



ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, ZONE 7

100 NORTH CANYONS PARKWAY • LIVERMORE, CA 94551 • PHONE (925) 454-5000 • FAX (925) 454-5727

ORIGINATING SECTION: ENGINEERING
CONTACT: JARNAIL CHAHAL

AGENDA DATE: August 16, 2017

ITEM NO. 14e

SUBJECT: Cal WaterFix Update

BACKGROUND:

The failing Delta conveyance system has been studied extensively, and many solutions have been proposed over the last 50 years. The table on the next page summarizes these efforts.

The Bay Delta Conservation Plan (BDCP) effort began in 2006 with the co-equal goals of achieving water supply reliability while improving the ecosystem. The BDCP was a voluntary effort to obtain long-term, incidental take permits for the operations and infrastructure improvements of the State Water Project (SWP) and the Central Valley Project (CVP) through development of a comprehensive Habitat Conservation Plan (HCP) under the federal Endangered Species Act, and a Natural Community Conservation Plan (NCCP) under the California Natural Community Conservation Planning Act.

Although the BDCP was a key element of the Delta planning framework established by the State Legislature in 2009, it was not the only effort needed to accomplish the “co-equal goals” of restoring the Delta ecosystem and water supply reliability for California. The Delta Stewardship Council, Delta Protection Commission, Delta Conservancy and State Water Resources Control Board all have important roles in the planning framework.

In 2014, the California State Administration developed the California Water Action Plan (see http://resources.ca.gov/california_water_action_plan/) to address the long-term sustainability of the State’s water supply. This Plan lays the foundation for implementing broader, statewide measures including water use efficiency, groundwater management, integrated regional water management, expanded recycling and potential development of surface storage as well as achieving the co-equal goals for the Delta of water supply reliability and to protect, restore and enhance the Delta ecosystem.

After several years of ongoing debate about the science and operation of the BDCP, resource agencies were still reluctant to guarantee a 50-year permit given the large uncertainty about the future. Unknowns about the effectiveness of habitat restoration and the impacts of climate change further muddied the waters until efforts to move a solution forward were at a near standstill.

In April 2015, Governor Brown introduced “California WaterFix,” a revised approach to secure water reliability, and “California EcoRestore,” a parallel program to restore habitat in the Sacramento-San Joaquin Delta. Together, these two efforts represent an alternative approach to implement related components of the California Water Action Plan. No longer seeking a 50-year

permit, these new programs aim to modernize Delta conveyance and restore habitat through separate tracks.

History of Delta Conveyance Studies

Year	Activity
1960s	California Department of Fish and Game, now known as the California Department of Fish and Wildlife, biologists publish an article in American Fisheries Society Special Publication #3, showing that the best protection for native fish populations, and solution to the Delta’s environmental problems, is abandoning sensitive river channels for water transport. U.S. Fish and Wildlife Service backs the Peripheral Canal proposal, calling it the only engineering plan that would not have detrimental effects on fish and wildlife while offering the biggest opportunity for fish enhancement. Interagency Delta Committee completes its report recommending various Delta facilities, including the Peripheral Canal.
1994	Bay Delta Accord is signed, authorizing “CALFED,” a joint state and federal agency process to develop water quality standards, coordinate operations of the SWP and CVP and work toward long-term Delta solutions.
1998	CALFED “Diversion Effects on Fish Team” finds that an isolated facility would substantially reduce entrainment and predation effects on the Delta’s native fish populations.
2000	CALFED Bay-Delta Program releases “California’s Water Future, a Framework for Action.” Among the list of comprehensive actions, it identifies the need to evaluate a screened diversion facility on the Sacramento River to improve water quality in the Delta and at the export facilities. Construction would begin by late 2007.
2007	Delta Vision Blue Ribbon Task Force recommends an assessment of dual conveyance, saying new facilities for conveyance and storage, and better linkage between the two, are needed to better manage California’s water resources for both the Delta and exports.
2008	Public Policy Institute of California states a peripheral canal is the best Delta conveyance option for meeting the coequal goals of a healthy Delta ecosystem and water supply reliability.
2009	The Governor enacts the Delta Reform Act, which includes the coequal goals of providing a more reliable water supply for California and protecting, restoring and enhancing the Delta ecosystem in a way that protects the Delta’s unique characteristics. The law directs state and federal officials to examine a reasonable range of ways to change Delta water project diversions, including isolated conveyance.
2010	The first administrative draft Bay Delta Conservation Plan (BDCP) was released.
2012	The second administrative draft Bay Delta Conservation Plan was released.
2013	Release of Draft BDCP and Draft EIR/EIS in compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) for formal public review and comment.
2014	Announcement of further refinements to the water delivery facilities to reduce impacts to Delta communities, minimize disturbances or dislocation to Greater Sandhill Cranes and improve the long-term reliability and operation of the proposed infrastructure.
2015	Announcement of a modified preferred alternative, Alternative 4A, known as California WaterFix.
2015	Release of Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement on the Bay Delta Conservation Plan/California WaterFix.
2016	Final BDCP/CA WaterFix and EIR/S.

Sources:

1. The information from the 1960s to 2009 is from “The History of Water Project Conveyance in the Delta,” which is a publication from the California WaterFix website. The following link is to a PDF version of this document: http://cms.capitoltechsolutions.com/ClientData/CaliforniaWaterFix/uploads/83my6_FIX_FS_ConveyanceHistory.pdf
2. The information from 2010 to 2016 is from the Bay Delta Conservation Plan (BDCP) website at the link: <http://baydeltaconservationplan.com/Library/BDCPLibrary/BDCPPlanningProcess/BDCPPlanningProcessHistory.aspx>.

California EcoRestore will pursue more than 30,000 acres of fish and wildlife habitat restoration (<http://resources.ca.gov/ecorestore/>). California WaterFix is focused on a new sub-alternative called Alternative 4a, comprised of two 30 mile long, 40 foot diameter tunnels linking the Sacramento River to the existing pump facilities in the South Delta. For more information, see: <https://www.californiawaterfix.com/>.

Zone 7's interest in the success of these programs is to restore water supply reliability lost to recent regulation and court actions, to guard against future reductions in supply reliability, and to improve the delta ecosystem.

CALIFORNIA WATERFIX INFRASTRUCTURE AND OPERATION

Information in this section summarizes the proposed infrastructure and operation of the California WaterFix and it is excerpted from California WaterFix reports\web site, and white papers and presentations prepared for the Metropolitan Water District of Southern California.

Overview of the California WaterFix Facilities



The infrastructure for the California Water Fix stretches about 38 miles from the intakes on the Sacramento River to Clifton Court. There are three intakes on the Sacramento River, each for flow up to 3,000 cfs. The water from those intakes is collected into the north tunnels and then flows to the intermediate forebay where the water is commingled together. The hydraulic grade for the twin tunnels is set and the water flows then through the main tunnels down to the Clifton Court pumping plant where the water is lifted into Clifton court and then can be distributed to either the Jones Pumping Plant or the Banks pumping plant, which are south of Clifton Court.

The three north tunnels are approximately 13.5 miles. The tunnels are fairly large because they are part of a gravity fed system. Those tunnels range from 28 feet to 40 feet in diameter. They convey the water from the intakes to the intermediate forebay; at that point, the water is split into the 40-foot diameter twin tunnels, which then carry the water 30 miles to the south to the Clifton Court pumping facilities.



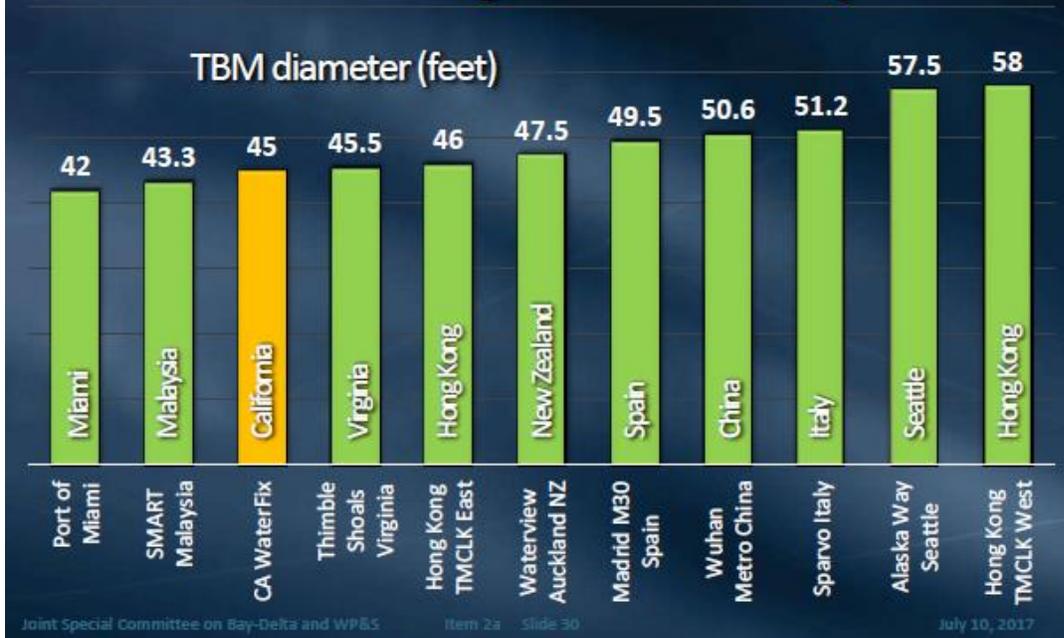
Main Tunnels

- Twin bore main tunnels
- 30 miles long each
- 150 ft below grade
- 2-foot thick concrete liner
- Pressurized face tunnel boring machine
- ±45-ft excavated diameter
- 40-ft internal diameter

Joint Special Committee on Bay-Delta and WP&LS Item 24 Slide 19 July 10, 2017

The dual parallel tunnels for the Main Tunnel reaches, approximately 30 miles each, are proposed to meet the total desired capacity of 9,000 cfs and ensure system reliability, allowing one tunnel to be isolated for maintenance or major repairs while the second tunnel is kept in operation. This concrete segmented liner would be the final lining system for the tunnels. This approach is commonplace on construction projects throughout the world and is used in both transportation and water infrastructure projects. The liner would be sealed with a series of gaskets and bolted connections between the adjacent segments to avoid leakage.

Large Diameter Tunnel Boring Machine Projects



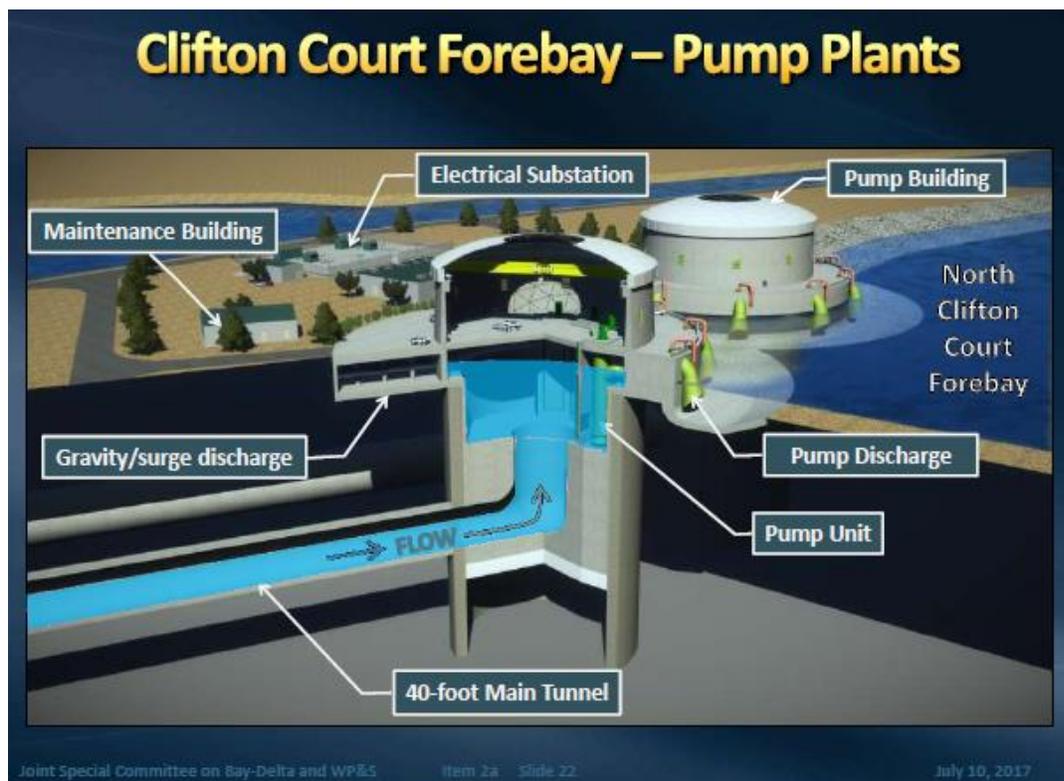
The excavated diameter of the tunnels is 45 feet. The tunnel segments themselves are approximately two feet thick; the inside diameter is about 40 feet. The planned California WaterFix tunneling machines are at the lower end of the range for large tunnel projects that have been implemented.

Tunnel construction will use over 700,000 tunnel segments, which is about 80,000 segmental rings. Excavation of the tunnels will remove 23 million cubic yards of material, all of which has been accounted for in the EIR/EIS. The material will be stockpiled near the tunneling sites on the islands as construction moves through the Delta.

Ten to twelve tunnel boring machines will be in operation simultaneously during the program. To power the machines, almost 200 megawatts of power will be needed to be brought to each of the launching shafts for these machines. Although there are large, high voltage transmission lines already in the Delta, those are not available as they are used to transport power up and down the state. So they are working with a number of different power providers in the Delta to ensure they can bring in the requisite amount of power needed to run the machines.



There will be three intakes, ranging in length from 1250 to 1600 feet long, depending on the morphology of the river at the different locations. The outlet shaft is at the back of the sedimentation basins. At that point, the water will drop into the tunnel system and then carried south to Clifton Court.



At the terminus of the tunnels at Clifton Court, there will be two large pumping stations at 4500 cfs each; they will lift the water about 15 to 20 feet out of the bottom of the tunnels and deposit it into Clifton court where it will then flow by gravity to both the Jones and the Banks pumping facilities.

Program Cost Estimate

Program Estimate

ITEM	AMOUNT (\$ billions)
Conveyance System	
• Program Management, construction management, and engineering	\$1.91
• Tunnel & shaft construction	\$6.82
• Remaining construction	\$2.68
• Contingency (~36% for tunnels, shafts, remaining construction)	\$3.38
• Land acquisition (includes 20% contingency)	\$0.15
Subtotal	\$14.94
Environmental Mitigation (includes 35% contingency)	\$0.80
OVERALL COST	\$15.74
Program Estimate in 2014 dollars	

Joint Special Committee on Bay-Delta and WP&S Item 2a Slide 36 July 10, 2017

The cost estimates were prepared between 2014 and 2017. All three separate estimates show that the proposed California WaterFix facilities can be completed within the proposed budget of \$14.94 billion.

Cost Estimate Comparison

ITEM	<u>Estimate 1</u> 5RMK Inc. (Billions) ^{1,2}	<u>Estimate 2</u> Jacobs Engineering (Billions) ^{1,2}	<u>Estimate 3</u> Risk Adjusted with Mitigation at 75% Confidence Interval (Billions) ^{1,3}
Construction	\$9.50	\$8.86	\$10.66
Contingency	\$3.38	\$3.15	----
Subtotal	\$12.88	\$12.01	\$10.66
PM/CM/Eng	\$1.91	\$1.91	\$1.91
Land acquisition	\$0.15	\$0.15	\$0.15
Overall Total	\$14.94	\$14.07	\$12.72

1. Program estimates in 2014 dollars
 2. ~36% contingency on construction for 5RMK and Jacob Engineering estimates
 3. Based on risks known at time of assessment

Joint Special Committee on Bay-Delta and WP&S Item 2a Slide 37 July 10, 2017

Organization of the Construction Enterprise

The design and construction of California WaterFix would be managed under contract with DWR through a proposed Delta Conveyance Design and Construction Joint Powers Authority designated the Design and Construction Authority, or “DCA.” This approach was successfully used in the mid-1990s when DWR contracted with the Central Coast Water Authority to design and construct a portion of the Coastal Branch of the California Aqueduct.



Above is the anticipated organizational structure of the DCA. The Program Director would be the single point of accountability to the Board of Directors for delivery of the program design and construction. The Program Director would set the overall direction of the program, coordinate all program execution with the Program Manager and ensure activities are on schedule, within budget and adhere to specifications. In addition, the Program Director would lead external interactions and administrative support functions of the program organization and interaction with the DCA directors and DWR.

Schedule

Once the program is authorized, it is anticipated that it will take 16 years to implement the project. First 12 to 15 months will be used to fill key positions and to hire the consultants that will be performing key work activities.

About four years after the commencement of the project, awarding major construction contracts will begin. Construction is anticipated to last for about 13 years.

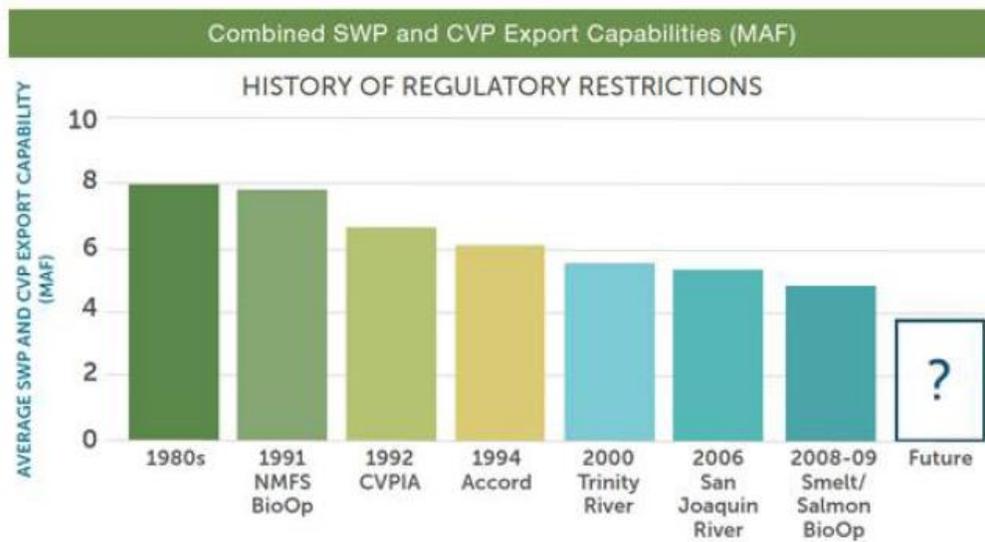


California WaterFix - Operations

a) Water supply - Both of California's two largest water projects, the State Water Project (SWP) and Central Valley Project, convey water through the Delta and deliver water to about two-thirds of all Californians and millions of acres of irrigated farmland. The projects serve areas such as Zone 7's and Silicon Valley in Northern California to the Central Valley and Southern California. Over 80% of Zone 7's water supply comes from the SWP.

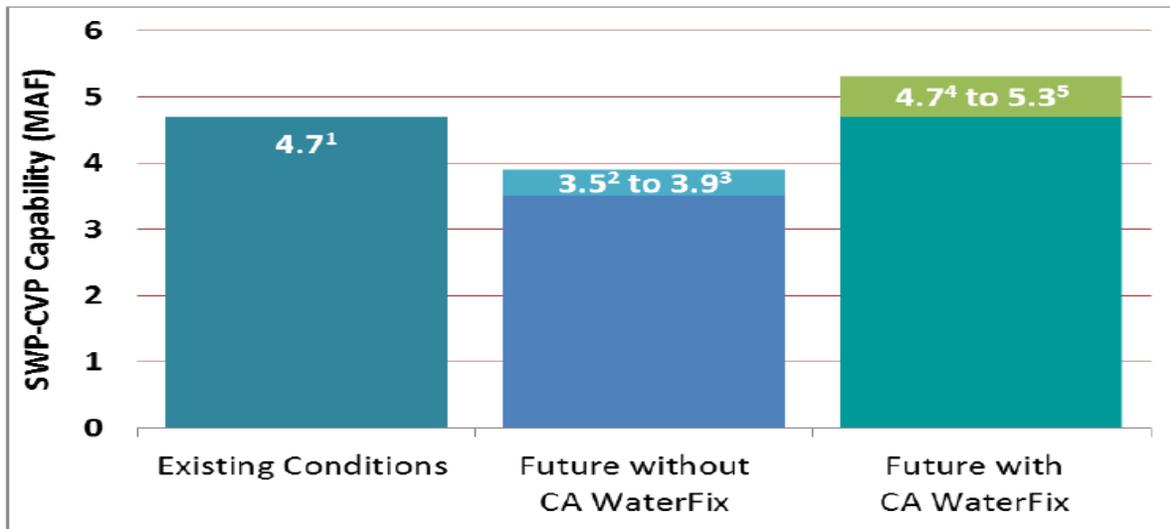
To protect listed species, the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and the California Department of Fish and Wildlife (CDFW) have issued biological opinions and incidental take permits requiring the state Department of Water Resources (DWR) and federal Bureau of Reclamation (Reclamation) to substantially alter the way the agencies operate the SWP and CVP facilities. These operational changes have reduced SWP and CVP deliveries and water supply reliability south of the Delta. In addition, the Delta is at risk from earthquake damage, persistent land subsidence, floods and rising sea levels.

The increased Delta requirements and export constraints have further impacted SWP and CVP operations decreasing operational flexibility and increasing water supply vulnerabilities during droughts. As shown in the figure below, over a period of little over 25 years, the export capability of the SWP and CVP pumps from the Delta has been reduced by over 3 MAF per year (~38%). The California WaterFix is intended to reverse this downward trend.



The operating criteria for California WaterFix will include both the existing regulatory requirements and new criteria and requirements associated with the proposed new facilities.

Extensive modeling and analysis have evaluated the potential operational and water supply benefits of California WaterFix. This work involved developing forecasts of SWP and CVP deliveries for a number of scenarios involving climate change, both with and without California WaterFix. The total water supply from the SWP and CVP under current conditions averages about 4.9 MAF of water per year. The No Action Alternative evaluated in the California WaterFix EIR/EIS is estimated to average about 4.7 MAF per year in year 2025 with climate change effects considered. The future water supply without California WaterFix and assuming increasing future regulatory constraints is estimated to be 3.5 MAF per year on average to 3.9 MAF per year (~17 to 26% further reduction). The total deliveries with California WaterFix are estimated to range from 4.7 MAF under Alternate 4A-H4 to 5.3 MAF under Alternate 4A-H3 per year on average.



¹California WaterFix EIR/EIS No Action Alternative, existing conditions with 2025 climate change impacts

²2015 Delivery Capability Report Existing Conveyance High Outflow scenario

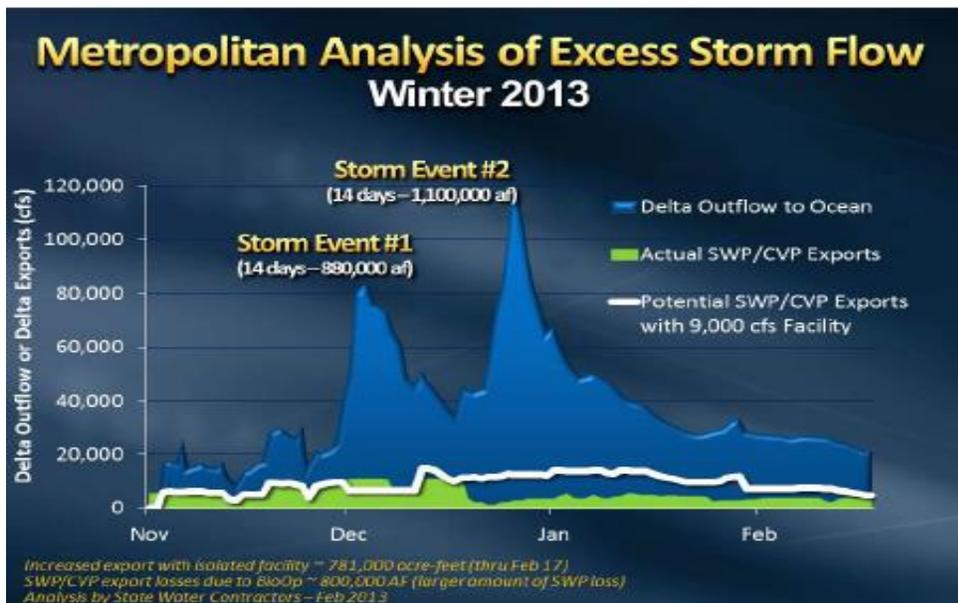
³2015 Delivery Capability Report Existing Conveyance Low Outflow scenario

⁴California WaterFix EIR/EIS Alternative 4A-H4, initial operating criteria lower range

⁵California WaterFix EIR/EIS Alternative 4A-H3, initial operating criteria upper range

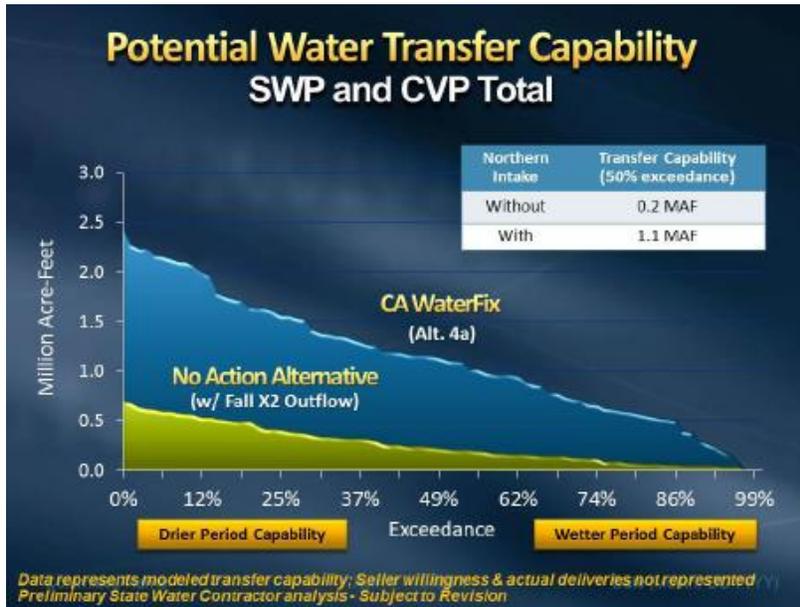
b) Operational Flexibility – the operational flexibility provide by California WaterFix can increase water supply reliability two ways in any given year: 1) by increased ability to take advantage of intermittent high-flow events in the Delta, and 2) increased conveyance capacity to facilitate water transfers between north and south of Delta.

The graph below shows an example of a major storm in the winter of 2012/2013 that produced significant volumes of water flowing through the Sacramento River past the new intake locations, 880,000 acre-feet over the first 14-day event and another 1.1 MAF over the second 14-day event.



During these events, SWP and CVP exports were relatively minor in comparison to the outflows. The analysis shows that with the additional flexibility of California WaterFix, it is estimated that several hundred thousand acre-feet of additional water could have been captured and put in storage during these two events. A similar analysis by DWR shows that the proposed project could have diverted an additional 1.2 MAF in 2016.

The figure below shows the estimated increase in available capacity with and without California WaterFix.



In addition to water supply reliability, the operation of the California WaterFix would provide; compliance with D-1641 Water Quality Standards, better export water quality (17-22% improvement in total dissolved solids, 31 to 43% improvement in bromide, 2-11% improvement in organic content, and 5-27% improvement in nitrates), allow flexibility for pumping operations in a dynamic fishery environment, reducing climate change risks (reduction in snowpack, increased intensity and frequency of extreme precipitation events, and rising sea level and salt water intrusion into the Delta), reducing seismic risks (without California WaterFix multiple levee failures during a seismic event could disrupt SWP and CVP pumping operation for up to 18 months), and enhance ecosystem fishery habitat throughout the Delta by providing improved flow patterns in the Delta.

CURRENT STATUS OF MAJOR ACTIVITIES\MILESTONES:

The California WaterFix continued to make progress towards achieving some key milestones and decision points. Following is a summary of key recent and upcoming activities.

Biological Assessment and Opinion

The proponents (DWR and the Bureau of Reclamation) completed the Biological Assessment (BA) in 2016.

On June 26, 2017, the resource agencies (National Marine Fisheries Service and U.S. Fish and Wildlife Service) released their biological opinions for the proposed construction and operation of the California WaterFix. These agencies are responsible for the protection of species listed under the U.S. Endangered Species Act (ESA). The goal of WaterFix is to balance the needs of California residents with the needs of Sacramento-San Joaquin Delta fish and wildlife by modernizing infrastructure to secure water supplies and better protect the Delta's ecosystem. Both biological opinions found the construction and operation of WaterFix as proposed would not jeopardize the continued existence of ESA-listed species or destroy or adversely modify critical habitat for those species. Completion of these biological opinions allows WaterFix to take a critical step forward. The biological opinions will serve as important components in several ongoing environmental review and regulatory activities.

EIR\EIS

The final Bay Delta Conservation Plan / California Water Fix EIR-EIS was released in 2016. On July 21, 2017 DWR certified the final environmental analysis for the California WaterFix and signed the Notice of Determination (NOD). With finalization of the NOD and associated decision documents, DWR has approved WaterFix as the proposed project under the California Environmental Quality Act

Change in Point of Diversion Petition

The WaterFix team continued to prepare for the hearing for the Change in Point of Diversion Petition (POD). A decision by the State Water Resources Control Board on approving the change in POD is most likely to occur in 2018.

Permits

On July 28, 2017, the California Department of Fish and Wildlife issued an incidental take permit for the construction and operation of California WaterFix in compliance with Section 2081(b) of the California Endangered Species Act. This permit authorizes the incidental take of state-listed species associated with future operation of the State Water Project (SWP) with the addition of the California WaterFix, which includes construction of certain proposed water conveyance facilities within the Sacramento-San Joaquin River Delta, along with operation of the SWP subsequent to and incorporating the newly constructed facilities for California WaterFix and future SWP operations. Issuance of this permit represents another significant milestone in the WaterFix planning process. As described in the permit application, WaterFix will implement measures for construction and operation of the project to fully mitigate the impacts of any incidental take of state-listed species, and will provide additional protection through real-time operation of the facilities in a manner that avoids and minimizes incidental take.

The WaterFix team continued to respond to comments received on the US Army Corps 404 Application Package, and coordinate the 1602 Streambed Alteration Agreement and work on that application. The decision on the US Army Corps 404 permit is anticipated by the end of 2017.

Cost Estimate and Funding

The original cost estimate for the Conveyance System, prepared based on the April 2015 conceptual engineering report, of \$14.94 billion (2014 dollars) for the three 3000 cfs intakes along the Sacramento River, the intake pipelines, two tunnels to Clifton Court and the two pumping plants at Clifton Court, which included a 36% construction contingency.

In April and May of 2016, the WaterFix team conducted a risk assessment workshop for the project that included approximately 60 experts. The risk assessment effort was lead by Aldea Services, a construction engineering firm. The risk assessment considered everything that can go wrong with the project and then estimated the respective cost impacts, assuming all those things occurred. The risk assessment team estimated the Conveyance System cost to be \$12.72 billion (2014 dollars), considering risk with mitigation at 75% confidence. It means there is 75% level of certainty that the cost will be \$12.72 billion or less. Utilizing a 75% confidence interval is a little higher than normal. Normal practice would be somewhere in the 50-60th percentile, but the team opted to be more conservative for a program of this size and technical complexity.

Another independent detailed cost analysis by Jacobs Engineering estimated the Conveyance System cost at \$14.07 billion (in 2014 dollars) as compared to \$14.94 billion original cost estimate. Both of these estimates include 36% construction contingency.

In the next several months, the WaterFix team is anticipated to continue to work on various funding and financing options\structures, including cost-share agreements between the federal and state contractors as well as determining cost allocations within each project, itself. Staff anticipates bringing possible interim funding for the WaterFix to the board at the September 2017 board meeting.