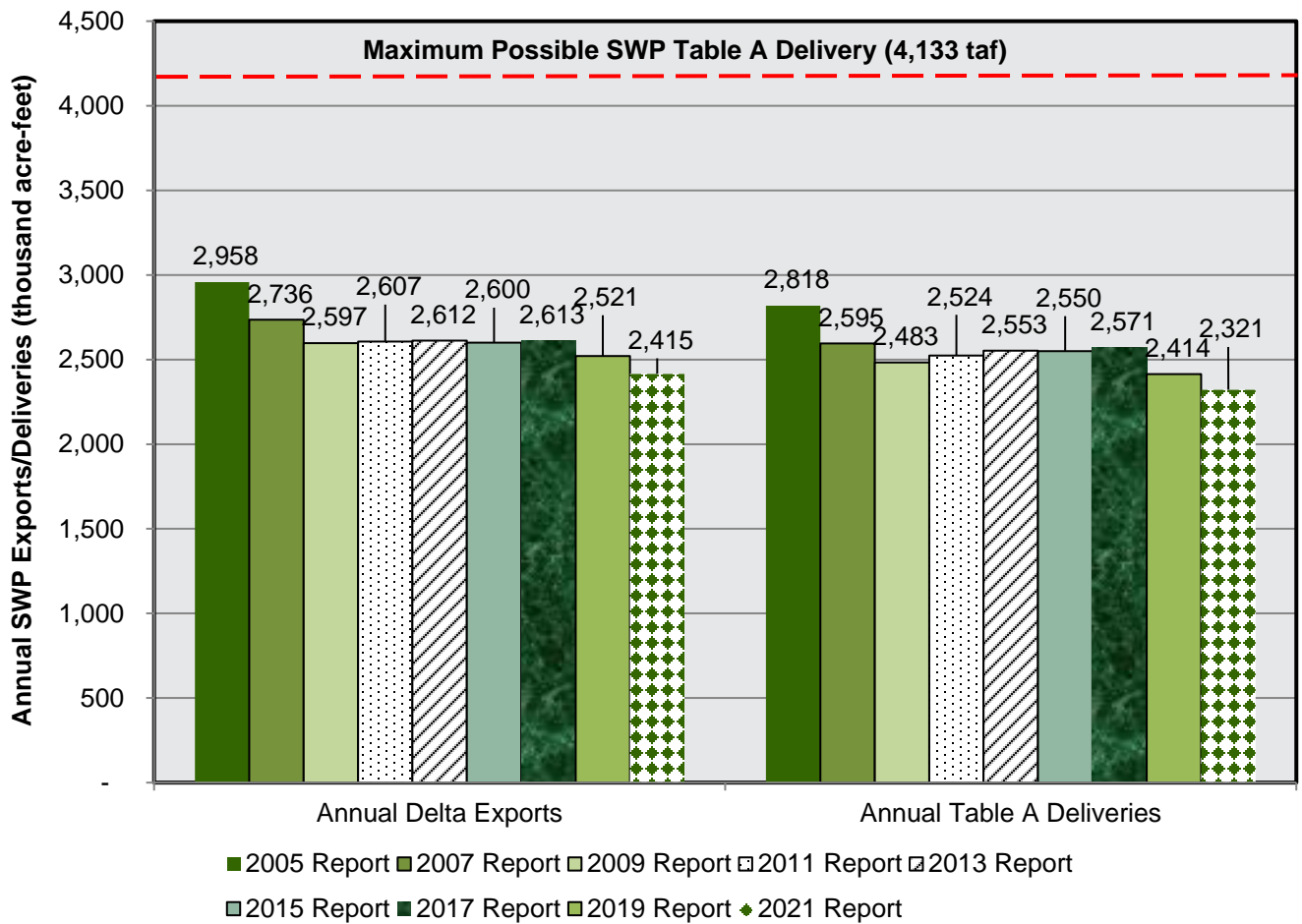


Figure 5-2. Estimated Average Annual Delta Exports and SWP Table A Water Deliveries (Excluding Feather River Area Contractors), for 2005 through 2021 Reports

Figure 5-3 presents the estimated likelihood of delivery of a given amount of SWP Table A water under the existing conditions scenario, as estimated for both the 2019 and 2021 Reports. This figure shows a 70% likelihood (compared to 72% in the 2019 Report) that more than 2,000 TAF/year of Table A water will be delivered under the current estimates.

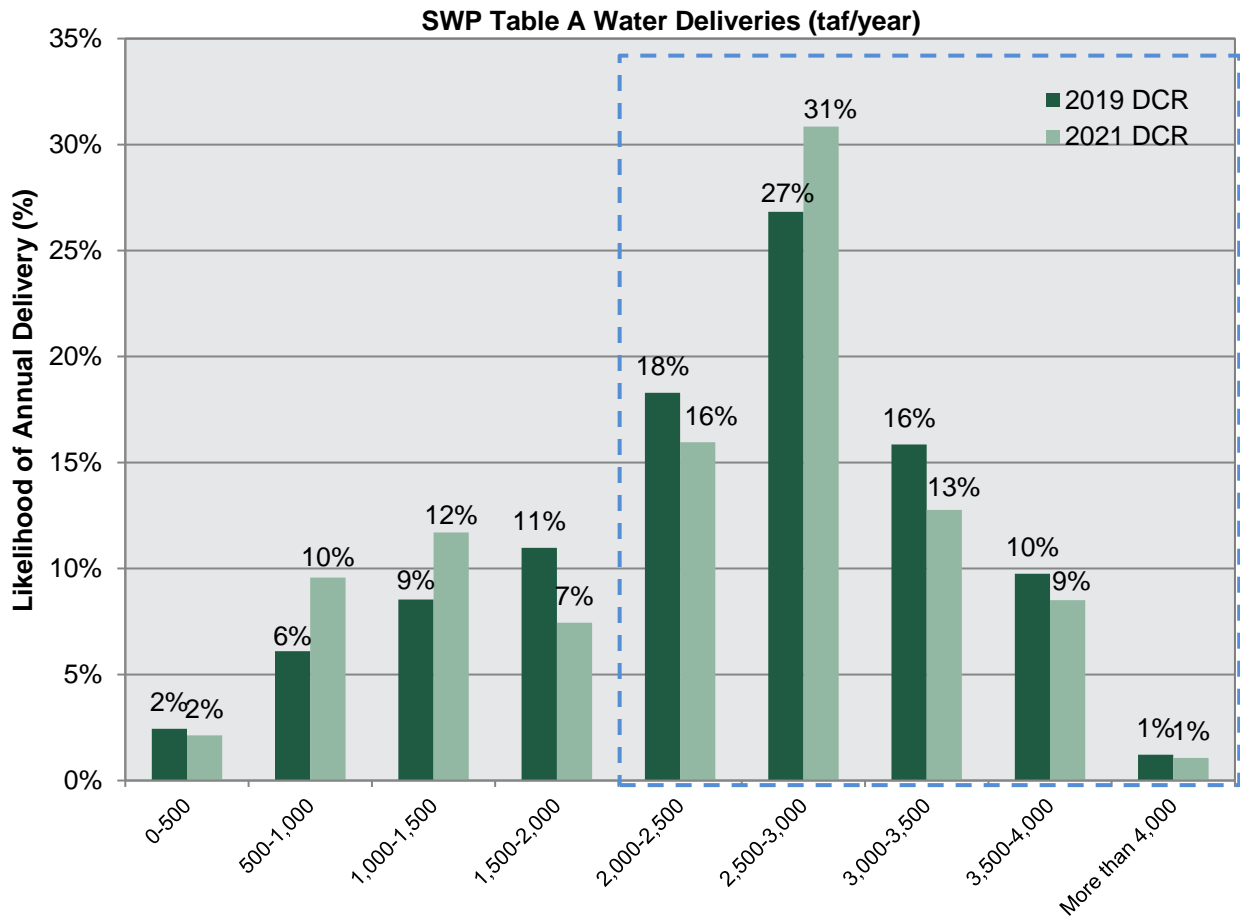


Figure 5-3. Estimated Likelihood of SWP Table A Water Deliveries, by Increments of 500 TAF (Excluding Feather River Area Contractors)

Wet-Year Deliveries of SWP Table A Water

Table 5-4 and Figure 5-4 present estimates of SWP Table A water deliveries under existing conditions during possible wet conditions and compare them with corresponding delivery estimates calculated for the 2019 Report. Wet periods for the 2021 Report are determined using historical precipitation and runoff patterns from the 1922–2015 period of record, although existing 2021 conditions (e.g., land use, water infrastructure) are also accounted for in the modeling. For reference, the wettest single year according to the historical Sacramento Valley Index (SVI) during the period of record was 1983. This year had the highest historical index at 15.29 million acre-feet (MAF).⁶ (Refer to Delta Inflows section for background on WYTs and SVI)

The results of modeling existing conditions over historical wet years indicate that SWP Table A water deliveries during wet periods can be estimated to range between yearly averages of 2,925 to 4,004 TAF. Table 5-4 and Figure 5-4 show that the 2021 deliveries of SWP Table A water decreased in all wet periods in comparison to the 2019 Report except in 1982-1983 where the 2021 Report 2-year deliveries are higher by 11 TAF.

Table A deliveries in 1983 (single wet year) are 97% of the Maximum Table A in 2019 and 95% in 2021 although the final raw allocation is 100%. A common inquiry is why Table A deliveries in both the 2019 and 2021 Reports are not 100% in 1983 despite the 100% allocation.

The Table A final allocation in contract year 1983 was 100% (Table 5-3). As such, SOD Table A contractors (including Napa County and Solano County) can theoretically receive the full 4,133 TAF allotment. In the 2019 DCR, of the maximum allotment, 3,470 TAF was delivered in contract year 1983 while 663 TAF was held for delivery as Article 56 in the following contract year (1984). Table A allocation in contract year 1982 was also 100%. As such, 663 TAF of Article 56 was requested to be delivered in 1983.

⁶ Data was obtained from the Chronological Reconstructed Sacramento Water Year Hydrologic Classification Indices section from CDEC at the following link: <https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST>

However, in the 2019 DCR, 125 TAF of the carryover request from 1982 spilled in contract year 1983 in February and March because San Luis reservoir filled up in those months. Therefore, the total contract delivery in 1983 was 3,470 TAF of Table A and 539 TAF of Article 56 for a total of 4,008 TAF. This is 97% of the maximum Table A amount of 4,133 TAF.

Similar behavior can be observed in the 2021 DCR. Instead, 196 TAF of the carryover request from 1982 spilled. This amount is 71 TAF more than the carryover spilled in the 2019 DCR (i.e., 125 TAF). Due to this higher carryover spill in the 2021 DCR, only 95% of the 4,133 TAF contract supply was delivered despite the 100% final SWP allocation.

Table 5-3. Comparison of 2019 and 2021 DCR1 1983 SWP Allocation, Table A and Article 56 Requests and Deliveries, and Carryover Spills.

	1	2	3	4	5	6	7
Report	SWP Allocation	Delivery w/o Article 56 Carryover (TAF)	Article 56 Carryover Requested from Previous CY (TAF)	Spill of Carryover Request from Previous CY (TAF)	Total Article 56 request from previous CY (3+4)	Total Table A Delivery (TAF) (2+3)	Percent of Maximum Table A ((6)/4,133)
2019 DCR	100%	3470	539	125	663	4008	97%
2021 DCR	100%	3469	468	196	664	3937	95%

Table 5-4. Estimated Average and Wet-Period Deliveries of SWP Table A Water (Existing Conditions, in TAF/year) and Percent of Maximum SWP Table A Amount, 4,133 TAF/year

Report	Long-term Average		Single Wet Year (1983) ⁷		Single Wet Year (2006) ⁸		2-Year (1982-1983)		4-Year (1980-1983)		6-Year (1978-1983)		10-Year (1978-1987)	
	TAF	%	TAF	%	TAF	%	TAF	%	TAF	%	TAF	%	TAF	%
2019 DCR (1922-2003)	2,414	58%	4,008	97%	-	-	3,750	91%	3,330	81%	3,210	78%	2,967	72%
2021 DCR (1922-2015)	2,321	56%	3,937	95%	4,004	97%	3,761	91%	3,212	78%	3,128	76%	2,925	71%

⁷ 1983 is the wettest single year according to the historical SVI.

⁸ A new single wet year column was added based on the year of the highest SWP Table A delivery during the whole CalSim 3 simulation period from October 1921 to September 2015. If this year is the same as the 1983 wet year, then the next highest SWP Table A delivery contract year will be displayed to prevent redundancy.

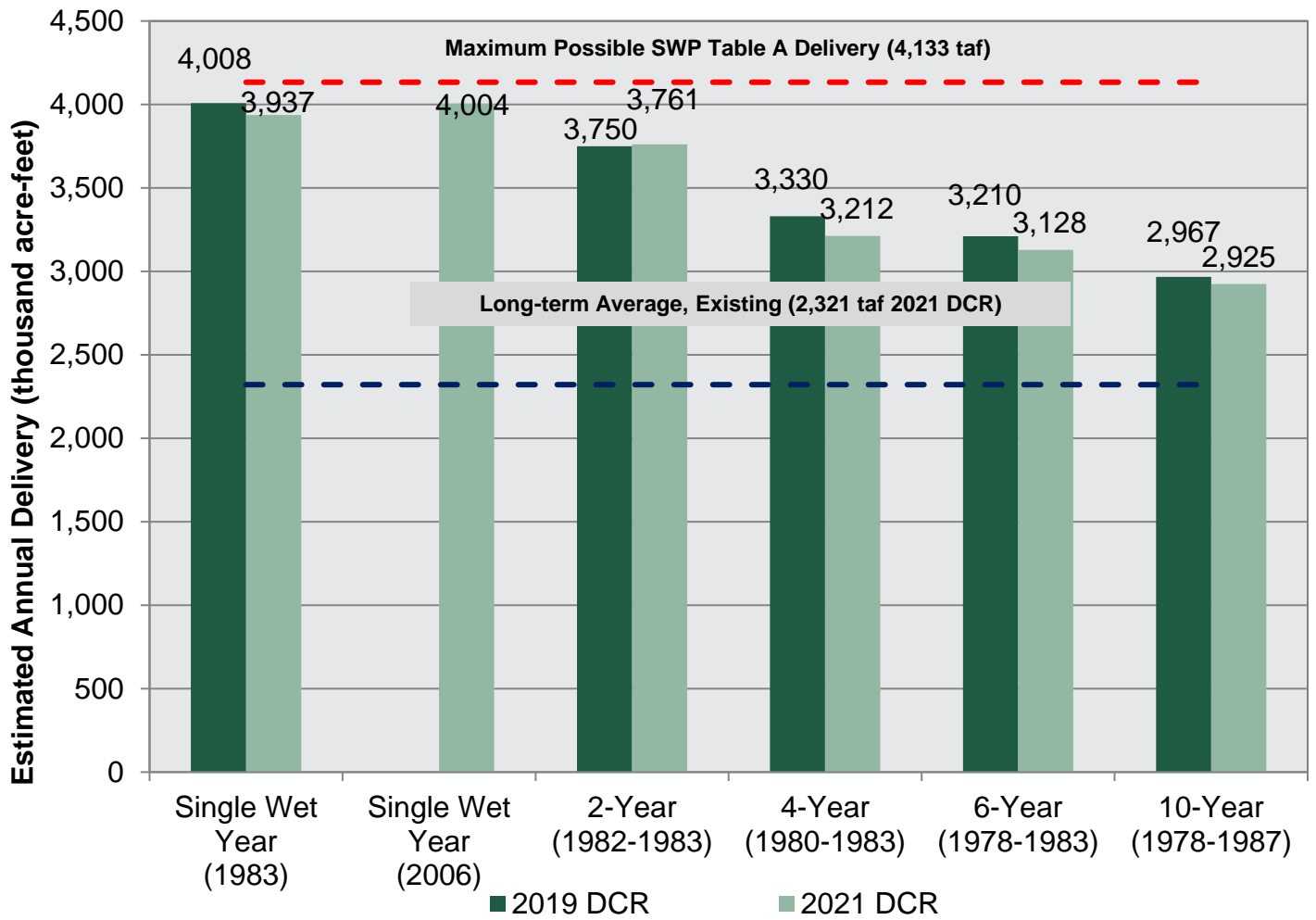


Figure 5-4. Estimated Wet-Period SWP Table A Water Deliveries (Excluding Feather River Area Contractors)

Dry-Year Deliveries of SWP Table A Water

Table 5-5 and Figure 5-6 present estimates of SWP Table A water deliveries under existing conditions during possible drought conditions and compare them with corresponding delivery estimates calculated for the 2019 Report. Droughts are analyzed using the historical drought-period precipitation and runoff patterns from 1922 through 2015 as a reference, although existing 2021 conditions (e.g., land use, water infrastructure) are also accounted for in the modeling. For reference, the worst multiyear drought on the 1922-2015 record was the 1929–1934 drought, although the brief drought of 1976–1977 was more intensely dry. The driest single year in terms of the historical SVI was 1977, which had the lowest index at 3.11⁹.

The results of modeling existing conditions under historical drought scenarios indicate that SWP Table A water deliveries during dry years can be estimated to range between yearly averages of 230 and 1,377 TAF. Table 5-5 and Figure 5-6 show that the 2021 Report deliveries of SWP Table A water decreased in most dry periods in comparison to the 2019 Report. The most significant difference in dry period deliveries occurred during the 4-year period from 1931-1934 where the percent maximum of SWP Table A amount decreased by 8%. However, when comparing the 6-year period from 1929-1934, the 2021 Report percent maximum of SWP Table A delivered only decreased by 3%.

The allocation from the 1931-1934 dry period is lower mainly because of higher allocation in 1930 (Figure 5-5). Compared to 2019 Report, allocation in 1930 was higher by about 21% in the 2021 Report which is due to higher Oroville storage. The higher allocation in 1930 drew down SWP San Luis much more. As a result, the allocation in 1931-1934 was lower in the 2021 Report.

⁹ Data was obtained from the Chronological Reconstructed Sacramento Water Year Hydrologic Classification Indices section from CDEC at the following link: <https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST>

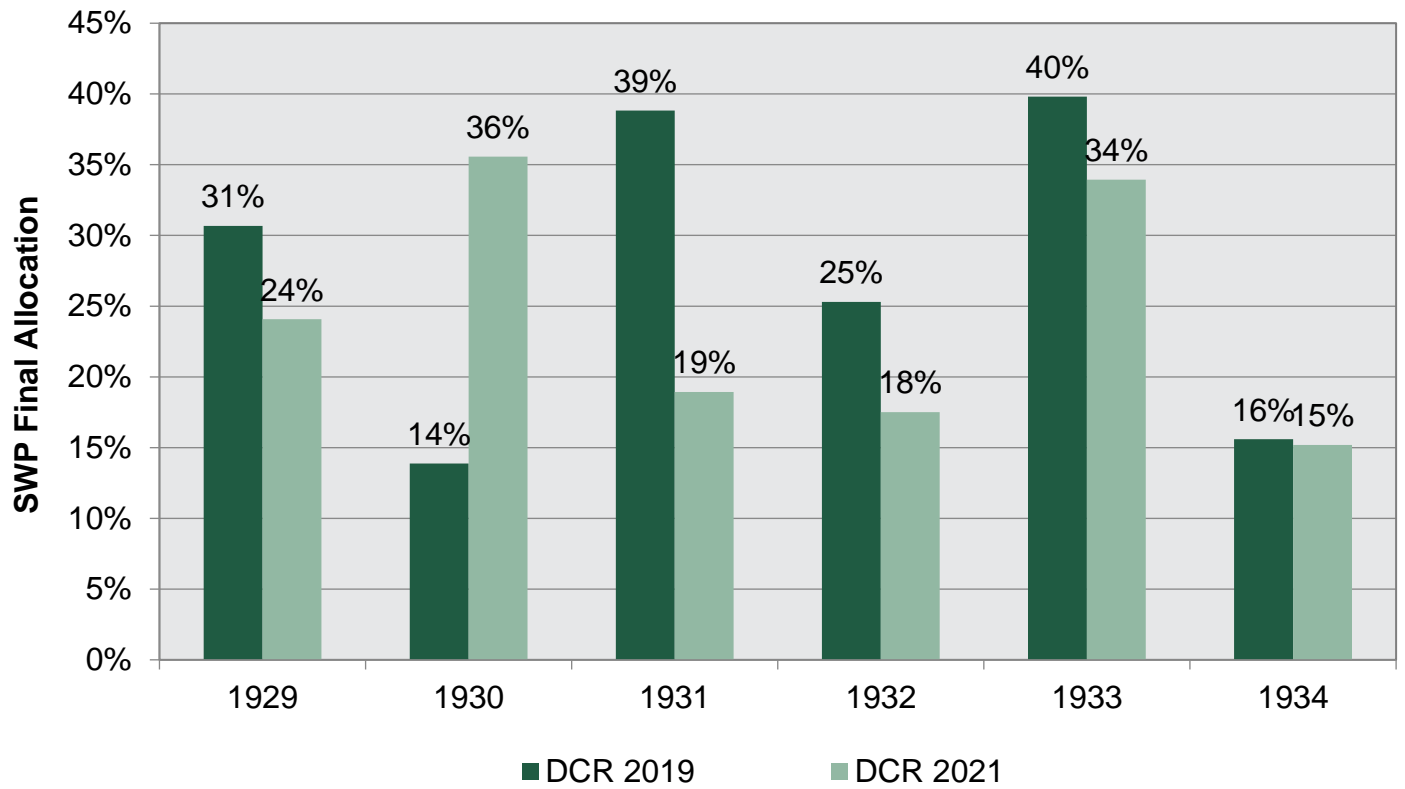


Figure 5-5. SWP allocation comparison from CY 1929 to 1934 for 2019 and 2021 Reports.

Table 5-5. Estimated Average and Dry-Period Deliveries of SWP Table A Water, Excluding Feather River Area Contractors (Existing Conditions, in TAF/year) and Percent of Maximum SWP Table A Amount, 4,133 TAF/year

Report	Long-term Average		Single Dry Year (1977) ¹⁰		Single Dry Year (2014) ¹¹		2-Year Drought (1976-1977)		2-Year Drought (2014-2015)		4-Year Drought (1931-1934)		6-Year Drought (1987-1992)		6-Year Drought (1929-1934)	
	TAF	%	TAF	%	TAF	%	TAF	%	TAF	%	TAF	%	TAF	%	TAF	%
2019 DCR (1922-2003)	2,414	58%	288	7%	-	-	1,311	32%	-	-	1,228	30%	1,058	26%	1,158	28%
2021 DCR (1922-2015)	2,321	56%	233	6%	230	6%	1,377	33%	708	17%	901	22%	1,163	28%	1,039	25%

¹⁰ 1977 is the driest single year according to the historical SVI.

¹¹ A new single dry year column was added based on the year of the lowest SWP Table A delivery during the whole CalSim 3 simulation period from October 1921 to September 2015. If this year is the same as the 1977 dry year, then the next lowest SWP Table A delivery contract year will be displayed to prevent redundancy.

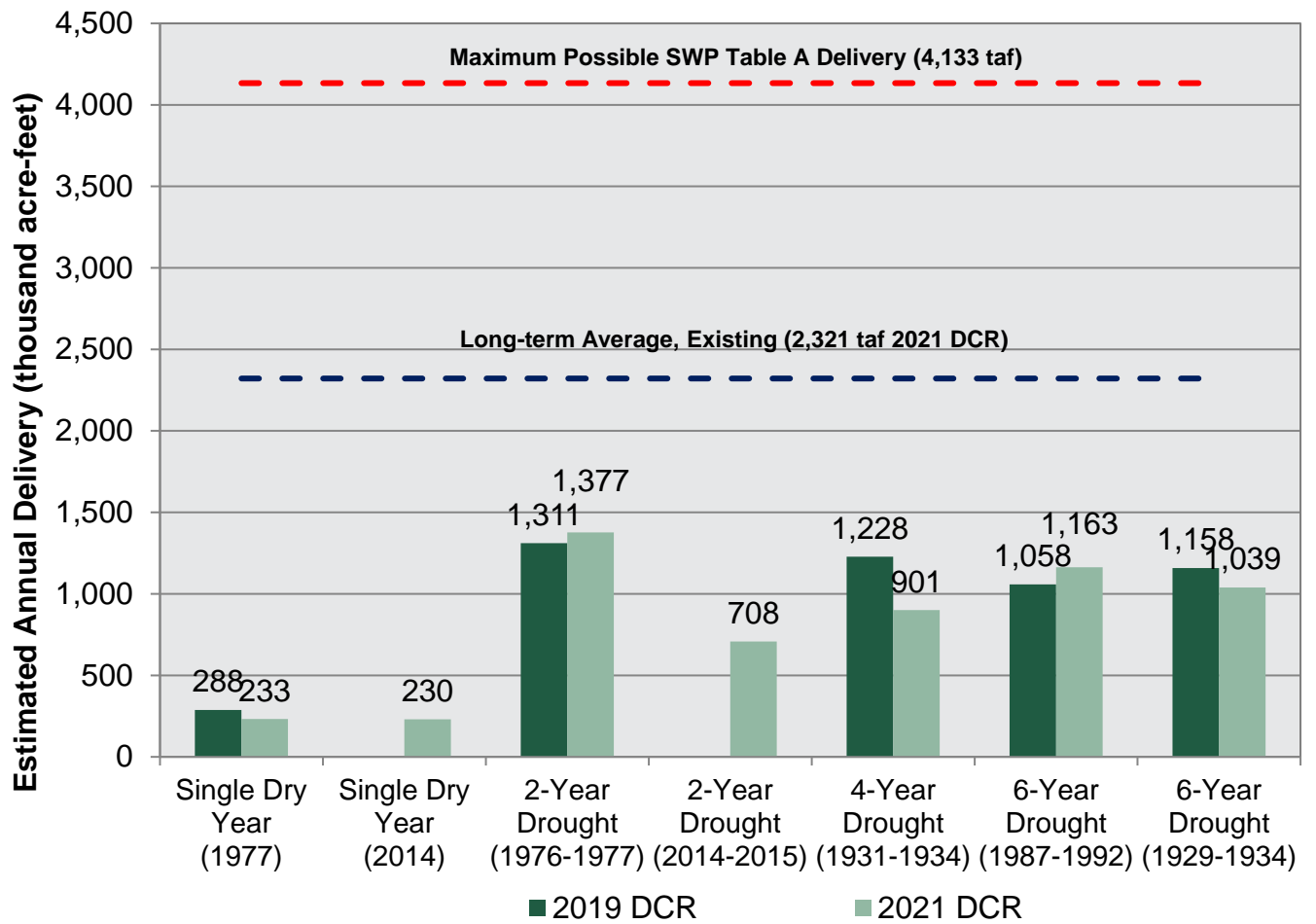


Figure 5-6. Estimated Dry-Period SWP Table A Water Deliveries (Excluding Feather River Area Contractors)

Estimates of SWP Article 21 Water Deliveries

SWP Article 21 water is the third type of SWP delivery considered in the model along with Table A and Article 56. Some SWP contractors store Article 21 water locally when extra water and capacity are available beyond that needed by normal SWP operations. Deliveries of SWP Article 21 water vary not only by year, but also by month. The estimated range of monthly deliveries of SWP Article 21 water is displayed in Figure 5-7 (only the maximum and averages have data labels shown as the minimums are zero). From June through November, essentially no Article 21 water is estimated to be delivered on average. In the winter and spring (December through May), maximum monthly deliveries range from 157 to 310 TAF/month.

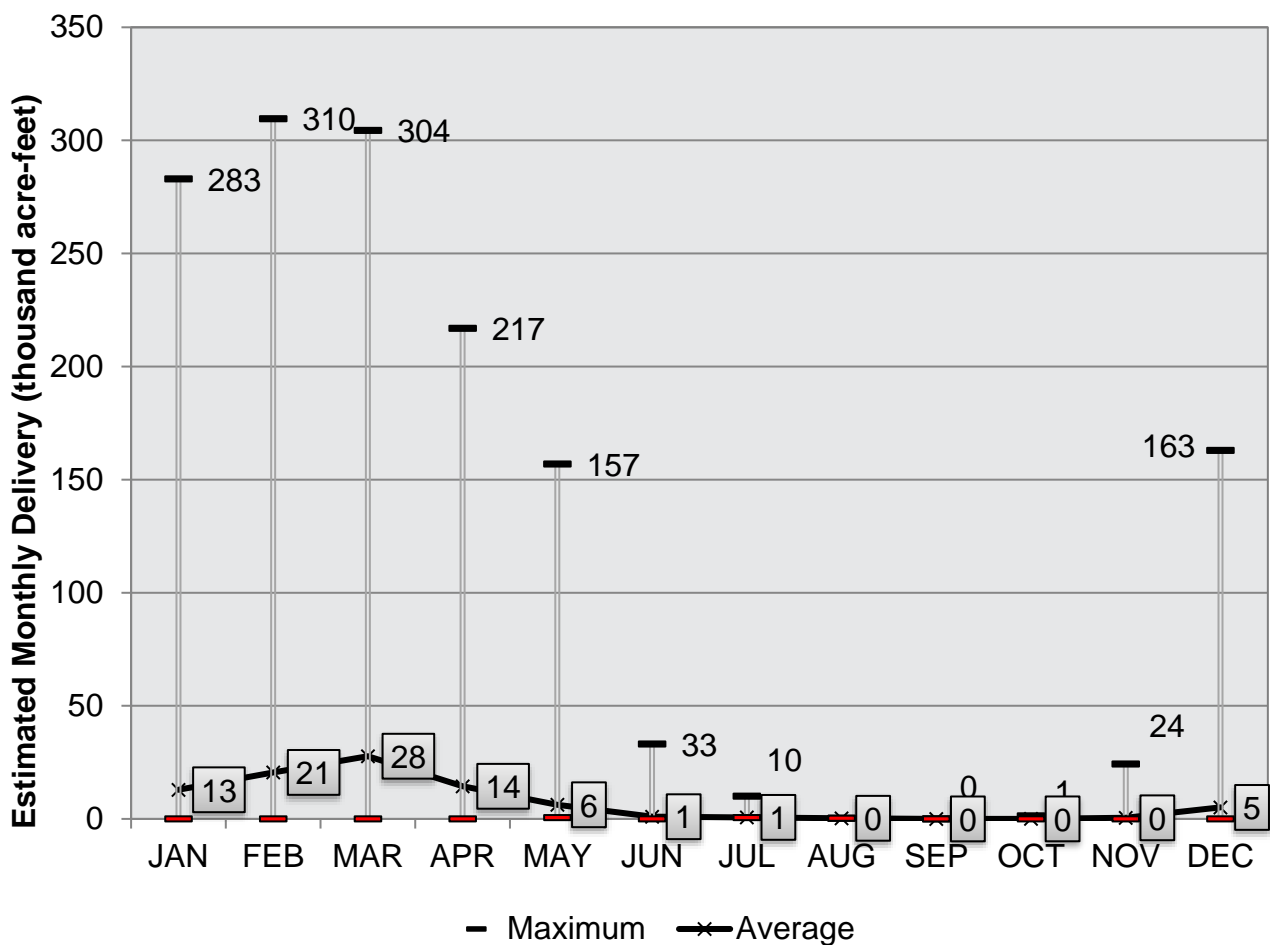


Figure 5-7. Estimated Range of Monthly Deliveries of SWP Article 21 Water (Existing Conditions)

The estimated likelihood that a given amount of SWP Article 21 water will be delivered is presented in Figure 5-8. The 77% chance of delivering 20 TAF or less is higher than the 57% chance in the 2019 Report. However, the likelihood of 20-100 TAF Article 21 deliveries is 14 percentage points lower (20% to 6%) from the 2019 to 2021 Report as shown in Figure 5-8. Lastly, the likelihood of receiving greater than 20 TAF/year Article 21 deliveries is 21 percentage points lower (43% to 22%).

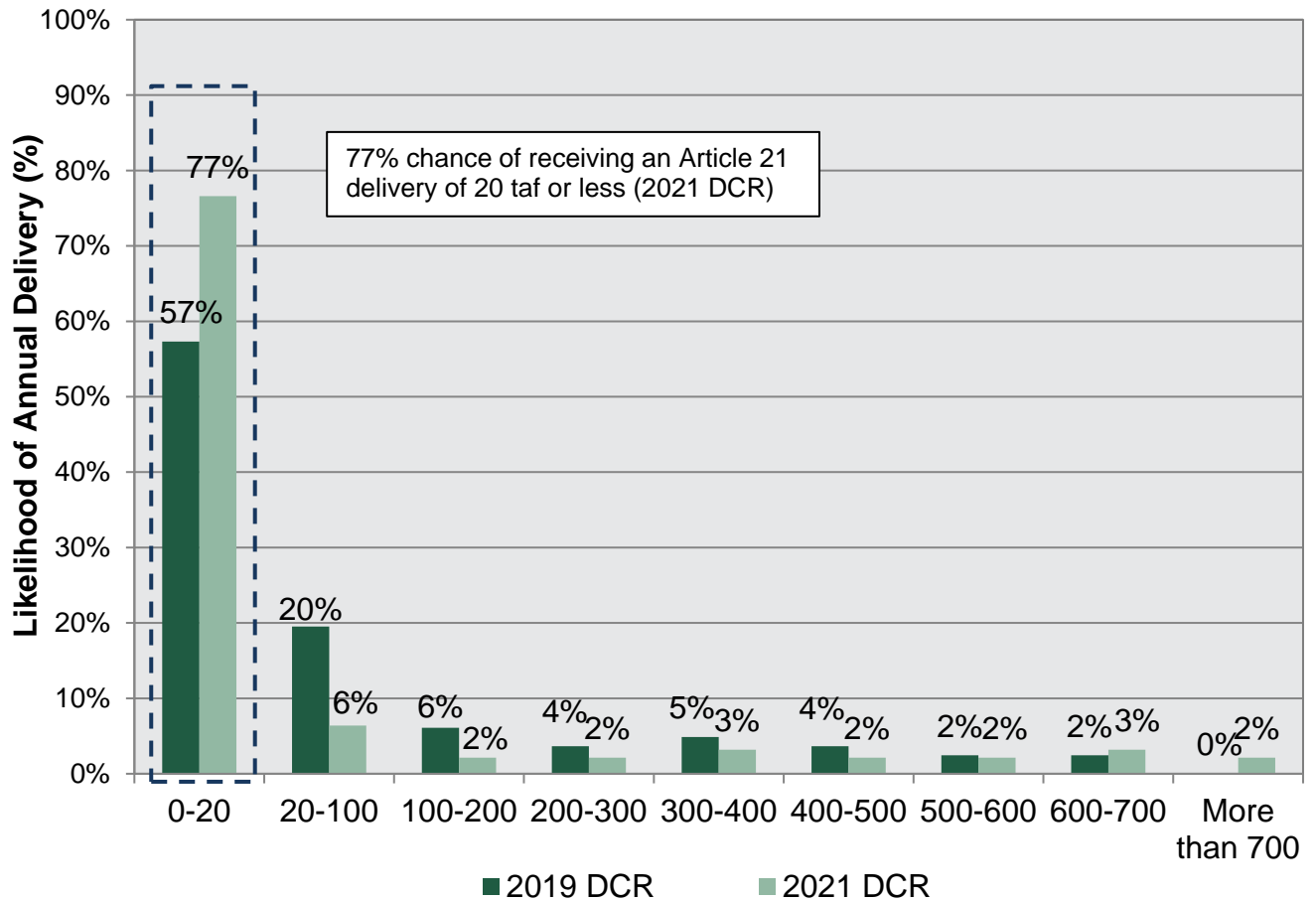


Figure 5-8. Estimated Likelihood of Annual Deliveries of SWP Article 21 Water (Existing Conditions)

Wet-Year Deliveries of SWP Article 21 Water

Table 5-6 shows the estimates of deliveries of SWP Article 21 water during wet periods under existing conditions. Estimated deliveries of SWP Article 21 water in wet periods range between 165-593 TAF. Wet-period Article 21 deliveries in this 2021 Report are higher than in the 2019 Report for most periods shown except for the 10-year 1978-87 period and the long-term.

Dry-Year Deliveries of SWP Article 21 Water

Table 5-7 shows the estimates of deliveries of SWP Article 21 water during dry periods under existing conditions. Estimated deliveries of SWP Article 21 water in dry periods range between 3-6 TAF. Although deliveries of SWP Article 21 water are lower during dry years than during wet ones, opportunities exist to deliver SWP Article 21 water during multiyear drought periods. Compared to the 2019 Report, Article 21 deliveries in all dry periods are lower.

Overall, there are two main reasons why Article 21 deliveries are lower in the long-term and all reported dry periods. The first reason is that surplus Delta outflow decreased in the 2021 Report. This directly reduces the Article 21 deliveries available to North Bay Aqueduct contractors. Lastly, SWP San Luis storage is less often at capacity (1,067 TAF) in the 2021 Report which is due to lower SWP San Luis storage in general. For more information, please refer to the Technical Addendum section on Article 21 deliveries analysis.

Table 5-6. Estimated Average and Wet-Period Deliveries of SWP Article 21 Water (Existing Conditions, in TAF/year)

Report	Long-term Average	Single Wet Year (1983)	Single Wet Year (2006) ¹²	2-Year Wet (1982-1983)	4-Year Wet (1980-1983)	6-Year Wet (1978-1983)	10-Year Wet (1978-1987)
2019 DCR (1922-2003)	94	527	-	322	225	156	170
2021 DCR (1922-2015)	89	593	520	416	274	186	165

Table 5-7. Estimated Average and Dry-Period Deliveries of SWP Article 21 Water (Existing Conditions, in TAF/year)

Report	Long-term Average	Single Dry Year (1977)	Single Dry Year (2014) ¹³	2-Year Drought (1976-1977)	2-Year Drought (2014-2015)	4-Year Drought (1931-1934)	6-Year Drought (1987-1992)	6-Year Drought (1929-1934)
2019 DCR (1922-2003)	94	6	-	10	-	68	18	50
2021 DCR (1922-2015)	89	3	5	3	4	5	5	6

¹² A new single wet year column was added based on the year of the highest SWP Table A delivery during the whole CalSim 3 simulation period from October 1921 to September 2015. If this year is the same as the 1983 wet year, then the next highest SWP Table A delivery contract year will be displayed to prevent redundancy.

¹³ A new single wet year column was added based on the year of the lowest SWP Table A delivery during the whole CalSim 3 simulation period from October 1921 to September 2015. If this year is the same as the 1977 dry year, then the next lowest SWP Table A delivery contract year will be displayed to prevent redundancy.

Section 6: Historical SWP Delivery Tables for 2011-2020

The SWP contracts define several types of SWP water available for delivery to its contractors under specific circumstances: Table A water, Article 21 water, turnback pool water, and carryover water. Many SWP contractors frequently use Article 21, turnback pool, and carryover water to increase or decrease the amount of water available to them in addition to SWP Table A.

Table 6-1 through Table 6-10 list annual historical deliveries by SWP water type for each Contractor for 2011 through 2020. This data was obtained from SWPAO. Similar delivery tables are presented for years 2009–2018 in the 2019 Report. Any differences in values presented in this 2021 Report and those in the 2019 Report are due to reclassification of deliveries since the production of the previous report.

Table 6-1. Historical SWP Deliveries, Calendar Year 2011

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	1,092	-	-	-	1,092
	Plumas County FCWCD	98	-	-	-	98
	Yuba City	2,297	-	-	-	2,297
	Subtotal	Subtotal	-	-	-	3,487
North Bay Area	Napa County FCWCD	9,426	-	1,388	-	10,814
	Solano County WA	9,620	14,739	-	-	24,359
	Subtotal	Subtotal	14,739	1,388	-	35,173
South Bay Area	Alameda County FCWCD, Zone 7	39,066	-	11,675	1,319	52,060
	Alameda County WD	24,813	1,959	9,332	506	36,610
	Valley Water (Santa Clara Valley WD)	64,538	970	20,491	-	85,999
	Subtotal	128,417	2,929	41,498	1,825	174,669
San Joaquin Valley Area	Dudley Ridge WD	40,141	11,666	5,524	823	58,154
	Empire West Side ID	1,626	138	151	-	1,915
	Kern County WA	753,707	194,119	119,773	16,068	1,083,667
	Kings County	5,294	552	558	152	6,556
	Oak Flat WD	2,644	-	71	-	2,715
	Tulare Lake Basin WSD	39,056	6,909	4,626	1,454	52,045
	Subtotal	842,468	213,384	130,703	18,497	1,205,052
Central Coastal Area	San Luis Obispo County FCWCD	3,340	-	479	-	3,819
	Santa Barbara County FCWCD	29,132	-	13,770	-	42,902
	Subtotal	32,472	-	14,249	-	46,721
Southern California Area	Antelope Valley–East Kern WA	77,549	7,629	5,888	-	91,066
	Santa Clarita Valley (previously Castaic Lake) WA	34,067	400	9,332	-	43,799
	Coachella Valley WD	88,017	-	-	2,262	90,279
	Crestline–Lake Arrowhead WA	423	-	51	-	474
	Desert WA	36,139	-	-	240	36,379
	Littlerock Creek ID	-	-	-	-	-
	Metropolitan WD of Southern California	1,286,935	181,610	55,540	8,237	1,532,322
	Mojave WA	4,831	-	268	-	5,099
	Palmdale WD	12,294	-	567	-	12,861
	San Bernardino Valley MWD	30,807	-	7,210	-	38,017
	San Gabriel Valley MWD	23,040	-	-	-	23,040
	San Geronio Pass WA	8,884	-	1,728	-	10,612
	Ventura County WPD	4,000	-	-	-	4,000
	Subtotal	1,606,986	189,639	80,584	10,739	1,887,948
TOTAL SWP DELIVERIES		2,632,876	420,691	268,422	31,061	3,353,050

Table 6-2. Historical SWP Deliveries, Calendar Year 2012

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	17,875	-	-	-	17,875
	Plumas County FCWCD	79	-	-	-	79
	Yuba City	2,695	-	-	-	2,695
	Subtotal	Subtotal	-	-	-	20,649
North Bay Area	Napa County FCWCD	5,065	-	4,278	64	9,407
	Solano County WA	11,673	-	9,641	-	21,314
	Subtotal	Subtotal	-	13,919	64	30,721
South Bay Area	Alameda County FCWCD, Zone 7	32,301	-	20,357	179	52,837
	Alameda County WD	11,951	-	8,787	93	20,831
	Valley Water (Santa Clara Valley WD)	34,612	-	11,462	222	46,296
	Subtotal	78,864	-	40,606	494	119,964
San Joaquin Valley Area	Dudley Ridge WD	17,694	-	-	112	17,806
	Empire West Side ID	1,468	-	774	-	2,242
	Kern County WA	560,969	-	32,477	2,180	595,626
	Kings County	5,337	-	2,001	21	7,359
	Oak Flat WD	2,596	-	612	-	3,208
	Tulare Lake Basin WSD	53,630	-	32,081	197	85,908
	Subtotal	641,694	-	67,945	2,510	712,149
Central Coastal Area	San Luis Obispo County FCWCD	3,111	-	833	-	3,944
	Santa Barbara County FCWCD	20,874	-	43	-	20,917
	Subtotal	23,985	-	876	-	24,861
Southern California Area	Antelope Valley–East Kern WA	80,694	-	32,854	-	113,548
	Santa Clarita Valley (previously Castaic Lake) WA	42,707	-	11,350	-	54,057
	Coachella Valley WD	89,928	-	22,663	307	112,898
	Crestline–Lake Arrowhead WA	624	-	-	-	624
	Desert WA	36,238	-	8,461	124	44,823
	Littlerock Creek ID	-	-	-	-	-
	Metropolitan WD of Southern California	1,086,084	-	118,172	4,241	1,208,497
	Mojave WA	4,672	-	6,572	-	11,244
	Palmdale WD	9,959	-	4,736	-	14,695
	San Bernardino Valley MWD	64,938	-	47,870	-	112,808
	San Gabriel Valley MWD	18,720	-	-	-	18,720
	San Geronio Pass WA	6,132	-	4,956	-	11,088
	Ventura County WPD	4,353	-	-	-	4,353
Subtotal	1,445,049	-	257,634	4,672	1,707,355	
TOTAL SWP DELIVERIES		2,226,979	-	380,980	7,740	2,615,699

Table 6-3. Historical SWP Deliveries, Calendar Year 2013

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	9,233	-	-	-	9,233
	Plumas County FCWCD	366	-	-	-	366
	Yuba City	3,360	-	1,490	-	4,850
	Subtotal	Subtotal	-	1,490	-	14,449
North Bay Area	Napa County FCWCD	2,963	-	9,075	-	12,038
	Solano County WA	5,355	-	17,805	-	23,160
	Subtotal	Subtotal	-	26,880	-	35,198
South Bay Area	Alameda County FCWCD, Zone 7	14,059	-	21,042	2,596	37,697
	Alameda County WD	4,241	-	15,349	50	19,640
	Valley Water (Santa Clara Valley WD)	9,353	-	16,261	10,749	36,363
	Subtotal	27,653	-	52,652	13,395	93,700
San Joaquin Valley Area	Dudley Ridge WD	6,113	-	9,951	5,412	21,476
	Empire West Side ID	1,004	-	482	16	1,502
	Kern County WA	314,466	-	73,303	37,005	424,774
	Kings County	2,851	-	591	1,000	4,442
	Oak Flat WD	583	-	2,200	7	2,790
	Tulare Lake Basin WSD	27,803	-	4,169	8,400	40,372
	Subtotal	352,820	-	90,696	51,840	495,356
Central Coastal Area	San Luis Obispo County FCWCD	1,178	-	2,503	-	3,681
	Santa Barbara County FCWCD	3,252	-	12,233	-	15,485
	Subtotal	4,430	-	14,736	-	19,166
Southern California Area	Antelope Valley–East Kern WA	37,628	-	13,386	-	51,014
	Santa Clarita Valley (previously Castaic Lake) WA	33,320	-	28,434	-	61,754
	Coachella Valley WD	48,423	-	-	164	48,587
	Crestline–Lake Arrowhead WA	1,368	-	2,000	-	3,368
	Desert WA	19,513	-	-	66	19,579
	Littlerock Creek ID	-	-	-	-	-
	Metropolitan WD of Southern California	619,863	-	106,288	32,267	758,418
	Mojave WA	25,294	-	2,852	-	28,146
	Palmdale WD	4,559	-	3,122	-	7,681
	San Bernardino Valley MWD	25,979	-	4,426	-	30,405
	San Gabriel Valley MWD	10,080	-	-	-	10,080
	San Geronio Pass WA	2,339	-	3,909	1,000	7,248
	Ventura County WPD	2,890	-	-	-	2,890
Subtotal	831,256	-	164,417	33,497	1,029,170	
TOTAL SWP DELIVERIES		1,237,436	-	350,871	98,732	1,687,039

Table 6-4. Historical SWP Deliveries, Calendar Year 2014

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	2,596	-	-	-	2,596
	Plumas County FCWCD	251	-	-	-	251
	Yuba City	96	-	4,085	-	4,181
	Subtotal	Subtotal	-	4,085	-	7,028
North Bay Area	Napa County FCWCD	41	1,444	9,731	-	11,216
	Solano County WA	450	-	9,493	-	9,943
	Subtotal	Subtotal	1,444	19,224	-	21,159
South Bay Area	Alameda County FCWCD, Zone 7	1,367	-	17,646	-	19,013
	Alameda County WD	-	-	10,326	-	10,326
	Valley Water (Santa Clara Valley WD)	-	-	12,339	79	12,418
	Subtotal	1,367	-	40,311	79	41,757
San Joaquin Valley Area	Dudley Ridge WD	1,783	-	15,783	40	17,606
	Empire West Side ID	104	-	46	303	453
	Kern County WA	1,393	-	24,217	520	26,130
	Kings County	112	-	360	-	472
	Oak Flat WD	-	-	983	-	983
	Tulare Lake Basin WSD	3,942	-	3,181	-	7,123
	Subtotal	7,334	-	44,570	863	52,767
Central Coastal Area	San Luis Obispo County FCWCD	379	-	2,693	-	3,072
	Santa Barbara County FCWCD	289	-	10,533	-	10,822
	Subtotal	668	-	13,226	-	13,894
Southern California Area	Antelope Valley–East Kern WA	2,152	-	12,345	111	14,608
	Santa Clarita Valley (previously Castaic Lake) WA	451	-	7,743	-	8,194
	Coachella Valley WD	6,918	-	-	-	6,918
	Crestline–Lake Arrowhead WA	83	-	645	-	728
	Desert WA	2,788	-	-	-	2,788
	Littlerock Creek ID	106	-	-	-	106
	Metropolitan WD of Southern California	59,900	-	223,358	-	283,258
	Mojave WA	3,347	-	2,228	-	5,575
	Palmdale WD	1,005	-	3,670	-	4,675
	San Bernardino Valley MWD	-	-	6,218	-	6,218
	San Gabriel Valley MWD	1,434	-	-	-	1,434
	San Geronio Pass WA	603	-	4,674	-	5,277
	Ventura County WPD	93	-	-	-	93
Subtotal	78,880	-	260,881	111	339,872	
TOTAL SWP DELIVERIES		91,683	1,444	382,297	1,053	476,477

Table 6-5. Historical SWP Deliveries, Calendar Year 2015

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	3,315	-	-	-	3,315
	Plumas County FCWCD	285	-	-	-	285
	Yuba City	2,400	-	604	-	3,004
	Subtotal	Subtotal	-	604	-	6,604
North Bay Area	Napa County FCWCD	5,365	690	3,896	35	9,986
	Solano County WA	2,020	-	15,718	-	17,738
	Subtotal	Subtotal	690	19,614	35	27,724
South Bay Area	Alameda County FCWCD, Zone 7	4,686	-	3,295	97	8,078
	Alameda County WD	-	-	2,233	51	2,284
	Valley Water (Santa Clara Valley WD)	-	-	2,858	120	2,978
	Subtotal	4,686	-	8,386	268	13,340
San Joaquin Valley Area	Dudley Ridge WD	7,414	-	1,570	55	9,039
	Empire West Side ID	578	-	46	-	624
	Kern County WA	173,581	-	43,265	707	217,553
	Kings County	698	-	333	11	1,042
	Oak Flat WD	696	-	348	-	1,044
	Tulare Lake Basin WSD	16,359	-	571	105	17,035
	Subtotal	199,326	-	46,133	878	246,337
Central Coastal Area	San Luis Obispo County FCWCD	3,411	-	-	-	3,411
	Santa Barbara County FCWCD	4,973	-	1,089	55	6,117
	Subtotal	8,384	-	1,089	55	9,528
Southern California Area	Antelope Valley–East Kern WA	21,810	-	5,154	174	27,138
	Santa Clarita Valley (previously Castaic Lake) WA	11,068	-	4,121	-	15,189
	Coachella Valley WD	27,670	-	-	-	27,670
	Crestline–Lake Arrowhead WA	154	-	247	-	401
	Desert WA	11,150	-	-	67	11,217
	Littlerock Creek ID	460	-	-	-	460
	Metropolitan WD of Southern California	379,706	-	35,675	1,374	416,755
	Mojave WA	16,538	-	1,871	-	18,409
	Palmdale WD	2,420	-	-	26	2,446
	San Bernardino Valley MWD	17,283	-	9,012	123	26,418
	San Gabriel Valley MWD	5,759	-	-	-	5,759
	San Geronio Pass WA	3,424	-	508	-	3,932
	Ventura County WPD	1,000	-	-	-	1,000
Subtotal	498,442	-	56,588	1,764	556,794	
TOTAL SWP DELIVERIES		724,223	690	132,414	3,000	860,327

Table 6-6. Historical SWP Deliveries, Calendar Year 2016

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	15,634	-	-	-	15,634
	Plumas County FCWCD	387	-	-	-	387
	Yuba City	1,229	-	-	-	1,229
	Subtotal	Subtotal	-	-	-	17,250
North Bay Area	Napa County FCWCD	13,138	3,319	-	295	16,752
	Solano County WA	12,595	-	4,130	-	16,725
	Subtotal	Subtotal	3,319	4,130	295	33,477
South Bay Area	Alameda County FCWCD, Zone 7	41,987	-	8,450	819	51,256
	Alameda County WD	14,280	-	8,400	-	22,680
	Valley Water (Santa Clara Valley WD)	40,214	-	32,863	-	73,077
	Subtotal	96,481	-	49,713	819	147,013
San Joaquin Valley Area	Dudley Ridge WD	17,372	-	1,656	461	19,489
	Empire West Side ID	1,800	-	22	-	1,822
	Kern County WA	458,825	-	-	3,533	462,358
	Kings County	2,466	-	1,095	95	3,656
	Oak Flat WD	832	-	1,023	-	1,855
	Tulare Lake Basin WSD	41,126	-	1,135	126	42,387
	Subtotal	522,421	-	4,931	4,215	531,567
Central Coastal Area	San Luis Obispo County FCWCD	4,199	-	-	-	4,199
	Santa Barbara County FCWCD	12,003	-	917	-	12,920
	Subtotal	16,202	-	917	-	17,119
Southern California Area	Antelope Valley–East Kern WA	56,148	-	6,054	1,471	63,673
	Santa Clarita Valley (previously Castaic Lake) WA	31,147	-	2,241	-	33,388
	Coachella Valley WD	52,922	-	-	-	52,922
	Crestline–Lake Arrowhead WA	1,873	-	-	-	1,873
	Desert WA	21,327	-	-	566	21,893
	Littlerock Creek ID	1,380	-	-	-	1,380
	Metropolitan WD of Southern California	1,006,900	-	-	6,871	1,013,771
	Mojave WA	32,045	-	1,170	-	33,215
	Palmdale WD	7,805	-	-	-	7,805
	San Bernardino Valley MWD	57,212	-	2,348	-	59,560
	San Gabriel Valley MWD	17,280	-	-	-	17,280
	San Geronio Pass WA	10,227	-	36	-	10,263
	Ventura County WPD	3,000	-	-	-	3,000
Subtotal	1,299,266	-	11,849	8,908	1,320,023	
TOTAL SWP DELIVERIES		1,977,353	3,319	71,540	14,237	2,066,449

Table 6-7. Historical SWP Deliveries, Calendar Year 2017

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	21,636	-	-	-	21,636
	Plumas County FCWCD	363	-	-	-	363
	Yuba City	1,746	-	-	-	1,746
	Subtotal	Subtotal	-	-	-	23,745
North Bay Area	Napa County FCWCD	974	6,429	822	-	8,225
	Solano County WA	15,190	-	-	-	15,190
	Subtotal	Subtotal	6,429	822	-	23,415
South Bay Area	Alameda County FCWCD, Zone 7	52,787	-	2,959	712	56,458
	Alameda County WD	27,260	-	1,776	-	29,036
	Valley Water (Santa Clara Valley WD)	28,779	-	25,972	582	55,333
	Subtotal	108,826	-	30,707	1,294	140,827
San Joaquin Valley Area	Dudley Ridge WD	27,917	15,722	9,838	400	53,877
	Empire West Side ID	1,698	-	-	-	1,698
	Kern County WA	760,939	114,112	159,238	8,670	1,042,959
	Kings County	5,149	1,414	-	82	6,645
	Oak Flat WD	2,858	-	35	-	2,893
	Tulare Lake Basin WSD	49,119	-	7,336	1,465	57,920
	Subtotal	847,680	131,248	176,447	10,617	1,165,992
Central Coastal Area	San Luis Obispo County FCWCD	2,263	-	582	-	2,845
	Santa Barbara County FCWCD	25,243	4,720	18,150	401	48,514
	Subtotal	27,506	4,720	18,732	401	51,359
Southern California Area	Antelope Valley–East Kern WA	83,343	17,400	15,581	-	116,324
	Santa Clarita Valley (previously Castaic Lake) WA	38,132	-	33,442	-	71,574
	Coachella Valley WD	47,617	-	30,088	806	78,511
	Crestline–Lake Arrowhead WA	2,897	-	-	-	2,897
	Desert WA	19,188	-	12,123	325	31,636
	Littlerock Creek ID	-	-	-	-	-
	Metropolitan WD of Southern California	1,283,294	123,950	130,511	-	1,537,755
	Mojave WA	29,995	-	820	-	30,815
	Palmdale WD	7,751	-	1,587	-	9,338
	San Bernardino Valley MWD	68,707	-	4,141	-	72,848
	San Gabriel Valley MWD	17,505	3,057	7	-	20,569
	San Geronio Pass WA	11,991	-	153	-	12,144
	Ventura County WPD	4,250	10,000	-	-	14,250
Subtotal	1,614,670	154,407	228,453	1,131	1,998,661	
TOTAL SWP DELIVERIES		2,638,591	296,804	455,161	13,443	3,403,999

Table 6-8. Historical SWP Deliveries, Calendar Year 2018

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	9,225	-	-	-	9,225
	Plumas County FCWCD	508	-	-	-	508
	Yuba City	-	-	1,715	-	1,715
	Subtotal	Subtotal	-	1,715	-	11,448
North Bay Area	Napa County FCWCD	10,159	2,180	5,243	-	17,582
	Solano County WA	12,757	-	11,627	-	24,384
	Subtotal	Subtotal	2,180	16,870	-	41,966
South Bay Area	Alameda County FCWCD, Zone 7	21,170	-	15,739	-	36,909
	Alameda County WD	4,721	-	8,440	-	13,161
	Valley Water (Santa Clara Valley WD)	26,297	-	56,221	-	82,518
	Subtotal	52,188	-	80,400	-	132,588
San Joaquin Valley Area	Dudley Ridge WD	13,626	-	7,415	-	21,041
	Empire West Side ID	739	-	852	-	1,591
	Kern County WA	243,960	-	74,382	-	318,342
	Kings County	1,284	-	2,363	-	3,647
	Oak Flat WD	302	-	1,987	-	2,289
	Tulare Lake Basin WSD	10,318	-	23,555	-	33,873
	Subtotal	270,229	-	110,554	-	380,783
Central Coastal Area	San Luis Obispo County FCWCD	2,427	-	-	-	2,427
	Santa Barbara County FCWCD	11,415	-	11,300	-	22,715
	Subtotal	13,842	-	11,300	-	25,142
Southern California Area	Antelope Valley–East Kern WA	40,415	-	26,121	-	66,536
	Santa Clarita Valley (previously Castaic Lake) WA	12,473	-	24,424	-	36,897
	Coachella Valley WD	48,423	-	69,175	-	117,598
	Crestline–Lake Arrowhead WA	186	-	617	-	803
	Desert WA	19,513	-	27,875	-	47,388
	Littlerock Creek ID	805	-	-	-	805
	Metropolitan WD of Southern California	578,831	-	61,561	-	640,392
	Mojave WA	14,213	-	5,471	-	19,684
	Palmdale WD	7,137	-	4,828	-	11,965
	San Bernardino Valley MWD	23,408	-	17,605	-	41,013
	San Gabriel Valley MWD	10,080	-	6,975	-	17,055
	San Geronio Pass WA	3,387	-	2,714	-	6,101
	Ventura County WPD	7,000	-	-	-	7,000
	Subtotal	765,871	-	247,366	-	1,013,237
TOTAL SWP DELIVERIES		1,134,779	2,180	468,205	-	1,605,164

Table 6-9. Historical SWP Deliveries, Calendar Year 2019

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	20,653	-	-	-	20,653
	Plumas County FCWCD	436	-	-	-	436
	Yuba City	1,655	-	-	-	1,655
	Subtotal	Subtotal	-	-	-	22,744
North Bay Area	Napa County FCWCD	3,120	3,964	201	-	7,285
	Solano County WA	16,179	-	237	-	16,416
	Subtotal	Subtotal	3,964	438	-	23,701
South Bay Area	Alameda County FCWCD, Zone 7	49,652	-	2,644	-	52,296
	Alameda County WD	19,154	-	2,577	-	21,731
	Valley Water (Santa Clara Valley WD)	37,544	1,123	8,703	-	47,370
	Subtotal	106,350	1,123	13,924	-	121,397
San Joaquin Valley Area	Dudley Ridge WD	24,811	3,468	3,885	-	32,164
	Empire West Side ID	1,592	35	311	-	1,938
	Kern County WA	570,950	130,806	98,583	-	800,339
	Kings County	4,331	431	167	-	4,929
	Oak Flat WD	2,175	-	9	-	2,184
	Tulare Lake Basin WSD	54,858	15,309	15,352	-	85,519
	Subtotal	658,717	150,049	118,307	-	927,073
Central Coastal Area	San Luis Obispo County FCWCD	2,531	-	111	-	2,642
	Santa Barbara County FCWCD	18,639	579	4,004	-	23,222
	Subtotal	21,170	579	4,115	-	25,864
Southern California Area	Antelope Valley–East Kern WA	75,647	8,174	2,595	-	86,416
	Santa Clarita Valley (previously Castaic Lake) WA	62,387	-	3,608	-	65,995
	Coachella Valley WD	34,588	-	-	-	34,588
	Crestline–Lake Arrowhead WA	403	-	-	-	403
	Desert WA	13,938	-	-	-	13,938
	Littlerock Creek ID	1,607	-	35	-	1,642
	Metropolitan WD of Southern California	1,176,362	65,491	92,763	-	1,334,616
	Mojave WA	19,843	-	872	-	20,715
	Palmdale WD	14,294	335	1,896	-	16,525
	San Bernardino Valley MWD	65,479	981	12,003	-	78,463
	San Gabriel Valley MWD	19,377	498	-	-	19,875
	San Geronio Pass WA	8,764	-	1,964	-	10,728
	Ventura County WPD	5,540	14,998	-	-	20,538
Subtotal	1,498,229	90,477	115,736	-	1,704,442	
TOTAL SWP DELIVERIES		2,326,509	246,192	252,520	-	2,825,221

Table 6-10. Historical SWP Deliveries, Calendar Year 2020

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	3,318	-	-	-	3,318
	Plumas County FCWCD	406	-	-	-	406
	Yuba City	1,812	-	-	-	1,812
	Subtotal	Subtotal	-	-	-	5,536
North Bay Area	Napa County FCWCD	5,106	994	10,359	-	16,459
	Solano County WA	860	-	15,248	-	16,108
	Subtotal	Subtotal	994	25,607	-	32,567
South Bay Area	Alameda County FCWCD, Zone 7	7,408	-	10,661	-	18,069
	Alameda County WD	-	-	9,449	-	9,449
	Valley Water (Santa Clara Valley WD)	130	-	21,843	-	21,973
	Subtotal	7,538	-	41,953	-	49,491
San Joaquin Valley Area	Dudley Ridge WD	3,536	-	9,193	-	12,729
	Empire West Side ID	590	-	658	-	1,248
	Kern County WA	189,950	-	46,727	-	236,677
	Kings County	584	-	2,060	-	2,644
	Oak Flat WD	487	-	1,653	-	2,140
	Tulare Lake Basin WSD	10,662	-	3,866	-	14,528
	Subtotal	205,809	-	64,157	-	269,966
Central Coastal Area	San Luis Obispo County FCWCD	1,318	-	1,366	-	2,684
	Santa Barbara County FCWCD	1,399	-	10,569	-	11,968
	Subtotal	2,717	-	11,935	-	14,652
Southern California Area	Antelope Valley–East Kern WA	15,790	-	32,216	-	48,006
	Santa Clarita Valley (previously Castaic Lake) WA	11,551	-	3,036	-	14,587
	Coachella Valley WD	27,670	-	69,175	-	96,845
	Crestline–Lake Arrowhead WA	-	-	215	-	215
	Desert WA	11,150	-	27,875	-	39,025
	Littlerock Creek ID	406	-	118	-	524
	Metropolitan WD of Southern California	330,978	-	78,013	-	408,991
	Mojave WA	17,960	-	3,159	-	21,119
	Palmdale WD	1,905	-	1,681	-	3,586
	San Bernardino Valley MWD	10,940	-	4,344	-	15,284
	San Gabriel Valley MWD	5,670	-	2,223	-	7,893
	San Geronio Pass WA	2,625	-	4,211	-	6,836
	Ventura County WPD	3,376	-	6,619	-	9,995
Subtotal	440,021	-	232,885	-	672,906	
TOTAL SWP DELIVERIES		667,587	994	376,537	-	1,045,118

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Appendix: Responses to SWP Contractors' Comments

This section presents SWP contractor comments on the Draft Final 2021 Report released at the end of December 2021. DWR's responses are also included.

The comments and questions came from two main sources:

1. State Water Contractors
2. Metropolitan Water District of Southern California (Sarah Bartlett)

DEPARTMENT OF WATER RESOURCES

P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791



State Water Contractors
1121 L Street, Suite 1050
Sacramento, CA 95814

Dear Members of the State Water Contractors:

This letter is in response to the State Water Contractors (SWC) comments dated February 4, 2022, on the Draft 2021 Delivery Capability Report (DCR). Thank you all for your comments on the Draft 2021 DCR. DWR's responses are attached. Your comments have been thoroughly reviewed and the recommended changes considered for inclusion into the final report.

If any of the SWC members would like to discuss this report further, please contact me at Erik.Reyes@water.ca.gov. For specific questions regarding the analyses used for the report, please contact Nazrul Islam at Nazrul.Islam@water.ca.gov.

Sincerely,

Erik Reyes

Erik Reyes, Principal Engineer
Modeling Support Office

Comment 1

“DCR should include the final raw Table A allocations and not just delivery-based allocations, which can be misleading.

“An extreme and unrealistic example just to show the point is a year with a 100% SWP allocation, but a contractor chooses to store it all and take no delivery that year. The DCR would say 0% but it was actually a 100% year.””

DWR Response

DWR included a supplementary Excel workbook where final raw Table A allocations are reported. DWR also included new tables in the Technical Addendum similar in layout to Table 5-4 and Table 5-5 which displays the simulated final average allocations instead of the SWP Table A deliveries. Please refer to section SWP Final SOD Allocation Tables in the Technical Addendum.

Comment 2

“Include a 5-year drought average allocation in the DCR report.”

DWR Response

DWR included new tables in the Technical Addendum similar in layout to Table 5-4 and Table 5-5 which displays the simulated final average allocations instead of the SWP Table A deliveries. Please refer to section SWP Final SOD Allocation Tables in the Technical Addendum.

Comment 3

“Future conditions projections would be appreciated in all DCR publications, not just those that align with UWMP submittals”

DWR Response

DWR included a future conditions scenario centered in 2040 with 55 cm sea-level rise in the final version of the DCR. The future conditions scenario is usually not published in the draft iteration.

Comment 4

DWR should consider future scenarios that take into account a warming climate and potential impacts to hydrology from reduced runoff efficiency, such as what was observed in recent years

DWR Response

A future conditions scenario centered on 2040 with 55 cm sea-level rise is included in the final DCR. A climate change transformation was implemented on the hydrology to consider the impacts of reduced runoff efficiency.

Comment 5

“Sea level rise assumptions for 2021 future conditions should be what DWR would scientifically justify and used in other regulatory processes.”

DWR Response

The 55 cm sea-level rise assumption in the future conditions scenario is based on the State of California Sea-Level Rise Guidance (2018 update) and the Delta Adapts: Creating a Climate Resilient Future Technical Memorandum (June 2021). This assumption of SLR is also adopted in the Delta Conveyance Project (DCP) future conditions modeling.

For more information, please refer to the Technical Addendum Appendix B: Future Condition with Climate Change and 55 cm Sea-Level Rise Scenario section.

Comment 6

“Driest two-year Table A deliveries seem high compared to actual 2014-15 Table A”

DWR Response

Thank you for pointing this out. The reason for the discrepancy with the 2014-2015 averages was due to the assumption made in patching the October-December 2015 deliveries.

In the past, the 2003 contract year deliveries were calculated as the sum of January-September 2003 and October-December 1921 data. This was for CalSim II whose period of record was from water year 1922-2003.

The patching assumption was carried over to calculating CalSim 3 Table A deliveries. Since CalSim 3 simulated data only went up to September 2015, there was no data for the last 3 months. To handle this, the same assumption was used to grab the October-December 1921 data to fill in the gaps and come up with a 2015 contract year delivery.

However, this was not an appropriate assumption. October-December 1921 was part of the 1922 Water Year categorized as Above Normal. Therefore, the 2015 deliveries presented in the draft DCR were inflated. 2015, a Critical Year, was patched with data from an Above Normal year.

After feedback from an MWD staff, the 2015 deliveries estimation were refined.

The equation to calculate the updated 2015 SWP deliveries is as follows:

2015Estimate

$$= (Jan2015TableADel + Feb2015TableADel \dots + Sep2015TableADel) \left(\frac{12}{9} \right)$$

What this basically does is calculate the 2015 monthly average of the last 9 months of the simulation. The multiplication by 12 is just to estimate an annual average from the monthly average.

Comment 7

“Additional information would be appreciated on the reason behind the reduction in frequency of Article 21 deliveries (e.g., 20% less likely to receive Article 21 between 20-700 TAF)”

DWR Response

The main reason why there are less occurrence of Article 21 deliveries over 20 TAF is because San Luis is less likely to be full in 2021 Report. This is because overall San Luis is also lower in general in 2021 Report. For more details, see the Article 21 deliveries analysis section in the Technical Addendum.

Comment 8

“Information and data in the technical appendix would be helpful for providing more substantive comments”

DWR Response

The technical addendum document is usually not published in the draft phase of the DCR. In the future, DWR will consider including a draft version of the technical appendix available for comment.

Comment 9

“Capture DWR’s outlook for SWP besides climate change/SLR – this report should be fairly firm on what the delivery capability is – b/c of the DCR’s use for UWMP and other regulatory needs.”

DWR Response

DWR currently has no further comments on SWP’s delivery capability beyond the impact of climate change and SLR.

Comment 10

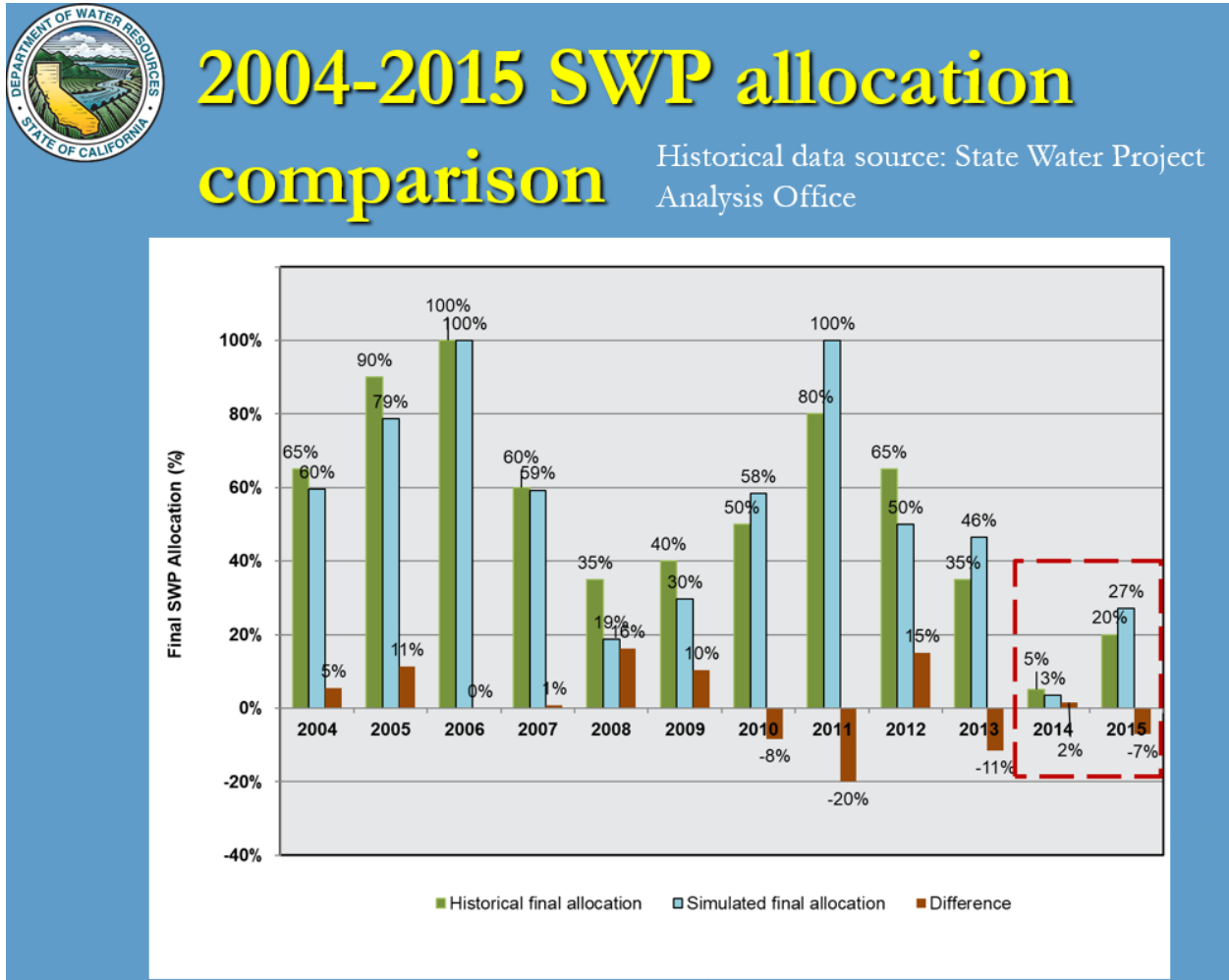
“We welcome DWR’s efforts to evaluate and compare long-term and recent hydrologic characteristics. As a SWP contractor, CVWD relies on DWR’s analyses for long-term water management planning including its Urban Water Management Plan and Sustainable Groundwater Management Act Alternative Plans. We encourage DWR to complete these analyses so that any adjustments can be incorporated into the next round of UWMP and Alternative Plan Updates which will be due to DWR by July 1, 2026, and January 1, 2027, respectively. Having sound and citable estimates of water supply reliability are critical to planning efforts and to communicate with stakeholders about water supply forecasts.”

DWR Response

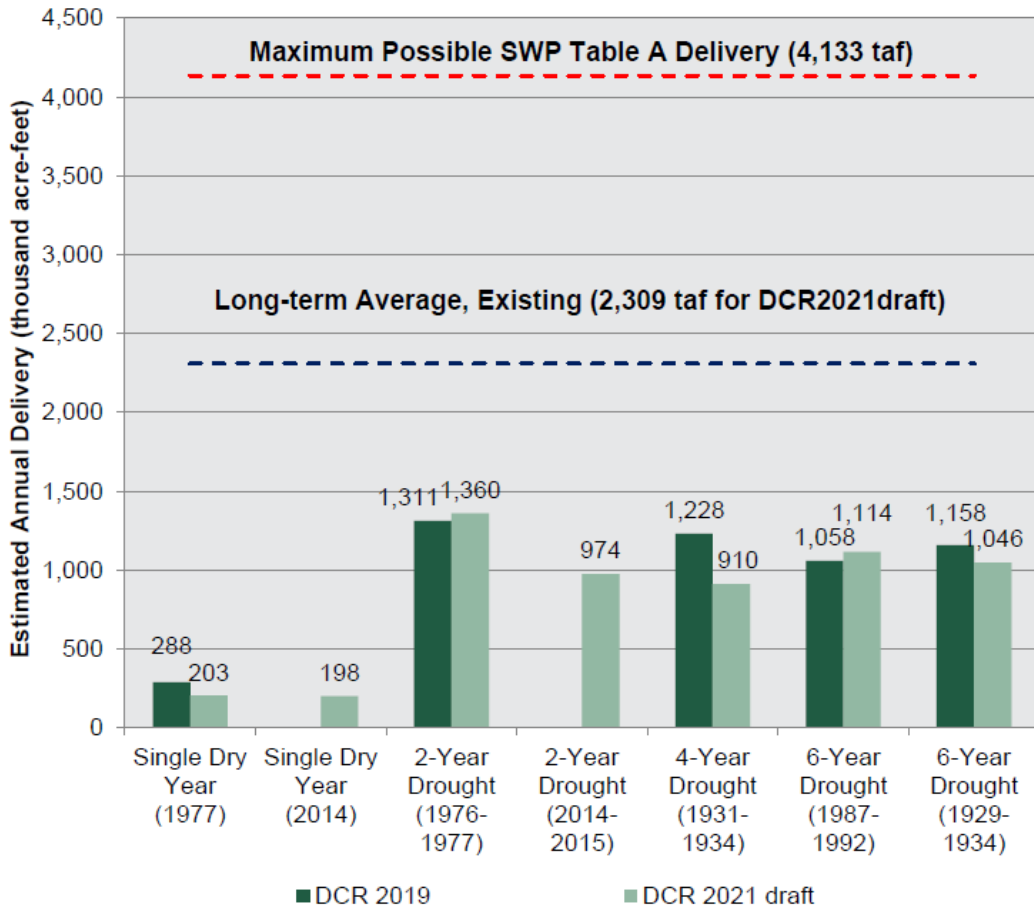
DWR has convened a historical observational data working group that is evaluating recent changes to hydrologic characteristics and will contrast them with long-term hydrologic characteristics. DWR expects this evaluation of recent hydrologic characteristics will be a part of the Delivery Capability Report starting in 2023.

MWD Comment 1

I noticed that the modeled results in the chart you presented looked close to actual for 2014 and 2015:



Taking the average of a modeled 3% and 27% allocation would be 15%... Do you know why the DCR chart below shows 974 TAF (~24%) and not ~15%? A 2-yr Table A of ~24% for 14-15 and ~33% for 76-77 seems on the high end:



Thanks for any clarification-

DWR Response

The reason for the discrepancy with the 2014-2015 averages was due to the assumption made in patching the October-December 2015 deliveries.

In the past, the 2003 contract year deliveries were calculated as the sum of January-September 2003 and October-December 1921 data. This was for CalSim II whose period of record was from water year 1922-2003.

The patching assumption was carried over to calculating CalSim 3 Table A deliveries. Since CalSim 3 simulated data only went up to September 2015, there was no data for the last 3 months. To handle this, the same assumption was used to grab the October-December 1921 data to fill in the gaps and come up with a 2015 contract year delivery.

However, this was not an appropriate assumption. October-December 1921 was part of the 1922 Water Year categorized as Above Normal. Therefore, the 2015 deliveries presented in the draft DCR were inflated. 2015, a Critical Year, was patched with data from an Above Normal year.

Table 3 shows that the 2014-2015 SWP allocation average was about 15% while the percent of maximum delivery 2-year average was at 24%.

To avoid confusion, DWR is planning to adopt one of the two approaches below.

- (1) Remove contract year 2015 deliveries from reporting.
- (2) Estimate the delivery for year 2015 by averaging the data to avoid the inappropriate mixing of Above Normal year deliveries in a Critical year.
- (3) Multiply estimated demand from Oct-Dec 2015 with the final 2015 SWP allocation

Method 2

The equation to calculate the updated 2015 SWP deliveries is as follows:

2015Estimate

$$= (Jan2015TableADel + Feb2015TableADel \dots + Sep2015TableADel) \left(\frac{12}{9} \right)$$

What this basically does is calculate the 2015 monthly average of the last 9 months of the simulation. The multiplication by 12 is just to estimate an annual average from the monthly average.

Table 4 shows the updated 2014-2015 averages with the refined calculation. The Percent of Maximum is now 15% compared to the 24% shown in Table 3.

Method 3

This method is a more informed estimate of the October-December 2015 SWP Table A deliveries. The general equation is as follows:

2015Estimate

$$= ActualSWPDeliveries_{Jan2015 \text{ to } Sep2015} + SWPSODAllocation_{May2015} (Oct2015Demand + Nov2015Demand + Dec2015Demand)$$

The first term is simulated available SWP deliveries data and the second term is the approximation of the October to December 2015 deliveries. The May 2015 SWP SOD allocation parameter in the second term is also simulated available data. For the Draft DCR 2021 study, this allocation is 27.14%.

The second term demands are only estimated for Table A. It was found that average carryover deliveries from October to December are negligible so the estimated carryover deliveries in these months for 2015 are zero.

Table 1. Average October-December SWP carryover deliveries in cubic feet per second (cfs) and thousand acre-feet (TAF)

Month	SWP carryover deliveries average (cfs)	SWP carryover deliveries average (TAF)
10	3.35	0.21
11	0.03	0.00
12	0.03	0.00

The method to obtain the October-December 2015 Table A demands basically revolve on post-processing the SWP demand patterns lookup table called “swp_3pattern_demands.” The general steps to determine demands are as follows:

1. Obtain the SWP demand profile output (SWP_PERCENT). In May 2015 this demand profile is 30%
2. Gather the SWP demand patterns by contractor lookup table (swp_3pattern_demands)
3. Filter the lookup table so that only October-December demand patterns with 30% demand profile is shown
4. Add up the demand column
5. Subtract the demands from contractors 7 and 9 (Yuba City and Butte County, respectively)
6. The actual demands for October-December 2015 are now determined

The October-December 2015 demands and estimated deliveries for Delta and South of Delta’s contractors are summarized in the table below:

Table 2. October-December 2015 allocation, demand, and deliveries.

Month	May 2015 SWP SOD allocation (%)	Delta and SOD only demand (TAF)	Delta and SOD only Table A deliveries (TAF)
Oct 2015	27.14%	428.35	116
Nov 2015	27.14%	336.33	91
Dec 2015	27.14%	288.26	78

Table 5 combines the updated 2014-2015 summaries using Method 3. Note that Method 2 and 3 2015 estimations are very close, with Method 3 estimation being higher by 11 TAF.

Table 3. Simulated 2014-2015 calculations presented in the Draft Report and SWC meeting on 01/19/2022.

Contract year	SWP allocation	DCR Table A excluding Feather River region	Delivery % - DCR Table A no Feather River region
2014	3.47%	198	4.80%
2015	27.14%	1750	42.34%
2014-2015 average	15.31%	974	23.57%

Table 4. Simulated 2014-2015 Method 2 calculations.

Contract year	SWP allocation	DCR Table A excluding Feather River region	Delivery % - DCR Table A no Feather River region
2014	3.47%	198	4.80%
2015	27.14%	1053	25.48%
2014-2015 average	15.31%	626	15.14%

Table 5. Simulated 2014-2015 Method 3 calculations.

Contract year	SWP allocation	DCR Table A excluding Feather River region	Delivery % - DCR Table A no Feather River region
2014	3.47%	198	4.80%
2015	27.14%	1075	26.02%
2014-2015 average	15.31%	637	15.41%

Note: Delivery % is the Table A delivery divided by the Maximum SWP Table A amount of 4,133 TAF.

MWD Comment 2

Hi Nazrul-

Thanks very much for the detailed explanation.

I think it would be preferable to report 2015 and not remove it, but to use one of your other methods other than taking Oct-Dec 1921 data.

Thanks again and hope you have/had a great weekend-
Sarah

DWR Response

DWR decided to adopt the simpler Method 2 because it is easier to interpret and does not have much difference with the more detailed Method 3 2015 estimation calculation.