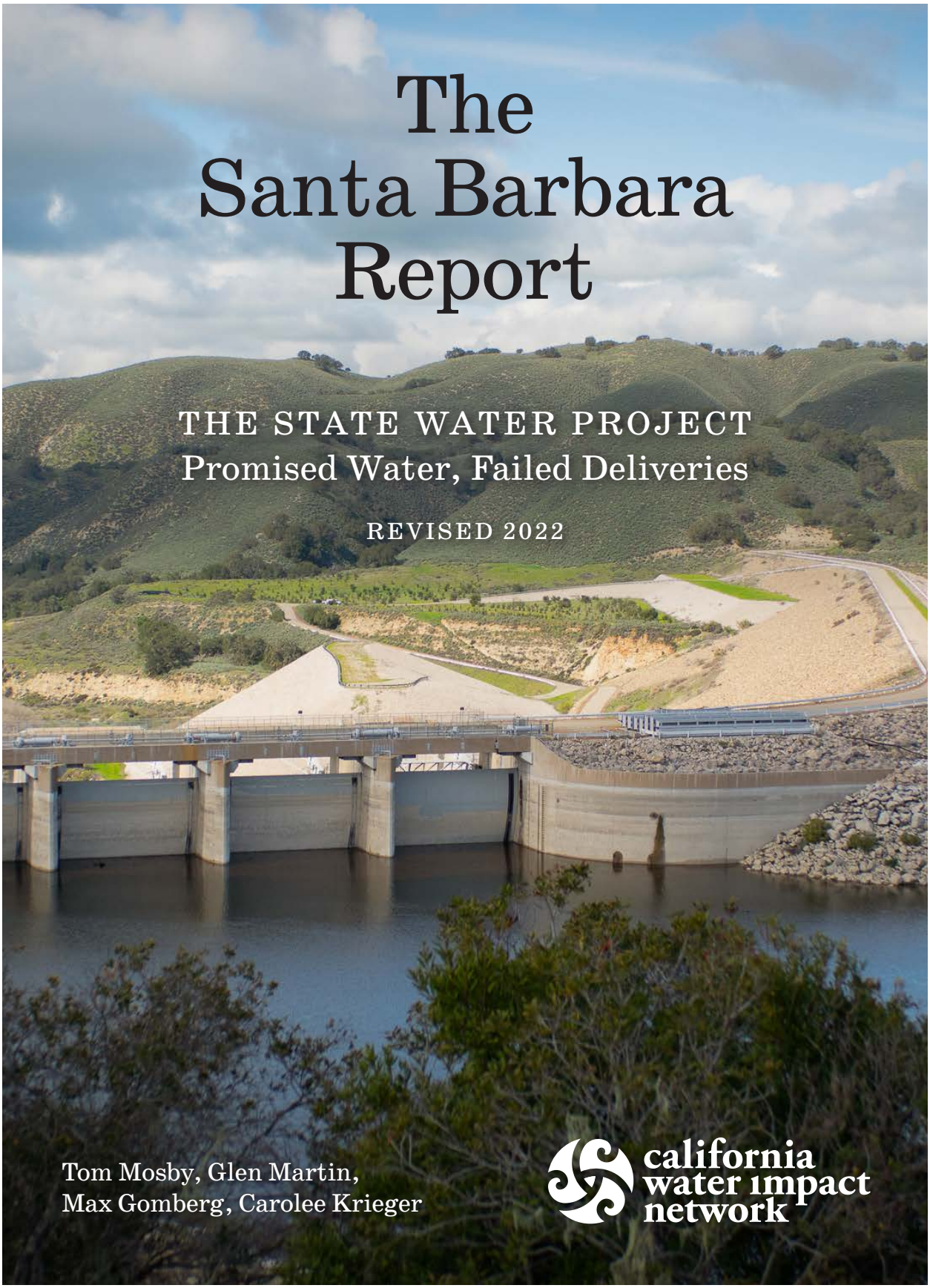


The Santa Barbara Report

THE STATE WATER PROJECT
Promised Water, Failed Deliveries

REVISED 2022

Tom Mosby, Glen Martin,
Max Gomberg, Carolee Krieger

california water impact network

Contents

Tables and Figures

The Santa Barbara Report

THE STATE WATER PROJECT
Promised Water, Failed Deliveries

Revised 2022

Summary

The revised 2022 Santa Barbara Report provides additional evidence that Governor Newsom's proposed Delta Conveyance Project (DCP) of a single tunnel running from the Sacramento River to the State Water Project's (SWP) aqueduct system will not increase water supply reliability and will have significant adverse consequences for SWP contractors and their ratepayers.

This 2022 Report Updates Cost and Reliability Data From the 2017 Report

Background

The Santa Barbara Report (Report), originally published in 2017 and revised in 2022, is produced by the California Water Impact Network (C-WIN), a statewide non-profit organization dedicated to the equitable and sustainable distribution of water in California.

This Report details the experiences of Santa Barbara County, a mid-sized agricultural and urban coastal county whose citizens voted in 1991 to join the State Water Project (SWP). Santa Barbara County is a case study of the high cost of SWP participation: a process that invariably involves great ratepayer expense without providing a reliable supplemental water supply.

The 2017 report was presented as evidence in a legal challenge to the proposed construction of the Twin Tunnels by the Department of Water Resources (DWR). The Twin Tunnels were designed to bypass the San Francisco Bay/Delta to "more efficiently move water" from the rivers of northern California to western San Joaquin Valley corporate agricultural water districts and urban southern California water agencies; urban beneficiaries included the largest SWP contractor, the Metropolitan Water District of Southern California. Cost estimates varied from a low of $20.6 billion (DWR) to $38 billion (ECONorthwest).

The Twin Tunnels project eventually was abandoned when it became apparent that the cost would be exorbitant with few if any benefits to rate payers.

State Water Project – General History[1]

The State Water Project was established in 1960 following the passage by voters of $1.75 billion in general obligation bonds authorized by the Burns-Porter Act. The Burns-Porter Act followed years of studies and engineering performed by the California Department of Water Resources (DWR), which was founded in 1956. On completion of its hydrological studies, DWR set the average annual yield of the SWP at 2.4 million acre-feet (MAF) with a maximum of 4.23 MAF during wet years.

The 1960 statewide vote was contentious and controversial, essentially pitting Northern California residents against their Southern California counterparts. Northern California voters saw the project as a seizure of the Sierra Nevada's water resources by Southern California to fuel excessive growth and development. In the final tally, approval was secured by only 174,000 votes of the 5.8 million ballots cast.

Passage was a consequence of a strong lobbying effort by the Kern County Water Agency for its 23.6% share of available Table A water (i.e., water based on the percentage of the total SWP annual yield set by DWR) and the powerful Metropolitan Water District of Southern California, which would acquire 45.8% of the remaining water supply. With funding authorized, construction of the SWP began immediately; much of the water conveyance and storage infrastructure was completed by the end of the 1960s.

When DWR established the annual Table A water quotas for its 29 contractors (as shown in Table 1, next page), the state's water agencies began allocation planning for

[1] See https://en.wikipedia.org/wiki/California_State_Water_Project, accessed November 30, 2022, for background and references, including the allocation amounts listed in Tables 1 and 2.

SWP water within their service areas. This initial water supply allocation planning set the stage for the water supply shortages that we are facing today.

TABLE 1

SWP CONTRACTOR LISTING - TABLE A ALLOCATIONS & %

No.	Contractor	Table A (AFY)	%
1	Metropolitan Water District	1,911,500	45.8
2	Kern County Water Agency	982,730	23.5
3	San Gorgonio Water Agency	173,000	4.2
4	Antelope Valley-East Kern Water Agency	144,844	3.5
5	Coachella Valley Water District	138,350	3.3
6	San Bernadino Valley Municipal Water District	102,600	2.5
7	Santa Clara Valley Water District	100,000	2.4
8	Castaic Water Agency	95,200	2.3
9	Tulare Lake Basin Water Storage District	87,471	2.1
10	Mojave Water Agency	85,800	2.1
11	Alameda County FC&WCD	80,619	1.9
12	Desert Water Agency	55,750	1.3
13	Solano County Water Agency	47,756	1.1
14	Santa Barbara County FC&WCD	45,486	1.1
15	Dudley Ridge Water District	45,350	1.1
16	Alameda County Water District	42,000	1.0
17	Napa County FC&WCD	29,025	.7
18	San Gabriel Valley Municipal Water District	28,800	.7
19	Butte County	27,500	.6
20	San Luis Obispo County FC&WCD	25,000	.6
21	Palmdale Water District	21,300	.5
22	Ventura County Watershed Protection District	20,000	.5
23	Yuba City	11,800	.2
24	Kings County	9,305	.2
25	Crestline-Lake Arrowhead Water Agency	5,800	.1
26	Oak Flat Water District	5,700	<.1
27	Empire West Side Irrigation District	3,000	<.1
28	Plumas County FC&WCD	2,600	<.1
29	Littlerock Creek Irrigation District	2,300	<.1
	Total	**4,172,686**	**100**

Santa Barbara County and the SWP

With the approval of the SWP by voters in 1960, government agencies across the state authorized financial commitments to DWR. The Santa Barbara County Flood Control and Water Conservation District was one of those agencies; it executed an agreement with DWR for 57,700 AFY. This was amended in 1981 to 45,486 AFY, which included a drought buffer to the Table A allocation of 39,078 AFY.

DWR costs were thus incurred by Santa Barbara County for the construction, operation, and maintenance of the project's infrastructure in exchange for a SWP commitment – even though no direct connection to the project had been established and water deliveries ultimately were the responsibility of the local participating Santa Barbara County (SBC) water agencies.

Santa Barbara County's Local and Regional Water Supply

Prior to connecting to the SWP, Santa Barbara County's South Coast water supply relied on surface water reservoirs; the primary reservoir was the U.S. Bureau of Reclamation's (USBR) Cachuma Project. Built in the 1950s, this nearly 200,000 AF reservoir provided water to the Goleta, Montecito and Carpinteria Water Districts, the City of Santa Barbara, and a portion of the Santa Ynez Valley. Being a surface water reservoir, its water levels were a direct result of rainfall runoff from the Santa Ynez River watershed. The Cachuma Project provides about 45% of the annual water supply to the South Coast water agencies in SBC.

The county's other water supplies consisted of groundwater and two smaller surface water reservoirs – Gibraltar Reservoir and Jameson Reservoir – located in the upper reaches of the Santa Ynez River. Gibraltar is owned by the City of Santa Barbara and the Montecito Water District owns Jameson. The yield of each of these reservoirs is noted below:

Santa Barbara County Santa Ynez River Reservoirs:

	Jameson	Gibraltar	Cachuma
Yield Avg (AFY)	1,800	4,600	23,500
Tunnel Yield (AFY)	500	1,100	2,000
Yield Total (AFY)	2,300	5,700	25,500

With the Cachuma Project subject to environmental restrictions, downstream releases and siltation, the South Coast water agencies saw the SWP as their best option

for avoiding water supply shortages to their respective communities; they expected a long-term and reliable allocation of 75% of the contracted amount of SWP water, regardless of drought.

On June 4, 1991, Santa Barbara County and San Luis Obispo County voters – reassured by highly optimistic projections from DWR – elected to build water conveyance, storage, and treatment infrastructure for the delivery of SWP water. The vote occurred during a devastating drought that lasted from 1987 to 1991, burdening ratepayers with water rationing, expensive surcharges, and penalties. Additionally, the cities of Santa Barbara and Goleta and the unincorporated town of Montecito were compelled to build a costly emergency desalination facility. Local water agencies and ratepayers alike were desperate to bolster water supplies, and a "Coastal Branch" connection to the SWP seemed the answer to their dilemma.

The subsequent county-wide vote approved connecting to the SWP by a 2-to-1 margin. Voters believed DWR claims that the SWP assured long-term 76% reliability for supplying water, and that the local threat posed by devasting droughts would be eliminated. The 1991 vote was basically the obverse of the 1979 Santa Barbara County State Water initiative. In that earlier vote, community concerns about high costs and unreliable deliveries led to a resounding defeat for state project water, with voters rejecting connection to the SWP by 43,987 of the 62,921 votes cast.

Interestingly, the June, 1991 vote occurred after the "March Miracle" of the same year: a series of late season storms that filled local reservoirs. But even these robust storms failed to assuage the concerns of Santa Barbara and San Luis Obispo ratepayers. The lingering effects of the 1987-1991 drought – and worries over future droughts – drove support for the SWP solution. Voter approval funded the building of the SWP Coastal Branch Phase II infrastructure. Estimated cost: $400+ million.

The cost of building conveyance and treatment facilities for SWP water delivery created an enormous budget challenge for the local South Coast water agencies, and customer rates and charges increased significantly. Due to the high cost of SWP water, the emergency desalination facility, a new and long-term local water supply funded by the three largest South Coast water agencies, ended its five-year standby service period in 1997. The City of Santa Barbara, the desal plant's owner, asked its two partnering water agencies, Montecito, and Goleta, if they intended continued participation in the desal facility. The two agencies declined, and the desalination facility was mothballed by Santa Barbara. The decisions by Montecito and Goleta were driven largely by the promised reliability of the SWP.

With the SWP Coastal Branch approved by voters on August 1, 1991, the participating Santa Barbara County agencies created and funded the Central Coast Water Authority (CCWA), a joint powers agency enjoined to oversee the construction, management, and operation of the SWP Coastal Branch. (See Table 2, which includes the disposition of the county's annual allocation of 39,078 acre- feet, exclusive of the drought buffer.)

The Coastal Branch's Phase II was engineered and constructed to deliver SWP water to its most southerly reach, i.e., the federal Cachuma Project Reservoir. Actual water deliveries to Lake Cachuma began on November 20, 1998. Note that the CCWA voting members do not include several participants with Table A water because those agencies were not represented in the 1991 county-wide vote.

TABLE 2

SANTA BARBARA COUNTY SWP PARTICIPANTS

No.	Agency	Table A (AFY) [1]	Voting %
1	City of Santa Maria	16,200	43.19
2	Goleta Water District	4,500	17.2
3	City of Santa Barbara	3,000	11.47
4	Montecito Water District	3,000	9.5
5	Carpinteria Valley Water District	2,000	7.64
6	Santa Ynez River WCD Improvement District #1	2,000	7.64
7	City of Buellton	578	2.21
8	City of Guadalupe	550	1.15
	Sub-total Table A - CCWA Voting Participation	**31,828**	**100**
9	Vandenberg Air Force Base	5,500	-
10	La Cumbre Mutual Water Company	1,000	-
11	Golden State Water	500	-
12	Morehart Land Company	200	-
13	Raytheon Systems Company	50	-
	Total Table A [1] Does not include drought buffer	**39,078**	**-**

Construction of the Coastal Branch Phase II 143-mile-long water conveyance system and associated infrastructure was completed by CCWA on June 25, 1998, at a cost of about $575 million – significantly higher than the $400+ million represented to SBC voters in 1991.[2]

[2] https://www.noozhawk.com/article/state_water_575m_aqueduct_branch_bails_out_south_coast, accessed November 30, 2022.

Swp Reliabilty and Costs – Santa Barbara County

With the Coastal Phase II SWP connection completed, scheduled deliveries to the SBC South Coast water agencies began in November 1998. The intervening 24 years have allowed analysts to assess SWP reliability and costs as they relate to current and expected project performance.

To a real degree, the Coastal Branch Phase II and CCWA function as a microcosm of the overall SWP water conveyance and storage system as it is operated, maintained, and managed by DWR. SBC water agencies demonstrate significant parallels to DWR in that CCWA, as a joint powers agency, manages, operates, and maintains the Coastal Branch reach for its contracting members. Connections to the SWP reservoirs are all subject to annual fluctuating DWR allocations driven by varying annual state meteorological conditions.

For the participating SBC agencies, costs for delivery of SWP water are divided up into DWR fixed costs (operation, maintenance, and management); variable delivery costs associated with the use of the statewide water conveyance and storage system; CCWA fixed costs (operation, maintenance, and management); and variable water delivery costs for the use of the Coastal Branch's water conveyance facilities.

The SBC water agencies and their annual wet year allocation of 39,078 AFY represent only 1% of the total annual SWP yield. This highlights a profound inequity: if CCWA is paying DWR costs for 1% of capacity, the burden of the DWR budget paid by the 28 other agencies and its rate payers is enormous.

Nor are SWP operating and delivery costs the primary concern. The costs paid by SBC water agencies for SWP reliability – actual annual water deliveries – are even more troublesome. In short, the extravagant DWR and CCWA operation and management costs do not guarantee a reliable water supply; when deliveries are most needed, SBC water agencies are still vulnerable to serious water shortages.

Central Coast Water Authority – Coastal Branch Phase II Water Management

The CCWA is the joint powers agency (JPA) tasked with managing water treatment, water delivery, and allocating costs to participating members. CCWA's management role is complicated and challenging; it answers to eight voting members that comprise its Board of Directors. The participating water agencies approve CCWA's annual budget, which in turn accounts for a significant portion of each water agency's annual budget. Even without water deliveries, each participating agency is subject to annual

budgetary costs that have resulted in regular and significant hikes to water customers' rates and charges.

The unreliability of SWP supplemental water deliveries (aimed at alleviating SBC water shortages during drought periods) is obvious from a review of the SWP's allocation history and the City of Santa Barbara's rainfall records from 2003 to 2021. The City of Santa Barbara's annual rainfall directly correlates to SBC water reservoir storage levels, which are determined by Santa Ynez River flow conditions. As noted, SBC's South Coast water agencies were counting on the SWP to provide a reliable supplemental water supply when their own local and regional water supplies were adversely affected by drought.

SWP Deliveries Track with Local Supply Availability

TABLE 3

SWP ALLOCATION/SB RAINFALL DATA — 2003 -2022

Year	SWP % Allocation	City of SB Rain (in.)	City of SB Rainfall YR %
2022	5	13.4	73.4
2021	5	14.2	77.8
2020	15	7.8	42.7
2019	75	24.1	132
2018	35	11.8	64.7
2017	85	19.8	108
2016	60	14.2	77.8
2015	20	4.4	2.4
2014	5	11.5	63
2013	35	4.7	2.6
2012	65	12.8	70.1
2011	80	19.4	106
2010	50	27.5	151
2009	40	13.2	72.3
2008	35	16.6	91
2007	60	8.3	45.5
2006	100	14.6	80
2005	90	27.7	152
2004	65	15.7	86
2003	90	14.6	80

As shown in Table 3 (previous page), SWP water availability mirrors SBC water supply conditions, i.e., when SWP water is needed to offset SBC water shortages, SWP water is nonexistent. SBC has relied on surface water supplies throughout its last 100 years, with most of its water derived from the Santa Ynez River and its associated reservoirs, the largest being the 200,000 AF Cachuma Project. Water supply and demand in SBC go hand in hand; when it rains water demand drops significantly, allowing surface water reservoirs to maintain adequate levels.

SWP annual allocation percentages appear to be set by DWR as a direct function of SWP reservoir levels. When annual SWP allocations are high, it's due to a "wet" year of above average rain and snow in the Sierra Nevada and Cascade Mountains, corresponding full reservoirs, and lower statewide water demand. This correlation demonstrates that the SWP is unable to provide water when it is most needed: during drought. Subscribers like SBC end up holding the bag and footing the bill. SBC has invested hundreds of million dollars – indeed, costs since 1998 most likely have exceeded $1 billion dollars – into a supplemental water supply that does not fulfil its promised role of reliable water deliveries during dry periods. Meanwhile, contractual SWP and CCWA operational and management costs continue to increase without any adjustment for water delivery shortfalls.

Further, the annual SWP allocation data also show an alarming and consistent trend: a high annual SWP water allocation in one year typically is followed by a low annual allocation the next year. Thus, the SWP operating conditions are very similar to the operating and water storage conditions in SBC. In other words, DWR's 1950s assessment of available Sierra Nevada water for the SWP was overestimated, resulting in an overallocation to its 29 contractors. This situation is not sustainable. It will result in continuing, accelerating, and severe statewide water supply shortages unless mitigation measures are implemented by water agencies at the local level.

Due to substantiated SWP water supply reliability concerns, local SBC water agencies have been forced to recalculate water supply and demand scenarios in accord with the Urban Water Management Plans (UWMP) required by state mandate. In the 2005 UWMP Update prepared by the Montecito Water District, an SBC water agency and CCWA member, the available SWP water supply was calculated in accordance with DWR's assertion that SWP contractors can expect to receive 100% of their allocations in "wet years," 76% in "average years," and 55% in "drought years".

DWR's optimistic projections ultimately proved woefully inaccurate – but they allowed SBC water agencies to plan for relatively robust growth within their respective service areas. Established moratoriums on new water meter hook-ups were

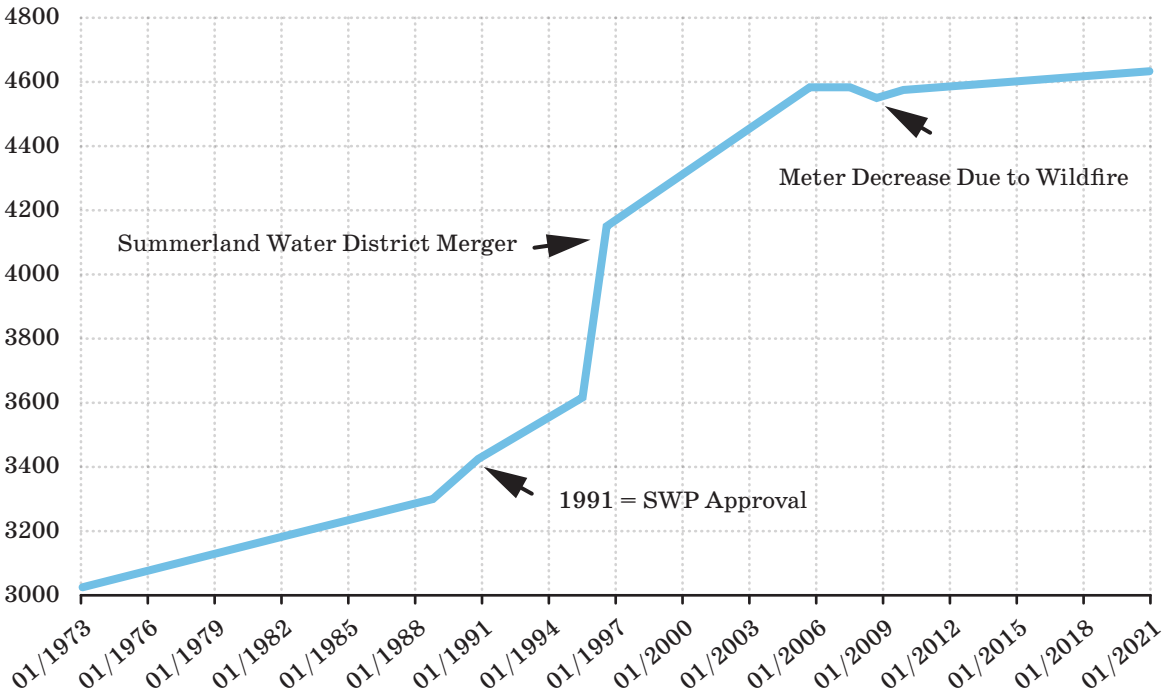
discontinued based on SWP water supply reliability projections. In fact, DWR's erroneous projections encouraged unsustainable local water policy decisions shortly after the Coastal Branch was completed: Montecito and Goleta Water District water service moratoriums that had been in place since 1973 were rescinded in the late 1990s.

The following graph (Figure 1 below) illustrates the increase in Montecito Water District customer meters from 1973 to 2021. Even with a water meter moratorium in effect from 1973 to the late 1990s, meters were added following the development of a dedicated groundwater system aimed at supplementing district supplies.

More importantly, the graph shows a major expansion of meters following the 1991 SBC vote approving the Coastal Branch connection to the SWP. This increase in meters slowed by early 2005 as the community neared its full build-out.

FIGURE 1

MONTECITO WATER DISTRICT, HISTORICAL WATER METER COUNT



Importing SWP Water – CCWA Expenses to SBC Water Purveyors

We now know SWP's water supply and performance have failed to meet the claims and objectives DWR has long promoted to its 29 contractors. In the final analysis, DWR's main contributions to SBC have been spiraling increases in water rates and charges and an absence of a reliable supplemental water supply.

As noted, the CCWA's annual budgets itemize costs to SBC water purveyors for the operation, maintenance, and delivery of water, including any water provided by DWR via the SWP. Annual budgets typically increase or decrease depending on debt service levels, the amount of water requested by an agency, and other factors. In any budget review, it is important to analyze what a water agency is paying and what it receives in return, with accommodation allowed for CPI and other time adjustments.

Local water agencies that funded the construction of the Coastal Branch Phase II delivery facilities experienced profound "sticker shock." The Montecito Water District is a case in point. Table 4 (next page) illustrates budget impacts caused by SWP water deliveries and subsequent changes to customer water rates that resulted from the significant increase in total operating expenses.

The table also summarizes revenues and expenses, not including service charges and other revenue, and excludes debt service and capital outlay expenses. The block rate structure shown for FYs 2010/11 and 2020/21 went into effect in 2008 to encourage customer conservation following a steady increase in water usage.

TABLE 4

MONTECITO WATER DISTRICT SELECTED FY ANNUAL BUDGET SUMMARY

	FY 1987-88 (Pre SWP)	FY 1999/00 (Begin SWP Payments)	FY 2010/11	FY 2020/21 (Includes Pre City WSA Funding)
FY Water Sales Revenue	$1.32M (4,500 AF in sales)	$5.9M (5,025 AF in sales)	$10M (5,800 AF in sales)	$15.5M (3,750 AF in sales)
FY Total Revenue	$1.82M	$8.8M	$13.4M	$20.9M
FY SWP Expense	0	$3.58M	$5.38M	$5.56M
FY Total Operating Expenses	$1.27M	$7.32M	$10.83M	$19.37M
Customer Water Rate/ HCF	Flat Rate $.86	Flat Rate $2.91	Block Rate 0-25 HCF: $3.90 25-60 HCF: $4.15 61-121 HCF: $4.90 > 121 HCF: $5.90	Block Rate 0-9 HCF: $6.56 10-35 HCF: $11.14 >35 HCF: $12.31

Takeaways from the table include the following:

- Budget operating cost increases are significant and require continued adjustment of rates and charges to fund SWP water deliveries, regardless of the amount of SWP water available for delivery. The preponderance of SWP expenses is the fixed DWR and CCWA fixed costs.
- The 2020/2021 FY water quantity sales are significantly lower than those of previous FYs due to implementation of customer water demand management.
- FY 20/21 water rates were calculated to fund the City of Santa Barbara's newly approved and guaranteed water supply of 1,430 AFY to the Montecito Water District.

Similarly, CCWA Coastal Branch operation and management costs to Santa Barbara County SWP participants are increasing dramatically without any assurances of actual water deliveries.

Table 5 (below) looks at CCWA FY budgets for FY2000/01 and FY 2020/21, a 20-year span. FY 2000/01 marks the beginning of actual costs allocated to each CCWA water agency participant following completion of the construction phase of the Coastal Branch.

The costs shown are rounded and divided between DWR SWP operations and CCWA Coastal Branch operations. Budget values shown are gross values and do not reflect the cost per acre-foot delivered to each SBC water purveyor.

As this table makes clear, CCWA's participation in the SWP is based on a 1960s-era fixed water allocation — whether water is delivered or not. That means CCWA pays – whether water is delivered or not. This is the crux of the problem.

TABLE 5

CCWA BUDGETS

Expense / Charge Description	FY 2000/01	FY 2020/21
CCWA Operating Expenses	$4.27 million	$10.1 million
Debt Service Payments	$10.4 million	$10.3 million
Capital Improvement Projects	$54,200	$1.95 million
Non-Annual Recurring Expenses	$202,000	-
Investment Income or Other	$200,000	$89,600
CCWA Credits	($4.5 million)	($452,000)
CCWA Total	**$10.7 million**	**$25 million**
DWR Fixed Charges	$26.4 million	$38.9 million
DWR Variable Charges	$2.0 million	$5.17 million
DWR Credit	($869,000)	
DWR Total	**$27.6 million**	**$44.1 million**
Total CCWA and DWR Expenses	**$38.3 million**	**$69.1 million**
SWP Water Delivered (AF)	**24,321**	**21,503**

The following tables and figure illustrate 2002-2022 CCWA member agency costs for SWP Coastal Branch management, operation, and maintenance, and DWR SWP operations exclusive of the Coastal Branch. These costs are represented in their respective fixed and variable components. In addition to costs, the annual allocation also is shown. Note that the DWR allocation is on an annual calendar basis with annual budgets based on the fiscal year (July 1 through June 30).

TABLE 6

CCWA MEMBER AGENCY COSTS

	DWR FY Costs		CCWA FY Costs			DWR+CCWA FY Costs	
FY	Fixed (SM)	Variable (SM)	Fixed (SM)	Variable (SM)	Debt Service (SM)	Total (Gross) (SM)	Total+DS (SM)
01/02	27.8	1.69	3.6	0.912	10.3	34.002	44.302
02/03	25.6	2.71	3.9	0.993	10.6	33.203	43.803
03/04	30.36	2.6	3.9	0.994	11	37.854	48.854
04/05	30.34	2.9	4.27	0.942	10.9	38.452	49.352
05/06	27.99	2.65	4.43	1.46	11.1	36.53	47.63
06/07	29.42	4.2	4.9	1.16	11.1	39.68	50.78
07/08	29.1	4.86	5.6	1.4	11.1	40.96	52.06
08/09	27.87	4.32	5.4	1.7	11.3	39.29	50.59
09/10	29.95	5.97	5.29	2.17	11.5	43.38	54.88
10/11	32.1	5.26	5.42	1.47	11.5	44.25	55.75
11/12	31.3	5.21	5.56	1.3	11.5	43.37	54.87
12/13	27.9	4.5	5.85	1.28	11.57	39.53	51.1
13/14	33.32	3.28	6.1	1.4	11.5	44.1	55.6
14/15	33.94	4.73	6.2	1.66	11.5	46.53	58.03
15/16	37.69	5.86	7.96	2.66	11.49	54.17	65.66
16/17	32.2	1.86	8.16	3.9	11.48	46.12	57.6
17/18	32	4.9	8.9	2.8	10.3	48.6	58.9
18/19	34.8	5.7	8.8	3.07	10.3	52.37	62.67
19/20	36.8	4.7	9.76	3.25	10.3	54.51	64.81
20/21	46.6	5.4	9.96	2.6	10.3	64.56	74.86
21/22	43.2	5.2	9.4	4.1	10.3	61.9	72.2
	$680.28	**$88.50**	**$133.36**	**$41.22**	**$230.94**	**$943.36**	**$1,174.30**

The importation cost of state water over the cited 20-year span illustrates the significant rate increases that are passed through to rate payers. The overall cost for the 20-year period – which includes debt service (DS) – is a staggering $1.17 billion. These costs highlight the exorbitant price paid by CCWA for a water supply that is anything but reliable; they also indicate this funding would be better spent by local agencies to develop more reliable local water supplies and implement demand management practices.

CCWA's actual costs and the DWR's allocation history are correlated in Table 7 (next page), elucidating the failure of the SWP to provide a reliable supplemental water

supply as a means of drought-proofing Santa Barbara County's communities. While climate change is properly identified as the primary driver of the state's accelerating and deepening droughts, our water management failures are rooted in the overallocation of the water resources of the Sierra Nevada and Cascade Mountains.

Establishing a 4.2M AFY Table A allocation during wet years and higher allocation percentages during normal and dry years falsely represents the capacity of the Northern California rivers that support the SWP. These policy failures have not only visited great harm on Santa Barbara County due to continuing water shortages; the damage to Northern California's ecosystems cannot be overstated.

TABLE 7

DWR + CCWA FY COSTS / DWR ALLOCATION

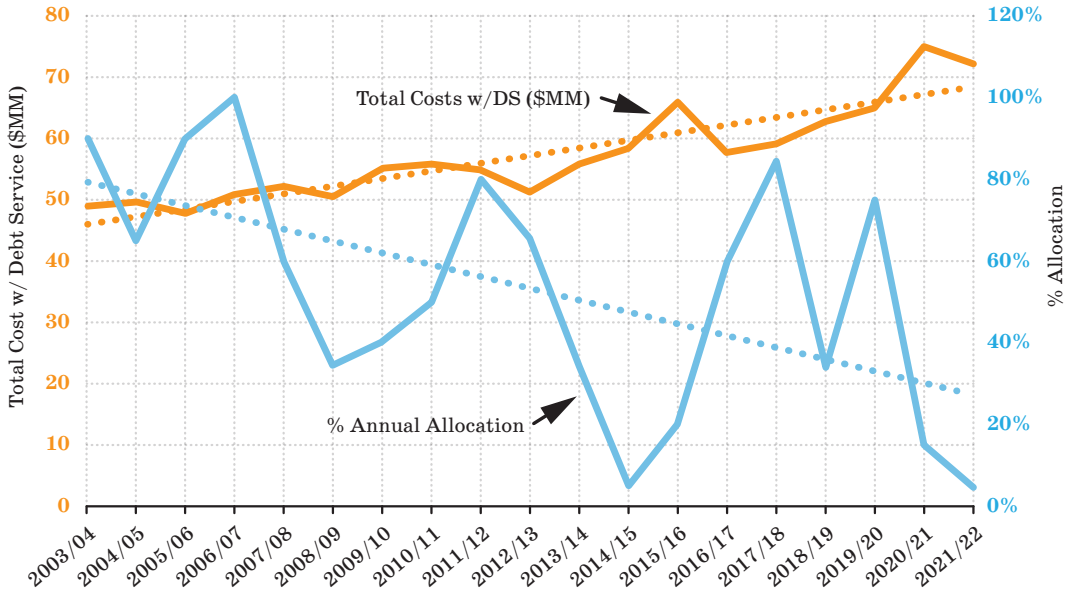
FY	Total Costs W/DS ($MM)	% Annual Allocation
03/04	48.854	90%
04/05	49.352	65%
05/06	47.63	90%
06/07	50.78	100%
07/08	52.06	60%
08/09	50.59	35%
09/10	54.88	40%
10/11	55.75	50%
11/12	54.87	80%
12/13	51.1	66%
13/14	55.6	35%
14/15	58.03	5%
15/16	65.66	20%
16/17	57.6	60%
17/18	58.9	85%
18/19	62.67	35%
19/20	64.81	75%
20/21	74.86	15%
21/22	72.2	5%

Even more compelling is the graphic representation of the data shown in Figure 2 (next page). This information is explicit: SBC will continue to pay millions of dollars each year for an unreliable supplemental water supply.

FIGURE 2

CCWA FY COSTS AND DWR % ALLOCATION

2003/04 - 2021/22



Drought is and will remain the greatest impediment to a secure water supply for SBC. As shown in Table 8 (next page), the dry period between 2012 and 2016 was extremely challenging for the SBC South Coast water agencies of Santa Barbara and Montecito. Montecito is particularly vulnerable to successive dry year periods due to its reliance on surface water supplies; the community has very limited groundwater supplies and no access to recycled water.

By 2014, Montecito – along with many other water agencies in the state – was forced to declare a water shortage emergency. The community passed ordinances that provided fixed water allocations with very steep and expensive surcharges for overuse. Through CCWA, Montecito ultimately was forced to purchase supplemental water from SWP contractors at exorbitant costs, including those incurred by term water repayment clauses added to satisfy customer health and safety requirements.

Montecito enacted an aggressive public outreach program, and customers responded by cutting water use between 40-50% from pre-drought levels. The reduction in landscape irrigation was especially dramatic; in fact, Montecito's drop in water use was the greatest in the state at the time.

The unavailability of SWP water during the 2012-2016 drought enlightened Montecito customers about the dire state of California's water resources. Today, community water

consumption is still well below pre-drought levels. Projected water sales for 2012/13 exceeded 6,000 AF; water sales in the 2020/21 budget were 3,750 AF. This water use demand reduction is a critical step in creating a reliable long term water supply.

During the same drought, the City of Santa Barbara also faced a significant water shortage dilemma. Confronted with an unreliable SWP supplemental water supply, the City Council approved the reactivation of the Charles E. Meyer Desalination Plant in July 2015, with the facility returning to service in May 2017. This plant is currently operational, and the city has decided to incorporate it as a permanent component in its water supply. Further, the City of Santa Barbara and Montecito have confirmed a water supply agreement wherein Santa Barbara will provide Montecito with 1,430 AFY over a 50-year renewable contract.[3]

In sum: the 2012 -2016 drought convinced SBC water purveyors that the SWP is unreliable – particularly during the times it is needed most.

TABLE 8

SWP ALLOCATIONS/SB RAINFALL DATA

Year	SWP % Allocation	City of SB Rain (in.)	City of SB Rainfall YR %
2022	5	n/a	n/a
2021	5	14.2	77.8
2020	15	7.8	42.7
2019	75	24.1	132
2018	35	11.8	64.7
2017	85	19.8	108
2016	60	14.2	77.8
2015	20	4.4	2.4
2014	5	11.5	63
2013	35	4.7	2.6
2012	65	12.8	70.1
2011	80	19.4	106

[3] City of Santa Barbara, 2020 Enhanced Urban Water Management Plan, June 30, 2021. Available at: https://santabarbaraca.gov/sites/default/files/documents/Public%20Works/Water%20Vision/Final%202020%20Enhanced%20Urban%20Water%20Management%20Plan.pdf, accessed November 30, 2022.

The Santa Barbara Report

2022 Update

In 2021, Governor Gavin Newsom promoted the Delta Conveyance Project, a single tunnel alternative to the Twin Tunnels that features two intakes north of the Sacramento River Delta. These new water conveyance facilities would divert up to 6,000 cfs of water to a new pumping plant in the south Delta. No cost estimates have been released, but the circumstances that made the Twin Tunnels costly, ineffective, and environmentally destructive apply equally to the Single Tunnel. Indeed, the outcomes for the Single Tunnel are even worse than those confirmed for its predecessor, given the rising sea levels and decreasing mountain snowpack associated with climate change, and the skyrocketing cost of debt due to the likelihood of long-term high interest rates.

The Santa Barbara Report highlights two main themes negatively impacting customers of the State Water Project generally and Santa Barbara County in particular: reliability and cost.

Reliability

Water for the SWP originates in the Sierra Nevada and Cascade mountains. Snowmelt and rainfall from these watersheds flow into the Central Valley rivers that ultimately enter the San Francisco Bay/Delta. The SWP was predicated on DWR selling the Delta's "surplus" water to southern California water agencies and districts. However, the state has never quantified the amount of water obtainable from Delta-associated rivers and the amount held by senior rights holders – in short, the state has never determined how much "surplus" water is actually available.

There was concern from the beginning of the SWP that there would not be sufficient water to meet the project's demands. Nonetheless, the state concluded agreements that allowed for the delivery of up to 4,230,000 acre-feet of Table A water a year to participating counties and water customers.[4] Many of these participating entities have enabled expanded agriculture and urban development based on this "paper water" – i.e., water that exists only on paper and not in our rivers, reservoirs, and

[4] See Department of Water Resources Bulletin 132, page 158 (2018), available at https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/State-Water-Project/Management/Bulletin-132/Bulletin-132/Files/Bulletin132-18.pdf, accessed November 21, 2022.

aquifers. As C-WIN and UC Davis have documented, DWR and the U.S. Bureau of Reclamation, the co-managers of the Central Valley Project (CVP), pledged contracts for 5 to 5 ½ times more water than is available.[5]

The Santa Barbara Experience

Actual delivery of SWP water between 1998 and 2015 for SBC's four south coast water agencies (Montecito and the Cities of Santa Barbara, Goleta and Carpinteria) was a mere 28% of full contract amounts. Delivery of SWP water between 1998 and 2020 for all Santa Barbara County contractors was 60% of Table A contract amounts. (See Table 9, next page.)

The State Water Resources Control Board, the agency that decides water allocations, relies on guesswork meteorology and the much-criticized CalSim Model – not actual water flows – to estimate water availability. Debacles like the Santa Barbara Experience are the result. The inability of the SWP to provide reliable deliveries is made clear by a thorough examination of Sacramento River hydrology (Appendix B SB Report 2017), which confirms that droughts are the determining factor in the project's ongoing deficiencies and failures.

[5] See Testimony on Water Availability Analysis submitted by Tim Stroshane (C-WIN) before the State Water Resources Control Board, October 26, 2012. P. 11. https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/comments111312/tim_stroshane.pdf, accessed October 25, 2022. Also, Theodore E Grantham and Joshua H Viers 2014 Environ. Res. Lett. 9 084012, available at: https://iopscience.iop.org/article/10.1088/1748-9326/9/8/084012/pdf, accessed November 21, 2022.

TABLE 9

SWP DELIVERIES TO SANTA BARBARA COUNTY CONTRACTORS AF/YEAR

Year	Deliveries	Table A Allocation
1998	18618	39078
1999	20137	39078
2000	22741	39078
2001	18946	39078
2002	27636	39078
2003	26968	39078
2004	29705	39078
2005	23344	39078
2006	23275	39078
2007	27740	39078
2008	18393	39078
2009	15452	39078
2010	17775	39078
2011	32945	39078
2012	19474	39078
2013	18018	39078
2014	16757	39078
2015	11673	39078
2016	35537	39078
2017	51105	39078
2018	28348	39078
2019	20557	39078
2020	12175	39078

The Santa Barbara experience is a prime example of the SWP water delivery shortfalls that have beleaguered California.

The difficulties of the SWP in providing reliable deliveries as climate change accelerates and droughts and aridification intensify are illustrated by the Table A allocations over the past fifteen years; the final spring allocation during this period has been greater or equal to 75 percent only three times.[6]

[6] See https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/State-Water-Project/Management/SWP-Water-Contractors/Files/1996-2022-Allocation-Progression-083022b.pdf, accessed November 21, 2022.

Unreliable delivery is the bane of any water agency's planning. The data show that in years when rain is abundant, local agencies will rely on local supplies and buy little or no water from the SWP – yet they still must still pay for infrastructure costs and maintenance of the system. In years of low rainfall, the SWP contract amounts are cut drastically, forcing local agencies to turn elsewhere to cover supply shortages.

Cost

The SWP is managed by the Department of Water Resources (DWR) on a cost/benefit pro-rated basis. (That is, for most contractors, the costs and delivery of water are based on the amount of water contracted.) These costs – including bond debt, maintenance of the entire SWP system, and water delivery – are passed on to ratepayers.

Because only preliminary engineering planning has been completed, the estimated cost for the Delta Conveyance Project has not been released. But based on historical government budget estimates compared to eventual costs, it is expected that the estimate will be low and actual costs will be high. In 1991, when the option of joining the SWP was on the Santa Barbara County ballot, the state estimated total cost for the necessary aqueduct hook-up terminating in Santa Maria would be $270 million. The project ultimately cost $670 million, with Santa Barbara County ratepayers obligated to spend $1.76 billion to cover amortization with interest and operations and maintenance expenses.

Moreover, the 1991 ballot measure did not mention that all operations and maintenance expenses for the entire SWP system would be prorated and billed to Santa Barbara County ratepayers.

Water agencies facing unknown deliveries and high fixed costs for State Water Project water grapple with an annual budget dilemma. Higher rates often mean lower demand and less revenue – yet capital costs, including higher system upkeep costs, continue to erode budgets. If the Single Tunnel project is constructed, SBC agencies will face increased budget pressure and lose opportunities for investment in demand management and local supply development.

The True Costs of SWP Water

Coastal Aqueduct unit (i.e., acre-foot) costs of SWP water are highly variable – but they are uniformly much higher than the cost projections promoted by project advocates during the 1991 ballot measure campaign.

That's because the subscribing water agencies must pay the fixed costs for contracted water – not the amount of water delivered. In other words, the agencies must pay whether they receive water or not. In the most recent CCWA fiscal year (2022-23) budget, Santa Barbara's cost per acre foot of SWP water is reported as $1,960, comprising $1,348 in fixed costs per acre-foot and $612 in variable costs per acre foot.[7] However, the fixed cost per acre-foot figure is based on the City's Table A allocation of 3,000 acre-feet.

Santa Barbara's 2022-23 SWP delivery request is only 1,510 acre-feet (excluding exchange deliveries).[8] For 1,510 acre-feet, the fixed per acre foot cost jumps to $2,677, which combined with the variable cost of $612, results in a total per acre-foot cost of $3,289. By contrast, Santa Barbara pays an average of $240 /acre-foot for Lake Cachuma water; $610/acre-foot for groundwater; $1,450/acre-foot for recycled water; and $2,700/acre-foot for desalinated water.[9]

Even if the SWP meets its long-term projection of providing an average of 60% of Table A allocations, Santa Barbara's average 1,800 acre-feet of SWP water would be the city's most expensive source of water at $2,858 per acre foot. This estimate understates the true cost, however, because Santa Barbara's share of the single tunnel project would add additional fixed costs. In 2023, the city will complete paying off $1.4 million per year in debt service related to the construction of the Coastal Branch.[10]

Ratepayer Impacts

Santa Barbara's ratepayers currently pay bills that include drinking water, wastewater, trash collection, and a utility tax of six percent. The drinking water rate includes

[7] CCWA FY 2022-23 Budget, pp. 33-34. Available at: https://www.ccwa.com/files/1a7a59061/FinalFY2022-23Budget.pdf, accessed December 1, 2022.

[8] Ibid, pp. 31.

[9] City of Santa Barbara, 2020 Enhanced Urban Water Management Plan, Attachment E, June 30, 2021. Attachment E is a technical memorandum that presents the comparative cost basis for different water supplies.

[10] Ibid., pp. 2.

a fixed fee (meter charge) and a tiered rate for usage. For a single-family household of three using 50 gallons per person per day, the monthly drinking water charge currently is $79.37,[11] and the monthly utility bill is approximately $200. For low-income households, their water bill is an oppressive and growing burden. As part of the state's COVID-19 water debt relief program, Santa Barbara received $710,798, an indication that any future economic downturn will add immense strain to existing affordability.

Conclusion

The issues that plagued the Twin Tunnels in 2017 are recapitulated in the Delta Conveyance Project and should lead to an identical conclusion: rejection.

Our findings confirm the negative fiscal impacts of SWP water for Santa Barbara County generally and the South Coast water districts especially. The construction of the Single Tunnel would only add to the already crushing burden endured by Santa Barbara ratepayers and force the county's water districts ever closer to insolvency. Further, it would do nothing to protect the community from dire water shortages. Some concluding observations follow:

- The Delta Conveyance will result in high debt to local agencies. It will provide no additional water nor increased reliability for participating Santa Barbara water agencies already hobbled by an over-subscribed system that is highly vulnerable to climate change impacts.
- The combination of current SWP debt, critical infrastructure maintenance and improvement expenses, and the costs needed to develop alternative, local and reliable water supplies have stretched South Coast water districts and their ratepayers to their financial limits. Adding the DCP could be untenable for many residents of Santa Barbara County.
- Local water agencies are seeking local projects that will provide more reliable and less costly water than deliveries from the prohibitively expensive and undependable State Water Project. The City of Santa Barbara has embraced this future by building a desalination plant and expanding its water conservation program.

[11] See https://santabarbaraca.gov/government/departments/public-works/water-resources/rates-forms-newsletters/water-and-wastewater, accessed November 30, 2022, for a description of adopted drinking water and wastewater rates.

Appendix A

The Unaffordable and Destructive Twin Tunnels:

Why the Santa Barbara Experience Matters

November 2017

The Unaffordable and Destructive Twin Tunnels: Why the Santa Barbara Experience Matters

Photo: Kenji Photography

The California Water Impact Network

November 2017

california water impact network

Board of Directors

Carolee Krieger, President and Executive Director
Michael Jackson, Secretary
Joshua Green, Treasurer
Yvon Chouinard
Malinda Chouinard
Dan Bacher
Aaron Budgor
Conner Everts
Bill Jennings
Gretchen Lieff
Tom Stokely
Barbara Vlamis

In Memoriam:
Dorothy Green, Co-founding Secretary

Advisors:
Maude Barlow, Gray Brechin, Nick Di Croce,
Jim Edmondson, Larry Farwell, Huey Johnson,
Arve Sjovold, Joan Wells

Staff:
Christina Speed, Georgia Strickland

Our Mission Statement

The California Water Impact Network is a non-profit, tax exempt California Corporation that advocates for the just and environmentally sustainable use of California's water – including in-stream flows and groundwater reserves – through research, planning, public education, media outreach, and litigation.

Purpose of this Report

1. Examine the deficiencies and financial cost of Governor Brown's proposed Twin Tunnels/CA WaterFix Project, illustrating the untenable financial burden placed on State Water Project contractors, local water agencies and its ratepayers;

2. Examine the potential quantity of water to be available and delivered with the Twin Tunnels, especially in times of drought;

3. Demonstrate the well documented cost impacts and consequences for State Water Project (SWP) participation to date, utilizing the experience of Santa Barbara County Coastal Aqueduct Project as an example of the statewide problem that will be encountered if the Twin Tunnels comes to fruition;

4. Present the financial cost scenarios and consequences of the Twin Tunnels project imposed on Santa Barbara County water districts and agencies.

This report was prepared by Carolee Krieger and Arve Sjovold with the assistance of Joan Wells, Aaron Budgor, Christina Speed and Georgia Strickland. The California Water Impact Network (C-WIN) obtained data on cost, usage, and fiscal indicators to evaluate the performance of the SWP. C-WIN has used public information obtained from the Central Coast Water Authority (the Santa Barbara county manager of SWP water) and its constituent water agencies for its information. Some data was obtained through requests under the California Public Records Act. Much of the data is available through CCWA and its member agency websites.

Table of Contents

Figures

Maps

Tables

Executive Summary

I. What is the Twin Tunnels/CA Waterfix project?

Governor Brown has proposed twin trans-Delta tunnels, each 40 feet in diameter, 35 miles long and buried 150 feet deep, running from the northwest Delta just south of the city of Sacramento directly to the SWP and CVP pumps at the southwest Delta. Bypassing the San Francisco Bay/Delta, they are intended to move water south "more efficiently" to corporate agricultural water districts in the western San Joaquin Valley and urban southern California water agencies who are beneficiaries of and contractors to the State Water Project (SWP) and the Central Valley Project (CVP). This includes the largest SWP contractor, the Metropolitan Water District of Southern California. There is no clear plan for financing the Tunnels. The administration and its supporters intend to build them without a vote of the people who must pay for them, the ratepayers of the State Water Project (SWP) and the Central Valley Project (CVP).

As of the date of this report, DWR has acknowledged that project planning and development is only 10% complete and that an additional 3 years and $1.2 billion is needed to complete engineering plans. On top of what is needed to complete engineering plans, construction costs, based on preliminary project planning and development, are estimated at $20 billion to $38 billion, according to analysis by ECONorthwest (see Appendix A). These estimates are also highly speculative since they are based on the aforementioned 10% completed engineering estimate. The annual cost burden to the contractors will reflect the amortization of the construction costs plus annual operations and maintenance, presumably under the terms of the SWP contracts. Financing the tunnels is now problematic. Westlands Water District, one of the largest agricultural participants, has voted not to support the tunnels because of the untenable cost to its farmers. With the withdrawal of Westlands, the entire CVP participation, which was to be 45% of the entire project financing, is now in doubt.

Project proponents have not defined quantitatively any of the purported benefits in terms of expected additional water deliveries or reliability. In fact, if there is to be additional water from the project it is not certain where the new water rights will come from or where it is to be delivered. In an October 2017 report, the California State Auditor summarized, "Additionally, DWR has not completed either an economic or financial analysis to demonstrate the financial viability of WaterFix. Finally, it has not fully implemented a governance structure for the design and construction phase, and has not maintained important program management documents for WaterFix." (See State Auditors Report, Appendix C.)

II. Impacts to Santa Barbara County

The water purveyors in Santa Barbara County are concerned about two aspects of the proposed project: additional costs to participating SWP contractors and no clear statement of benefits to be provided. **The microcosm of the Santa Barbara County Coastal Aqueduct experience serves as a red flag warning for all Southern California SWP contractors and their customers.**

Regarding affordability, the current debt burdens that followed South Coast participation in the SWP (1991) have reached a limit whereby any increases in customer water bills are met with decreases in water usage. This reduction in water demand means that the significant cost of the WaterFix Project will have the adverse effect of causing a further reduction in water demand due to the coincident debt loads. Indeed, the expected additional debt loads from the Twin Tunnels project are of such a magnitude that the question of affordability may be attended by concerns of water district solvency for some of Santa Barbara South Coast's most vulnerable districts.

Compounding water demand and affordability concerns, the conservation mandated water demand management measures under DWR's SBX7-7, provide a significant reduction in water agency dependence on use of SWP water by December 31, 2020. This translates to less delivery and dependence of SWP water to all participating SWP water contractors. Water agencies are now reviewing and implementing local water supply development projects recognizing the reliability concerns of the SWP project.

In this report we show the current problems with affordability of SWP and what the difficulties would be with the addition of the Twin Tunnels project based on current estimates of construction. In addition, we have analyzed the Sacramento River hydrology (See CVP & SWP Operations, Appendix B) to assess the likelihood of actually capturing more water with the Twin Tunnels and *to clearly show no proven improvement in SWP reliability of delivery.*

III. Conclusions

- **The Twin Tunnels project promises more debt with no additional water or increase in reliability to the participating South Coast water agencies.**

- **The combination of a) current SWP debt, b) critical infrastructure maintenance and improvement expenses and, c) the costs needed to pay for development of more local and reliable water supplies have brought South Coast water districts to their limits for absorbing new debt, even without the Twin Tunnels.**

- **SWP water deliveries have never been reliable for the South Coast, especially in droughts, and the Twin Tunnels project promises no relief from that scenario.**

Each of these conclusions follows from the detailed, quantitative analyses in the body of the report. We start with the economic challenges that the water districts presently face with the current SWP debt burdens. We have examined each of the South Coast districts budget details and how they are meeting their financial obligations. We also examined the difficulties of providing water deliveries to their customers with a strong focus on the recent drought and the failure of the SWP to deliver.

The difficulties of the SWP in providing reliable deliveries is revealed in a thorough examination of the Sacramento River hydrology (Appendix B) where it is shown that the droughts are the determining factor in why the SWP demonstrates such poor reliability. Concurrently, the Bay Delta Conservation Plan/CA WaterFix relies almost entirely on the capability of the Twin Tunnels to capture more water during wet periods. *For SWP contractors, in particular the Santa Barbara County South Coast water agencies in the Central Coast Water Authority (CCWA), there are no local SWP water storage facilities for use during wet years, which voids the value of the Twin Tunnels.*

We then examine the likely cost impacts of the proposed Twin Tunnels project, based on the meager information (The Twin Tunnels project as of this date is only 10% engineered) available on its estimated construction costs, and how those costs, when allocated to SWP contractors, will affect water district budgets.

We conclude by finding that for Santa Barbara's South Coast purveyors the cost/benefit analysis cannot justify the Tunnels construction. By analysis, the construction of the Twin Tunnels could result in vast economic hardship and financial turmoil with no added benefit for the water agencies and ratepayers. These financial resources should be applied to construction and delivery of more reliable local sources of water such as treated wastewater and desalination.

Terminology

Water issue terminology may be unfamiliar to some readers. The following are some key terms that will be used throughout the report:

Table A Allocations: "Table A Allocations" are the total annual contractual amount of water as determined by the Department of Water Resources (DWR) that may be delivered to State Water Project (SWP) contractors under the terms of a State Water Project water service contract. Fixed costs allocated to each SWP contractor must be paid every year regardless of whether any water is delivered at all.

Table A Deliveries: This amount represents what a water contractor actually receives in deliveries from the State Water Project under the contract in a given year. For the four Santa Barbara County water agencies we examine in this report, the actual annual average of Table A deliveries is 28% of allocation since state water began arriving in 1998.

Article 21, and other "surplus water": The SWP contracts deal with three types of non-scheduled water deliveries. They are *Article 21 or "Surplus Water"*; *"Turn-back Pool"*; and *"Carryover Water"*.

Article 21 or surplus water is non-Table A water that may be declared available in the first three months of the contract year after all current Table A demands are met, reservoir refill requirements are satisfied, and there is fresh water in the Delta.

Turn-back Pool water is Table A water that was requested but not fully delivered in the previous contract year. The contractor who has unused Table A water receives a specified rebate for relinquishing his unused amount; any other contractor may offer to buy water from Turn-back Pool sources at a specified price.

Carryover Water is Table A water for a specific contractor that was available but not fully delivered in the previous contract year and can be claimed during the first three months of a new contract year if there is a demand for it or a place to store it.

The determining factors for exploiting these accounts are adequate capacity in the aqueduct facilities that deliver the water, satisfaction of all demands by the SWP contractors for Table A water, and water availability. The test of water availability is not necessarily constrained by Delta health considerations. Availability can be met simply by certifying that there is fresh water in the Delta as if it were a lake. This has not been healthy for the Delta.

Cachuma Project: The Cachuma Project consists of the Bradbury Dam and Lake Cachuma reservoir. The project stores floodwater runoff from the Santa Ynez River in Santa Barbara County. Completed in 1958, it is managed by the Federal Bureau of Reclamation and provides water for South Coast urban and agricultural use by a series of tunnels that traverse the Santa Ynez mountain range.

Central Coast Water Authority (CCWA): Is a Joint Powers Authority (JPA) that manages Santa Barbara County's water from the SWP.

Safe Yield: The level of water a project can deliver every year, given some small probability of short fall. "Safe Yield" is an operational concept whereby a reservoir is operated on the basis of a steady, firm annual yield calculated at a high probability to extend through the worst drought of record; the drought's extension is determined as the interval between spills or fills. The SWP is not operated on a safe yield basis.

Effective Unit Cost: This is the cost of supply divided by the actual water delivered over a given time period, usually a year. It is a measure of the cost-effectiveness of a given source of supply.

Water Supply Reliability is the likelihood that the requested demand for delivery in a given year by a contractor can be met. It is usually stated as a probability. The prudent level of probability for each contractor depends on the availability to that contractor of other sources of water. For example, a contractor that is totally dependent on SWP water requires a very high level for SWP deliveries because shortfalls for that contractor are not easily tolerated. On the other hand, a contractor that has a year-to-year or longer-term storage carryover capability can tolerate lower levels of probability of delivery. The reliability of delivery is also limited by the availability of water to the project and the project's ability to carry over water year-to-year in storage reservoirs. The probability of availability can be calculated by investigating the probability distributions of runoff from the hydrologic record convolved with the prescribed operations

"SWP Reliability" is calculated as "frequency of return" as calculated by the model CALSIM II.

Water Year: October 1 - September 31 of a given year, as opposed to Calendar Year which runs from January 1 - December 31 or fiscal year which typically runs from July 1-June 30. By using these three different definitions, contractual operations are separated from project operations with significant consequences and give rise to contractual terms that are not necessary. (See "Article 21, and other surplus water".

The Santa Barbara Experience

I. Introduction

The cost of the SWP has placed a heavy burden on the water purveyors of Santa Barbara County's South Coast. We have evaluated the fiscal operations of four of the most prominent water districts in that region over the past several years and will demonstrate how large, capital intensive projects, such as the construction of the Coastal Aqueduct, have a deleterious effect due to experienced varying reliability affecting those districts' operations and budgets. The necessity of raising water rates and the responses to those increases have revealed interesting insights that are pertinent to how the Twin Tunnels cost burdens might develop. Only through a detailed analysis of these districts can we establish the likely impacts of the Twin Tunnels project.

II. Overview

History of SWP and South Coast Santa Barbara County

Following a prolonged drought in 1991, the voters of Santa Barbara County approved joining the SWP and authorized bonds for the construction of a Coastal Aqueduct to connect to the primary SWP conveyance in central California. The costs of bringing SWP water to Santa Barbara County were not accurately disclosed when voters approved the project ballot measure. The ballot measure authorized bonds for the Coastal Aqueduct but did not explain the financial burden of potential costs that could be added by DWR without voter approval. Prior to the election, the state estimated the total cost to ratepayers for construction of the **Coastal Aqueduct** to its terminus in Santa Maria would be **$270 million. Undisclosed additional costs were subsequently charged to SWP contractors** located south of the terminus for a 43-mile local aqueduct connection to Lake Cachuma, where existing conveyances bring water to the South Coast.

Based on information provided by the Central Coast Water Authority (CCWA), the total costs of construction for the coastal branch and the local branch was **$670 million**, which is to be contrasted with the $270 million estimate given to the voters. Santa Barbara ratepayers will have paid **$1.76 billion**, including amortization with interest and operations and maintenance (O & M), for bringing state water to Santa Barbara. The large cost is best illustrated by Montecito, which has only 4,200 meters, but which must pay over $6 million a year for SWP related debt whether any water is delivered or not. As will be shown, the much higher than expected construction costs for the original 1991 SWP 144 mile connecting pipeline has materially affected the affordability of the SWP for the South Coast districts.

Santa Barbara County has paid and will continue to pay extremely high

Map 1:
Proposed Twin Tunnels route

costs for minimal amounts of the SWP water, largely due to the low reliability of the SWP. **Actual delivery of SWP water between 1998 and 2015 for the four South Coast water agencies (Montecito, the City of Santa Barbara, Goleta and Carpinteria) was only 28% of full contract amounts**, despite the fact that Santa Barbara County voters were told in 1991 ballot information that the State Water Project was expected to deliver 97% of contract amounts to urban water users.

Current Cost/Benefit Analysis

The SWP has failed in delivering water to Santa Barbara's South Coast water districts and cities in a cost-effective and reliable manner. But to fully understand these impacts, they must be viewed from an historical perspective.

Prior to the 1987-1992 drought South Coast water purveyors had relatively small budgets. Water supply costs represented less than 10% of the budgets and local sources provided all the water. The drought changed everything. At the peak of the drought all South Coast water purveyors, believing in the State's projections on the reliability of the state water delivery system, voted to import state water at enormous construction costs. The South Coast is now living with the consequences of that decision; some very important lessons have been learned.

A. Costs

Due primarily to the region's connection to the SWP, South Coast water district budgets have increased substantially. Upon emerging from the 1987-92 drought, the water districts were immediately faced with increasing cost burdens from the construction of the Coastal Aqueduct and the local aqueduct necessary for the importation of state water. Rates had to be maintained at high levels, and raised in many cases. When the drought ended and mandatory conservation and restrictions were lifted, demand remained depressed due to the high water rates that were still in effect and some instilled conservation habits. Before the drought, water use was not necessarily sensitive to water costs, but now the higher costs have caused demand to decrease. Increased rates are met with commensurate decreases in customer water demand such that the districts have resorted to large increases in the fixed charges for water service.

By way of example, the budget for the Montecito Water District went from $1 million in the early 90's before deliveries of state water to $14 million in 2016. For 2017, the budget is $21 million, an extraordinary increase of 50%, as Montecito tries to catch up on needed repairs to old infrastructure

B. Potential Benefits

Because of its inherent unreliability, there are ***no benefits*** *redounding from the importation of state water*, especially during droughts. Because

severe droughts are often statewide phenomena, state water deliveries typically are curtailed at the very time they are needed most on the South Coast. The recent drought demonstrates the unexpected and unplanned water delivery and reliability failure exceedingly well.

There has been one benefit of the Coastal Branch tie-in to the SWP: *water demand has decreased* due to the cost impacts of the project on water agencies and ratepayers. Before the 1987-1992 drought, normal water demand in the City of Santa Barbara was about 16,500 acre-feet per year. The 1987-1992 post-drought new normal water demand was 13,500 acre-feet 3,000 acre-feet less due to customer conservation and increasing customer water rates. The most recent and ongoing drought, beginning in 2013, continues to affect South Coast water demand. This reduction in customer demand is tied directly to the unreliability of SWP annual allocations and deliveries and the increasing cost of water to rate payers as districts seek development of a local, more reliable, water supply.

The additional cost to agencies and ratepayers from the construction of the Twin Tunnels will have a negative effect on water supply and demand given the unreliability of delivery, lack of new water sources, and higher rates required to cover costs plus more stringent conservation measures.

C. Impact of Paper Water

There is a third category beyond cost and benefit analysis that deserves just as much attention in the way it impacts local water districts, and that is “Paper Water”.

Paper water is simply the difference between the original expected amount of water to be delivered and the amounts actually delivered. In other words, it is water that exists only in state or federal documents, not in California’s rivers. The CVP and the SWP water rights are essentially “clouded titles” for water in the Sacramento and San Joaquin Rivers and their tributaries. The SWP was predicated on damming the state’s North Coast Rivers with their waters to be delivered to the Delta for export. These streams ultimately were declared off limits due to Wild and Scenic designations in the 1970s. Five million acre feet of water from the North Coast never made it to the CVP and SWP, but DWR distributed contracts for export from the Delta as though the water was in the pipeline. Because of the way the CVP and SWP contracts are structured and the way the project is operated, all CVP and SWP contractors have to deal with paper water.

1. Paper Water and Delta Operations

The SWP is not operated on a “safe yield” basis and instead relies on a “run-of-the-river” operation. This requires the SWP to make a prediction early in the water year of the expected deliveries, a process, which in addition to the normal prediction errors, is fraught with systematic errors. As shown in Appendix B, CVP & SWP Operations, the indicators

used by the SWP to guide its operations and predictions are not accurate. Furthermore, the major tool used by SWP, CALSIM II, to calculate the likelihood of certain levels of delivery is inaccurate and highly biased. The CALSIM II model has never been properly calibrated nor peer reviewed. The deliveries received in Santa Barbara County have been significantly below the estimates provided by the SWP and the CALSIM II model.

Paper water and Delta operations cause significant harmful impacts on the environment and thus secondary impacts on SWP contractors. **The surplus water categories in the SWP contract, Article 21, Carry-over, and Turn-back pool, are <u>not</u> real surpluses, but are created solely within the structure of the contract**. These three categories are used to justify export pumping from the Delta in January, February, and March, irrespective of the environmental condition of the Delta. Water that is pumped in this manner, and which cannot be justified as surplus to the environmental needs, is indeed one of the most pernicious effects of paper water. It is arguably one of the prime causes of the Pelagic Organism Decline that was much discussed a decade ago. To demonstrate that these three categories are truly paper water, a shift of the SWP contracts and SWP operations to a water year would obviate these categories.

2. Paper Water Impact at the Local Level

The problem for local water districts is two-fold. For water supply planning a district needs a confident estimate of the amount of water it can expect; an average delivery amount will not do, especially if that district has no year-to-year storage to help equalize and offset delivery variances. A shortfall in delivery against the expectation means that the water agency must search for supplemental water on the spot market at exorbitant prices. This was and is the situation on the South Coast during the continuing drought. The "reliability" estimates from the SWP were of little use in these circumstances because of their reliance on CALSIM II, a flawed modeling system.

The second impact of paper water deals with the local districts' use of expected deliveries in the planning and development process. The long-term water supply plans of water districts are used to determine the numbers of new hook-ups that can be allowed. If those water supply plans are based on unrealistic expectations of deliveries, it is difficult to manage growth and provide sustainable water supplies. And in cases where a District wishes to sell off some of its SWP allocation, because of paper water, it is difficult to assign a value to the transaction and the amount of real water that can be relied on in the transfer. This is a continual difficulty on the South Coast and paper water is at the heart of these difficulties.

3. Underlying Problem of Paper Water

The paper water problem is directly attributable to the fact that the State

Water Resources Control Board has never actually quantified the amount of consumptive water available in the Delta watershed. C-WIN spent three years gathering this information through Public Records Act requests and Freedom of Information Act requests and found that consumptive water rights claims are at least 5 ½ times more than available supply (see C-WIN Quanitification Report, Appendix D). In 2014, a UC Davis study corroborated this work. (see UC Davis Quantification Report, Appendix E).

Real Water v Paper Water

River Basin	Annual Flows	Water Rights***	Ratio
Sacramento River Basin*	21.6 MAF	120.5 MAF	5.58
San Joaquin River Basin**	6.2 MAF	32.7 MAF	5.28
Trinity R. Basin*****	1.283 MAF	8.725 MAF	6.70

Even this rough accounting is not a fair picture. Every competent hydrologist knows that it is not cost-effective to try and capture all the run-off, which using the annual average implies. Instead perhaps only 50 to 60 percent is feasible. If so it is this lesser value that must be used by the SWRCB to allocate water to rightful users. But an even more stringent criterion would be the amounts of water available in dry years. As shown in Appendix B, the dry group years constitute a separate group from the wet years. Therefore, the water rights that should be granted should provide for reliable amounts to rightful users of water with the consequence that wet years would make available amounts for use much higher than the dry group would indicate.

The second impact of paper water deals with the local districts' use of expected deliveries in the planning and development process. The long-term water supply plans of water districts are used to determine the numbers of new hook-ups that can be allowed. If those water supply plans are based on unrealistic expectations of deliveries, it is difficult to manage growth and provide sustainable water supplies. This is a continual difficulty on the South Coast and paper water is at the heart of these difficulties. And in cases where a District wishes to sell off some of its SWP allocation, because of paper water, it is difficult to assign a value to the transaction and the amount of real water that can be relied on in the transfer.

The "surplus" water categories in the SWP, *Article 21 water, Carry-Over water* and *Turn-Back-Pool* water, are not real surpluses. They are created solely within the structure of the contract. These three categories of so called surplus water are used to justify export pumping from the Delta in January, February and March, irrespective of the environmental condition of the Delta. Water that is pumped in this manner, and which cannot be justified as surplus to the environmental needs, is indeed one of the most pernicious effects of paper water. It is arguably one of the prime causes of the Pelagic Organism Decline that was much discussed

a decade ago. To demonstrate that these three categories are truly paper water, a shift of the SWP contracts and SWP operations to a water year would obviate these categories. Water ratepayers and taxpayers should not be expected to expend billions of dollars for a system that will provide no extra water, and could actually result in reduced deliveries.

Finally, acknowledging the existence of paper water is critical to understanding why long term projections of SWP deliveries are problematic. *If Wild and Scenic River protections remain in place, senior water rights are honored and water quality standards are met, there will be little if any "surplus" water available for export south of the Delta.* This is especially critical during drought. The junior water rights of the SWP contractors would make it legally difficult to operate such a conveyance system. Further, the Bay/Delta Conservation Plan (BDCP) and the Twin Tunnels would reduce Bay/Delta outflows, conflicting with the SWRCB's 2010 Bay/Delta outflow recommendations, which were developed to protect the health of the Bay/Delta and determine the flows necessary for the recovery of listed fish populations.

Lake Cachuma during current drought

III. Geographic Area Covered by the Report

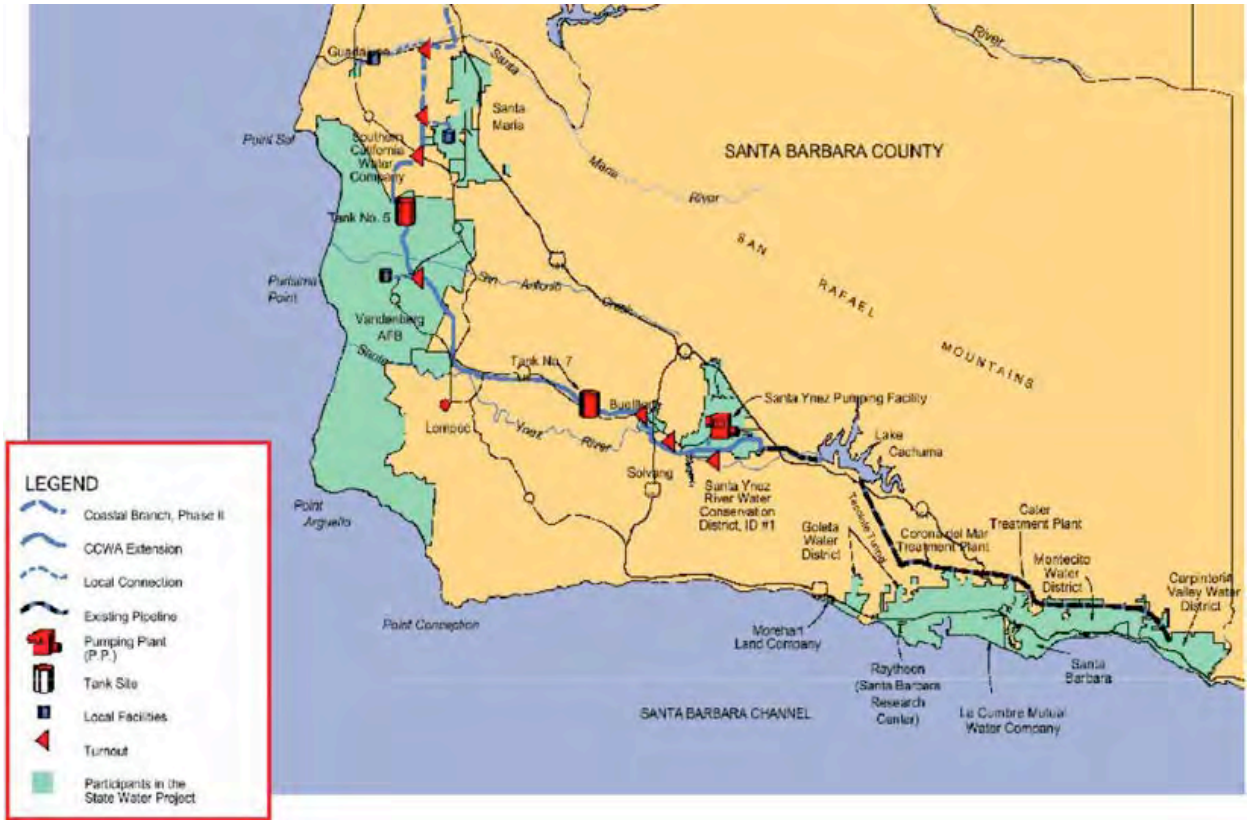
This report clarifies the cost of State Water Project water to four urban and suburban water districts and their customer service areas along the foothills and coastal plain of Santa Barbara County.
These water districts include:

- City of Santa Barbara
- Montecito Water District
- Carpinteria Valley Water District
- Goleta Water District

These four water districts and cities are among the major customers in Santa Barbara County for water delivered by the State Water Project's California Aqueduct. They are located on the littoral plain of the south coast of Santa Barbara County along Highway 101. SWP water originates at Lake Oroville and travels down the Feather River to the Delta. When water is pumped from the Bay-Delta estuary, it must travel 330 miles south through the California Aqueduct traversing the western San Joaquin Valley to the State-owned Coastal Branch Aqueduct. The Coastal Branch Aqueduct terminates at the Santa Maria River. (See Map 2 on following page.)

Map 2:
Water Agencies of the Central Coast Water Authority; Coastal Branch Aqueduct, and the Local Aqueduct in Santa Barbara County. Map courtesy of CCWA

From the Santa Maria River, the water enters the Central Coast Water Authority's local pipeline to Lake Cachuma in Santa Barbara County. Map 3 portrays the route of the local aqueduct, and the location of the districts that receive SWP water.



Map 3:
Central Coast Water Authority pipeline. Map courtesy of CCWA

The transport of state water in Santa Barbara County occurs under the administration of the Central Coast Water Authority (CCWA), which manages the water under a Joint Powers Agreement with the County of Santa Barbara. The County of Santa Barbara holds the SWP contract with the Department of Water Resources.

The primary reason for focusing on the water agencies analyzed in this report is their location at the terminus of the Coastal Aqueduct and the CCWA local pipeline. The cost burdens faced by the South Coast water districts for their shares of the local aqueduct are nearly equal to the cost of their shares in the SWP Coastal Aqueduct.

Table 1 presents a summary profile of the cities and water agencies that are included in the scope of this report.

Table 1:
Summary Profile of Four Santa Barbara County Water Districts

	Goleta Water District	City of Santa Barbara	Montecito Water District	Carpinteria Valley Water District
Population (DWR est. tool)	86,946	91,416	14,000	15,141
Single Family Accounts	13,342	16,920	4,204	3,078
MF Res Accounts	1,578	6,126	74	314
Total Water Budget Fiscal Year 2011	$24,646,996	$34,600,000	$13,545,136	$11,147,539
Residential Deliveries 2010 (AF)	6,115	8,755	3,794	1,354
Table A Allocations (AF)	4,500	3,000	3,000	2,000
2010 SWP Deliveries (AF)	813	541	541	363

As can be seen in Table 1, SWP deliveries are small fractions of Table A Allocations and small fractions of deliveries.

Note that this material shown above excludes some Santa Barbara County contractors from detailed analysis as explained below.

- The City of Santa Maria is located close to the terminus of the Coastal Branch Aqueduct and faces none of the costs of financing, construction, operation, and maintenance for delivery of water to Lake Cachuma. Consequently, Santa Maria's water importation burdens are not equivalent to those borne by the South Coast districts. The difference is due to the significant costs of the local aqueduct, which is intended to serve districts downstream from Santa Maria. *However, due to Santa Maria's large allocation of Table A water, it represents a special case when it comes to the assessment of impacts due to the Twin Tunnels. These impacts are addressed later in this report*.

- Vandenberg Air Force Base is excluded from this analysis because it is a federal military installation and is not a voting CCWA member. It will be able to pay the costs of its SWP water supply that is provided to Santa Barbara County.

- Other voting members of the Central Coast Water Authority were excluded from the analysis in this report because they had small Table A Allocations. C-WIN chose a threshold of 1,000 acre-feet of Table A Allocation for determining a voting member exclusion from this report. Voting members excluded under this criterion included the City of Buellton, the City of Guadalupe, Solvang, and the Santa Ynez Water Conservation Improvement District #1.

- Because information from private corporations is not available under the Public Records Act, non-voting members such as Raytheon, Morehart Land Company, Southern California Water

Company, and La Cumbre Mutual Water Company are not included here.

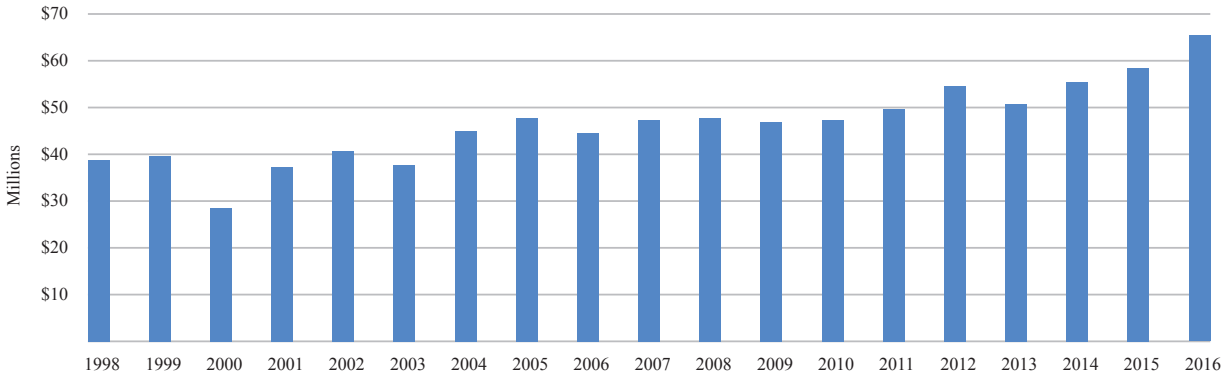
IV. Costs to Santa Barbara County of SWP Water

In 1991, the voters in each of the various water districts of Santa Barbara County approved a ballot measure to construct 144 miles of the Coastal Branch Aqueduct in order to connect Santa Barbara County water purveyors to the State Water Project. The aggregate vote was 66% for and 34% against. In 1979 voters in a single countywide ballot defeated a similar measure by a vote of 72% to 28%. The 1991 election ballot material prepared by the State and SWP proponents told Santa Barbara County voters that the costs for a Santa Barbara hook-up to the SWP would be **$270 million**. The actual construction costs for the Coastal Branch Aqueduct to Santa Maria came in at just under **$500 million**. What was not told the voters was the necessity of building the local aqueduct from Santa Maria to Lake Cachuma, the storage facility for Santa Barbara contractors south of Santa Maria. The addition of the local aqueduct construction costs brought the **total construction costs to $670 million**. The local aqueduct construction had to be financed at a much higher interest rate than the Coastal Branch. Because the South Coast Districts are at the end of the local pipeline their proportionate costs are much higher. The consequences of this higher cost, together with the higher interest rate, causes the South Coast water districts' payments for the local aqueduct to be nearly equal to that of their Coastal aqueduct costs!

Water agencies face two key challenges as they continue providing SWP water to the suburban and urban communities along the Santa Barbara Coastal Plain: 1) rising State Water Project costs, and 2) an obligation to pay – whether any water is delivered or not.

Santa Barbara County water districts cumulatively paid more than $893 million for all project costs (capital, financing, power, operations and maintenance) between July 1, 1997 and June 30, 2016; further, costs continue to escalate annually. Figure 1 shows the trend of total annual costs to all the CCWA water districts receiving state water (including local aqueduct charges) from completion of construction to 2016. This figure shows increasing costs, even though Santa Barbara County water districts have not added any new projects. These recent increases most likely reflect the resources that DWR has dedicated to the ongoing planning for the BDCP/CA WaterFix and the Twin Tunnels. These costs are buried in the invoices for the SWP that are sent to the SWP contractors.

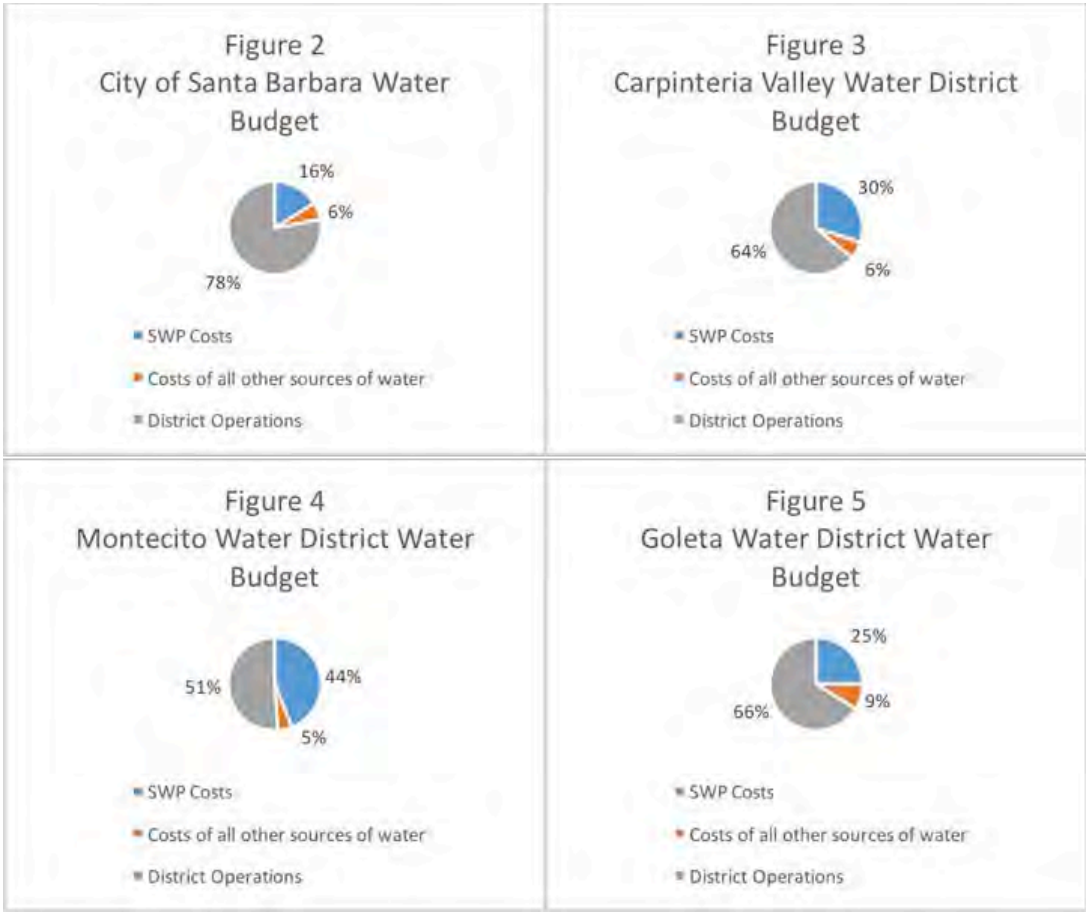
Fig. 1:
Annual Payments by Santa Barbara County to Water Agencies



Source: CCWA Budgets

Based on district budgets and financial information supplied by CCWA, C-WIN has calculated the proportion of CCWA's annual budget for repayment of SWP capital and operating charges, as well as operations and maintenance charges for delivery of SWP water. Figures 2 through 5 show the percentage of water district budgets allocated to SWP costs for each of the four South Coast districts averaged over the years 2012 to 2015.

Fig.'s 2-5: District Water Budgets



Impact on Local Water Districts: The high costs imposed by the SWP on the South Coast districts exact a severe penalty to district priorities. For example, a report by the Santa Barbara County 2006-07 Grand Jury noted that the Carpinteria Valley Water District is paying half of its $10 million/year budget for non-operational expenses, i.e., those primarily related to purchase and delivery of SWP water (this includes some other non-SWP costs as well).

The opening paragraph of this Grand Jury Report states as follows:

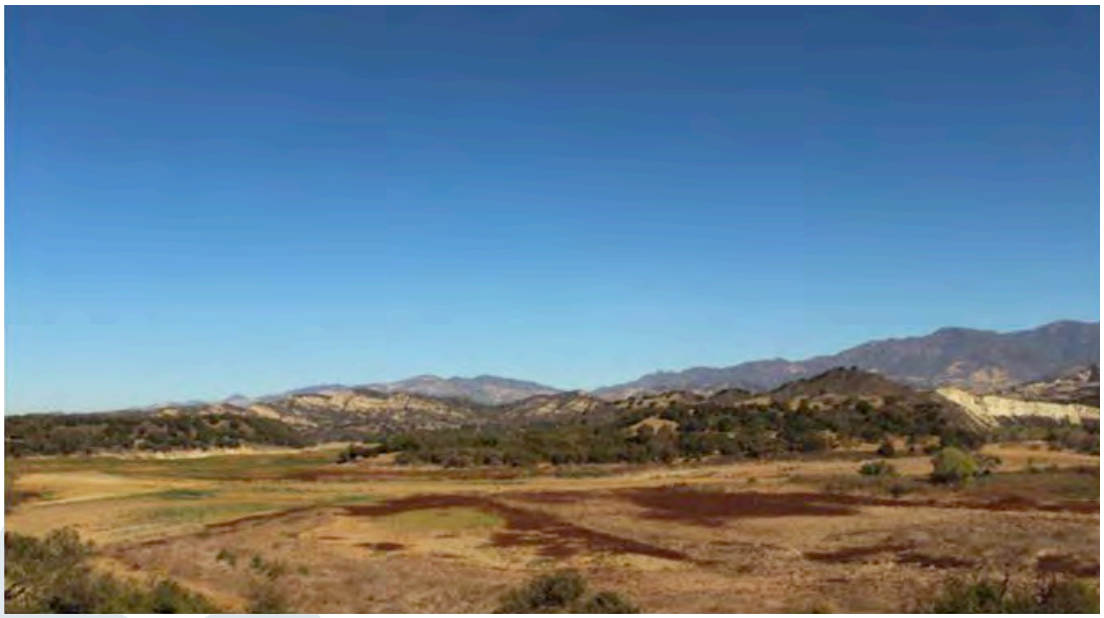
> *"The Carpinteria Valley Water District (CVWD) has delivered an essential product but has experienced the need for an exceptional amount of facility maintenance and upgrades. This has resulted in outstanding loans of $33.8 million against a total operating budget of less than $5 million per year. Coupled with the expense of a State Water option,* ***which it does not need and uses little****, the district is strapped with nonoperational yearly expenses, which exceed $5 million. Total annual expenses therefore exceed $10 million, giving rise to high water rates."*

Montecito's 2012-13 Adopted Budget states that 45% ($4,995,100) of its

operating budget and 39% of its total budget is required to pay for its SWP costs. **In 2014 all SWP contractors received only 5% of their Table A allocations of State Water** but had to pay the full costs of the construction debt.

Many other Santa Barbara County water districts also are suffering from the high cost of SWP water. Repayment of SWP debt, along with SWP ongoing operation and maintenance costs, comprise the dominant costs for each water agency. Yet the volume of water these districts draw from the SWP in normal and wetter years is minimal compared to other available local sources such as the Cachuma Project. The high cost for the SWP debt, combined with reduced water sales, strains district budgets, compromises district ability to maintain adequate reserves, perform system upgrades, and needed repairs. As a result, maintenance and upgrades are backlogged or must be paid out of dwindling reserve funds. C-WIN believes districts' defaults on SWP payments are a real threat for many of these districts.

Debt Requirements Looming: In some cases, water districts are struggling to maintain the lenders' required bond coverage covenant of 125%. For instance, for fiscal year 2012-2013, Montecito had a bond coverage ratio of only 115%. During fiscal year 2009-2010, Goleta had a bond coverage ratio of only 120%.



Santa Barbara County during current drought

V. SWP Reliability and Effective Unit Costs

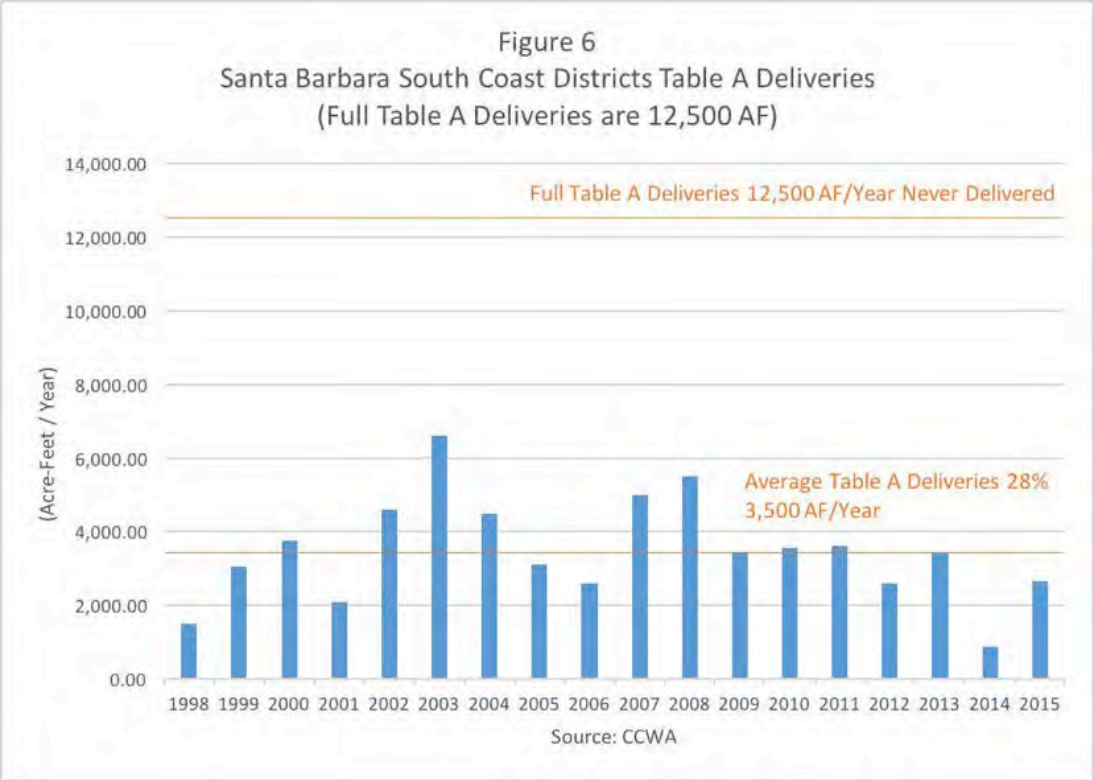
Reliability

Before the 1991 election, voters were promised that the SWP contracts would be "97% reliable", meaning 97% of Table A water could be delivered. This promise has never been fulfilled.

However, it was made clear by all the supporting districts that SWP water was sought as a supplemental source to existing local sources, a supply that would be utilized during extreme droughts when local sources proved to be insufficient. This established a requirement for reliability quite different than that characterized as average delivery capability over a long period of time. The assurance of state water in time of need constitutes the best measure of reliability. This assurance is probably best met by operating the SWP on the basis of **safe yield**, which is that level the project can deliver every year given some small probability of shortfall. The SWP is not operated on this basis, and can therefore never meet the requirements for a reliable supplemental water source as intended by Santa Barbara County's water districts.

Figure 6 shows that over the past 18 years, the four South Coast districts received approximately 28% of their Table A allocation. **2014 was a very dry year for the entire state. The official SWP allocation of 5% is a clear demonstration that the SWP is coming up very short in the years it is needed most.**

Fig. 6: Table A Deliveries



The availability of state water under present operational rules is limited year-to-year by the amount of runoff experienced in each year. C-WIN has examined the 98-year hydrologic record of the Sacramento River and **found that statistically, present operations can only provide a small fraction of Table A amounts during droughts**. DWR has never performed a proper analysis to determine a truly reliable level of delivery. Without such analysis, it is fruitless to propose structural solutions to the Delta's problems, given that precipitation is the main limiting factor. (See CVP & SWP Operations, Appendix B, for details on mischaracterizations of Sacramento River hydrology by DWR.)

Origin of SWP Supply Problems

The SWP's difficulties in delivering full Table A allocations can be traced to the origin of the project, which dates to the late 1950's. The full statewide Table A amounts were developed in the 1950's and 1960's, and were based on potential new sources anticipated from further damming of California's North Coast rivers. Federal and State Wild and Scenic River designations for most North Coast rivers closed the door on these projections. The State Water Project also planned to build a Peripheral Canal to move water through the Delta. The bond measure to fund the Peripheral Canal was voted down by California voters in 1982, in large part due to the potential environmental devastation to the Bay/Delta.

Without the availability of these sources, there is no likelihood of meeting Table A amounts.

Two independent analyses of northern California watersheds have concluded that consumptive water rights claims are over 5-times more than the available water supply. The California Water Impact Network (C-WIN) published its results of a three-year study in 2012 (Appendix D). The University of California Davis analysis reached the same conclusion in a paper published in 2014 (Appendix E), stating that "inaccurate and incomplete accounting of water rights has made the state ill-equipped to satisfy growing societal demands for water supply reliability and healthy ecosystems."

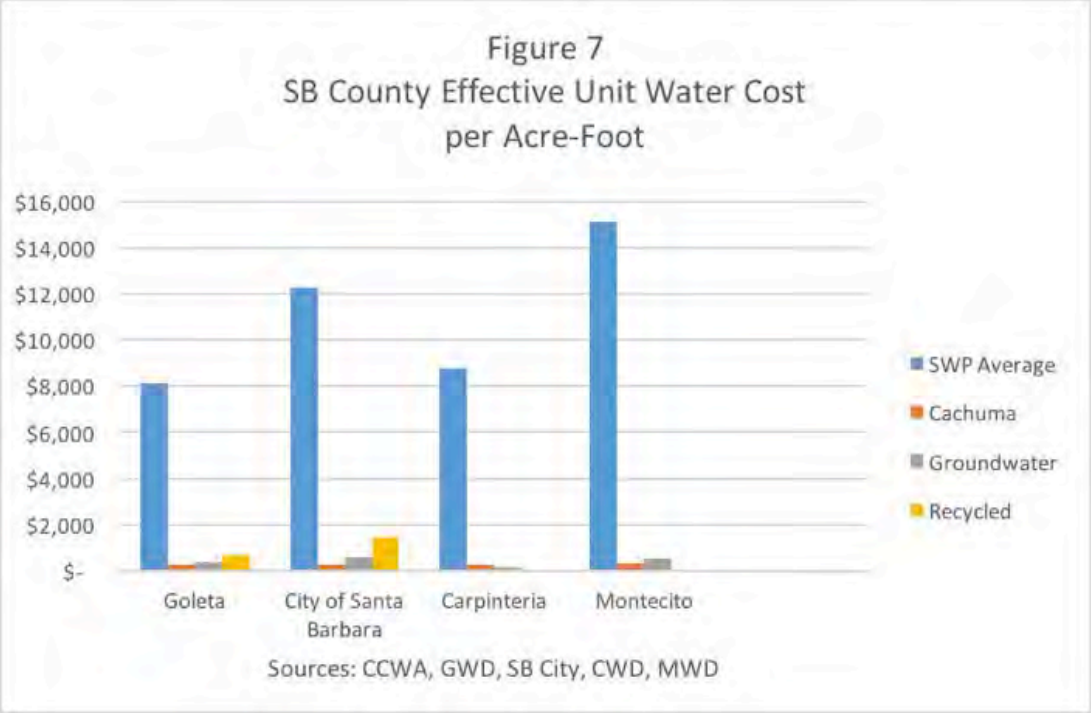
Effective Unit Costs

The effective unit (acre-foot) costs of SWP water are highly variable and have led to costs considerably higher than those estimated for the 1991 ballot measure. This is because the water agencies must pay the fixed costs for the amount of water contracted, regardless of the amount delivered annually. Even if no SWP water is delivered these fixed costs must be paid.

C-WIN has determined that CCWA's estimated unit costs for SWP water on a per acre-foot basis are often greatly understated because CCWA bases cost estimates on full delivery of Table A Allocation amounts that have been shown to be a fictitious delivery amount. As shown in Figure 6 on the previous page, full Table A Allocations have **never** been delivered by the SWP and are unlikely to ever be delivered because of limited availability in times of drought and lack of need during wet years when the water is available!

Figure 7, on the following page, shows the **effective unit water cost** per acre foot for SWP water; *the cost of supply divided by the actual water delivered*. This is based on information from the four water agencies. Figure 7 compares the effective unit costs of state water against the effective unit cost of local sources for each of the four South Coast districts. In this figure, average costs over the last 5 years for SWP and local sources are presented. This is another way of showing the impact of a costly and unreliable project. Figure 7 shows that SWP costs significantly outweigh the costs of local water sources.

Fig. 7: Effective Unit Water Cost



	SWP Average	Worst year, 2014 SWP Drought	Avg. Cachuma	Avg. Groundwater	Avg. Recycled
Goleta	$8,150AF	$21,500AF	$240AF	$376AF	$707AF
City of Santa Barbara	$12,299AF	$28,200AF	$240AF	$610AF	$1,450AF
Carpinteria	$8,800AF	$19,800AF	$240AF	$144AF	
Montecito	$15,132AF	$30,600AF	$310AF	$516AF	

Table 2 demonstrates the singular effects of SWP costs and deliveries by calculating the *effective unit costs of SWP deliveries* focusing only on those costs that are the fundamental allocations of Table A made by DWR at the beginning of each new contract year. Accordingly, no deliveries associated with the Article 21 surplus water, Turn-back Pool water, or Carryover water are included in delivered Table A allocations. Similarly, all the costs that are included in the CCWA invoices for such deliveries have been deducted from the invoiced costs. Also excluded are deliveries of and costs for supplemental purchased water.

On this basis Table 2 confirms the very high effective unit costs and exposes the extraordinary high costs during droughts when deliveries are curtailed. It is important to note that the costs and deliveries shown in Table 2 are more representative of SWP contract scenarios as they stood in 1991, when votes were taken. Since 1991, the SWP contract has been significantly amended to provide a far more liberal interpretation of non-Table A types of water and the established requirements for

buying and selling water among SWP and non-SWP contractors. Further the amended SWP contract eliminated the urban preference for Table A deliveries, a primary factor causing lower deliveries during drought years and consequent high unit costs. The **urban preference** required water for people before agriculture in times of drought. This safeguard was eliminated by the Monterey Amendments to the SWP contracts in 1995. C-WIN is currently contesting these Amendments in court.

Table 2: SWP Effective Unit Costs

City of SB	Delivery (AF/yr)	Total Cost ($M)	Effective Unit Cost ($/AF)
2010	541	4.31	$7,970
2011	773	4.71	$6,090
2012	703	4.77	$6,735
2013	339	4.24	$12,500
2014	165	4.81	$28,200
2015	0	4.66	(NWD)

Montecito	Delivery (AF/yr)	Total Cost ($M)	Effective Unit Cost ($/AF)
2010	500	4.91	$9,800
2011	218	4.86	$22,300
2012	0	4.45	(NWD)
2013	1155	5.27	$4,560
2014	165	5.06	$30,600
2015	660	5.56	$8,400

Goleta	Delivery (AF/yr)	Total Cost ($M)	Effective Unit Cost ($/AF)
2010	1103	3.75	$3,400
2011	1126	6.63	$5,900
2012	972	7.24	$7,400
2013	1433	6.5	$4,500
2014	373	8.03	$21,500
2015	1592	9.83	$6,200

Carpinteria	Delivery (AF/yr)	Total Cost ($M)	Effective Unit Cost ($/AF)
2010	492	3.22	$6,500
2011	501	3.23	$6,400
2012	433	3.03	$7,000
2013	500	3.66	$6,600
2014	110	3.08	$19,800
2015	450	3.01	$6,500

In the years of no SWP water deliveries, each district is still required to pay millions of dollars for its share of the revenue bonds.

Impact on Ratepayers

Retail water agencies are responsible for delivering water directly to homes and business customers. As nonprofit governmental institutions, they must by law recover their costs through their revenue- generating operations. They typically have two means of doing this: charging customers for the water they directly consume ("water rates") and charging customers for the meters that provide access to water and measures their consumption at the street. The latter is commonly referred to as the "fixed service charge."

Montecito is an example of the severity of the budget shortfalls experienced when water sales drastically decrease. In 2014 Montecito determined it had less than a year left of water from traditional sources and instituted a drastic rationing plan. Severe penalties were imposed for going over allocations. Raising rates and fixed service charges along with monetary penalties were still not enough to cover operations and debt, so Montecito levied an additional drought surcharge. Montecito's revenue from fines, levies and fixed charges is greater than revenue from water sales. This is not a sustainable way to run a water district.

Single Family Residential Rate Structures

C-WIN investigated retail water costs for an average single-family residential customer by obtaining data from updated Urban Water Management Plans (UWMP) and current district fee schedules for the four water agencies of the Santa Barbara coastal plain.

All four water districts have responded similarly in their efforts to increase revenues following high SWP costs. Prior to the 1987-1992 drought, unit rates and service charges were substantially lower as were the consequent water bills of the customers. However, these rates are not as high as would be indicated by the effective unit costs of SWP deliveries. That is due to the fact that the bulk of delivered retail water is supplied by much lower- cost sources such as Lake Cachuma. Nonetheless, customer bills are several times higher than before the drought. For example, in 1991 (before South Coast districts incurred state water debt), Montecito's Water District's annual budget was $1 million. Today, with SWP debt, it is $14 million. The current drought promises further rate increases due to the need to procure supplemental purchased water because SWP water isn't there. These additional sources must be purchased on the spot market at prevailing prices, which are much higher than the variable costs of SWP water.

Balancing of Water Rates for Large and Small Users

The Santa Barbara County Grand Jury Report on the Carpinteria Valley Water District noted "...a serious imbalance in the monthly service charges between small and large meters ... resulting in small water user costs that ... are 2 ½ times the going rates in the general area." The subtext here: it is particularly difficult for Carpinteria to increase rates to provide sufficient revenues. Carpinteria has a substantial agricultural sector that constitutes a significant fraction of its retail water deliveries. If rates for agriculture are raised too high many of the farmers will activate private wells that can be operated at lesser cost. This results in lost revenue to the district leaving the residential sector to bear a disproportionately higher load.

In Montecito the district has instituted a parcel fee that is applied to developed and undeveloped parcels alike. This has helped raise needed revenues. Santa Maria has folded its waste water operation into the water department to constitute a single enterprise fund to help meet its obligations. *The need for increased revenues has brought about many creative cost/management solutions to balance revenues with obligations, of which the single most important factor is SWP charges.*

The Impact of the Twin Tunnels

Presently, the Twin Tunnels are in the very early stages of definition as a project. Much planning and preliminary engineering work is yet to be done to define a project from which competent cost estimates can be made. Similarly, very little has been made public as to how this project is to operate, who will be participating and how it will be financed (see State Auditors Report, Appendix C.)

Currently, the State Water Project (SWP) and the Central Valley Project (CVP) contractors have spent **$280 million** on planning to date, and estimate it will cost an additional **$1.2 billion** to get the project "shovel ready" with 90% of the required engineering still to be completed. These costs are paid proportionately by South Coast Contractors. CCWA's local contractors appear to be paying large amounts of money for the planning and engineering of the tunnels.

Given the available information on the project, C-WIN has documented the estimated cost of construction of the Twin Tunnels. Santa Barbara County's annual payment with interest and principle on these construction costs will range from **$7.7 million/yr.** to **$46.4 million/yr.** The South Coast districts' share will range from **$2 million/yr.** to almost **$15 million/yr.** These estimates are based on a 55/45 division in costs between the State Water Project (SWP) and the Central Valley Project (CVP). Since recent developments indicate that the CVP will likely not participate in the financing, estimates have been made on this assumption as well.

The California Auditor has released the results of a study on planning, financing, and management of the Twin Tunnels and has found serious departures from legally required management practices. The Auditor's report is attached here as Appendix C. In summary the report shows the serious paucity of information upon which to base project estimates and a management strategy. Furthermore, the report points out that the current project manager does not have the legal technical requirements and education background to lead the project.

If Santa Barbara County is forced to participate in the construction of the Twin Tunnels, its SWP expenditures will increase significantly at a minimum. The resultant increases in retail water costs will burden Santa Barbara County customers without any assurance that additional water supplies will be forthcoming. This increased cost burden will depress demand even further.

I. Estimated Costs and Allocations to SB County Water Districts

Given the shaky basis described in Appendix C, the Auditor's Report, the available information was used to make some preliminary estimates and cost impacts of the Twin Tunnels.

In 2012, BDCP/CA WaterFix cost estimates for the Tunnels were $17.2 billion for construction. This is a gross underestimate because cost estimates have not been updated to reflect the construction timeline and do not include the potential for cost overruns. Such overruns are all too common for large construction projects, and can occur for a variety of reasons. The Coastal Branch Phase II Aqueduct, the most recent project built by DWR, which serves Santa Barbara and San Luis Obispo counties, is a classic example of an engineering project with significant cost overruns.

With only 10% of the engineering completed, the construction costs for the tunnels range from an estimate of **$20.6 billion** (DWR) to **$38 billion** (ECONorthwest). The $20.6 billion number represents DWR's $17.2 billion estimate escalated to the expected period of construction, while the $38 billion is based on an independent analysis obtained by the consulting firm ECONorthwest, also escalated to the expected period of construction. (See ECONorthwest Report, Appendix A).

In order to calculate the annual costs that would accrue from selling bonds to finance these construction costs, several assumptions have been made. First, an interest rate of 6.1% was used as the bond financing rate. How the annual bond financing costs would be paid is still uncertain.

The proposed project would be built under the authority of the SWP contracts. Under those contracts, the Twin Tunnels financing costs likely would be part of Delta water cost. On this basis, each contractor's proportionate share would be equivalent to its proportionate share of Table A allocations.

The tunnel project was originally conceived to provide for both CVP and SWP deliveries across the Delta, with the CVP responsible for just less than half the costs. Almost all CVP deliveries south of the Delta are for agriculture and about one-fourth of SWP deliveries are for agriculture. Agribusiness contractors are unsure they can sustain such a financial burden. They would prefer that the urban contractors assume a larger share. There is no obvious objective basis within the SWP to make such a shift between agriculture and urban beneficiaries but we have assumed an allocation based on each contractor's proportionate share of SWP construction costs to date. Since urban SWP contractors typically lie at the ends of the various branches of the SWP, they assume proportionately larger shares of construction costs than proportions based on Table A allocations.

Santa Barbara County Water District contractual cost share of Table A Delta water is approximately 1.1 % of the financed total. If the allocation is based on proportionate shares of SWP construction costs, the Santa Barbara County share of financing costs is approximately 3.4%. These two values were used in estimating the impacts on Santa Barbara County SWP contractors. The costs are allocated further within Santa Barbara to CCWA members (the water agencies) on the basis of their proportionate shares of Table A water.

The impact analysis also addresses the possibility that the CVP would decline to participate in the tunnels project, which provides a high value limit. In Tables 4 and 5, the designation "55/45" represents shares of the total costs allocated to the SWP and CVP; "100/0" indicates the total burden allocated to the SWP.

Table 4 shows the estimated share that would be allocated to the Santa Barbara County Flood Control and Water Conservation District (SBCFCWCD), the entity that holds Santa Barbara's SWP contract. Tables 5 and 6 show the shares further allocated to CCWA participants. Invoices to the SBCFCWCD will show only a single additional charge for the County's share of the Twin Tunnels financing costs. These will be passed on to the CCWA participants based on proportionate shares of Table A amounts.

Table 4:
Annual Costs Allocated to SBCFCWCD (CCWA), $Million/yr.

	SWP/CVP Share			
SB Co. % Allocation	Low (55/45)	Low (100/0)	High (55/45)	High (100/0)
1.1%	7.7	14	15	27.3
3.4%	23.4	43.3	46.4	84.3

Table 5:
Annual Costs to CCWA Participants (Participant Budget Impacts), $Million/yr.

	SWP/CVP Share			
SB Co. % Allocation	Low (55/45)	High (55/45)	Low (55/45)	High (55/45)
	at 3.4%	at 3.4%	at 1.1%	at 1.1%
Montecito	1.71	3.4	.56	1.1
SB City	1.71	3.4	.56	1.1
Carpinteria	1.14	2.27	.38	.74
Goleta	2.57	5.10	.84	1.65
Santa Maria	9.36	18.5	3.04	6.00

As a state water contractor, Santa Barbara County will be required to make all payments necessary to recover its portion of the state's bond costs for constructing and operating the Twin Tunnels project. Tables 4, 5, and 6 demonstrate these impacts will significantly impact Santa Barbara County and CCWA participants. Participation will likely result in even greater water rate increases to cover the costs of a project that will likely not provide additional water supplies.

Steadily increasing water rates already have spurred fierce resistance from local ratepayers. The additional financial burden

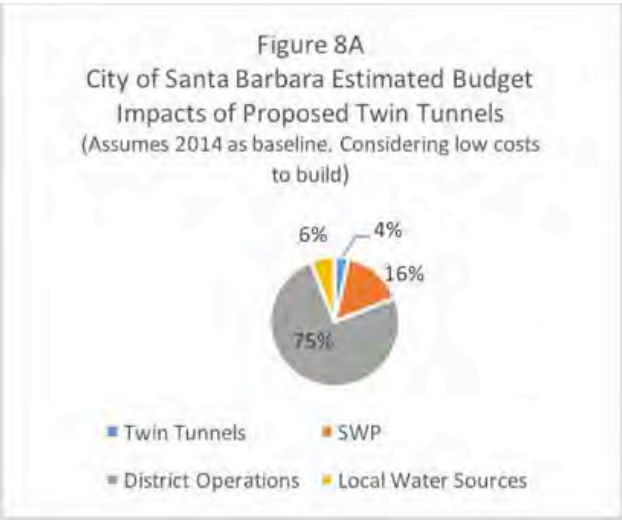
of the Twin Tunnels may result in ratepayer revolts through local elections or remedies provided by Proposition 218 to challenge fee increases. The statement from the 2006-07 Santa Barbara County Grand Jury Report on the Carpinteria Valley Water District is thus relevant to all County water agencies:

> *"Coupled with the expense of State Water option, which it does not need and uses little, the district is strapped with non-operational yearly expenses which exceed $5 million… giving rise to high water rates."*

II. Budgetary Impacts

The cost allocations presented in Table 5 are examined from the perspective of water district budgets. This represents the impacts of the proposed Twin Tunnels. The following pie charts, one set for each district plus a set for Santa Maria, show the proportions of budgets that would be allocated to the SWP and the Twin Tunnels for each district under the assumptions of high and low construction costs. The pie charts in figures 8A-12B use the year 2014 as a baseline for all the costs not accounted by the SWP and the Twin Tunnels. These impacts reflect the degree of exposure for each district based on SWP Table A allocation relative to non-SWP sources of supply.

Fig.'s 8A - 12B: Estimated Budget Impacts by District



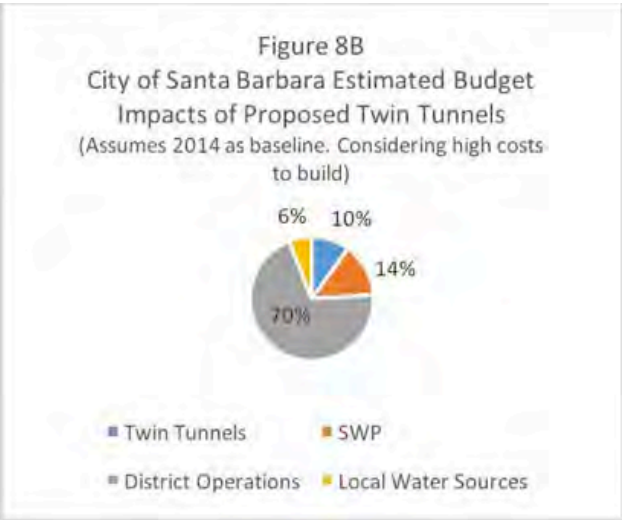


Figure 9A
Carpinteria Estimated Budget Impacts of Proposed Twin Tunnels
(Assumes 2014 as baseline. Considering low costs to build)

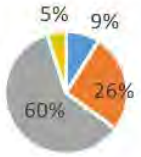


Figure 9B
Carpinteria Estimated Budget Impacts of Proposed Twin Tunnels
(Assumes 2014 as baseline. Considering high costs to build)

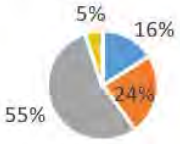


Figure 10A
Montecito Estimated Budget Impacts of Proposed Twin Tunnels
(Assumes 2014 as baseline. Considering low costs to build)

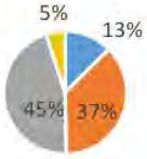


Figure 10B
Montecito Estimated Budget Impacts of Proposed Twin Tunnels
(Assumes 2014 as baseline. Considering high costs to build)

Figure 11A
Goleta Estimated Budget Impacts of Proposed Twin Tunnels
(Assumes 2014 as baseline. Considering low costs to build)

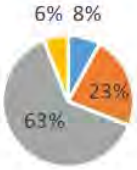


Figure 11B
Goleta Estimated Budget Impacts of Proposed Twin Tunnels
(Assumes 2014 as baseline. Considering high costs to build)

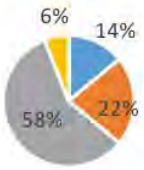


Figure 12A
Santa Maria Estimated Budget Impacts of Proposed Twin Tunnels
(Assumes 2014 as baseline. Considering low costs to build)

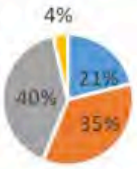
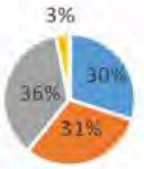
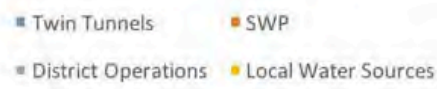


Figure 12B
Santa Maria Estimated Budget Impacts of Proposed Twin Tunnels
(Assumes 2014 as baseline. Considering high costs to build)





Santa Maria has a large Table A allocation and therefore will have a very large allocation of Twin Tunnels cost. Figures 12A and 12B show the degree of exposure.

Without the CVP

The pie charts above all depict the cases with the assumption that the CVP would be shouldering 45% of the total burden. With recent developments it now seems that the CVP will not be participating. Accordingly, Table 6 has been prepared to show the cost burdens that local water districts would be required to share under various assumptions of project costs, high or low, and the percentage allocation at the State level, 1.1% or 3.4%, with the CVP not participating.

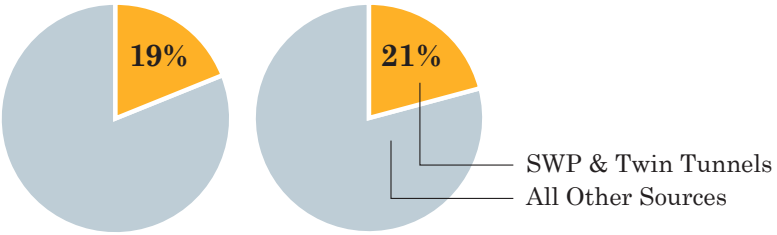
Figures 13A&B, 14A&B, 15A&B, 16A&B, and 17A&B, are pie charts depicting the share of each selected water district budget the combined SWP and Twin Tunnels will require. The pie charts only depict the case of the 1.1% allocation at the State level since we regarded the 3.4% case as too extreme in its impacts. (The 3.4%, high estimate just for the Twin Tunnels for Santa Maria exceeds its current water budget.)

Table 6:
Allocation of Annual Costs to CCWA Participants SWP Assumes 100% of Financial Burden of Project $Million/year

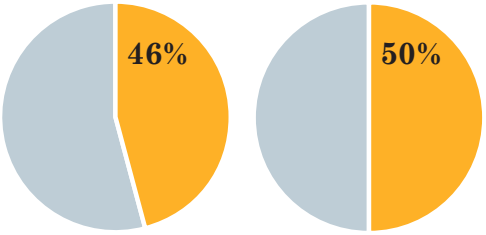
SB County Allocation	3.4%		1.1%	
Project Cost Estimate	Low	High	Low	High
Montecito	3.14	6.11	1.05	1.98
SB City	3.14	6.11	1.05	1.98
Carpinteria	2.09	4.05	0.67	1.31
Goleta	7.14	13.9	2.31	4.50
Santa Maria	16.9	33.0	5.5	10.1

Figs. 13-17: Share of Water District Budgets

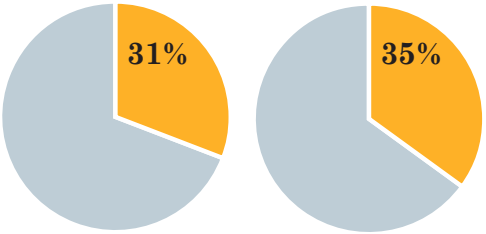
Figs. 13a-b
City of Santa Barbara



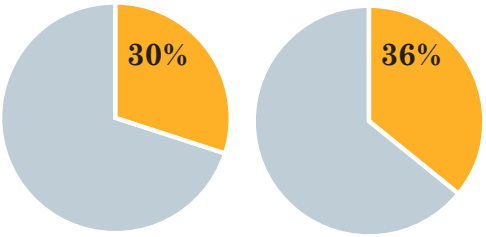
Figs. 14a-b
Montecito



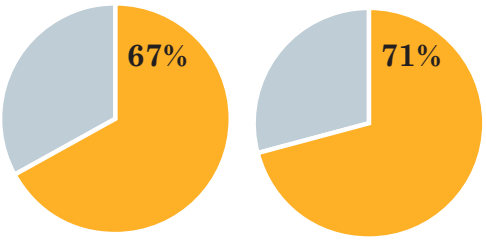
Figs. 15a-b
Carpinteria



Figs. 16a-b
Goleta



Figs. 17a-b
Santa Maria



Cost Estimating Risk

The estimates provided above are based on the analyses of ECONorthwest as presented in Appendix A. Those analyses in turn are based on the best available information from project proponents: Bay Delta Conservation Plan (BDCP), DWR studies, and input from SWP contractors. That information is speculative at best. Detailed investigations of tunneling to support competent engineering designs, which is a first order cost driver

for the project, have not yet been completed. Without such designs it is unlikely that initial cost estimates are very accurate. The financing plan originally articulated in the March 12, 2012, BDCP, "Economic Benefits and Financing Strategies" has been used by ECONorthwest to develop the cost impacts of the project (Appendix A).

The BDCP/WaterFix estimated a 10 to 12-year construction period; that means 10 to 12 years of construction costs are accumulated before any tangible water delivery benefits are produced. The financing strategy proposes to capitalize only two years of the bond interest accumulated over the construction period; project participants are expected to cover the major fraction of the bond financing during the construction period. These costs are considerable. According to the spreadsheets prepared by ECONorthwest, these un-capitalized interest costs, when allocated to the SBCFCWCD, accumulate to $45 M and $135 M for the low case at 1.1% and 3.4% respectively. Correspondingly, the amounts for the high case are $99 M and $308 M. These amounts equate to 20% to 24% of the estimated project costs without capitalized interest. Accordingly, all the values presented in Tables 4 and 5 would be increased by these percentages if it is determined that construction interest should be fully capitalized. The project participants, the SWP contractors, should make this determination. It should also be a concern for the bond issuers and the bond buyers.

III. Twin Tunnels Potential Benefits

If there are any benefits to the Twin Tunnels project they must be measured by its likelihood of improving the delivery of the SWP and CVP water, its stated purpose.

According to the analysis in Appendix B, at least half of the years in the 100-year record of the Sacramento River watershed will be dry. Of those years, half are too dry to confidently allow much, if any, export. In the other half of the dry years, if we account for senior water rights in the Delta and Sacramento Valley and provide for sufficient outflow to maintain Delta health, it is very unlikely that the dry group exports can exceed 2 million acre-feet. During droughts, 4-5 dry years can occur in sequences; therefore, the project must be operated to provide a reliable yield under these circumstances; in effect a safe yield operation. **Because the Twin Tunnels proposes only to capture excess flows during wet years, it can make no claim to improve reliability.**

Project proponents claim the Twin Tunnels will improve the State's ability to capture and store the excess run-off that occurs in wet years. Wet years comprise 44% of the 100-year run-off record as shown in Appendix B; however, the Twin Tunnels project involves no new storage. Project supporters claim ground water basins in the San Joaquin Valley can be used to store significant amounts of water. But these basins are neither SWP nor CVP facilities. **Storing water there would amount to a privatization of project waters resulting in probable legal**

challenges.

The SWP did acquire a large ground water basin in Kern County for the specific purpose of improving SWP deliveries as part of their contractual obligations. But this basin ultimately was transferred to the Kern Water Bank Authority, a quasi-public district controlled by a non-SWP party. Water from this basin has been sold to water districts at monopoly prices though the current drought. If the SWP had continued to own and operate the basin, the costs of the water through the drought would be governed by SWP contractual pricing. It is this aspect of the Twin Tunnels project that is most disquieting. **It potentially allows the privatization of large amounts of project water with no guarantee of price limitations of any sort. Without a complementary SWP storage element south of the Delta, the Twin Tunnels provide no benefit to SWP contractors.**

Since there is **no public storage component south of the Delta** as part of the project, it is inconceivable that the Tunnels will deliver any new water. It could provide the capability to continue deliveries of SWP and CVP water south in the event of possible levee failures due to earthquakes, although the integrity of the delivery system itself may be jeopardized by such an event. Its merits as a hedge against climate change and consequent sea level rise are even less certain.

C-WIN sees no benefits for Santa Barbara County water users from the Twin Tunnels, only drawbacks.

Conclusions

C-WIN has documented the fundamental problems associated with the importation and distribution of SWP water. These findings have shown the ominous fiscal consequences for Santa Barbara County generally and for the South Coast water districts specifically: The City of Santa Barbara, Goleta, Carpinteria and Montecito. Costs estimated for construction of Governor Brown's Twin Tunnel/ CA WaterFix would add to the burden forcing these agencies even closer to insolvency. Meanwhile ratepayers are responding to the price elasticity of supply and demand by using less water, resulting in declining district revenue. C-WIN believes these conclusions should be a warning to other SWP contractors.

Costs

For Water Districts:

- Presently, significant portions of water district budgets must be dedicated to the fixed costs of State Water Project delivery infrastructure and expenses.

- The four South Coast water districts addressed in this report presently have great difficulty with cost recovery, and the consequent drawdown of cash reserves signals that they face continuing dangerous deficits.

- All the districts in this study experience high effective unit costs for SWP water; this applies to normal years, but spikes during drought years when water supplies decrease.

- The Twin Tunnels will add significantly to these present burdens with no prospect of commensurate benefits.

For Both Ratepayers and Water Districts:

- Agencies have increased water rates substantially and local customers and ratepayers will see continued escalation in water rates to cover ongoing State Water Project costs. The Twin Tunnel cost burden will add to financial difficulties. To recover all costs and rebuild reserves without going into additional debt, the water agencies will need to continue increasing monthly water service (i.e., fixed access) charges.

- Higher water rates and drought awareness have increased water conservation; this reduces revenue, incentivizing larger water users to turn to private sources, e.g. wells.

- Water districts are paying high fixed and operational costs for state water they either don't take, or take in small amounts. In times of

need, such as the recent drought, state water is either unavailable or available only in deeply reduced allocations. The Twin Tunnels rely on paper water.

Approval and construction of the Twin Tunnels is not inevitable. This report finds that the extra costs of the project will produce significant budgetary impacts and no benefit.

It is too late for Santa Barbara County and its water agencies to withdraw from the burdensome financial obligations that they have incurred by connecting to the State Water Project. However, it is not too late to withdraw from the Bay-Delta Conservation Plan/CA WaterFix/Twin Tunnels and any subsequent plan to construct tunnels under or around the Sacramento-San Joaquin Bay Delta. Santa Barbara County needs its financial resources to explore and create alternative water conservation projects and new local water resources such as desalination.

Appendix A

California WaterFix: Potential Costs to Santa Barbara County
ECONorthwest Report

APPENDIX A

California WaterFix:

Potential Costs to Santa Barbara County

July 2016

Prepared for:

California Water Impact Network

FINAL REPORT

ECONorthwest
ECONOMICS • FINANCE • PLANNING

The Washburne Building
72 W Broadway
Suite 206
Eugene, OR 97401
541.687.0051

KOIN Center
222 SW Columbia Street
Suite 1600
Portland, OR 97201
503.222.6060

Acknowledgments

For over 40 years ECONorthwest has helped its clients make sound decisions based on rigorous economic, planning, and financial analysis. For more information about ECONorthwest: www.econw.com.

Kristin Lee and Ralph Mastromonaco prepared this report to California Water Impact Network with additional assistance from ECONorthwest staff and others. That assistance notwithstanding, ECONorthwest is responsible for the content of this report.

The staff at ECONorthwest prepared this report based on their general knowledge of water resource economics, and on information derived from government agencies, private statistical services, the reports of others, interviews of individuals, or other sources believed to be reliable. ECONorthwest has not independently verified the accuracy of all such information, and makes no representation regarding its accuracy or completeness. Any statements nonfactual in nature constitute the authors' current opinions, which may change as more information becomes available.

For more information about this report:

Kristin Lee
lee@econw.com
The Washburne Building
72 W Broadway
Suite 206
Eugene, OR 97401
541.687.0051

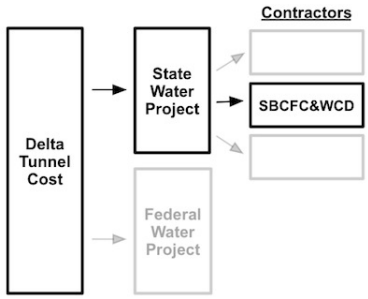
Ralph Mastromonaco
mastromonaco@econw.com
KOIN Center
222 SW Columbia Street
Suite 1600
Portland, OR 97201
503.222.6060

Table of Contents

Introduction

In this report we summarize our analysis of the potential costs of the California WaterFix project to Santa Barbara County Flood Control and Water Conservation District (SBCFC&WCD). Our study has two primary scenarios: a low-cost scenario and a high-cost scenario. For each of these scenarios, we conduct several analyses using alternative assumptions about (1) how the costs of the WaterFix project would be allocated between the State and Federal Water Projects and (2) how the costs allocated to the State Water Project would be distributed among the 29 contractors (including SBCFC&WCD) participating in the State Water Project. (See Figure 1 below).

Figure 1. Flow of Costs of the Bay-Delta Conveyance Structure to Santa Barbara County Flood Control and Water Conservation District



Source: ECONorthwest

I. Cost of California WaterFix Project

In this section we describe our calculations of the cost of building and operating the California WaterFix project. We base our calculations on publicly available information about the project's costs.

The costs of the project would be paid, at least in part, by the State Water Project (SWP). The SWP would, in turn, pass the costs along to the 29 contractors that participate in the SWP. Ultimately, ratepayers, including those in Santa Barbara County, would bear the burden of paying for the project.

Given the preliminary nature of the available cost information, we conducted our analysis using two primary scenarios: a low-cost scenario and a high-cost scenario, as we describe below and in Table 1.

A. Low-Cost Scenario (Excluding Finance Charges)

Information from the California Natural Resources Agency (CNR) released in June 2016 identifies the estimated cost of the California WaterFix project. According to CNR, the project's design, construction, O&M, and related mitigation cost is an estimated $17.1 billion (in 2014 dollars).[1] We use this estimated cost in the low-cost scenario. Additional detail about the construction and mitigation costs (but not the O&M costs) is included in a January 2016 agreement between the Department of Water Resources and the Conveyance Project Coordination Agency.[2] We gleaned additional information about the costs by reviewing the cost data, and underlying documentation, for the previous proposals.[3]

We adjusted the costs to account for likely inflation of costs between the time of the cost estimate, 2014, and the estimated year construction would begin. For the design and construction costs, we also account for inflation during the 10-year construction period. For purposes of our analysis, we inflate the $17.1 billion in costs (in 2014 dollars) by applying an annual inflation rate of 2 percent, which is the same inflation rate used in previous analyses of the BDCP.[4] As Table 1 shows, the result is $20.3 billion (in 2017 dollars).

B. High-Cost Scenario (Excluding Finance Charges)

To address the uncertainty associated with the cost estimates, we use a high-cost estimate with double the design and construction costs of the low-cost estimate. As Table 1 shows, we use the same mitigation and O&M costs as in the low-cost estimate. Cost overruns on large construction projects are not uncommon. In its analysis of the costs of the WaterFix project, the San Diego Water Authority also used a high-cost estimate that was twice the size of the low-cost estimate to help capture the uncertainty associated with the cost estimates.[5] For purposes of this analysis, we use a high-cost estimate of $38.2 billion (in 2017 dollars).

---

[1] California Natural Resources Agency. 2016. "Fast Facts." June. Accessed at http://www.californiawaterfix.com/.

[2] State of California, Department of Water Resources and Conveyance Project Coordination Agency. 2016. "Agreement Regarding Construction of Conveyance Project Between the Department of Water Resources and the Conveyance Project Coordination Agency." January. Accessed at http://www.californiawaterfix.com/resources/design-and-construction-enterprise/.

[3] *See,* for example, California Department of Water Resources. 2013. *Bay Delta Conservation Plan. Public Draft. November*. Sacramento, CA. Prepared by ICF International (ICF 00343.12). Sacramento, CA; and California Department of Water Resources. 2012. *Bay Delta Conservation Plan. Administrative Draft. November.* Sacramento, CA. Prepared by ICF International. Sacramento, CA.

[4] Ibid.

[5] San Diego County Water Authority. 2015. "Bay Delta Conservation Plan/California WaterFix: Potential Cost Impact to the Water Authority." December.

Table 1. California WaterFix: Low-Cost and High-Cost Scenarios without Financing Costs

		Design & Construction	Mitigation	O&M	Finance Costs	Total
Low-Cost Scenario	2014 $	$14.9 billion	$796 million	$1.4 billion	Not included	**$17.1 billion**
	2017 $	$17.9 billion	$845 million	$1.49 billion	Not included	**$20.3 billion**
High-Cost Scenario	2017 $	$35.8 billion	$845 million	$1.49 billion	Not included	**$38.2 billion**

Source: "Low Cost Scenario" data are from CNR "Fast Facts"
"High Cost Scenario" data are based on calculations by ECONorthwest.
Note: all dollar values are undiscounted.

II. Financing California WaterFix

The most recent publicly available information about the WaterFix project does not include details on how the project would be financed. For purposes of this analysis, we assume the project would be financed similar to the financing plan outlined for the project in the Bay Delta Conservation Plan (BDCP).[6] According to this plan, four revenue bonds would be used to finance the design and construction elements of the project.[7] Each bond would fund a portion of these costs over time. All of the bonds would have a period of capitalized interest and a 40-year pay-back period, with interest rates ranging from 6.132 to 6.135 percent.[8]

[6] *See,* for example, California Department of Water Resources. 2013. *Bay Delta Conservation Plan. Public Draft. November.* Sacramento, CA. Prepared by ICF International (ICF 00343.12). Sacramento, CA; California Department of Water Resources. 2012. *Bay Delta Conservation Plan. Administrative Draft. November.* Sacramento, CA. Prepared by ICF International. Sacramento, CA; and Southern California Water Committee and The PFM Group. 2012. *Bay Delta Conservation Plan: Economic Benefits and Financing Strategies*. March.

[7] As we understand, these bonds would be issued by DWR. Financing costs would be different if the contractors had to issue separate bonds for their shares.

[8] These interest rates represent the "all in true interest cost." *See,* for example, California Department of Water Resources. 2013. *Bay Delta Conservation Plan. Public Draft. November.* Sacramento, CA. Prepared by ICF International (ICF 00343.12). Sacramento, CA; and California Department of Water Resources. 2012. *Bay Delta Conservation Plan. Administrative Draft. November.* Sacramento, CA. Prepared by ICF International. Sacramento, CA.

Table 2. Overall Costs of California WaterFix, with Finance Costs Included

	Design & Construction	Mitigation	O&M	Finance Costs	Total	Annual Cost
Low-Cost Scenario	$17.9 billion	$845 million	$1.49 billion	$30.5 billion	**$50.8 billion**	**$1.27 billion**
High-Cost Scenario	$35.8 billion	$845 million	$1.49 billion	$61.1 billion	**$99.2 billion**	**$2.48 billion**

Source: ECONorthwest.

Table 2 shows the financing costs associated with the two cost scenarios. Adding the costs of financing brings the overall cost of the low-cost scenario to $50.8 billion and the high-cost scenario to $99.2 billion. It also shows, for budgeting purposes, the peak annual costs associated with payments on the bonds and the mitigation and O&M costs. See the Appendix for more detailed tables of results.

III. Allocation of Costs Between State and Federal Water Projects

In this section we calculate the share of the overall WaterFix costs that would be allocated to the State Water Project (SWP). This is the first step in identifying the potential costs that the SBCFC&WCD would bear.

Based on the information we have reviewed, we assume that the State and Federal Water Projects would share the costs of California WaterFix.[9] Although the split between the state and federal projects has not been determined, there is precedent for a 55/45 cost share ratio (the SWP would pay 55 percent of the cost, and the federal project would pay 45 percent of the cost).[10] Therefore, for one set of calculations, we assume the SWP would be allocated 55 percent of the overall cost. We also run a second set of calculations using an assumption that the SWP would pay 100 percent of the cost.

[9] According to the California Natural Resources Agency, "state/federal funding" may also cover an unidentified portion of the $1.4 billion O&M. *See* California Natural Resources Agency. 2016. "Fast Facts." June. Accessed at http://www.californiawaterfix.com/.

[10] California Department of Water Resources. 2013. *Bay Delta Conservation Plan. Public Draft. November*. Sacramento, CA. Prepared by ICF International (ICF 00343.12). Sacramento, CA. *See also,* San Diego County Water Authority. 2015. "Bay Delta Conservation Plan/California WaterFix: Potential Cost Impact to the Water Authority." December.

Table 3. State Water Project Share of California WaterFix Costs

	SWP Share	Total
Low-Cost Scenario	55	$27.9 billion
	100	$50.8 billion
High-Cost Scenario	55	$54.6 billion
	100	$99.2 billion

Source: ECONorthwest.

Table 3 shows that the SWP would bear $27.9 billion to $99.2 billion of costs for the project, depending on how the cost estimates would be allocated between the State and Federal Water Projects.

IV. Allocation of Costs to State Water Contractors

In this section we calculate the potential costs that the Santa Barbara County Flood Control and Water Conservation District (SBCFC&WCD) would bear. We assume that the State Water Project would pass the WaterFix costs onto its 29 contractors, including SBCFC&WCD.

For this part of the analysis, we allocated the costs in two different ways. First, we allocated the costs based on SBCFC&WCD's share of the water allotment from the State Water Project. We used the "Table A" maximum amount. SBCFC&WCD has a maximum volume of 45,486 acre-feet, which is 1.1 percent of the total maximum volume of the State Water Project.[11] Therefore, one set of our calculations is based on allocating 1.1 percent of the SWP's WaterFix costs to SBCFC&WCD.

Second, we used a different allocation of costs, based on SBCFC&WCD's share of total payments to the SWP. According to the latest data available, SBCFC&WCD payments account for 3.4 percent of the total payments to the SWP through 2013.[12] Therefore, a second set of our calculations is based on allocating 3.4 percent of the SWP's WaterFix costs to SBCFC&WCD.

[11] California Department of Water Resources. 2016. "California State Water Project Contractors: Maximum Table A Amounts." January. Accessed at www.water.ca.gov/swpao.

[12] California Department of Water Resources. 2015. *Management of the California State Water Project*. Bulletin 132-14. November.

Table 4. Allocation of Costs to SBCFC&WCD

		SWP 55/45		SWP 100	
	SBCFC&WCD Share:	1.1%	3.4%	1.1%	3.4%
Low-Cost Scenario		$304 million	$554 million	$944 million	$1.7 billion
High-Cost Scenario		$595 million	$1.08 billion	$1.84 billion	$3.35 billion

Source: ECONorthwest.

Table 4 shows SBCFC&WCD's shares of the California WaterFix costs. The results range from $304 million to $3.35 billion using the different allocation assumptions for the SWP allocations and, in turn, for the SBCFC&WCD allocations.

Summary

This analysis provides a range of results identifying SBCFC&WCD's potential share of the costs of the California WaterFix project over a 10-year construction period and 40 years of operations.

Based on the low-cost scenario of $50.8 billion in overall costs, SBCFC&WCD would bear costs ranging from $304 million to $1.7 billion depending on how the costs are allocated to the SWP and to SBCFC&WCD.

Based on the high-cost scenario of $99.2 billion in overall costs, SBCFC&WCD would bear costs ranging from $595 million to $3.35 billion depending on how the costs are allocated to the SWP and to SBCFC&WCD.[13]

[13] See the Appendix for more detailed tables of results.

Appendix: Detailed Tables

Total Payments, Low-Cost Scenario

								SWP Pays	*SWP Pays*	*SB % of SWP (vol)*	*SB % of SWP (vol)*	*SB % of SWP ($)*	*SB % of SWP ($)*
								55%	*100%*	*1.1%*	*1.1%*	*3.4%*	*3.4%*
Date	**1st Series Payment**	**2nd Series Payment**	**3rd Series Payment**	**4th Series Payment**	**O&M**	**Mitigation**	**Total**	**Cost Paid by SWP (55/45)**	**Cost Paid by SWP (SWP 100)**	**Cost Paid by SB (55/45)**	**Cost Paid by SB (SWP 100)**	**Cost Paid by SB (55/45)**	**Cost Paid by SB (SWP 100)**
6/1/17	-	-	-	-		$68,128,450	$68,128,450	$37,470,648	$68,128,450	$408,454	$742,643	$1,266,256	$2,302,284
6/1/18	$295,065,303	-	-	-		$70,839,023	$365,904,326	$201,247,379	$365,904,326	$2,193,723	$3,988,588	$6,800,811	$12,365,111
6/1/19	$295,065,303	-	-	-		$70,839,023	$365,904,326	$201,247,379	$365,904,326	$2,193,723	$3,988,588	$6,800,811	$12,365,111
6/1/20	$295,065,303	$285,192,400	-	-		$40,621,645	$620,879,348	$341,483,641	$620,879,348	$3,722,387	$6,767,977	$11,539,856	$20,981,556
6/1/21	$295,065,303	$285,192,400	$436,328,085	-		$40,621,645	$1,057,207,433	$581,464,088	$1,057,207,433	$6,338,325	$11,524,228	$19,649,585	$35,726,518
6/1/22	$295,065,303	$285,192,400	$436,328,085	-		$40,621,645	$1,057,207,433	$581,464,088	$1,057,207,433	$6,338,325	$11,524,228	$19,649,585	$35,726,518
6/1/23	$295,065,303	$285,192,400	$436,328,085	$194,767,054		$40,603,737	$1,251,956,580	$688,576,119	$1,251,956,580	$7,505,914	$13,647,117	$23,269,253	$42,307,732
6/1/24	$295,065,303	$285,192,400	$436,328,085	$194,767,054		$39,962,417	$1,251,315,260	$688,223,393	$1,251,315,260	$7,502,069	$13,640,126	$23,257,333	$42,286,060
6/1/25	$295,065,303	$285,192,400	$436,328,085	$194,767,054		$39,962,417	$1,251,315,260	$688,223,393	$1,251,315,260	$7,502,069	$13,640,126	$23,257,333	$42,286,060
6/1/26	$295,065,303	$285,192,400	$436,328,085	$194,767,054		$34,798,759	$1,246,151,602	$685,383,381	$1,246,151,602	$7,471,111	$13,583,839	$23,161,359	$42,111,563
6/1/27	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$25,620,645	$32,088,186	$1,269,061,674	$697,983,921	$1,269,061,674	$7,608,465	$13,833,573	$23,587,173	$42,885,769
6/1/28	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$25,620,645	$32,088,186	$1,269,061,674	$697,983,921	$1,269,061,674	$7,608,465	$13,833,573	$23,587,173	$42,885,769
6/1/29	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$25,620,645	$20,964,010	$1,257,937,498	$691,865,624	$1,257,937,498	$7,541,772	$13,712,312	$23,380,416	$42,509,847
6/1/30	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$25,620,645	$20,964,010	$1,257,937,498	$691,865,624	$1,257,937,498	$7,541,772	$13,712,312	$23,380,416	$42,509,847
6/1/31	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$25,620,645	$20,964,010	$1,257,937,498	$691,865,624	$1,257,937,498	$7,541,772	$13,712,312	$23,380,416	$42,509,847
6/1/32	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228	$20,964,010	$1,271,105,080	$699,107,794	$1,271,105,080	$7,620,716	$13,855,847	$23,625,153	$42,954,823
6/1/33	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228	$20,964,010	$1,271,105,080	$699,107,794	$1,271,105,080	$7,620,716	$13,855,847	$23,625,153	$42,954,823
6/1/34	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228	$20,964,010	$1,271,105,080	$699,107,794	$1,271,105,080	$7,620,716	$13,855,847	$23,625,153	$42,954,823
6/1/35	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228	$20,964,010	$1,271,105,080	$699,107,794	$1,271,105,080	$7,620,716	$13,855,847	$23,625,153	$42,954,823
6/1/36	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228	$20,964,010	$1,271,105,080	$699,107,794	$1,271,105,080	$7,620,716	$13,855,847	$23,625,153	$42,954,823
6/1/37	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228	$20,964,010	$1,271,105,080	$699,107,794	$1,271,105,080	$7,620,716	$13,855,847	$23,625,153	$42,954,823
6/1/38	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228	$20,964,010	$1,271,105,080	$699,107,794	$1,271,105,080	$7,620,716	$13,855,847	$23,625,153	$42,954,823
6/1/39	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228	$20,964,010	$1,271,105,080	$699,107,794	$1,271,105,080	$7,620,716	$13,855,847	$23,625,153	$42,954,823
6/1/40	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228	$20,964,010	$1,271,105,080	$699,107,794	$1,271,105,080	$7,620,716	$13,855,847	$23,625,153	$42,954,823
6/1/41	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228	$20,964,010	$1,271,105,080	$699,107,794	$1,271,105,080	$7,620,716	$13,855,847	$23,625,153	$42,954,823
6/1/42	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228	$20,964,010	$1,271,105,080	$699,107,794	$1,271,105,080	$7,620,716	$13,855,847	$23,625,153	$42,954,823
6/1/43	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/44	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/45	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/46	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/47	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/48	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/49	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/50	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/51	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/52	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/53	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/54	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/55	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/56	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/57	$295,065,303	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$1,250,141,070	$687,577,589	$1,250,141,070	$7,495,030	$13,627,326	$23,235,509	$42,246,380
6/1/58	-	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$955,075,767	$525,291,672	$955,075,767	$5,726,011	$10,410,928	$17,751,334	$32,275,152
6/1/59	-	$285,192,400	$436,328,085	$194,767,054	$38,788,228		$955,075,767	$525,291,672	$955,075,767	$5,726,011	$10,410,928	$17,751,334	$32,275,152
6/1/60	-	-	$436,328,085	$194,767,054	$38,788,228		$669,883,367	$368,435,852	$669,883,367	$4,016,183	$7,302,151	$12,450,660	$22,637,563
6/1/61	-	-	-	$194,767,054	$38,788,228		$233,555,282	$128,455,405	$233,555,282	$1,400,245	$2,545,900	$4,340,931	$7,892,601
6/1/62	-	-	-	$194,767,054	$38,788,228		$233,555,282	$128,455,405	$233,555,282	$1,400,245	$2,545,900	$4,340,931	$7,892,601
6/1/63	-	-	-	-	$38,788,228		$38,788,228	$21,333,525	$38,788,228	$232,549	$422,816	$720,930	$1,310,782
6/1/64	-	-	-	-	$38,788,228		$38,788,228	$21,333,525	$38,788,228	$232,549	$422,816	$720,930	$1,310,782
6/1/65	-	-	-	-	$38,788,228		$38,788,228	$21,333,525	$38,788,228	$232,549	$422,816	$720,930	$1,310,782
6/1/66	-	-	-	-	$38,788,228		$38,788,228	$21,333,525	$38,788,228	$232,549	$422,816	$720,930	$1,310,782
						TOTAL	**$50,784,476,175**	**$27,931,461,896**	**$50,784,476,175**	**$304,470,557**	**$553,582,830**	**$943,895,995**	**$1,716,174,537**

Total Payments, High-Cost Scenario

								SWP Pays	*SWP Pays*	*SB % of SWP (vol)*	*SB % of SWP (vol)*	*SB % of SWP ($)*	*SB % of SWP ($)*
								55%	*100%*	*1.1%*	*1.1%*	*3.4%*	*3.4%*
Date	**1st Series Payment**	**2nd Series Payment**	**3rd Series Payment**	**4th Series Payment**	**O&M**	**Mitigation**	**Total**	**Cost Paid by SWP (55/45)**	**Cost Paid by SWP (SWP 100)**	**Cost Paid by SB (55/45)**	**Cost Paid by SB (SWP 100)**	**Cost Paid by SB (55/45)**	**Cost Paid by SB (SWP 100)**
6/1/17	-	-	-	-		$68,128,450	$68,128,450	$37,470,648	$68,128,450	$408,454	$742,643	$1,266,256	$2,302,284
6/1/18	$590,130,606	-	-	-		$70,839,023	$660,969,629	$363,533,296	$660,969,629	$3,962,742	$7,204,986	$12,284,986	$22,336,338
6/1/19	$590,130,606	-	-	-		$70,839,023	$660,969,629	$363,533,296	$660,969,629	$3,962,742	$7,204,986	$12,284,986	$22,336,338
6/1/20	$590,130,606	$570,384,800	-	-		$40,621,645	$1,201,137,051	$660,625,378	$1,201,137,051	$7,201,233	$13,093,152	$22,324,705	$40,590,373
6/1/21	$590,130,606	$570,384,800	$872,656,171	-		$40,621,645	$2,073,793,221	$1,140,586,272	$2,073,793,221	$12,433,110	$22,605,654	$38,544,163	$70,080,296
6/1/22	$590,130,606	$570,384,800	$872,656,171	-		$40,621,645	$2,073,793,221	$1,140,586,272	$2,073,793,221	$12,433,110	$22,605,654	$38,544,163	$70,080,296
6/1/23	$590,130,606	$570,384,800	$872,656,171	$389,534,109		$40,603,737	$2,463,309,422	$1,354,820,182	$2,463,309,422	$14,768,395	$26,851,627	$45,783,831	$83,243,330
6/1/24	$590,130,606	$570,384,800	$872,656,171	$389,534,109		$39,962,417	$2,462,668,102	$1,354,467,456	$2,462,668,102	$14,764,550	$26,844,636	$45,771,912	$83,221,658
6/1/25	$590,130,606	$570,384,800	$872,656,171	$389,534,109		$39,962,417	$2,462,668,102	$1,354,467,456	$2,462,668,102	$14,764,550	$26,844,636	$45,771,912	$83,221,658
6/1/26	$590,130,606	$570,384,800	$872,656,171	$389,534,109		$34,798,759	$2,457,504,444	$1,351,627,444	$2,457,504,444	$14,733,592	$26,788,349	$45,675,938	$83,047,161
6/1/27	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$25,620,645	$32,088,186	$2,480,414,516	$1,364,227,984	$2,480,414,516	$14,870,946	$27,038,083	$46,101,752	$83,821,367
6/1/28	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$25,620,645	$32,088,186	$2,480,414,516	$1,364,227,984	$2,480,414,516	$14,870,946	$27,038,083	$46,101,752	$83,821,367
6/1/29	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$25,620,645	$20,964,010	$2,469,290,340	$1,358,109,687	$2,469,290,340	$14,804,252	$26,916,823	$45,894,995	$83,445,445
6/1/30	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$25,620,645	$20,964,010	$2,469,290,340	$1,358,109,687	$2,469,290,340	$14,804,252	$26,916,823	$45,894,995	$83,445,445
6/1/31	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$25,620,645	$20,964,010	$2,469,290,340	$1,358,109,687	$2,469,290,340	$14,804,252	$26,916,823	$45,894,995	$83,445,445
6/1/32	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228	$20,964,010	$2,482,457,923	$1,365,351,858	$2,482,457,923	$14,883,197	$27,060,358	$46,139,731	$83,890,421
6/1/33	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228	$20,964,010	$2,482,457,923	$1,365,351,858	$2,482,457,923	$14,883,197	$27,060,358	$46,139,731	$83,890,421
6/1/34	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228	$20,964,010	$2,482,457,923	$1,365,351,858	$2,482,457,923	$14,883,197	$27,060,358	$46,139,731	$83,890,421
6/1/35	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228	$20,964,010	$2,482,457,923	$1,365,351,858	$2,482,457,923	$14,883,197	$27,060,358	$46,139,731	$83,890,421
6/1/36	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228	$20,964,010	$2,482,457,923	$1,365,351,858	$2,482,457,923	$14,883,197	$27,060,358	$46,139,731	$83,890,421
6/1/37	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228	$20,964,010	$2,482,457,923	$1,365,351,858	$2,482,457,923	$14,883,197	$27,060,358	$46,139,731	$83,890,421
6/1/38	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228	$20,964,010	$2,482,457,923	$1,365,351,858	$2,482,457,923	$14,883,197	$27,060,358	$46,139,731	$83,890,421
6/1/39	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228	$20,964,010	$2,482,457,923	$1,365,351,858	$2,482,457,923	$14,883,197	$27,060,358	$46,139,731	$83,890,421
6/1/40	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228	$20,964,010	$2,482,457,923	$1,365,351,858	$2,482,457,923	$14,883,197	$27,060,358	$46,139,731	$83,890,421
6/1/41	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228	$20,964,010	$2,482,457,923	$1,365,351,858	$2,482,457,923	$14,883,197	$27,060,358	$46,139,731	$83,890,421
6/1/42	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228	$20,964,010	$2,482,457,923	$1,365,351,858	$2,482,457,923	$14,883,197	$27,060,358	$46,139,731	$83,890,421
6/1/43	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/44	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/45	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/46	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/47	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/48	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/49	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/50	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/51	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/52	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/53	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/54	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/55	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/56	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/57	$590,130,606	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$2,461,493,913	$1,353,821,652	$2,461,493,913	$14,757,510	$26,831,837	$45,750,088	$83,181,978
6/1/58	-	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$1,871,363,307	$1,029,249,819	$1,871,363,307	$11,219,472	$20,399,041	$34,781,738	$63,239,523
6/1/59	-	$570,384,800	$872,656,171	$389,534,109	$38,788,228		$1,871,363,307	$1,029,249,819	$1,871,363,307	$11,219,472	$20,399,041	$34,781,738	$63,239,523
6/1/60	-	-	$872,656,171	$389,534,109	$38,788,228		$1,300,978,507	$715,538,179	$1,300,978,507	$7,799,818	$14,181,487	$24,180,389	$43,964,344
6/1/61	-	-	-	$389,534,109	$38,788,228		$428,322,336	$235,577,285	$428,322,336	$2,567,941	$4,668,984	$7,960,932	$14,474,421
6/1/62	-	-	-	$389,534,109	$38,788,228		$428,322,336	$235,577,285	$428,322,336	$2,567,941	$4,668,984	$7,960,932	$14,474,421
6/1/63					$38,788,228		$38,788,228	$21,333,525	$38,788,228	$232,549	$422,816	$720,930	$1,310,782
6/1/64					$38,788,228		$38,788,228	$21,333,525	$38,788,228	$232,549	$422,816	$720,930	$1,310,782
6/1/65					$38,788,228		$38,788,228	$21,333,525	$38,788,228	$232,549	$422,816	$720,930	$1,310,782
6/1/66					$38,788,228		$38,788,228	$21,333,525	$38,788,228	$232,549	$422,816	$720,930	$1,310,782
						TOTAL	**$99,238,589,870**	**$54,581,224,429**	**$99,238,589,870**	**$594,969,781**	**$1,081,763,239**	**$1,844,479,152**	**$3,353,598,459**

Appendix B

SWP & CVP Operations, the Indices That Govern Them and Their Validity
by Arve Sjovold

SWP AND CVP OPERATIONS, THE INDICES THAT GOVERN THEM AND THEIR VALIDITY

By: Arve R. Sjovold
February 29, 2016

INTRODUCTION

In State Water Resources Control Board Decision 1485, an index was promulgated for the classifying of water year types. This index provides varied tables, and sets of values for a variety of Delta protection standards. No supporting analysis was cited to show how and why this index, and its, water year type derivative were established. The Water Year Index is specified by the following formula:

$$INDEX = 0.4*X + 0.3*Y + 0.3*Z$$

Where: X = Current water year's April-July Sacramento Valley unimpaired run-off

Y = Current water year's October-March Sacramento Valley unimpaired run-off

Z = Previous water year's index

Once an index has been calculated, its value is used to determine one of five water year types: Wet, Above Normal, Below Normal, Dry, and Critical. This water year type designation is then used to set a multitude of water quality and flow standards throughout the Delta. Variations on this type of designation (e.g. the Shasta Index, American River Index, and the Trinity River Index) are also used in a multitude of operational and flow release standards for reservoirs throughout the Sacramento Basin. All of these indexes are used as well in the CALSIM II model.

D-1485 also specifies that when it is too early in the water year to have observations in hand for April-July and October-March, run-off forecast values should be based on "normal" precipitation for the unknown parts of the water year. "Normal" precipitation is not precisely defined, nor is it specified how it is to be used to calculate a value for run-off.

It is clear from a careful examination of the requirements of D-1485 that water year type is a very important parameter in managing the water resources of the Delta. Because of that high level of importance, it is fair to question both the reliability of this index and the wisdom of using it to manage the operation of the SWP and CVP.

SACRAMENTO BASIN HYDROLOGY

It is clear that the Water Year Index is profoundly dependent on the characteristics of the Sacramento Basin Hydrology. The three most important derivatives of that hydrology - particularly in regard to forecast reliability - are run-off flows for April-July and October-March, the reliance of the previous year's Water Year Index, and the notion of "normal" precipitation. If we take the statement "normal" precipitation to mean "normal" run-off, then we may perform some analyses to address these important characteristics.

A careful, quantitative examination of Sacramento Basin Hydrology was performed using the 4-river index as a surrogate for total Sacramento Basin run-off. Figure B-1 is a graph of the run-off history based on the 4-river index. A rudimentary look at the distribution of annual run-off from the 98-year record shows that the data divides into distinct groups; a drier year group comprising 56% of the years and a wet year group comprising 44% of the years as shown in figure B-2. Very few years are found near the average or "normal" value, in fact, the average value is at the relative minimum between the drier group and the wet group. Each of these groups does exhibit characteristics of a more normal distribution when taken separately.

Accordingly, each group was analyzed as a separate distribution and a statistical test was performed to determine the likelihood that they might actually be drawn from a single population. Table B-3 presents the characteristics of each of these groups.

Figure B-1
Sacramento 4 River Index
% of Historical Average

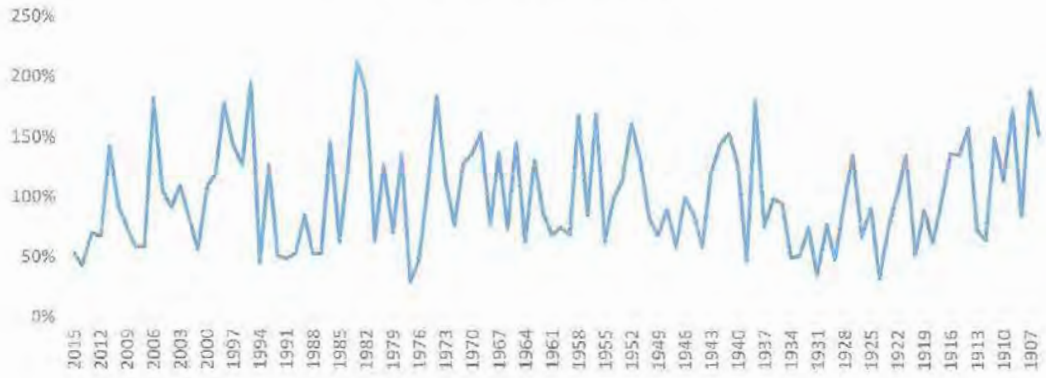


FIGURE B-2
ANNUAL SACRAMENTO 4-RIVER RUN-OFF,
98 YEARS

Table B-3
Statistical Characteristics of Wet and Dry Groups
4-River Index (MAF)

Dry	Wet

Mean	12.18	25.55
Standard Deviation	3.27	4.65
Std. Error of Mean	.441	.709

The standard t-test between means showed less than a 1% chance that the means of these two distributions came from a single population.

VALIDITY OF INDEXES

The water year index formula comprises three terms, two dealing with the current water year run-off and the third being a weighted run-off of the previous year's water year index. We investigated the validity and reliability of the three terms as predictors of the current water characteristics.

Influence of Previous Water Year

To test the validity of using the previous year's water year index, we determined if there was any significant serial correlation between successive years within the 98-year record of annual run-off. The serial correlation co-efficient [R] was found to be 0.084, which indicates no significant serial correlation, even though drought sequences of up to 5 years and wet sequences of several years were noted. (The probability that there was a real correlation was much less than 1%). The persistence of wet and dry sequences probably reflects shifts in the jet stream that may be stable for several years before shifting. This, in turn reflects typical Pacific, synoptic weather patterns. With such an insignificant correlation co-efficient we must conclude there is very little chance that a previous year's run-off has any effect on predicting the run-off of a successive year. *This conclusion requires that the last term in the formula for water year index must be eliminated from the equation.* If we eliminate the last term in the equation there is little need to use any weighting coefficients because the remaining two terms comprise all but about 4% of the expected total run-off for the current water year. The remaining task is to estimate run-off for the unknown months to come.

Forecasting Future Months of the Water Year

The ability to forecast run-off accurately for future months depends on the information at hand. Upon entering a new water year, there is very little information available, especially given the fact that data from the previous water year is not relevant. There is potential information in the measurements of snow pack but snow in the Sierra Nevada and southern Cascades only begins to accumulate in late winter and early spring. The only factual information early in the water year is the current measure of run-off, which in the fall is extremely low. Since the distribution of annual run-off really comprises two independent distributions, it is virtually impossible to designate in which domain, dry or wet, the coming water year falls.

Each of these distributions has its own "normal" begging the question: which one should be chosen for forecasting purposes? D-1485 states that when a forecast value is needed for the formulation it should be based on the value for normal precipitation. *We have shown that there is no "grand normal" for run-off.* (Usually the average or mean value is meant by this term); it is therefore very likely that there is no such thing as a "grand normal" for precipitation. Precipitation data exhibits extreme variation, and because the physical relationship between precipitation and run-off is not linear and is dependent on such parameters as antecedent moisture in the soil, precipitation is probably not a good choice for basing a forecast.

The most prudent choice is to assume that the coming water year will be dry until there is sufficient data to state otherwise. Assuming that the coming water year will be wet runs a 56% or higher chance of being wrong, hardly a prudent assumption given the importance of obtaining a reliable supply from the SWP. If the average for the dry group is chosen for the initial forecast there will be roughly a 25% chance of over-estimating the subsequent run-off. Prudence would dictate that perhaps a 5% chance of such a mistake would be tolerable. At a 5% chance the basis for the forecast would produce annual run-off in the range of 7-8 MAF. In terms of the 4-river index; actual run-off would be 20% to 25% higher. In effect, *a forecast*

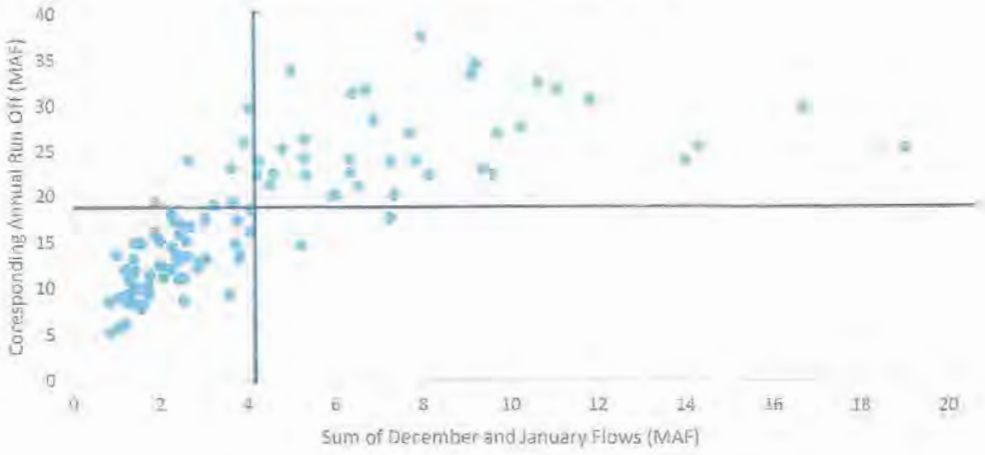
range this low would likely cause a suspension in SWP and CVP operations for the first few months of the new water year, though some export might be possible if there is reservoir storage to support it in these early months.

How soon in the water year can it be stated with some confidence how the water year will play out? October and November produce little to no excess run-off. The first month with the potential for large run-off is December followed by an even more likely run-off in January, February, March, April, and May when snow melt really begins in earnest (and possibly June) are the main run-off producers. Therefore, we must look at the earliest run-off months for an indicator.

An investigation was begun to find early indicators to assess the likelihood of a dry or wet future water year. We first examined whether the run-off of December alone would suffice. Our findings were inconclusive. The same DWR data base from which the annual run-off data was used to generate the graph in Figure 1, also contains the record of monthly run-offs which was used in this investigation. That was inconclusive. We then examined the sum of December and January run-off, and *we found that the sum of December and January could reliably predict if the coming water year would be dry*. A maximum threshold of 3.9 MAF for the sum would capture all but 2 of 55 dry years, which indicates a less than 5% chance of error. That same threshold also falsely designated 6 of 43 wet years as dry. However, that error is not critical since the unfolding water year could easily allow positive corrections in operations.

A scatter plot of the map of total annual run-off versus the sum of January and December run - off is presented in Figure B-3 on the following page. Axes are drawn vertically at a value of 3.9 and horizontally at the grand average of total run-off, creating four quadrants labeled dry winter-wet spring, wet winter-wet spring, wet winter-dry spring, and dry winter-dry spring. Most of the data points are found in either the dry winter-dry spring or wet winter-wet spring designations, which effectively constitute the dry and wet groups used in our analysis. The lack of data points in the other two quadrants confirms that these two groups are distinct. The figure also shows the few data points not in the populated quadrants, demonstrating the low likelihood of error in using the 3.9 MAF locus as a decision basis for declaring a dry winter-dry spring in the early part of the water year.

Figure B-3
Annual Run-off
-vs-
Cumulative December & January



With further examination of the dry group distribution, we found a bounding locus that contains the entire dry group set except for two points. The equation of this locus is:

RUN-OFF = 2.877*DEC-JAN + 2.67

Where: **RUN-OFF** = minimum annual run-off, MAF

DEC-JAN = sum of December and January run-off, MAF

provided **DEC-JAN** is less than or equal to 3.9 MAF

This equation provides a minimum run-off for the dry group with only about a 5% chance of a lower run-off. With this equation, prudent SWP operations can be devised for the months past January until subsequent run-off data can supersede it. It may be possible to find additional bounding equations to guide SWP operations, assuming December and January data are already known. This process may be repeated for successive months and should converge on the actual run-off by the end of the run-off season.

The analyses above establish several constraints in developing prudent SWP operations:

1) No reliance can be placed on a previous water year's run-off in forecasting run-off for a given water year.

2) If run-off through January for a given water year is low (less that 3.9 MAF) it is very likely that the remainder of the water year will be low.

3) There is no meaningful value in referring to the grand average of the hydrologic record as "normal". The record indicates strongly that there are two distinct groups that cluster below and above the grand average, each with its characteristic average or normal value.

4) The equation for calculating the Water Year Index is without merit; the same applies to its derivative, Water Year Type.

POTENTIAL EFFECTS ON SWP OPERATIONS

Winter Pumping

Because low winter run-off through January indicates the very strong likelihood of a dry year overall, winter pumping through January should be minimal if not altogether suspended until further run-off data shows that pumping can be done without jeopardizing the reliability of future deliveries or threatening Delta health. The prudent level of pumping from the Delta during such low periods of winter run-off remains to be investigated.

Overall Project Yield

Since dry years predominate the record, and no confident statement can be made at the beginning of a water year concerning expected project yield, the project yield should be base-lined on the amount that can be reliably exported given the expectation that the ensuing water year will be dry. *This finding necessarily will lead to an export level that is much lower than the current value of 4.1 MAF.* The project can now be studied to determine the amounts of surplus water that can be safely delivered until winter run-off is sufficient to conclude that the total water year will be wet. This implies that the safe level of export will be continuously evaluated as the water year progresses.

Reservoir Operations

Because the designations of water year type are based on a calculated water year index which has been shown to have no validity, *all reservoir operations must be re-examined to determine prudent levels of release*

and storage.

SWRCB Regulations and Constraints

Because so many of the regulations and constraints that have been promulgated by the SWRCB are based on the flawed water year type, *all such regulations and constraints must be re-visited.*

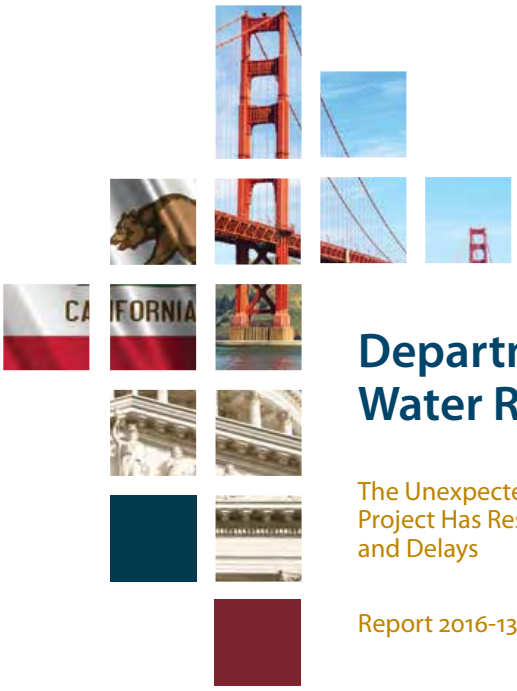
Arve R. Sjovold graduated with a B.A. in Physics from the University of California, Berkeley in 1956. For 41 years he specialized in operations research and systems analysis as a Research Scientist. He retired in 1996 from Tecolote Research Inc. in Santa Barbara, CA as Chief Cost Scientist

Appendix C

The Unexpected Complexity of the California WaterFix Project has Resulted in Significant Cost Increases and Delays
California State Auditors Report

California State Auditor

October 2017



Department of Water Resources

The Unexpected Complexity of the California WaterFix Project Has Resulted in Significant Cost Increases and Delays

Report 2016-132

CALIFORNIA STATE AUDITOR
621 Capitol Mall, Suite 1200 | Sacramento | CA | 95814

916.445.0255 | TTY **916.445.0033**

For complaints of state employee misconduct,
contact us through the **Whistleblower Hotline**:
1.800.952.5665

Don't want to miss any of our reports? Subscribe to our email list at **auditor.ca.gov**

For questions regarding the contents of this report, please contact Margarita Fernández, Chief of Public Affairs, *at* 916.445.0255

October 5, 2017 2016-132

The Governor of California
President pro Tempore of the Senate
Speaker of the Assembly
State Capitol
Sacramento, California 95814

Dear Governor and Legislative Leaders:

As requested by the Joint Legislative Audit Committee, the California State Auditor presents this audit report concerning the Department of Water Resources' (DWR) management of the planning efforts for the California WaterFix Project (WaterFix). WaterFix is intended to address environmental and water supply reliability issues related to pumping water from the Sacramento-San Joaquin Delta (the Delta). Planning began in 2006 on the development of the Bay Delta Conservation Plan (BDCP), which consisted of several measures or activities for restoring the Delta and improving water reliability. Subsequently, in 2008 DWR initiated the Delta Habitat Conservation and Conveyance Program (conservation and conveyance program) to evaluate how to implement the BDCP and alternatives to it, including evaluating the environmental impacts and completing preliminary engineering work. Through the evaluation effort, DWR identified one of the alternatives—WaterFix—as its preferred approach. This report concludes that the planning phase experienced significant cost increases and schedule delays because of the scale and unexpected complexity of the project. For example, costs of the conservation and conveyance program's efforts to evaluate and plan for the potential implementation of the BDCP and its alternatives, which eventually included WaterFix, increased significantly. As of June 2017, the planning costs had reached $280 million.

We also found that DWR did not follow state law when it replaced the program manager for the conservation and conveyance program. Specifically, DWR selected the Hallmark Group (Hallmark) to provide program management services without advertising a request for qualifications, and DWR could not demonstrate that it ever evaluated Hallmark's qualifications for this role. The cost of DWR's current contract with Hallmark has tripled from $4.1 million to $13.8 million.

Additionally, DWR has not completed either an economic or financial analysis to demonstrate the financial viability of WaterFix. Finally, it has not fully implemented a governance structure for the design and construction phase, and has not maintained important program management documents for WaterFix.

Respectfully submitted,

Elaine M. Howle

ELAINE M. HOWLE, CPA
State Auditor

621 Capitol Mall, Suite 1200 Sacramento, CA 95814 916.445.0255 916.327.0019 fax www.auditor.ca.gov

Selected Abbreviations Used in This Report

A&E	architectural and engineering
BDCP	Bay Delta Conservation Plan
DWR	Department of Water Resources
EIR	environmental impact report
EIS	environmental impact statement
NEPA	National Environmental Policy Act
URS	URS Corporation

CONTENTS

Blank page inserted for reproduction purposes only.

SUMMARY

The California WaterFix Project (WaterFix) is intended to address environmental and water supply reliability issues related to pumping water from the Sacramento-San Joaquin Delta (the Delta). The Department of Water Resources (DWR) began collaborating with state and federal entities as well as local water agencies (water contractors) in 2006 to develop an approach to restoring the Delta and improving water reliability, referred to as the Bay Delta Conservation Plan (BDCP). In conjunction with developing the BDCP, DWR also initiated the Delta Habitat Conservation and Conveyance Program (conservation and conveyance program) to evaluate how to implement the BDCP, which included considering alternatives to the BDCP, performing preliminary design, and assessing environmental impacts. Through this evaluation, DWR identified one of the alternatives—referred to as WaterFix—as its preferred approach. WaterFix focuses on the construction of a new water conveyance facility to improve water reliability and separates the large-scale Delta restoration effort originally included in the BDCP into a separate program called California EcoRestore. Water contractors of the State Water Project and the Central Valley Project, and the U.S. Bureau of Reclamation have primarily funded the project planning efforts that began with the BDCP and that have now shifted to WaterFix. This audit report concludes the following:

Because of the unexpected complexity of the project, the planning phase has experienced significant cost increases and schedule delays.

Page 17

The cost and timeline for preparing the BDCP increased because of the scale and unanticipated complexity of the project. In addition, costs of the conservation and conveyance program's efforts to evaluate and plan for the potential implementation of the BDCP and its alternatives, which eventually included WaterFix, also significantly increased. As of the end of June 2017, planning phase costs had reached approximately $280 million.

DWR did not select appropriately its current program manager for the conservation and conveyance program.

Page 23

DWR did not follow state law when it replaced the program manager for the conservation and conveyance program. Additionally, DWR did not accurately value its initial contract with the new program manager—the Hallmark Group (Hallmark)—or ensure that it received fair and reasonable pricing for one of Hallmark's subcontractors.

DWR needs to take certain steps to better prepare for the transition of WaterFix to the design and construction phase.

Page 33

DWR has not completed either an economic or a financial analysis to demonstrate the financial viability of WaterFix. Furthermore, DWR has not fully implemented a governance structure for the design and construction phase of WaterFix. Moreover, DWR has not maintained important program management documents for WaterFix.

Other Areas We Reviewed

To address the audit objectives approved by the Joint Legislative Audit Committee, we also reviewed whether the State allocated any money from its General Fund to pay for the planning and design costs of WaterFix. We reviewed budget acts from 2006 through 2016 and found that the State did not allocate any General Fund money for the planning and design of the project. We also analyzed DWR accounting data, reviewed its 2008 management plan for the project, and interviewed relevant staff, and found that DWR did not use any General Fund money to fund the planning and design for the project.

Summary of Recommendations

Legislature

To improve management of large and complex infrastructure projects, the Legislature should enact legislation requiring agencies to publicly report significant changes in the cost or schedule of such projects if they are expected to exceed their established budgets by 10 percent or schedules by 12 months.

DWR

To better manage large infrastructure projects, DWR should develop and implement a project-reporting policy requiring its management staff to document and justify decisions to proceed with such projects if they are expected to exceed their established budgets by 10 percent or schedules by 12 months. DWR should make these documented decisions and justifications publicly available and submit them to the California Natural Resources Agency for review and approval.

To fully comply with state contracting law, DWR should ensure that it competitively selects architectural and engineering consultants based on demonstrated competence and professional qualifications. In addition, DWR should document in the contract file its evaluation of the competence and professional qualifications of all contractors and any subcontractors that are added to the contract subsequent to the competitive selection process. Further, DWR should ensure that it retains adequate documentation in its contract files to support that contract prices are fair and reasonable.

To ensure that DWR manages WaterFix in an effective manner, DWR should complete both the economic analysis and financial analysis for WaterFix and make them publicly available as soon as possible.

To prepare for the potential approval of WaterFix and to ensure that the project is managed properly during the design and construction phase, DWR should do the following:

- Develop an appropriate governance structure so that it is prepared to oversee the design and construction of WaterFix in the event it is ultimately approved.
- Develop and update when necessary the associated program management plan for the design and construction phase of the project.

Agency Comments

DWR generally agrees with our findings and recommendations, although it disagrees with our conclusion that DWR did not follow state law in selecting the program manager. DWR also did not agree with our recommendation that it develop and implement a project reporting policy.

Blank page inserted for reproduction purposes only.

INTRODUCTION

Background

The Department of Water Resources (DWR) and other entities are developing the California WaterFix Project (WaterFix) in response to concerns about the impact of exporting water through pumps in the southern part of the Sacramento-San Joaquin Delta (the Delta). The pumping causes *reverse flows* in that it essentially pulls water upstream, adversely affecting endangered fish species by pulling them toward the pumps. To reduce these adverse effects, regulators have reduced water exports, which has in turn created a negative economic impact on communities and farms that depend on water from the Delta. The water from the Delta is mainly transported by two systems of water infrastructure: the State Water Project and the Central Valley Project. DWR is responsible for the construction, maintenance, and operation of State Water Project facilities while the U.S. Bureau of Reclamation (Reclamation) is generally responsible for Central Valley Project facilities. Local water agencies (water contractors) contract for water deliveries from these two systems. Figure 1 on the following pages presents the locations of certain State Water Project and Central Valley Project facilities, and of their respective water contractors that have participated in funding the planning phase that has culminated in WaterFix.

Development of the Bay Delta Conservation Plan

Planning efforts to address these environmental and economic concerns about the Delta began in 2006. We refer to all of the planning efforts from 2006 to the present as the *planning phase*. This phase would eventually include two overlapping efforts: development of the Bay Delta Conservation Plan (BDCP) and evaluation of how to implement it and other alternatives, including the environmental impacts and preliminary engineering. This evaluation effort was called the Delta Habitat Conservation and Conveyance Program (conservation and conveyance program). Figure 2 on page 9 describes the two planning efforts and the participants. The BDCP consisted of several conservation measures or activities that were intended to accomplish two goals: helping conserve native fish and wildlife species in the Delta and improving water reliability and quality. The BDCP was also expected to reduce future risks to water supplies conveyed through the Delta from earthquakes, levee failure, and climate change. The first conservation measure was the construction of a new conveyance (or water transportation) facility with new intakes on the Sacramento River in the north Delta to reduce the use of the pumps in the south Delta so as to minimize the reverse flows.

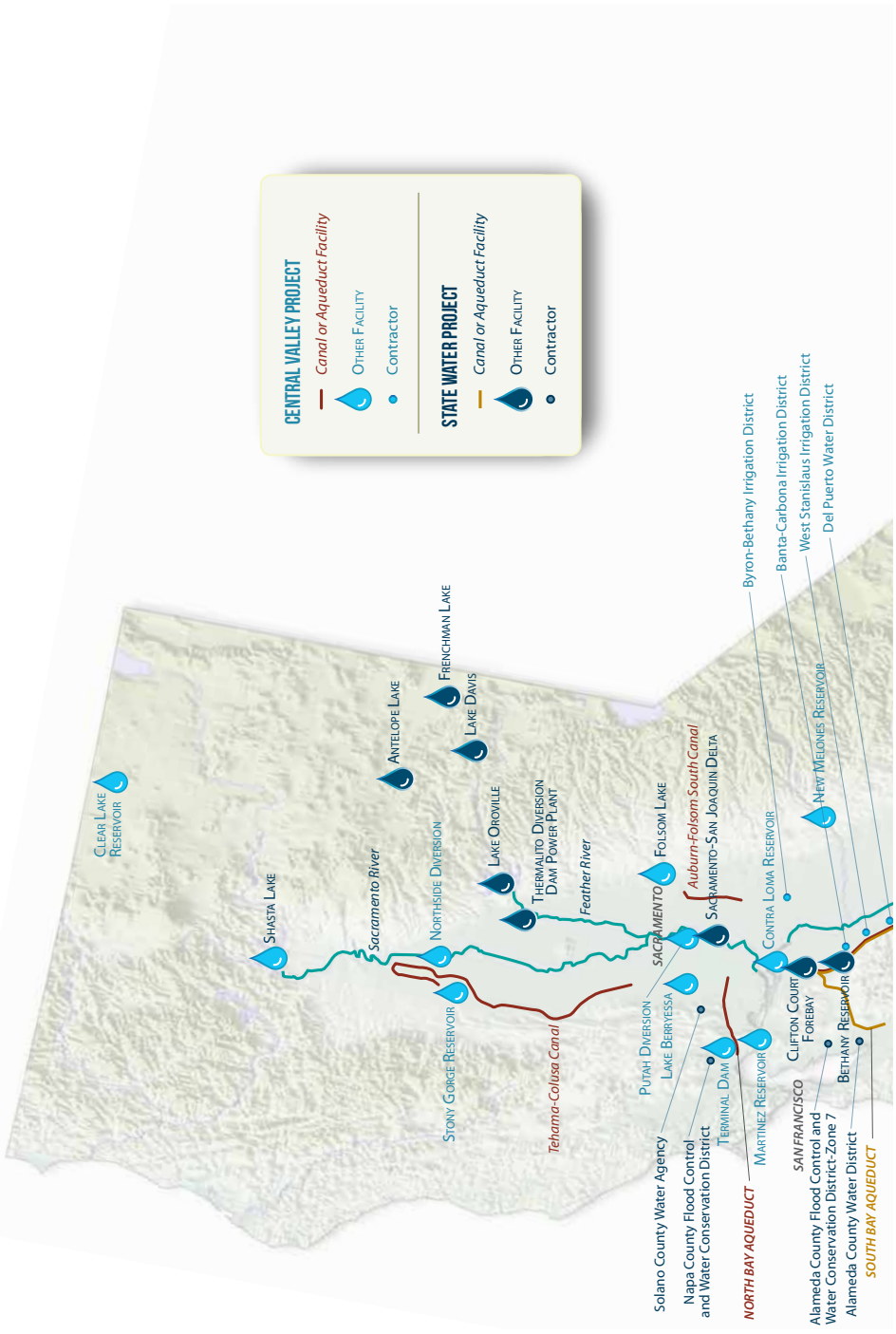


Figure 1
Water Contractors That Contributed to the Conservation and Conveyance Program and Their Key Facilities

Sources: California State Auditor's analysis of DWR and Reclamation documents.

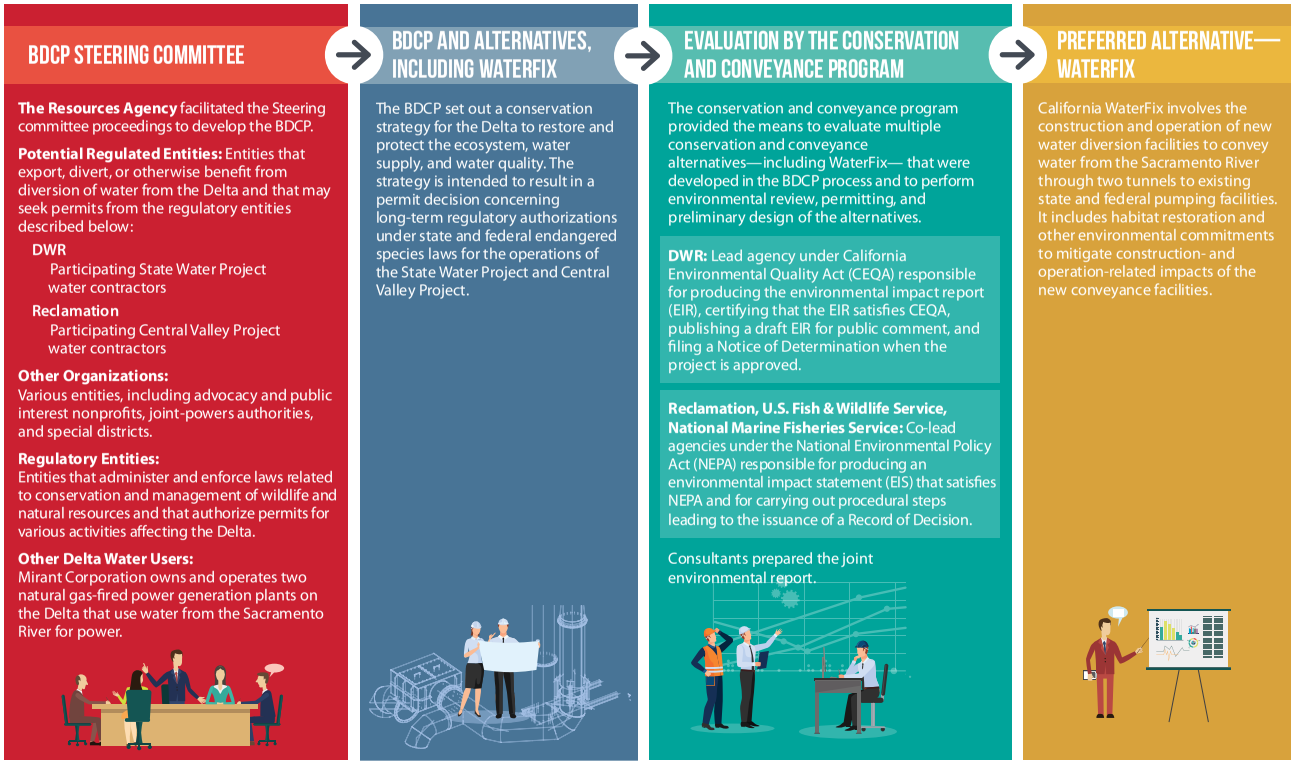
* Santa Clara Valley Water District contracts with both the State Water Project and Central Valley Project.

The BDCP was intended to be the basis for obtaining 50-year permits under the federal Endangered Species Act and California Endangered Species Act that would create a stable regulatory framework for operations of the State Water Project and Central Valley Project. Specifically, the permits would provide long-term assurance that regulators would not require additional commitments of or place additional restrictions on the use of land, water, or other natural resources, nor would they require financial compensation—without the consent of the parties to the BDCP—as long as the BDCP was being implemented appropriately. The permits would also allow state and federal entities to engage in the activities included in the BDCP, which fell into the following categories:

- New water facilities construction, operation, and maintenance.
- Operation and maintenance of State Water Project facilities.
- Nonproject diversions of water.
- Habitat restoration, enhancement, and management.
- Monitoring activities.
- Research.

Multiple entities have voluntarily participated in the planning phase. These parties entered into a planning agreement that defined goals and objectives for the planning phase. The planning agreement also established a steering committee as the principal forum for discussing policy and strategy issues pertaining to the BDCP. The California Natural Resources Agency (Resources Agency) facilitated the steering committee and Figure 2 shows the other entities that constituted the committee. The steering committee, through a finance subcommittee, also developed the funding structure and budget for developing the BDCP.

Figure 2
WaterFix Planning Efforts and Participants



Sources: 2009 BDCP Planning Agreement, Conservation and Conveyance Program Memorandum of Agreement (MOA), Amended MOA, and www.californiawaterfix.com.

Transition From the BDCP to a New Approach Called *WaterFix*

The next planning effort began in 2008 when the Governor directed the Resources Agency to expedite completion of the BDCP and directed DWR to proceed with the environmental analysis of four Delta conveyance alternatives. To provide the means for evaluating and planning for the possible construction and implementation of these alternative conveyance facilities and habitat restoration projects, DWR initiated the conservation and conveyance program. This program was responsible for evaluating the BDCP and many other alternatives, which eventually included WaterFix. The conservation and conveyance program was composed of a team responsible for the following activities:

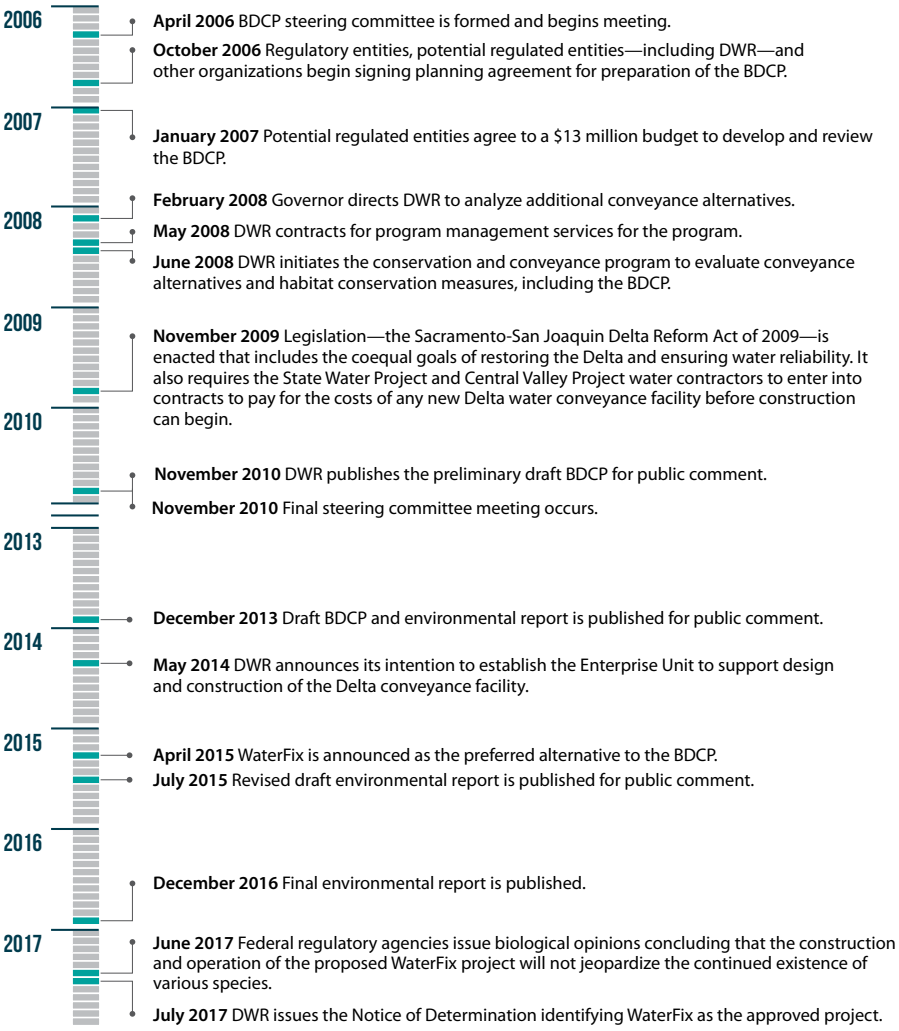
- Examining conveyance alternatives.
- Performing cost analyses.
- Formulating schedules.
- Selecting preferred alternatives.
- Obtaining the required environmental permitting and documentation.
- Obtaining property rights.
- Completing preliminary design.
- Completing final design and construction.

DWR initially contracted with an engineering firm to provide program management services and engineering support services for the conservation and conveyance program. Figure 3 shows a timeline of the key developments in the planning phase.

However, DWR and Reclamation revised their approach to improving reliability of water deliveries and protecting the Delta based on comments they received from the public and regulatory agencies during the environmental review process. In December 2013, DWR and Reclamation published a draft environmental impact document for the BDCP. The California Environmental Quality Act requires lead agencies to create an EIR to provide public disclosure of the environmental impacts of a proposed project. The report must identify all significant environmental effects, the mitigation measures proposed to minimize those effects, and alternatives to the project. The NEPA has similar requirements for an EIS. As the lead agencies, DWR, Reclamation, U.S. Fish & Wildlife Service, and the National Marine

Fisheries Service developed the joint environmental impact report/ environmental impact statement (environmental report) presenting the environmental impacts of the BDCP and alternatives to it.

Figure 3
Timeline of Key Developments in the BDCP and WaterFix Planning Process



Sources: DWR planning documents, state law, Governor's letter to the Senate in February 2008.

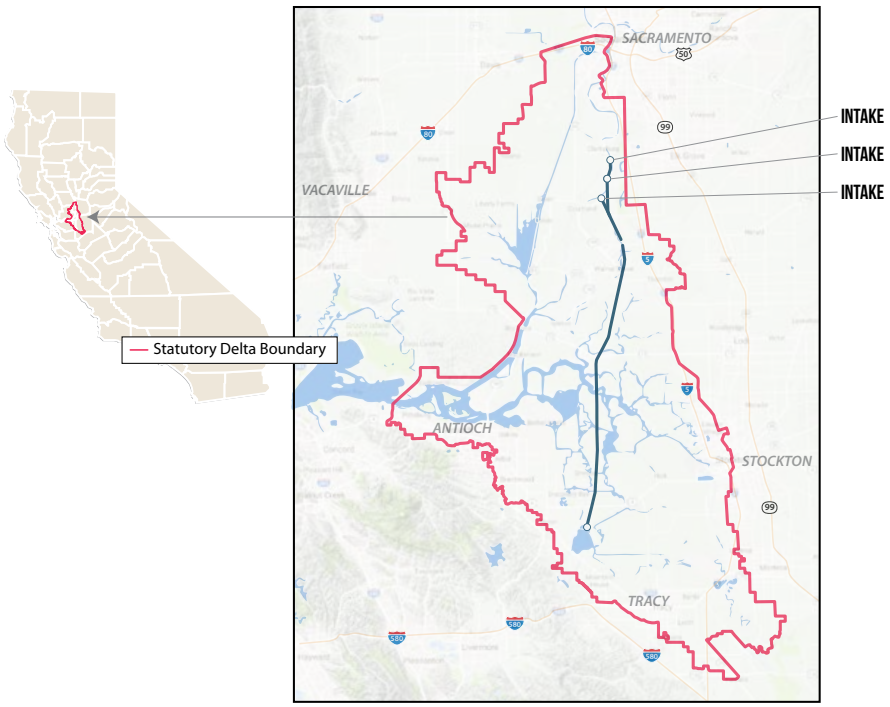
Following its publication of the draft environmental report in December 2013, DWR reported receiving numerous comments. These comments suggested that because of the uncertainty of the effects of climate change and the long-term effectiveness of habitat restoration in recovering fish populations, DWR should pursue a shorter permit term than the 50-year term the BDCP sought. Other comments suggested that the proposed conveyance facilities should be separated from the habitat restoration components of the BDCP. To address these concerns, DWR and Reclamation subsequently analyzed additional alternatives that would seek shorter-term permits and include only limited amounts of habitat restoration. They identified one of these alternatives, WaterFix, as the preferred alternative to the BDCP. WaterFix essentially separates the water conveyance effort from the large-scale Delta conservation effort.

As shown in Figure 4, WaterFix consists of three new intakes north of the Delta and other water conveyance facilities to address the reverse flow problem. However, WaterFix limits habitat restoration only to mitigating the construction-and operations-related impacts of the new facilities. A separate program, California EcoRestore, would provide restoration efforts for species conservation independent of the facility upgrades. Unlike the BDCP, WaterFix does not seek a permit like the 50-year permit discussed previously, and it does not provide the assurance that regulators will not restrict water and land use.

To give the public an opportunity to comment on the additional alternatives, DWR and Reclamation published in July 2015 a revised draft environmental report that presents WaterFix as the preferred alternative. Again, the public provided numerous comments. In December 2016, DWR and Reclamation published the final environmental report, which incorporates changes from the additional public comments. DWR initially estimated that in spring 2017, Reclamation would issue its *Record of Decision* stating which alternative it had chosen to pursue, the alternatives it had considered, and whether all practicable means to avoid or minimize environmental harm had been adopted. However, Reclamation has not issued the Record of Decision. The director of DWR nevertheless stated that in the meantime DWR will continue moving forward with WaterFix planning efforts, including permitting and regulatory efforts. On July 21, 2017, DWR issued a Notice of Determination that identified WaterFix as the approved project and indicated that the project will have a significant effect on the environment, an EIR was prepared, and a mitigation monitoring plan was adopted. In addition to these approvals, several regulatory and permitting processes are ongoing and must be completed before construction of WaterFix can move forward, including hearings by the State Water Resources Control Board

regarding water rights and water quality that are expected to last until sometime in 2018. We refer to the overall activities that span the BDCP and WaterFix as the *project*.

Figure 4
WaterFix Proposed Project Location



Source: DWR's final EIR, figures 1-1, 3-9, and 3-10.

Funding for the Planning Phase Has Come From a Number of Sources

Generally, the State Water Project's water contractors pay the costs for its construction, replacement, and maintenance and operations. However, because the planning phase for the BDCP and WaterFix has been a voluntary collaboration among several state and federal entities to improve water supply reliability and to restore ecosystem health in the Delta, Reclamation and some Central Valley Project water contractors also contributed funding. As we stated in the Summary, DWR did not use any General Fund money to fund

the planning of the project. DWR did not fully track the various contributions made toward the costs of preparing the BDCP, as we explain more fully later. These costs consisted of two categories—the costs attributable to fishery agencies[1] for their work related to the development and review of the BDCP, and other costs related to preparing the BDCP, including contracted consultant costs. The $6 million cost for the first category was split evenly between DWR and Reclamation over two years. For the second category, three entities agreed to share the consultant costs and other related costs: DWR; San Luis & Delta Mendota Water Authority (the Authority)—a joint-powers authority that represents certain Central Valley Project water contractors; and Mirant—a corporation that owns and operates power generation plants on the Delta.[2] The costs for the second category have reached approximately $54 million. Although documentation is limited, DWR explained that it included charges for its share of the BDCP costs in the State Water Project water contractors' annual statements. The Authority collected funds for its portion of the costs from its member agencies.

Participating State Water Project and Central Valley Project water contractors agreed to share the planning costs for the conservation and conveyance program equally between the two groups. DWR established a specific account to track these contributions. As noted previously, participation in the funding was voluntary, and any participating water contractor could withdraw upon 30-days notice; however, doing so would require the remaining participating water contractors to make up for the lost contributions. Figure 5 shows the amounts and proportional share each entity contributed. Figure 5 also shows that Reclamation, Metropolitan Water District of Southern California (Metropolitan), the Authority, and Kern County Water Agency (Kern) together contributed roughly 82 percent of the total planning funds through June 2017.

To collect the State Water Project share, DWR entered individual funding agreements with the 20 State Water Project contractors that decided to participate. Contributions were proportionate to each participating contractor's water allocation from the State Water Project. For example, Metropolitan and Kern receive the two largest allocations of water from the State Water Project; therefore, they contributed the largest portions of the State Water

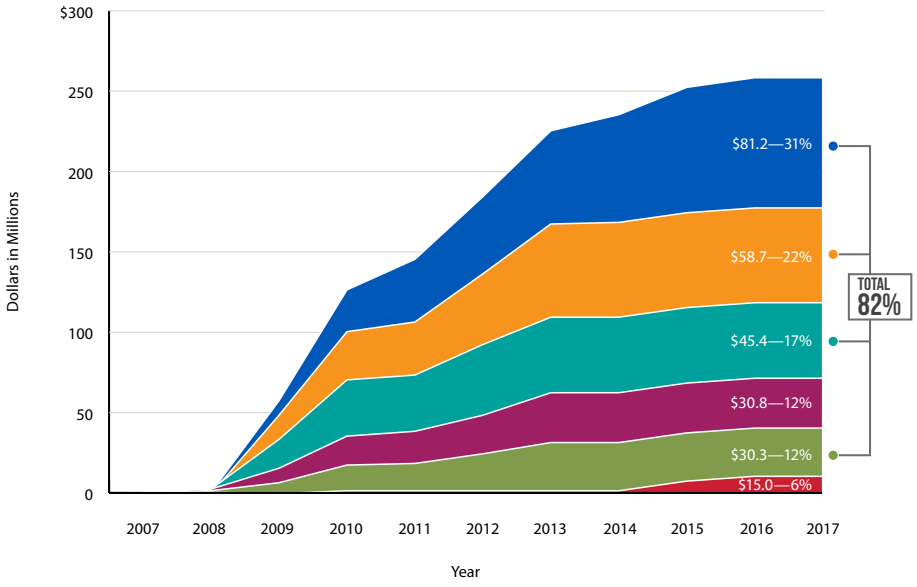
[1] *Fishery agencies* refers to the California Department of Fish and Game, the U.S. Fish & Wildlife Service, and the National Marine Fisheries Service.

[2] Initially in January 2007, Mirant Corporation agreed to contribute 10 percent of the approved consultant costs and DWR and the Authority agreed to split the remainder equally. Two years later, the parties agreed to cap Mirant Corporation's contributions at the lesser of 10 percent or $300,000 per 12-month period.

Project's share of costs. Their contributions generally came from their revenues, which are largely composed of proceeds from water sales, user charges, and property taxes.

Figure 5
Four Entities Contributed Most of the Funding for the Conservation and Conveyance Program
January 2008 Through June 2017

CONTRIBUTORS	FUNDING SOURCES
Reclamation	Federal appropriations, American Recovery and Reinvestment Act funds, in-kind services
Metropolitan	Revenues from water sales, operations charges, and property taxes
The Authority	Debt financing and direct contributions from participating member agencies*
Other State Water Project contractors	Revenues of 18 water contractors
Kern	Revenues from water sales, operations charges, and property taxes
DWR	Surplus revenue from State Water Project contractors



Source: California State Auditor's analysis of DWR accounting data.

* The Authority contributed a total of $47.1 million in funds from debt financing and direct contributions from participating member agencies toward the planning phase, $2.1 million of which was used to meet its BDCP funding obligations. In June 2017, it contributed another approximately $400,000.

The Authority and Reclamation contributed the Central Valley Project share of costs for the conservation and conveyance program. The Authority contributed $45.4 million and used debt financing for 95 percent of its contribution, with the principal and interest required to be paid from water system revenues generated by 17 Central Valley Project water contractors that decided to participate.[3] The remaining 5 percent, or roughly $2.3 million, was contributed directly by another five water contractors. Reclamation contributed $81.2 million in federal funds and in-kind services, such as program management, legal services, and preliminary engineering.

[3] Westlands Water District agreed to pay 100 percent of the principal and interest on the debt. The Authority reimburses Westlands Water District for a portion of such debt service payments from amounts the Authority receives from the 16 other participating Central Valley Project water contractors.

Because of the Unexpected Complexity of the Project, the Planning Phase Has Experienced Significant Cost Increases and Schedule Delays

Key Points

- The costs and timeline for preparing the BDCP increased because of the scale and unexpected complexity of the project.
- The costs to evaluate and plan for the potential implementation of the BDCP and its alternatives, which eventually included WaterFix, also increased.

The Costs and the Timeline for Preparing the BDCP Increased Because of the Unexpected Complexity of the Project

In a June 2006 steering committee meeting, the finance subcommittee presented a $13 million budget for preparation of the BDCP, which included budgeted consultant costs for completing all tasks except public outreach. The budget consisted of $6 million to provide for the participation of fishery agencies and $7 million for consultant costs and other costs related to the BDCP. As stated in the Introduction, fishery agency costs were to be split evenly between DWR and Reclamation and the consultant and other costs were to be split among DWR, the Authority, and Mirant Corporation. Following the establishment of the budget, DWR entered into a $1.6 million contract with Alameda County Flood Control and Water Conservation District Zone 7 (Zone 7) to cover its share of consultant costs for December 2006 through June 2008. The contract states that Zone 7 possessed special expertise related to the unique environmental compliance process that would guide the BDCP process. The scope of work in the contract included engaging the services of a BDCP consultant, the preparation of the BDCP, and the services of Zone 7 to manage the contract with the BDCP consultant. However, the parties subsequently discovered that the $1.6 million budgeted over the 19-month term of the contract was insufficient to allow the consultant to successfully complete the BDCP. The parties first amended the contract in June 2008 to add an additional year, extending the term through June 30, 2009. In the spring of 2009, the parties agreed to amend the contract a second time, increasing the contract by $3.5 million and the term by another two years, thus extending the contract through June 30, 2011. The parties amended the contract a third time in March 2010 to increase the contract by another $2.6 million. These three amendments collectively increased the cost of this contract from $1.6 million to $7.7 million, nearly five times the original amount, and they extended its term by three years. DWR's financial records indicate that it spent $7.5 million on this contract, and according to the chief of its enterprise accounting branch, the funding for these payments came from State Water Project contractors. However, DWR did not fully track BDCP funding or spending. Documentation provided by the Authority indicates that it contributed $5.2 million toward these costs, but we do not have any data on Mirant Corporation's share of BDCP costs.

According to contract documents justifying the amendments, the BDCP was being developed with a greater level of stakeholder involvement than was customary in most conservation plans; consequently, development of the plan was proving to be more complicated, time-consuming, and expensive than originally anticipated. For example, the justification included in DWR's second amendment to its contract with Zone 7 states that the BDCP process called for a more extensive independent science advisory effort—the process of including independent scientific input to assist with plan development—than is typically the case with conservation plans, and this effort increased the cost of preparing the conservation strategy beyond the original estimate.

Development of the plan was proving to be more complicated, time-consuming, and expensive than originally anticipated.

The science advisors for the project also recommended expanding the scope of the plan to include a larger share of terrestrial species and habitat, and this recommendation further increased projected costs. The cost increase contained in the third contract amendment was primarily due to the decision to have the BDCP consultant take on portions of the EIR that were not originally included in the scope of work. Specifically, according to the contract documents justifying this amendment, the parties decided that part of the environmental impact evaluation could be conducted most efficiently by the same consultants that were preparing the BDCP.

The organizational and decision-making structure of the BDCP effort presented another challenge to the timely and efficient completion of the plan. In particular, the documented justifications for the second and third contract amendments explained that the time and cost of preparing the BDCP increased substantially because the BDCP consultant, while designing the plan, engaged directly with the steering committee, which consisted of several dozen members representing state and federal water and resource agencies, water contractors, and other organizations—a unique departure from the customary process in which a consultant team primarily develops the conservation plan elements that are then endorsed by a single advisory committee. For example, according to the justification for the second amendment, the consultant spent a significant amount of time and resources developing a report that evaluated conservation strategy options, but it subsequently

received requests from members of the steering committee that required the consultant to develop and model various operational scenarios repeatedly, and these efforts were costly and time-consuming. However, the justification for the contract amendment also defended the time-consuming stakeholder process, stating that it would help ensure the plan's stability and likelihood of implementation. Nevertheless, the project's costs increased significantly.

Although Zone 7 stopped managing the BDCP consultant in July 2010, costs for preparing the BDCP continued to increase when DWR entered into a direct contract with the consultant to continue preparing the BDCP. This new contract ultimately increased the BDCP costs by $41.4 million. Specifically, in June 2010, DWR and the consultant signed a two-year, $11 million contract for tasks such as completing working drafts of the BDCP chapters, obtaining public feedback on the BDCP, and finalizing the BDCP. By the time DWR and Reclamation released the draft BDCP for public review and comment in December 2013, the contract had been amended several times increasing the maximum amount payable under the contract by a total of $20 million, in part because of unanticipated modifications to the project that resulted in the need for multiple revisions to the plan. After publishing the draft BDCP in December 2013, DWR further amended the contract three more times, increasing the contract amount by an additional $10.4 million.

The cost of preparing the BDCP rose to approximately $60 million.

These amendments cited the need for additional time and funds because of changes in the public draft of the BDCP resulting from a new permitting approach; the addition of three new alternatives to be analyzed, reviewed, and incorporated into the BDCP; and an extended public comment period. Notwithstanding, we estimate that the cost of preparing the BDCP rose to approximately $60 million.

Costs to Evaluate and Plan for the Potential Implementation of the BDCP and Other Alternatives Also Significantly Increased

DWR has so far spent roughly $260 million to evaluate and plan for the possible construction of alternative conveyance facilities and habitat restoration projects, including those that constitute

the BDCP and, subsequently, WaterFix. In March 2009, DWR estimated the initial budget for these activities to be $140 million, including the costs of management, planning, administration, preliminary engineering, and environmental services. The budget was to cover the conservation and conveyance program's evaluation and planning efforts starting in 2008 until its expected completion in 2010. Conservation and conveyance program funds were also used to pay for the $41.4 million direct contract that DWR entered into with the BDCP consultant, as mentioned previously.

However, DWR subsequently reassessed the scope, technical needs, and schedule for the conservation and conveyance program's evaluation and planning efforts, which led to a substantial cost increase. Consequently, in October 2010, the steering committee discussed the need for an additional $100 million—a 71 percent increase to the initial budget of $140 million—to continue the planning process. In 2012 DWR signed agreements with water contractors for the supplemental funding of $100 million to pay the "actual" remaining costs of the planning phase. These supplemental funding agreements extended the term of the planning process through December 2014. A document prepared by the former chief of DWR's division of engineering indicates that the $100 million was intended to fund remaining environmental and engineering activities as well as a contingency reserve. With the $100 million in supplemental funding, the total budget for the conservation and conveyance program's evaluation and planning efforts had increased to $240 million.

DWR ultimately exhausted the $240 million budget and contributed $15 million in surplus revenue in 2015 and 2016 to fund additional planning costs. Reclamation and the Authority also together contributed an additional $6.8 million. Through June 2017, total contributions exceeded the planning phase budget by more than $21 million. Moreover, as of June 2017, DWR had spent 99 percent of the $261 million contributed to fund the conservation and conveyance program. As described previously, although DWR officials filed the Notice of Determination in July 2017, Reclamation has not filed the Record of Decision. Nevertheless, DWR officials stated that no additional funds would be needed to complete the planning phase for WaterFix, as approved.

As discussed in the Introduction, DWR has entered into water supply contracts with State Water Project contractors. Pursuant to these contracts, DWR collects payments from the contractors to recover all water supply-related costs. DWR deposits this revenue in a special account. The text box shows the purposes for which this revenue can be used. According to DWR, surplus revenue is available to DWR to fund the acquisition and construction of the State Water Project, including WaterFix planning activities that are

a necessary precursor to construction. When we researched the $15 million of surplus revenues that DWR used to fund project planning costs in 2015 and 2016, we discovered that the account in which DWR collects the revenues had an available cash balance that had grown from $10.7 million in December 2013 to $286 million by the end of April 2017. Furthermore, DWR projects the balance will increase to $293 million by the end of December 2017. According to DWRs' chief of the State Water Project Analysis Office, a major factor contributing to the increase in the balance of this fund has been the decrease in outstanding debt resulting from the repayment of a California Water Fund loan and general obligation bonds initially used to finance the State Water Project. He further stated that DWR holds monthly meetings with the state water contractors, at their request, to provide transparency of State Water Project activities and financial information regarding State Water Project costs and revenues, including the surplus revenue balance. We reviewed the agenda and minutes for the June 2017 meeting and found that DWR disclosed the $286 million surplus to the state water contractors. Finally, the chief stated that these funds are available to pay for new State Water Project facilities, including WaterFix. However, DWR has not developed any concrete plans for how it will use this growing surplus revenue balance.

Purposes and Priorities for Using State Water Project Revenue as Described in State Law

All revenues the State derives from the State Water Resources Development System (also known as the State Water Project)—including those from the sale, delivery, or use of water or power—shall be used annually only for the following purposes and in the following order:

1. The payment of the reasonable costs of annual maintenance and operation of the State Water Resources Development System and the replacement of any of its parts.
2. The annual payment of the principal and interest on the bonds issued in accordance with the Water Code.
3. Reimbursement to the California Water Fund for funds used for State Water Resources Development System construction.*
4. Any surplus revenues in each year not required for the purposes specified in this chapter of the law shall be appropriated to the department for acquisition and construction of the State Water Resources Development System.

Source: Water Code, Section 12937 (b).

* Priority 3 is no longer active because DWR has reimbursed all funds it used from the California Water Fund.

Recommendations

Legislature

To improve management of large and complex infrastructure projects, the Legislature should enact legislation requiring agencies to publicly report significant changes in the cost or schedule of such projects if they are expected to exceed their established budgets by 10 percent or schedules by 12 months.

DWR

To better manage large infrastructure projects, DWR should develop and implement a project-reporting policy requiring its management staff to document and justify decisions to proceed with such projects if they are expected to exceed their established

budgets by 10 percent or schedules by 12 months. DWR should make these documented decisions and justifications publicly available and submit them to the Resources Agency for review and approval.

To ensure it makes appropriate use of its growing surplus revenue balance, DWR should develop a detailed plan describing how it intends to use these funds.

DWR Did Not Select Appropriately Its Current Program Manager for the Conservation and Conveyance Program

Key Points

- DWR did not follow state law when it replaced the program manager for the conservation and conveyance program.
- DWR did not accurately value its initial contract with the new program manager—the Hallmark Group (Hallmark)—or ensure that it received fair and reasonable pricing for one of Hallmark's subcontractors.

DWR Did Not Follow Proper Procedures in Replacing the Program Manager for the Conservation and Conveyance Program

Although DWR initially used a robust selection process that was in line with both the letter and spirit of state contracting law to select its first program manager, it later used other methods to select a replacement program manager, and these methods did not follow the competitive process required under the law. State law requires state agencies that are contracting for architectural and engineering services to select contractors based on demonstrated competence and professional qualifications. The architectural and engineering (A&E) contract process seeks the most highly qualified contractor; the agency then negotiates with that contractor a price that is fair and reasonable although not necessarily the lowest price. Additionally, based on the services DWR identified in the Scope of Work section of its request for qualifications and its contract with URS Corporation (URS)—its original choice to provide program management services—DWR was contracting for specific services that are consistent with *construction project management*, which a licensed engineer or general contractor must perform, as state law requires.

In May 2008, DWR used a competitive process to engage a consultant to provide program management services and engineering support services, as required by state contracting law and its own regulations. DWR followed the process detailed in the text box to select URS as the most qualified firm to support the

DWR's Process for Selecting Its Initial Program Manager

- Developed a request for qualifications that established the criteria for selecting the program manager, including relevant education; possession of a valid California professional engineer license; experience in the planning, managing, and overseeing of large water resources infrastructure; strategic program development; project management; and experience in environmental compliance and engineering and construction.
- Published the request for qualifications in the State Contracts Registry and a relevant professional publication.
- Held a mandatory meeting attended by approximately 55 individuals representing numerous interested firms. The meeting included a detailed question-and-answer session to clarify requirements and expectations.
- Received statements of qualifications from two interested firms.
- Interviewed the two responding firms.
- Used a defined scoring rubric to score the qualifications and interview responses of the two responding firms based on criteria defined in the request for qualifications.
- Negotiated with the highest-scoring firm for a cost that was deemed fair and reasonable.
- Awarded the contract to the most highly qualified responding firm.

Sources: DWR's request for qualifications and various other DWR documents.

conservation and conveyance program team's efforts. In its response to the request for qualifications, URS identified the individual who would serve as program manager and presented his qualifications, detailed in Table 1, as part of the larger competitive process. DWR then negotiated with URS for a contract worth up to $60 million and with a term from May 2008 through December 2015.

Table 1
Hallmark's Program Manager Does Not Appear to Possess the Qualifications That DWR Required When It Selected URS

REQUIREMENTS AND SELECTION CRITERIA FROM DWR'S REQUEST FOR QUALIFICATIONS	URS – PROGRAM MANAGER	HALLMARK – PROGRAM MANAGER
Possession of a valid professional engineering license	Yes	No
Relevant education	M.S./B.S. Civil Engineering Rutgers University	B.S. Economics North Carolina State University
Demonstrated competence and relevant experience of the program manager in the planning of large water resources infrastructure projects	• Project Director, MWD Isolated Facility, Metropolitan Water District of Southern California, Sacramento County, California • Project Manager and Sponsor, Lake Perris Dam Seismic Evaluation and Dam Replacement Options, State of California Department of Water Resources, 2006 • Senior Reviewer, Swift No. 2 Hydroelectric Project, Cowlitz County PUD, Cougar, Washington, 2006	None included in information provided to DWR or on Hallmark's website.
Demonstrated competence and relevant experience of the firm in the planning of large water resources infrastructure projects, strategic program development, project management, environmental compliance, engineering, and construction	Managed programs ranging from those costing hundreds of millions of dollars to those costing more than $19 billion in construction value, including the following: • $3.4 billion San Francisco Transbay Terminal Program • $5.5 billion California Prison Health Care Receivership Program Developed and implemented public and stakeholder coordination strategies to address the outreach issues associated with these complex programs.	Managed construction for several projects including the following: • $500 million UC Merced Campus • $33 million UC Davis MIND Institute • $120 million Bay Area Housing Project • $3.5 million Silicon Laboratories facility

Sources: DWR's request for qualifications (RFQ NO. 10023878), URS's statement of qualifications, Hallmark's website (http://hgcpm.com/), and contract documentation.

However, not long after awarding the contract, DWR directed URS to replace its program manager with the president of Hallmark without DWR's demonstrating that Hallmark was qualified to provide these services or had the required professional license. Specifically, 13 months after awarding the contract to URS, DWR issued a notice of disapproval that removed the individual URS had designated as the program manager apparently because he was not working full-time on the project. A clause in DWR's contract with URS allowed DWR to disapprove "the assignments or the continuing assignment of specific contractor personnel, subcontractors and subcontractor personnel." However, the contract did not indicate a specific process by which the disapproved personnel should be replaced. Because of the size, cost,

complexity, and significance to the State of WaterFix, we expected DWR to require URS to provide an equally qualified replacement; alternatively, DWR could have used a competitive process to select a replacement program manager based on the criteria it had established in the original request for qualifications. Instead, in an August 2009 amendment to its contract with URS, DWR replaced the program manager by directing URS to engage Hallmark as a subcontractor to provide the program management services.

The contract did not indicate a specific process by which the disapproved personnel should be replaced.

By directing URS to engage Hallmark as a subcontractor in this manner, DWR did not select a firm that met the requirements of the request for qualifications, DWR's regulations, or state law. Our review of the Hallmark contract file found no indication of how DWR identified Hallmark as the replacement program manager nor any evidence that DWR evaluated Hallmark's qualifications for this role. DWR asserted that Metropolitan recommended Hallmark based on Metropolitan's previous experience working with the firm. However, the general manager of Metropolitan told us that although he did recommend Hallmark, Metropolitan had not previously worked with the firm. Furthermore, when we asked him why he recommended Hallmark, he indicated that he was given the name by a third party but could not recall who that third party was. He also said that Metropolitan and other water contractors interviewed other individuals but determined Hallmark was the firm it would recommend to DWR; however, he was unable to provide us with any documentation of those interviews or how the water contractors arrived at their conclusion to recommend Hallmark. We were also unable to ascertain why Metropolitan was interviewing candidates on behalf of DWR.

DWR officials stated that DWR made its own independent assessment of Hallmark's qualifications, and it based its selection on Hallmark's successful program management experience in other programs. We subsequently talked to the former director of DWR who was involved in the selection of Hallmark. He recalled that Hallmark's efforts on the University of California, Merced campus project brought Hallmark to the attention of the water contractors because Hallmark was largely given credit for managing the engineering contractors on that project. He also indicated that he thought the initial recommendation for Hallmark came from the

general managers of Metropolitan and Westlands Water District. He stated that the water contractors believed that Hallmark could provide additional cost controls over the project. Nonetheless, DWR was unable to provide us with documentation of any assessments or with any other records supporting the selection of Hallmark.

Therefore, we performed a high-level comparison of the qualifications of Hallmark and URS and found that Hallmark does not appear to possess the technical credentials or experience on relevant projects that DWR required when it engaged URS. In the initial request for qualifications, DWR identified the following as necessary qualifications of the program manager:

- Relevant education.
- Possession of a valid professional engineering license.
- Experience in the planning, managing, and oversight of large water resources infrastructure.
- Experience in strategic program development.
- Experience in project management and environmental compliance.
- Experience in engineering and construction.

In selecting Hallmark, DWR disregarded many of the qualifications required for the original program manager. Table 1 on page 24 shows that Hallmark lacked a licensed engineer required by law for construction project managers and had no demonstrable experience planning large water resources infrastructure projects. Further, DWR was unable to provide some of the information listed in Table 1 regarding Hallmark's qualifications. Instead, we searched Hallmark's website and other public sources to obtain more information about the firm's qualifications.

DWR explained that after one year working with URS, it became clear that demonstrated program management skills were needed rather than a strict focus on engineering. Although DWR officials cited Hallmark's successful program management experience in other programs as a reason for the selection, staff members in its A&E contracting unit (contracting unit) raised concerns over Hallmark's apparent lack of qualifications.

Additionally, an employee at DWR with knowledge of the A&E contracting process also raised concerns over Hallmark's qualifications. The employee indicated that Hallmark's president,

who is the program manager, had no architecture, engineering, or environmental services experience—only a degree in economics—as the allegations in the text box indicates. DWR's internal auditors conducted an investigation into these allegations and concluded that DWR entered into the contract with Hallmark without using a request for qualifications. However, the internal auditors also stated that determining whether DWR's entering into that contract without such a request violated state contracting law was a legal question that the investigation could not answer. DWR's legal counsel subsequently reviewed the issues and found that DWR's approach was legal; however, DWR's counsel based its opinion in part on an unsupported assertion that DWR had determined that Hallmark was qualified.

Excerpts From Allegations Against DWR About Selection of Hallmark as Program Manager

"The first activity that I believe violates the code and one that we routinely allow is letting contract managers direct contractors to add a specific sub to an existing contract. Put simply, the contract manager wants a specific contractor not currently under contract to perform some type of work allowed under the existing contract. Direct the prime to add the firm you want and have them do the work. No pesky RFQ, no SOQ review, no silly determining if the new folks are actually the most qualified, no allowing other firms to apply for the work, no following the code. The practice has become so prevalent, we're actually starting to address it in our additional payment provisions where we allow a higher markup on subs we direct the contractor to add. This looks surprisingly like a bribe to keep them quiet."

"Possibly the most egregious example of this [letting contract managers direct contractors to add a specific sub to an existing contract] is when a former DOE Division Chief, directed the Washington Division of URS ('URS-WD') to engage the president of Hallmark Group, Inc. ('Hallmark'), to fill the position of Program Manager by subcontracting with Hallmark for this purpose" (46-8104, Amendment 1). Subsequently the PM services were removed entirely from the 8104 scope of work (Amendment 6) and Hallmark Group was issued its own contract (46-9986). No RFQ was issued; the new contract's scope of work says simply that 8104 'was being administratively separated into two contracts.' According to his LinkedIn profile, Hallmark Group, provides '[m]anagement of large capital programs on behalf of government and institutional entities.' No architecture, no engineering, no environmental services. He has a degree in economics. The 'E' in A&E does not stand for economics. The new contract was later tripled in size."

Source: DWR employee emails.

In directing URS to subcontract with Hallmark, DWR also failed to follow the selection process that state law and DWR's own regulations require, potentially resulting in DWR not receiving the best value for the contracted services. Although DWR asserted that subcontracting the program management services was appropriate and legal, the relationship established between URS and Hallmark does not appear to be a contractor-subcontractor arrangement. In a traditional contractor-subcontractor relationship, we would expect to see several conditions, including the following: the contractor is responsible for the subcontractor's work products, the contractor determines payment to the subcontractor, and the contractor is legally responsible for the work of the subcontractor. However, the provisions DWR added to the contract with URS in the amendment to bring Hallmark on as a subcontractor clearly demonstrate that URS was not overseeing Hallmark's work products, it was not determining payment to Hallmark, and it was not legally responsible for Hallmark's work. Specifically, the language in the contract amendment that added Hallmark stated the following:

- "Hallmark will be reporting directly to and receive direction from DWR."
- "DWR shall make the sole and final determination as to the payment to Hallmark of any and all amounts invoiced by Hallmark."

- "DWR shall provide written notice to URS of those portions of Hallmark's invoice that are approved for payment."
- "URS's liability to DWR in any manner arising out of or in connection with any act, omission, negligence or any other aspect of [Hallmark's program manager] or Hallmark's performance that is the subject of the amendment shall be strictly limited to whatever damages or other relief URS actually obtains from [Hallmark's program manager] or Hallmark."

In summary, the process DWR used to award the "subcontract" without demonstrating that Hallmark had the required qualifications and professional license is contrary to the letter and spirit of the law, which is intended to create competition to ensure that the State obtains a competent and qualified contractor at a fair and reasonable price.

The ultimate result of this subcontract is that DWR later awarded Hallmark its own contract, also without a competitive process. Specifically, in 2013 DWR removed the program management services component from the URS contract and entered into a new direct contract with Hallmark through what DWR termed an *administrative separation*, known also as an *assignment*.[4] The contract documentation justified DWR's choice not to use a competitive process by referencing the fact that URS had been selected through a request for qualifications. However, this justification is inapplicable given that Hallmark was never identified nor included in URS's response to the request for qualifications. DWR officials told us that Hallmark had been functioning as program manager for three years and thus had demonstrated its qualifications. Nevertheless, as shown in Table 1 on page 24, Hallmark did not have the necessary qualifications to fill the program manager role in the first place based on DWR's original request for qualifications.

DWR later awarded Hallmark its own contract, also without a competitive process.

We question DWR's rationale for assigning the contract to Hallmark. When we asked DWR about the administrative separation and assignment of the program management services to Hallmark, DWR officials stated that it did so to increase workflow efficiencies. They also stated that its staff had experienced frustration going through URS to

[4] *Assignment* is the legal term for transferring the rights and obligations of a contract from one entity to another.

work with Hallmark, because of the additional layer of administrative processes. They did not believe paying URS the 5 percent subcontractor markup for work Hallmark performed was cost-effective. According to DWR officials, the assignment provided its staff with direct access to the program manager while simultaneously saving the program significant costs. However, we question that reasoning because DWR created the difficulties in the first place by not awarding competitively a new contract for program management services, which would have provided its staff direct access to the selected program manager, following its notice of disapproval of URS's program manager in July 2009. In addition, we are not convinced that DWR is saving money through the assignment because Hallmark has had to subcontract many of the program management functions, and DWR is generally paying a markup of 5 percent for invoices to Hallmark for overseeing those subcontractors.

DWR Did Not Accurately Value Its Initial Contract With Hallmark or Ensure That It Received Fair and Reasonable Pricing for one of Hallmark's Subcontractors

DWR did not establish accurately the cost of the Hallmark contract before awarding it, resulting in an increase in the expense of the original contract award. When it awarded the contract to Hallmark, DWR did not ensure that the funding would cover adequately the services required for the duration of the contract; instead it simply transferred $4.1 million from the original URS budget to the new Hallmark contract. Although DWR awarded the contract for $4.1 million, it did not base this amount on accurate historical monthly costs or the correct term of the contract. Instead, DWR incorrectly used a contract term of 12 months to calculate the contract amount even though the contract itself was drafted for a term of 37 months. DWR also did not take into account the additional services that Hallmark's subcontractors were performing under the contract.

Hallmark has had to subcontract many of the program management functions and DWR is generally paying a markup of 5 percent.

Consequently, just seven months after awarding the contract, DWR amended it, increasing the budget by $7.3 million to cover the contract's full term. DWR amended the contract three additional times to extend the term through December 2017 and to increase the total cost by $2.4 million. As of July 2017, the amount of the Hallmark contract had increased to a total of $13.8 million.

In addition, DWR paid for an important work product without ensuring that the price was fair and reasonable or that the work product was finalized. Specifically, in October 2012 DWR issued a deliverables paid task order to engage McKinsey & Company (McKinsey), a subcontractor to Hallmark, for $2.69 million, to develop the governance structure for the design and construction phase of the project, but DWR did not justify adequately the cost or ensure that it received a final work product.[5] DWR regulations require it to estimate the value of services to be provided based on fees paid for similar services or based on a market survey. However, DWR staff in the contracting unit raised concerns about whether the cost of this task order was fair and reasonable because Hallmark did not present price comparisons or market rates for similar work. Although the task order stated that the price negotiated for McKinsey was fair and reasonable, it provided no analysis or support for the price, and we do not believe it complied with DWR's regulations that require a fair and reasonable price be provided based on fees paid for similar services or on a market survey.

DWR's contracting unit staff stated that they did not feel an email from Hallmark was sufficient justification for a fair and reasonable price because Hallmark did not provide either comparable prices or a market survey. The DWR contracting staff also were concerned that Hallmark's email did not specify how Hallmark determined whether the price was reasonable because the email simply stated that the dollar amount "is worth it because McKinsey has such a great track record", without specifying the dollar amount. However, DWR could not provide any documentation showing that the contracting unit staff's concerns were ever addressed. Consequently, we don't believe that DWR had adequate assurance that Hallmark's price for this $2.69 million deliverable was "fair and reasonable." Additionally, despite paying $2.69 million for this task order, DWR never made sure the consultant finalized the governance structure documents. DWR stated within the task order that these documents were due in January 2013, and according to DWR officials, DWR received draft documents but did not receive final governance structure documents. We discuss the status of the governance structure in more detail later in the next section.

[5] *Deliverables paid task orders* are task orders for which the contractor receives payment based on completion of the deliverable or work product. This differs from regular task orders for which the contractor is paid a specified rate for time spent on the task.

Recommendations

To fully comply with state contracting law, DWR should ensure that it competitively selects architectural and engineering consultants based on demonstrated competence and professional qualifications. In addition, DWR should document in the contract file its evaluation of the competence and professional qualifications of all contractors and any subcontractors that are added to the contract subsequent to the competitive selection process.

To ensure that only qualified subcontractors are added to contracts after the initial award is made, DWR should make sure that contractors select their own subcontractors and that DWR subsequently approves the selection after it verifies their qualifications.

DWR should ensure that it retains adequate documentation in its contract files to support that contract prices are fair and reasonable and all deliverables are received.

Blank page inserted for reproduction purposes only.

DWR Needs to Take Certain Steps to Better Prepare for the Transition of WaterFix to the Design and Construction Phase

Key Points

- DWR has not completed either an economic or a financial analysis to demonstrate the financial viability of the project.
- DWR has not implemented a governance structure for the design and construction phase of WaterFix.
- DWR has not maintained important program management documents for WaterFix.

DWR Has Not Completed Needed Analyses That Would Demonstrate the Financial Viability of WaterFix

Despite DWR's own policy stating that an economic analysis is a critical element of the planning process, DWR has not yet finalized one for WaterFix, although it released an incomplete draft economic analysis in 2016. The text box defines the critical questions about the project that this analysis and a financial analysis are intended to answer. In October 2012, DWR issued a task order for a subcontractor, the Brattle Group, to perform an economic analysis that would measure the benefits and costs of the BDCP from a statewide perspective. Over the next 31 months, DWR budgeted $434,000 for the economic analysis. According to the various task order amendments, development of this analysis was a lengthy process that included various scope changes and input from a variety of stakeholders including Reclamation, the fishery agencies, public water agencies, and Delta agricultural interests. In addition, the economic analysis was revised several times to address feedback from stakeholders, changes in the project's costs and footprint, and revisions to the draft BDCP. Then in May 2015, DWR canceled the remaining work on the BDCP economic analysis because the project transitioned from the BDCP to WaterFix, as described in the Introduction.

Questions That Economic and Financial Analyses Answer

ECONOMIC ANALYSIS	FINANCIAL ANALYSIS
Answers the questions:	Answers the questions:
Should the project be built at all?	Who benefits from the project?
Should it be built now?	Who will repay the costs?
Should it be built to a different configuration or size?	Can the beneficiaries meet repayment obligations?
Will it have a net positive social value for Californians regardless of who receives the benefits and who pays the costs?	Will the beneficiaries be better off financially after they meet repayment obligations?

Source: DWR's *Economic Analysis Guidebook*.

In June 2015, DWR directed the Brottle Group to instead develop an economic analysis for WaterFix, for which it had allocated an additional $356,000. DWR made public a November 2015 incomplete draft of the WaterFix economic analysis in response to a Public Records Act request in September 2016. However, DWR has not finalized the economic analysis report. According to DWR officials, the economic analysis could not be finalized because DWR determined it was not possible to complete an accurate cost-benefit analysis until understanding which agencies will be participating in and funding the project and at what level. DWR officials further stated that the project will have varying economic benefits for each of the funding agencies, based on their unique situation including access to alternative water supplies and type of water users. DWR officials stated that once individual water agencies define their level of participation through their various public board processes, DWR will incorporate that information into a final cost-benefit analysis.

DWR has not finalized the economic analysis report.

We believe that it is essential for DWR to complete the economic analysis report as soon as it determines the extent to which individual water agencies will participate in funding the design and construction of WaterFix.

DWR also has not completed a financial analysis for WaterFix. The financial analysis answers critical questions about the project, which the previous text box lists. In 2012 DWR contracted with the consulting firm Public Finance Management through Hallmark, and in 2013 DWR initiated a task order for Public Finance Management to support the completion of a financial analysis for the project. The scope of work in the task order was organized to generate key deliverables, with the general objectives of reaching agreement on fair and affordable cost allocations and establishing reliable financing for implementation of the project. The task order acknowledged that these deliverables would require the collective effort of DWR, Reclamation, and state and federal water contractors, with the consultant providing support. As of July 2017, DWR data show that it has paid Public Finance Management $276,000 for its efforts.

However, according to DWR officials, no final decisions on cost allocations or interim financing have been made because discussions with state and federal water contractors are still ongoing. DWR officials further explained that the final financial analysis report

cannot be prepared until the contractors desiring to participate in WaterFix are identified. They also stated that DWR's contractor—Public Finance Management—modeled a wide range of financing options for WaterFix that were shared with water contractor boards. According to DWR officials, once individual agencies decide to participate, the financing will be tailored to meet each agency's needs.

The financial analysis is critical in determining whether water contractors are willing and able to pay for the construction of WaterFix. The Delta Reform Act of 2009 states that construction of a new Delta conveyance facility (such as WaterFix) shall not be initiated until the water contractors that contract to receive water from the State Water Project and Central Valley Project have made arrangements or entered into contracts to pay for two things: (1) the costs of the environmental review, planning, design, construction, and mitigation required for the construction, operation, and maintenance of any new Delta water conveyance facility and (2) the full mitigation of property tax or assessments levied for land used in the construction, location, mitigation, or operation of new Delta conveyance facilities. The financial analysis is intended to provide a business case that the project is beneficial, financial modeling to analyze the cost of the project and the debt service associated with financing the project, and an acceptable cost-allocation methodology.

DWR Has Not Fully Implemented a Governance Structure for Managing the Design and Construction Phase of WaterFix

Although DWR contracted with a consultant to develop a governance structure for the design and construction phase of the project, it has not fully implemented such a structure. Originally, in 2008, DWR intended the role of the program manager to include overseeing the entire project, from planning through construction. However, in the first nine months of 2012, DWR management, Hallmark, and the State Water Project water contractors attempted with limited success to create a new governance structure that would address issues of organizational design and governance, the roles and responsibilities of the stakeholders in the decision-making process, and guidance on project implementation. In an October 2012 task order, DWR stated that such a governance structure would be unique and immensely important. At the same time, DWR contracted with McKinsey to develop a governance structure that would create a new way for DWR to work with the public water agencies. DWR used McKinsey's draft work product as input for the development of the Design and Construction Enterprise Unit (Enterprise Unit), which DWR publicly announced as the governance structure for the project in 2014.

Program Management Documents

Program Management Plan
A dynamic document maintained by the program manager throughout the life of the program providing a scope of work, schedule, and cost estimates. It also includes the following:

- Staffing requirements.
- Funding sources.
- Reporting relationships.
- Participant roles and responsibilities.
- Monitoring, change control, and reporting policies and procedures.
- Critique of project successes and recommendations for improvements (upon completion of the project).

Funding Statement
Also called the *program component statement*, this is the authorizing document for funding a program and is the key monitoring and control document. It is a dynamic document maintained by the program manager throughout the life of the program. It includes the following:

- Specific funding sources for the estimated, budgeted, and proposed years.
- Explanation of any changes between the budgeted year and the proposed year.

Charter
Describes a proposed activity at a high level. It is the responsibility of the program manager to ensure that the charter is kept up to date during the life of the program. The Charter includes the following:

- Program objective.
- Scope.
- Critical success factors.
- Deliverables.
- Milestones.

Source: DWR's Water Resources Engineering Memorandum 65a.

In September 2015, DWR developed a draft agreement that would formally implement the Enterprise Unit as the governance structure for the design, construction, and implementation phase of WaterFix. The draft agreement envisioned that the water contractors would create a joint-powers authority—the Conveyance Project Coordination Agency (coordination agency)—to be a party to the agreement along with DWR. The contractors would organize the coordination agency to assist DWR in the design, construction, and implementation of WaterFix. The draft also envisioned that DWR and the coordination agency would enter into a contract with a "world-class project manager"—designated the *program director*—to head the Enterprise Unit.

However, according to DWR officials, it is currently in discussion with the public water agencies to create a governance structure, but whether it will be the same or similar to the Enterprise Unit is unclear. According to DWR officials, because WaterFix has not yet been approved and because the public water agencies have yet to form the coordination agency, the Enterprise Unit has yet to be officially implemented. DWR officials stated that it is currently in discussion with the public water agencies to determine, under current conditions, what the most effective governance structure will be for the design and construction phase. Further, these officials told us that the governance structure will very likely follow some of the recommendations from the McKinsey effort. It is essential that DWR develop an appropriate governance structure so that it is prepared to oversee the design and construction of WaterFix in the event that the project is ultimately approved.

DWR Did Not Properly Maintain Important Program Management Documentation

Although WaterFix has evolved since it began as the BDCP, DWR has not maintained required program management documents for the planning phase. DWR policy requires certain documentation to initiate and authorize a State Water Project-funded program—such as the DWR program that supports WaterFix—including a management plan, funding statement, and charter. The text box describes each of these documents. That policy also states that the program manager

should maintain this documentation throughout the life of the program, and DWR included that same requirement in its contracts with URS and Hallmark.

Initially, when DWR established the conservation and conveyance program, it followed its policy by creating the required management documents. Specifically, in 2008, DWR's division of engineering prepared a Charter and Management Plan (management plan) for the program, which contained all of the necessary management documents. Within the management plan, DWR identified and listed URS's program manager's responsibilities, including requesting program changes, reporting the status of business activities to DWR's executive manager and deputy directors, and updating the management plan as required.

The contract with the program manager also specified that the program manager was to develop and maintain the program management plan and further enumerated the following responsibilities: reporting on cost, schedule, significant milestones, and resources compared to established baselines as well as providing oversight, analysis, and quality control of other contractors. The management plan identified the chief of DWR's division of engineering as the executive manager of the conservation and conveyance program and the individual responsible for overseeing the program manager. The executive manager was also to oversee the program budget, schedule, engineering, and real estate activities and report to DWR's executive management with periodic updates.

However, roughly one year after DWR established the conservation and conveyance program, it began to experience significant personnel changes but did not ensure that the management plan was properly updated to reflect these changes. For example, as this report describes earlier, DWR replaced URS as the program manager with Hallmark in August 2009. Four years later in 2013, DWR's executive manager of the conservation and conveyance program retired. According to a former chief deputy director, DWR subsequently moved the responsibility for overseeing the program manager to DWR's executive management, although the management plan was never updated to reflect this change.

Roughly one year after DWR established the conservation and conveyance program, it began to experience significant personnel changes.

Furthermore, DWR's executive management also experienced significant turnover. For example, since DWR established the conservation and conveyance program in 2008, it has had three different directors and five different chief deputy directors. However, DWR did not update the management plan to document these changes or to describe how DWR handled them.

We reviewed the contents of the electronic document management system that DWR uses to store project management documents. The system is an electronic repository that contains numerous documents, including monthly progress reports that provide updates on the project's milestones and accomplishments, various meeting agendas and minutes, and monthly budget reports. However, through our review of the documents in this system we were only able to locate one update to the management plan that covers the planning phase. The updated program management plan was completed in November 2009, but it did not properly address the significant personnel changes or the shift in the project from the BDCP to WaterFix. If WaterFix is ultimately approved, it will be important for DWR to develop, and update when necessary, a management plan for the design and construction phase of the project.

Recommendations

To ensure that DWR manages WaterFix in an effective manner, DWR should complete both the economic analysis and financial analysis for WaterFix and make the analyses publicly available as soon as possible.

In order to prepare for the potential approval of WaterFix and to ensure that the project is managed properly during the design and construction phase, DWR should do the following:

- Develop an appropriate governance structure so that it is prepared to oversee the design and construction of WaterFix in the event it is ultimately approved.
- Develop and update when necessary the associated program management plan for the design and construction phase of the project.

SCOPE AND METHODOLOGY

The Joint Legislative Audit Committee (Audit Committee) requested the California State Auditor to examine the funds spent on planning and design of WaterFix by DWR. Table 2 lists this audit's approved objectives and the methods we used to address them.

Table 2
Audit Objectives and the Methods Used to Address Them

	AUDIT OBJECTIVE	METHOD
1	Review and evaluate the laws, rules, and regulations significant to the audit objectives.	Reviewed relevant laws, regulations, and other background materials related to the WaterFix project.
2	Determine how DWR collaborated to organize and fund the planning and design of the BDCP and subsequently WaterFix. Specifically, Identify the following:	
	a. DWR's role in organizing and financing the planning and design.	• Interviewed relevant individuals and reviewed planning documents, including various planning agreements among participants and DWR's funding agreements with the State Water Project water contractors, the Authority, and Reclamation. • Reviewed the BDCP and various drafts of the environmental impact report. • Reviewed a May 2008 Legislative Counsel opinion regarding DWR's authority to construct a water conveyance facility.
	b. The extent to which DWR engaged local agencies required to contribute towards WaterFix costs in developing the funding structure for planning and design.	• Interviewed relevant individuals at DWR, Metropolitan, Kern, and the Authority. • Reviewed relevant documents, including BDCP steering committee minutes from 2006 through 2010, BDCP management committee documents, WaterFix business committee documents, and conservation and conveyance program financial meeting agendas.
	c. The amounts and proportional share of contributions each local agency and any other entity that provided funds for planning and design made from 2006 to present.	• Reviewed funding agreements to determine the funding obligations of entities participating in the planning phase. • Reviewed budgets and contracts DWR developed for the preparation of the BDCP beginning in 2006 to determine estimated costs because DWR did not track adequately BDCP contributions or spending. • Obtained data from DWR's accounting system identifying participating state and federal entities and their proportionate contributions to the conservation and conveyance program's planning costs from January 2008 through June 2017. • Traced the amounts from DWR's data to supporting documentation from the two largest State Water Project water contractors (Metropolitan and Kern), the Authority, and Reclamation.
	d. Whether the State allocated any General Fund money for planning and design.	• Reviewed state budget acts for fiscal years 2006–07 through 2016–17 to determine whether the State allocated any General Fund money for the planning of the BDCP and WaterFix. • Interviewed DWR staff to determine if DWR used General Fund money to fund the planning and design. • Analyzed the expenses from the fund that DWR set up for the conservation and conveyance program expenses to determine whether DWR used any General Fund money to fund the planning and design.

continued on next page . . .

	AUDIT OBJECTIVE	METHOD
3	Identify, by source, the amounts of funding DWR, each local agency, and any related joint powers authority raised and used to finance the BDCP and subsequently WaterFix. In the case of debt financing, identify the entities that issued debt and their relationships to the water contractor and determine when and how they secured each debt issuance.	• Reviewed documents and data, as further described in Objective 2c. • Interviewed individuals at Metropolitan and Kern and traced their contribution amounts reported in DWR's data to the entities' audited financial statements to confirm the amounts and identify the sources of the funds. • Interviewed individuals at the Authority and obtained documentation of the Authority's 2009 revenue note issuance, repayment, and cost-sharing structure among its participating member agencies to determine the source of the funds. • Reviewed federal assistance agreements and interviewed individuals at Reclamation to determine the sources of its contributed funds. • Interviewed individuals at DWR to determine the need for any additional funding to carry out the remainder of the planning phase.
4	Determine the nature of the Conveyance Project Coordinating Agency's activities, date of its charter, its composition, and the amount of funding, by source, it has received since its inception.	• Interviewed individuals at DWR and reviewed relevant documentation. We determined that the water contractors have not created the coordinating agency; thus, it has no activities, no charter, and has not received any funding. DWR mentioned the coordinating agency in a draft agreement that DWR prepared to establish how DWR intended to manage the design and construction phase. DWR has not executed the draft. • We discuss the coordinating agency beginning on page 35 of the report.
5	Evaluate the process DWR used to select the contractor to manage design and engineering for the Design and Construction Enterprise Unit.	• Reviewed relevant contracts, contract amendments, emails, and other documentation regarding DWR's selection of the contractor to provide program management services for the conservation and conveyance program, and DWR's efforts to replace that contractor with Hallmark. • Interviewed individuals at DWR regarding the selection of the program manager for the conservation and conveyance program and regarding the subsequent replacement of that program manager with Hallmark. • Reviewed Statements of Economic Interests (Form 700s) for relevant DWR employees and contractors. We did not identify any apparent conflicts. • As we describe on page 36, the Enterprise Unit was never officially established, nor was a contractor selected to manage it.
6	Review and assess any other issues that are significant to the audit.	• Interviewed responsible individuals at DWR and reviewed management practices and policies, analyses, and agreements related to moving forward with the construction of WaterFix. • Reviewed and analyzed task orders and deliverables related to the contract for program management of the conservation and conveyance program and WaterFix.

Sources: California State Auditor's analysis of the Audit Committee's audit request 2016-132 and information and documentation identified in the table column titled *Method*.

Assessment of Data Reliability

In performing this audit, we obtained electronic files of conservation and conveyance program revenues and expenses from DWR's accounting system for January 1, 2008, through June 30, 2017. The U.S. Government Accountability Office, whose standards we are statutorily required to follow, requires us to assess the sufficiency and appropriateness of computer-processed information that we use to support our findings, conclusions, or recommendations. To gain assurance of the accuracy of these data, we traced the program revenues from the two largest state water contractors and all federal sources, which constitute 82 percent of the revenues, to supporting documentation from the responsible

entities and found that the dollar amounts materially matched. We performed completeness testing of these data by comparing the total program revenues from DWR's data to the budgeted amounts in planning documents and by ensuring that the data provided were not comingled with other data. We found the data to be complete. Consequently, we found DWR's data to be of sufficient reliability for the purposes of determining the amounts that the various state and federal contractors contributed.

We conducted this audit under the authority vested in the California State Auditor by Section 8543 et seq. of the California Government Code and according to generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives specified in the Scope and Methodology section of the report. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Respectfully submitted,

ELAINE M. HOWLE, CPA
State Auditor

Date: October 5, 2017

Staff: Mike Tilden, CPA, Audit Principal
Jordan Wright, CFE
Mariyam Ali Azam
Mary Anderson
Logan J. Blower

Legal Counsel: Mary K. Lundeen, Sr. Staff Counsel

For questions regarding the contents of this report, please contact Margarita Fernández, Chief of Public Affairs, at 916.445.0255.

Blank page inserted for reproduction purposes only.

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY EDMUND G. BROWN JR., Governor

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

September 28, 2017

The Honorable Elaine M. Howle*
State Auditor
California State Auditor
621 Capitol Mall, Suite 1200
Sacramento, California 95814

California WaterFix Audit, State Audit Report No. 2016-132

Dear Ms. Howle:

On behalf of the Department of Water Resources (DWR), I am writing to address Draft Audit Report No. 2016-132 (Report) regarding the project that eventually developed into, and was recently approved, as the California WaterFix.[1] DWR appreciates the professionalism of the Bureau of State Audit staff and their openness to hearing DWR perspectives.

DWR is pleased that after 10 months of investigation, the Report validates that no General Fund money has been used for the planning and design for WaterFix. (Report p. 4.) All activities for the planning and design of the project were supported and paid for by the public water agencies that will benefit from the project. ①②

The Report also finds the project's complexity resulted in unforeseen expenses and schedule extensions. We appreciate this acknowledgement. WaterFix is unprecedented both in the scale of its complexity and the extent of its public and stakeholder engagement. DWR has worked diligently to address concerns as they emerged and has made significant changes to the project in direct response to input from the public and regulatory agencies, including analyses of additional alternatives, additional species evaluations and optimization of the project. These changes required additional time and funding to implement.

The Report's primary concern involves the way DWR documented project decisions and selected the program manager. DWR agrees that decisions should be documented. We also agree that a governance structure is critical for a project of this scope, and one has been in development and will be ready for implementation at the appropriate stage of the project.

[1] For convenience, we refer to the project variously known as Delta Habitat Conservation and Conveyance Program, the Bay Delta Conservation Plan, and California WaterFix as "WaterFix" throughout these comments.

* California State Auditor's comments begin on page 87.

In addition, DWR agrees that a financial analysis is important, and is prepared to complete a final economic analysis when each potential participant in WaterFix has made its decision to opt into the project.

③ We must respectfully disagree with the Report's conclusion that DWR did not follow state law in selecting the project manager. As project needs changed, DWR reassigned the project management task consistent with the terms of the contract and pursuant to DWR and state policies. The facts demonstrate the high value that DWR and the project have received from the project manager's performance.

WaterFix is a science-driven project that will upgrade the state's outdated water delivery system and maintain a reliable source of water for 25 million Californians and more than 3 million acres of farmland in the San Francisco Bay Area, Central Valley and Southern California. It is a critical element of the state's overall strategy to address climate change and ensure a reliable water supply for the future, as outlined in Governor Brown's California Water Action Plan.

The extensive outreach and responsiveness to stakeholder and public input described above resulted in what many considered unachievable: the issuance of permits from state and federal agencies to move forward with a viable and achievable long-term solution to decades-old problems in the Bay-Delta. Consistent engagement with the local public agencies funding the project has allowed for close scrutiny of any increased costs and changes to the project, affecting the scope and schedule. These local agencies have found the additional work on the project to be reasonable and necessary.

DWR's response to the Report's findings is summarized here, followed by detailed discussion of each, and concludes with our comments on the Report's recommendations.

④ Summary:

1. DWR Received Excellent Value and Quality for Services Under the Hallmark Group Contract
2. The URS Contract Authorized Multiple Tasks; Only One Task was Construction
3. Requiring a Subcontractor to Provide Program Management Services to URS was Necessary and was Appropriately Defined
4. DWR Followed Proper and Lawful Procedures in the Necessary and Appropriate Replacement of the Program Manager
5. The Structure of The McKinsey Contract was Beneficial to Both DWR and the Public Water Agencies that Will Ultimately Pay for the Project,
6. DWR Developed a Governance Structure for Implementation at the Appropriate Project Stage

7. DWR Will Prepare a Financial Analysis and Economic Analysis When WaterFix Participants are Identified
8. DWR Has Performed Significant Planning During the Planning Stage and Has Maintained and Provided Extensive Documentation

Our comments will address the Report's specific findings, and then address the Report's recommendations.

A. FINDINGS

1. DWR Received Excellent Value and Quality For Services Under The Hallmark Group Contract

The Report devotes a full one-fourth of its length to DWR's hiring and subsequent utilization of the Hallmark Group (Hallmark) to provide program management services for what has become California WaterFix. In these sections, the Report finds that Hallmark's program manager did not appear to possess the qualifications DWR required when it selected contractor URS, and that the failure to ensure Hallmark possessed these qualifications was contrary to the letter and spirit of the law, which is intended to create competition to ensure that the state obtains a competent and qualified contractor at a fair and reasonable price. Finally, the Report notes that DWR "potentially" did not receive "the best value for the contracted services." (Report p. 27-29.) DWR addresses the contracting issues later in this response, but here, we note the facts about Hallmark's performance are contrary to the above statements in the Report. The state received excellent value and a high work product for the services Hallmark provided. ① ⑤

When URS was hired for WaterFix, the project was conceived as an engineering enterprise, to be staffed and managed by engineers. After little more than a year, it became apparent to DWR and its stakeholders that engineering expertise alone would not be sufficient to manage the project; efficiency and management expertise would be essential in successfully moving the project forward. ⑥

As described by former DWR Director Lester Snow, the almost exclusive motivator to bring the Hallmark Group on as program manager was cost control. The entities funding WaterFix, the water contractors, were impressed by Hallmark's work managing the $500 million UC Merced campus construction project and presented a united front in urging Hallmark be utilized to increase efficiencies on the project. Hallmark's job was to scrutinize costs, monitor schedules and ensure that tasks were completed on time. Hallmark's task did not include performing engineering work, such as deciding what approach (canals, tunnels, or levies) should be used. ⑦

Hallmark was not a substitute for URS expertise in large water infrastructure management. Rather, when added as a subcontractor, the Hallmark Group augmented

⑧ URS' engineering expertise by providing proven project management skills. Later in the program, the contract was divided, with program management being assigned to Hallmark, and URS retaining engineering tasks.

⑥ Addition of a specialized program management team made sense. Not all engineers make great managers. Management excellence transcends the field in which one is trained; many exceptional managers succeed in overseeing work in specialized fields ⑧ not because of their particular scholarly training, but because of the strength of their leadership and management abilities.

⑤⑦ Hallmark has succeeded in the task which it was originally brought on board to provide, cost control. As stated repeatedly by the participating public water agencies and DWR, Hallmark has done an outstanding job managing WaterFix. For example, within a year of being hired, Hallmark reduced staffing on the project by 40 percent, reduced monthly burn rate costs by 44 percent, and within two years costs were reduced by 65 percent. ⑨ Further, Hallmark dramatically increased program efficiency, enabling WaterFix to take a budget projection intended to last for three years through an initial projected project approval of April 2012, and extend it to cover **nearly five years** of unanticipated additional work through project approval (the California Environmental Quality Act Notice of Determination) in July 2017.

Over time, WaterFix evolved, transitioning from a Habit Conservation Plan to an Endangered Species Act section 7 process, resulting in further revisions to the schedule. On two different occasions in 2013 and 2014 Hallmark developed ramp down plans to further contain costs allowing the project to continue the environmental process. Beyond its obvious cost control success, Hallmark provided excellent leadership by keeping the teams organized, the stakeholders completely informed and an unflagging focus on resolution of issues as they developed.

California water law and policy is extremely complicated, making all water development projects protracted and therefore challenging—not least of which a project like WaterFix. There will be many more challenges to overcome in the future. The Hallmark Group has provided indispensable assistance to DWR, enabling the Department to reach this point of the process.

2. The URS Contract Authorized Multiple Tasks; Only One Task Was Construction

⑩ The Report characterizes the URS contract as one for "construction project management, which a licensed engineer or general contractor must perform under state ① law." (Report, p. 24.) This is a misunderstanding of the URS contract, which can be readily understood by reviewing the contract's scope of work which states the services contracted for included:

> [E]ngineering support services and the program management of the planning, coordination and oversight of the programs, environmental engineering and construction phases, strategic program development, risk assessment and oversight of program costs and schedules of DWR's Delta Habitat Conservation and Conveyance Program (DHCCP). (Contract 46-00008104, p. 1, attached hereto as Exh. 1.)

Thus, the contract DWR made with URS authorized a number of tasks to be performed, including strategic program development, planning, coordination and oversight among other tasks. It is inaccurate to summarize the above services as "construction project management." Rather, construction is one element of a multi-element program where oversight of environmental engineering, strategic program development, risk assessment and oversight of program costs and schedules are equally or more important. At the time the contract was made, comparatively little environmental analyses was performed for the project, there was no overall project plan, and no environmental permits had been obtained. The Report's incomplete characterization of the URS contract appears to undermine the Report's conclusions. (10)

3. Requiring A Subcontractor To Provide Program Management Services To URS Was Necessary And Was Legally Justified

The Report criticizes the manner in which DWR utilized Hallmark, a subcontractor, to provide project management services for the prime contractor. It asserts that this 2008 subcontract "does not appear to be a contractor-subcontractor arrangement" and is different from what the Report believes to be a "traditional contractor-subcontractor relationship." The Report further criticizes sections of the subcontract that details how DWR expected Hallmark to work as program manager with DWR and with URS staff. (Report p. 28.) (11) (1)

The URS amendment made clear the uniqueness of the program management function, performed as a subcontract, and provided clear specific provisions to prevent any conflict. (Contract No. 4600008104, Am. 1, Exhibit E, Attachment 6, attached hereto as Exh. 2.) The subcontract to Hallmark was to provide a specific service – program management. In order to accomplish this function it was essential that Hallmark, as the program manager, exercise the functions typically performed by that position, including general direction and reporting, tasks which are essential for a program manager to perform in order to successfully manage WaterFix.

The URS amendment provided comprehensive details, "... in order to avoid the appearance of or any actual conflicts that might arise from such an arrangement ...." (Ibid, page 1.) For example, the contract required Hallmark to submit all invoices to URS, whereupon URS would submit the invoice to DWR for approval while Hallmark

was to provide program management functions by communicating and coordinating with URS. The roles and responsibilities of the parties to the agreement were clearly defined by the amendment. The amendment proved successful to the program, as
⑫ ⑤ demonstrated by the high level of performance for the three years duration in which the amendment was in effect.

4. DWR Followed Proper Procedures in Replacing the Program Manager for the Conservation and Conveyance Program.

a. The URS Subcontracting of Program Manager Responsibilities to Hallmark was Both Necessary and Lawful.

The Report's finding that DWR "... later used other methods to select a replacement program manager, and these methods did not follow the competitive process required under the law" does not take into account applicable statutes, regulations and contract terms permitting the replacement. DWR's replacement of the WaterFix program manager was in full compliance with the law.

⑪ As explained above, the URS contract expressly permitted subcontracting, the terms of which DWR followed in selecting the Hallmark firm. (Contract No. 4600008104, Exhibit D, paragraph 6, attached hereto as Exh. 3.) Architectural and Engineering ("A&E") contracts are frequently amended to subcontract for specialized services, replacement personnel, program changes, and for other reasons. Such amendments permit DWR to accomplish cost effective, specialized services as program needs change or require. The original URS contract was for a term of 7.5 years for a project that the Report recognizes presented "unexpected complexity." A contract for such a lengthy term for such a complex project will by necessity require modifications and changes consistent with law. When it became apparent that the assigned URS program manager was not able to devote himself full-time to the project, and that the program
⑦ required a stronger emphasis on cost containment, it became essential for DWR to
⑥ subcontract for a program manager to ensure effective continued progress of the contract.

The Legislature intended that the A&E process be liberally construed to accomplish its purposes. (Gov't Code § 4529.19.) Specific legal authority permitting modification of A&E contracts is provided by DWR regulation:

> Where the Director determines that a change in the contract is necessary during the performance of the services, the parties may, by mutual consent, in writing, agree to modifications, additions or deletions in the general terms, conditions and specifications for the services involved, including extensions of time,

with a reasonable adjustment in the firm's compensation.
(23 Cal.Code Regs § 387.)

Lester Snow, DWR Director in 2008, determined that a change in the contract was necessary and effected a change. There is no indication that Director Snow failed to sufficiently assess the qualifications of Hallmark in doing so. (8)

The Report narrowly focuses on the Request for Qualifications (RFQ) process as the sole mechanism to replace the WaterFix program manager. But the contract itself, as well as DWR's regulations, provides another equally appropriate path. (13)

Indeed, the circumstances on the ground indicate why DWR's approach to contract amendment was appropriate. For example, as the contract performance was already in its 13th month, an RFQ selection process, even when given a high priority, would have required at least five months to obtain a new program manager. The program could not afford the absence of the program manager for such a lengthy period of time. Had an RFQ been utilized, it would likely have significantly delayed the project and incurred higher costs while waiting five months for a replacement program manager. Given the authorized alternative approach that DWR took, a "competitive" RFQ selection process for replacing the program manager was simply not a realistic or optimal option.

b. It Was Not Necessary That Hallmark As A Subcontractor Be An Engineer or Licensed Contractor.

The Report faults Hallmark for not having engineering expertise, but the contractor team as a whole provides all necessary expertise. As a subcontractor, Hallmark was a member of the URS team. The team, including URS, retained all the engineering/licensed contractor knowledge that was required to perform the services required under the contract. As the contract itself stated, the contract had many purposes well beyond just engineering. (14) (11)

Government Code section 4529.5 requires any individual or firm to have requisite experience to provide construction project management services.[2] The firm, URS, had engineering expertise before Hallmark was assigned to provide program management

[2] Section 4529.5 states the following:

> Any individual or firm proposing to provide construction project management services pursuant to this chapter shall provide evidence that the individual or firm and its personnel carrying out onsite responsibilities have expertise and experience in construction project design review and evaluation, construction mobilization and supervision, bid evaluation, project scheduling, cost-benefit analysis, claims review and negotiation, and general management and administration of a construction project.

services and afterwards. All requisite engineering qualifications were retained within the
(14) URS contract to be performed by URS personnel after Hallmark was added to the team.

The URS contract's terms make clear that "... the various areas of expertise required of the successful Program Management team include planning and implementation of . . . engineering and construction program phases." (Exh. A, attached hereto at at p 1, emphasis added.) No one person has all of the qualifications necessary to perform all of the services under the contract. It is a team approach, here contained within URS and its subcontractor Hallmark.

c. Assignment of Program Management Responsibilities to Hallmark Was Appropriate and Legally Supportable

(15) DWR respectfully submits that the Report incorrectly concludes that the 2013 contract assignment to Hallmark violated the law and, instead, should have been accomplished
(1) through a competitive RFQ process. (Report pp. 29-30.) With the essential engineering expertise firmly in place, DWR determined that to improve workflow efficiencies and to
(16) save the 5 percent subcontractor markup costs imposed by URS, it was necessary to assign program manager responsibilities directly to Hallmark.

The Hallmark assignment was for the initial planning, coordination, and oversight of WaterFix. The engineering, environmental and construction management functions remained separately as a continuing part of the URS contract. The program manager responsibilities had already been performed by Hallmark for the three preceding years prior to the assignment. DWR management was satisfied with Hallmark's performance
(5) and Hallmark was experienced and successful in managing the program. Given Hallmark's success, there appeared to be no benefit from introducing a new less-experienced program manager to replace the successful incumbent and disrupt the continuity of the program. DWR determined that given Hallmark's experience and demonstrated performance, it was clearly the most qualified contractor to perform the assignment function.

(13) Nor did it make any sense to adjust the timeline for the program for five months in order to submit an RFQ to replace the successful program manager not to mention the additional time required for a new untested program manager to become knowledgeable of the program's requirements. For the success of the WaterFix program, it was important to keep the existing program manager and maintain continuity.

(15) The contract assignment was accomplished lawfully. As previously mentioned, DWR's regulations permit the Director to make a change in an A&E contract when necessary. (See 23 Cal.Code Regs § 387 ["Where the Director determines that a change in the contract is necessary during the performance of the services, the parties may, by mutual consent, in writing, agree to modifications, additions or deletions in the general

terms, conditions and specifications for the services involved. . ."].) The Director appropriately determined that a change was necessary, for the reasons stated above, to help ensure the success of the program.

Finally, the URS contract contained a specific provision regarding contract assignments:

> GTC 307, 3. ASSIGNMENT: This agreement is not assignable, either in whole or in part, without the consent of the State in the form of a written amendment.
> (Contract 4600008104, Exhibit C, paragraph 3, attached hereto as Exh. 4.)

Further, state law allows contracts to be assigned without a new competitive bidding process. DWR followed state law, its own regulations and the contract terms in the January 2013 contract assignment of program management responsibilities to Hallmark. (15)

5. The Structure of the McKinsey Contract Was Beneficial to Both DWR and the Public Water Agencies That Will Ultimately Pay for the Project

The Report finds that DWR did not ensure that the price paid for work product produced by subcontractor McKinsey & Company (McKinsey) was fair and reasonable. (Report, p. 31.) (17) (1) It may be difficult to appreciate today, but when DWR authorized the work performed by McKinsey in 2012, it was widely believed by DWR and its stakeholders that the WaterFix (then the BDCP) project would be approved in 2013, and construction would commence shortly thereafter. Even after substantial prior work by DWR and its WaterFix program manager there was still no consensus among stakeholders about how the project would be managed during construction. In June 2012, DWR and its WaterFix stakeholders determined to retain highly specialized consultants tasked with resolving these fundamental issues, and to resolve them in an expeditious manner to match the perceived tight time schedule.

DWR initially contemplated six consultants, McKinsey, Bain, Boston Consulting, Monitor, Booz/Allen/Hamilton, AT Kearney, and KPMG. In July 2012 multiple prospective qualified consultants were interviewed by phone, reducing the number of candidates to two, McKinsey and KPMG. These candidates were interviewed by a DWR/water contractor panel, and McKinsey emerged as the top ranked firm. References provided by McKinsey were interviewed, with interviewees reporting outstanding consultant performance and extraordinary results on projects with similar challenges. A fee for the work plan was established. (17)

DWR determined the work required to produce the product was appropriately valued at $2.6 million. Due to the expedited timeline, a fixed price contract task order was utilized to establish a time frame and to control costs. DWR maintained control of the final

product and the value derived. As the amendment to the contract authorizing this work noted, "The structure of the contract, fixed fee based on deliverables, is beneficial to both DWR and the stakeholders that will ultimately pay the costs for this consultant, since the consultant is only authorized to bill the fixed price for deliverables that have been accepted and approved, as opposed to hourly labor each month." (Contract 4600008104, Am. 5, Std 215, p. 3, attached hereto as Exh. 5.)

6. DWR Developed a Construction Governance Structure For Implementation at the Appropriate Project Stage

⑱ ① The Report (pp. 37-38) implies no governance structure exists and that lack of a governance structure for implementation of the WaterFix is somehow contrary to DWR's legal requirements. This implication is not supported by the facts. DWR has always had the legal authority to carry out the project itself. There is no legal requirement that it have a governance structure in place prior to approval of a project. Based on recommendations by McKinsey, DWR developed a governance structure in the last quarter of 2012. DWR posted the governance structure on the BDCP website and it has been publicly available since January 2016. When a decision is made regarding public water agency participation, a structure will be ready for implementation at the appropriate time and will be able to draw on the substantial materials already prepared during the work with McKinsey.

7. DWR Will Prepare a Financial Analysis and Economic Analysis When WaterFix Participants Are Identified

As the Report noted, DWR cannot complete a final economic analysis until individual water agencies define their level of involvement in WaterFix. We are pleased the ① Report reflects this consideration. (Report, p. 35.)

⑲ With regard to the WaterFix financial analysis, the Report appears to suggest that DWR must assess each water agency's needs and provide a final financial analysis before ① the decision to opt in to WaterFix is made. (Report, pp. 36-37.) This is not correct: DWR's contractor Public Finance Management has already provided a wide range of financing options to water contractor governing boards as tools to enable each contractor to determine what financing option would best work for them. To date, we have received no requests for additional information. Once individual agencies decide to participate, financing will be tailored to meet each agency's needs. There is no need to prepare a full financial analysis for each potential participant in WaterFix before the decision is made to opt in to the project.

8. DWR Has Performed Significant Planning During The Planning Stage and Has Maintained and Provided Extensive Documentation

The Report states DWR failed to update its Program Management Plan (PMP) and suggests that the absence of a PMP meant there was little or no documented WaterFix

planning effort. Although DWR did not update the PMP itself, DWR has maintained an extensive record of program management documents meeting the same planning function. DWR has provided State Auditor full access to all of the program management and planning documents on the program manager's database, Acononex, and on multiple occasions provided them with physical samples. These documents included but were not limited to documentation for the Business Committee, Core Policy, DCE, EIR/S, Biological Opinion, Project Manager, Finance, engineering, Request for Qualifications, major agreements, budget reports, invoices, and deliverables. Maintaining the critical project documentation throughout the program has been performed. (20)

Although DWR experienced management changes, as an industry best practice, DWR required that the program manager maintain all work plans and associated documents to provide continuity for the project. This practice provided seamless transitions without loss of institutional knowledge. This proved to be a successful strategy as the project continued to make consistent progress throughout management changes.

As evidenced in the program documents, as early as 2012 DWR anticipated project approvals by the federal and state participants and began preparing to transition to the design and construction phase. DWR began the update to the PMP for the design stage, but unexpected complexities of the project forced a delay in implementing the design stage and the PMP update effort was put on hold. Given the constantly changing nature of the planning process, DWR managed the project from workplans that could quickly be developed and implemented to react to changing conditions, which proved to more efficient than constantly updating the planning PMP.

B. RECOMMENDATIONS

In this section of DWR 's comments, DWR provides a response to the Auditor's recommendations made throughout the report. Since the recommendations are not consecutively numbered, DWR identifies them by the page on which they appear. DWR's response to the recommendation is provided in italicized text.

(Report, p. 21) To improve management of large and complex infrastructure projects, the Legislature should enact legislation requiring agencies to publicly report significant changes in the cost or schedule of such projects if they are expected to exceed their established budgets by 10 percent or schedules by 12 months. (1)

The Department will continue to abide by any existing or new laws, and takes no position on this general recommendation to the Legislature.

(Report, p. 21) To better manage large infrastructure projects, DWR should develop and implement a project reporting policy requiring its management staff to document and justify decisions to proceed with such projects if they are expected to (1)

Honorable Elaine M. Howle
September 28, 2017
Page 12

exceed their established budgets by 10 percent or schedules by 12 months. DWR should make these documented decisions and justifications publicly available and submit them to the Resources Agency for review and approval.

This recommendation does not make a distinction between the planning phase of a project and the design and construction phase. DWR believes this is an important distinction, as evidenced in the Report's findings for the planning phase of the WaterFix. The recommendation presupposes that an extension of time during a project planning phase is something that has a negative consequence. This recommendation has limited applicability here, since decisions regarding this project were made in response to stakeholder input and public comments to increase the range and scope to better meet the needs of the state. The planning process for large infrastructure projects is complex and subject to changing requirements and scope from a variety of sources including regulating agencies, project proponents, stakeholders, and the public at large. As seen with WaterFix, this results in increases in scope and schedules that are beyond the control of DWR. Limiting the Department's ability to be responsive to stakeholder input during complex "planning" efforts would be counterproductive. (21)

(1) (Report, p. 22) To ensure it makes appropriate use of its growing surplus revenue balance, by December 2017 DWR should develop a detailed plan describing how it intends to use these funds.

The Department is already in the process of preparing this plan related to Water Code section 12937(b)(4) funds.

(1) (Report, pp. 32-33) To fully comply with state contracting law, DWR should ensure that it competitively selects architectural and engineering consultants based on demonstrated competence and professional qualifications. In addition, DWR should document in the contract file its evaluation of the competence and professional qualifications of all contractors and any subcontractors that are added to the contract subsequent to the competitive selection process.

(3) *The Department will continue to comply with state contracting law including the process outlined above.*

(1) (Report, p. 33.) To ensure that only qualified subcontractors are added to contracts after the initial award is made, DWR should make sure that contractors select their own subcontractors and that DWR subsequently approves the selection after it verifies their qualifications.

(22) *It is essential that DWR work with a contractor to identify the specific tasks for which a subcontractor will be required. Additionally, it is important to convey to the contractor the expertise and qualifications necessary of the subcontractor in*

Honorable Elaine M. Howle
September 28, 2017
Page 13

order to ensure the most highly qualified subcontractor is chosen to accomplish the specified tasks. The Report's Recommendation, above, isolates DWR from such consultation. Without these communications, time is unnecessarily expended while the contractor attempts to obtain a suitable sub-contractor without the benefit of input from DWR. The recommended edit below allows for the indispensable communications necessary to successfully obtain, and approve, subcontractors.

Proposed Revision: To ensure that only qualified subcontractors are added to contracts after the initial award is made, DWR should make sure that contractors select their own subcontractors in consultation with DWR and that DWR subsequently approves the selection after it verifies their qualifications (Report, p. 33). (22) (1)

(Report, p. 33) DWR should ensure that it retains documentation in its contract files to support that contract prices are fair and reasonable. (1)

The Department agrees to adopt the above recommendation.

(Report, p. 41) To ensure that DWR manages WaterFix in an effective manner, DWR should complete both the economic analysis and financial analysis and make the analyses publicly available as soon as possible. (1)

As planned, the Department will release completed versions of these reports as soon as practicable. This will necessarily follow the determinations currently being contemplated by the public water agencies regarding level of participation.

(Report, p. 41.) In order to prepare for the potential approval of WaterFix and to ensure that the project is managed properly during the design and construction phase, DWR should do the following: (1)

- Develop an appropriate governance structure so that it is prepared to oversee the design and construction of WaterFix in the event it is ultimately approved.

A governance structure will be ready to be implemented to oversee the design and construction of WaterFix in the event it is ultimately approved.

- Develop and update when necessary the associated program management plan for the design and construction phase of the project.

The Department agrees to adopt the above recommendation.

Honorable Elaine M. Howle
September 28, 2017
Page 14

We appreciate this formal opportunity to respond to the Draft Audit Report No. 2016-132. If new evidence presents itself in the finalizing of this draft Report, DWR requests the opportunity to respond to such new information, which the Auditor may send to Deputy Director Taryn Ravazzini at taryn.ravazzini@water.ca.gov.

Sincerely,

Grant Davis
Director

Honorable Elaine M. Howle
September 28, 2017
Page 15

Attached Exhibits

1. URS Contract, Exhibit A (Scope of Work)
2. URS Contract, Amendment 1, Exh. E, Attachmt 6 (Covenants)
3. URS Contract, Exhibit D (Special Terms and Conditions)
4. URS Contract, Exhibit C (General Terms and Conditions)
5. URS Contract, Amendment 5, Std. 215 (Agreement Summary)

Exhibit 1

Exhibit A
Scope of Work

BACKGROUND:

The Department of Water Resources (DWR) requires the services of a consultant firm to assist with engineering support services and the program management of the planning, coordination and oversight of the programs, environmental engineering and construction phases, strategic program development, risk assessment and oversight of program costs and schedules of DWR's Delta Habitat Conservation and Conveyance Program (DHCCP).

DWR manages the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments. DWR operates California's State Water Project (SWP), the largest State-built multipurpose project in the United States. Through the SWP, DWR supplies good quality water for municipal, industrial, agricultural, and recreational uses and for protecting and enhancing fish and wildlife.

The heart of DWR's vital water supply system, the Sacramento-San Joaquin Delta, is in jeopardy of collapse without both immediate action and long term solutions to restore the ecosystem and protect water supplies. DWR is tasked to improve the Delta water conveyance system. DWR will also coordinate with the Bay Delta Conservation Plan to provide a foundation to help conserve the Delta ecosystem and a reliable water supply for California.

PURPOSE:

DWR requires a highly qualified firm with extensive experience to provide engineer support services and Program Management (PM) for the DHCCP under the DWR's direction. Some of the various areas of expertise required of the successful Program Management team include planning and implementation of large water resources infrastructure, strategic program development, project management, program risk assessment, oversight and coordination of environmental, engineering, and construction program phases. The PM Contractor will provide program management expertise of comparable size water resources programs but only at the direction and auspice of DWR authorized representative. Based on conceptual level estimates the DHCCP is anticipated to be in the range of 4 to 5 billion in present dollars.

DESCRIPTION:

A. The PM Contractor will serve as the DHCCP Program Manager and provide program/project management, coordination and oversight over the planning, development, coordination, and implementation of the DHCCP. The PM Contractor will provide necessary staff, including ancillary services in support of this effort, as required to support the DHCCP and manage the integration of DWR and Contractor staff to effectively implement the DHCCP as authorized and approved by the DWR authorized representative. It is DWR's expectation that the DHCCP Program Manager's team be fully integrated with DWR internal staff to effectively manage the implementation of the DHCCP. Upon approval, the PM Contractor will be authorized to perform the work per the contract within the funding and time limits outlined.

B. The PM Contractor shall be responsible for the professional quality, technical accuracy, and the coordination of all services furnished. Support service, including engineering, will be provided as needed to support DWR staff but only on a temporary basis. The PM Contractor shall, without additional compensation, correct or revise any errors or deficiencies in its work products including management reports, costs, schedules, risk analysis, drawings, specifications, and other engineering support services.

C. The PM Contractor will provide their best skill and judgment in discharging all duties and will promulgate and implement, efficient business administration, including best practices, and use their best efforts to complete the work in an expeditious and economical manner consistent with the best interest of DWR.

D. The PM Contractor shall maintain financial information both in written form and electronically as required by DWR including: books, records, documents, copies of receipts, and other evidence pertinent to the performance of the work in accordance with the provisions of this Scope of Work. In addition, financial information shall be compiled in accordance with consistently applied, generally accepted accounting principles, and made available for auditing purposes by authorized representatives of DWR or the State of California. Financial information shall be maintained until three years after the date of final payment for the work in accordance with the provisions of this Scope of Work. In addition, financial information and other program records shall be transferred to DWR upon their request and timelines.

E. The PM Contractor's staff shall be experienced in the use of software that is compatible with DWR's requirements in accordance with Exhibit D.10.

F. Resumes containing the qualifications and experience of the PM Contractor's personnel shall be submitted to the Division of Engineering's (DOE) Contract Manager for review prior to assignment on the DHCCP. If in the opinion of DOE's Contract Manager an individual lacks adequate experience, the PM Contractor's employee may be accepted on a trial basis until such time as the individual's ability to perform the required services has been demonstrated.

G. The DWR's DOE will have the ultimate responsibility of determining the quality and quantity of work performed by the PM Contractor's personnel. If, at any time, the level of performance is below expectations, DWR may release PM Contractor's personnel and request another person assigned as needed. DWR reserves the right to disapprove the assignment or the continuing assignment of specific contractor personnel, subcontractors, and subcontractor personnel. The PM Contractor's withdrawal of said personnel will be immediate upon DWR's Notice of Disapproval. Replacement personnel must be approved by DWR prior to their participation in the contract. Replacement personnel must report within seven calendar days after DWR approves PM Contractor personnel. Resumes will be required for any new personnel of the PM Contractor or subcontractor.

H. The PM Contractor is required to submit a written request and obtain the Chief of DOE approval at least 30 calendar days prior to changing previously approved lead program management staff. The PM Contractor is required to provide the DWR authorized representative with the technical qualifications of proposed replacement staff if allowed by DWR.

I. As the PM Contractor will be involved in coordinating and overseeing the work of other firms under contract for this program, the PM Contractor shall agree in writing that neither it nor any of its subsidiaries will submit proposals or bids for any other DHCCP contract work related to but not limited to environmental and engineering and construction services. The written agreement shall remain in force until one year after the completion of this contract. If the PM Contractor is a subsidiary of another company, the other company shall also make this written commitment.

J. The PM Contractor shall not receive compensation for any services that are found to be in conflict of interest. In the event of non-acceptance due to discovery of conflict of interest, the PM Contractor shall provide replacement deliverables free of any conflict of interest prior to payment. In the event replacement deliverables are not possible, the PM Contractor shall not receive compensation for the deliverables containing conflict of interest.

K. DWR does not guarantee, either expressly or by implication, that any work or services will be required under this contract. In addition, as the scope is developed, DWR reserves the right to add or delete related tasks as the

program evolves. In reference to the amount shown on the Standard 213, Item 3, the estimated amount of $60,000,000 can be decreased or increased by amendment to allow for program changes as the scope is more fully developed.

AVAILABLE INFORMATION:

The DWR will provide the selected PM Contractor existing and available studies, plans, and other information acquired by DWR that would be useful for the program.

PROCUREMENT AND CONTRACTING:

The PM Contractor will answer directly to DWR as lead Contractor. DWR will administer the contract and pay invoices submitted by the PM Contractor in accordance with Exhibit B. DWR will issue task orders for specific work assignments, tied to the contract in accordance with Exhibit A, Attachment I. Each task order will be budgeted, scheduled and compensated in accordance with Exhibit B, Attachment I, not to exceed limit.

DWR will take the lead in issuing task orders for this contract, and will be the sole source in directing the PM Contractor. DWR will work with PM Contractor to develop the task orders. Unless otherwise directed by DWR, any and all work performed by the PM Contractor and its sub-contractors in preparation of this contract shall be submitted directly to DWR.

DELIVERABLES:

The PM Contractor will be responsible for, but not limited to, the following services:

1. Under the general direction of the DWR authorized representative the PM Contractor will successfully implement the DHCCP, work cooperatively with DWR and other staff.
2. Develop and deliver presentations to DWR management and stakeholders, as required by DWR, on the status, direction, schedule, budgets, cost, and other applicable items related to the DHCCP.
3. Prepare and review required reports, correspondence, other documents related to the DHCCP as necessary, and provide timely comments, findings, and recommendations to DWR management in accordance with issued task orders.

4. Provide timely notifications and recommended actions to DWR management regarding significant issues that could or would impact the DHCCP.

5. Develop a PM Plan for the DHCCP that includes project budgets, needed resources, schedules, quality assurance, quality control, and performance measures in accordance with issued task orders. Ensure and report on cost, schedule, including significant milestones and meetings, and resources as compared to established baselines and provide corrective action and notification to DWR when variances occur.

6. Develop overall safety program and plans in conformance to DWR, State, and Federal policies, rules, and regulations. Also provide and foster good safety practices.

7. Coordinate, oversee, and monitor other DHCCP contractors including but not limited to environmental, engineering and construction services.

8. Establish and maintain a library of all DHCCP program/project documents electronic and written.

9. Develop scopes of work for other service contracts required for the DHCCP as directed by DWR.

10. Coordinate and provide oversight on construction contract bidding packages for procuring engineering and construction services in accordance with DWR procedures and policies.

11. Provide oversight, analysis, and quality control as required by DWR of other contractors associated with DHCCP to ensure contractual requirements are consistent and complete.

12. Assist in other service contracts required for DHCCP upon approval by DWR in accordance with issued task orders.

13. Develop and maintain a claims avoidance program throughout all phases of the program.

14. Develop a uniform format and editorial style manual for program documents in cooperation with DWR.

15. Maintain all financial records related to the Program Manager contract.

16. Coordinate and provide oversight with contractors related to the DHCCP including reviewing, auditing, and assisting with the processing of invoices.

17. Prepare and maintain specific plans and reports, such as the PM Plan, Milestone Schedule, Environmental Status Report, Engineering Status Report, Construction Status Report, Cash Flow Report, Project Close-Out Report, and Program Status Reports for DWR management along with other reports as needed.

18. Cooperate in a timely fashion with DWR to provide necessary program documents in response to any internal review and audit requests.

19. Implement a program management information system for budget, schedule, and records management and reporting to support this effort and in accordance with DWR issued task orders. PM information system shall be compatible and interface with DWR's information systems and requirements as specified in Exhibit D.10.

20. Define the business processes and program procedures necessary to implement a comprehensive program control system.

21. Prepare and maintain a work definition system that incorporates the work breakdown structure and the organization breakdown system translating functional requirements into identifiable elements of work as required.

22. Prepare and maintain a cost control system that measures expenditures and changes for program work elements, and measures them against established performance baselines as required.

23. Coordinate and provide cost estimating support to establish budgets and verify environmental, engineering and construction, and other project cost estimates as necessary.

24. Prepare Critical Path Method comprehensive program schedules addressing all program activities from program development through program close-out, measuring progress against these schedules, identifying and reporting trends and variances and recommending corrective actions.

25. The DHCCP control system shall also accurately display contracted, revised and forecasted costs for other contracts including environmental, engineering and construction contracts from award through completion.

26. Coordinate, monitor, and effectively integrate the work of the environmental contractor team with program management efforts, other appropriate DHCCP contractors, and DWR project teams.

27. Coordinate with DWR staff and provide assistance when required for the review of environmental cost estimates, schedules, and quality control of project work, and reports on program status.

28. Monitor, document, and report on the environmental contractor's conformance with budget, schedule, and overall performance of the work.

29. Coordinate, monitor, and effectively integrate the work of all DHCCP project teams, including but not limited to planning, environmental, real estate, mapping, engineering, construction, operations, etc.

30. Coordinate with DWR staff and provide support, when required, to provide technical engineering and constructability reviews, value engineering reviews, and reviews for operability, maintainability, and project reliability.

31. Coordinate with DWR staff and provide support, when required, to review the engineering cost estimates, project schedules, quality control of project work, and report on program status.

32. Coordinate, oversee, and monitor the engineering contractor's conformance with respect to budgets, costs, schedules, and overall performance of the work.

33. Coordinate with DWR staff and provide support when required of the review of all construction contract documents to ascertain that they are descriptive, complete, and in accordance with applicable codes, regulations, and design criteria prior to DWR's final approval and contract advertisement.

34. Assure adequate preparation and scheduling for pre-bid, pre-construction, progress, coordination, completion and project close-out meetings. This includes the preparation of all necessary notices, forms, documents, hand-outs, agendas, attendance records, minutes, action item lists and proper filing of meeting documents.

35. Assure responses to requests for clarifications/information, assistance, access, quotation, and coordination by other contractors is provided accurately and in a timely manner.

36. Oversight of work progress and inspection of the work placed to ascertain compliance with contract documents, industry standards, site security and safety, testing, housekeeping, budget quality, and schedule and the successful interface with other public and private entities.

37. Monitor, document, and report on the construction contractor's conformance with budget, cost, schedule, and overall performance of the work.

38. Oversee and monitor contract change requests, progress payments, schedule adjustments, completion, startup, and project acceptance are properly reviewed, evaluated, revised, approved, and implemented.

39. Provide oversight and reporting on significant contract changes to assure the best interests of DWR are maintained and contract requirements are enforced.

40. Assure project close-out procedures are planned, prepared, executed, documented, and completed for the successful training, startup, commissioning, and transfer of completed facilities to include inspection, preparation of completion certificates, receipt and review of contractor waivers, certifications, operations and maintenance data, as-built drawings and warranties, etc., and the preparation and execution of transfer documents.

41. The PM Contractor will lead the overall effort to foster and sustain a strong integrated team of assigned staff from DWR and the DHCCP Program Manager as well as staff from other agencies and contractors part of the DHCCP.

42. Establish and maintain a DHCCP office in Sacramento, California for staff from DWR and PM Contractor as well as staff from other agencies and contractors if required. Selection of location is subject to DWR approval.

43. Assist DWR in developing an overall program organizational structure to successfully implement the DHCCP within required timelines and budgets.

44. Implement continuous program improvement processes.

45. Assist DWR in maintaining a team spirit, cooperation between program participants, and good lines of communication.

POTENTIAL ADDITIONAL SERVICES:

DWR reserves the right to have the PM Contractor provide the following additional services. The PM Contractor could be required to provide support expertise in planning, environmental, engineering and construction, and other program management areas when requested. Other areas could include:

1. Assist DWR with public information/public outreach efforts.
2. Program and/or project risk assessment.
3. Water resources and recreational planning.
4. Water rights specialist to support program work.
5. Safety management and oversight.
6. Real Estate services.

CONTACT INFORMATION:

The Authorized DWR and PM Contractor representatives during the term of this agreement will be:

Department of Water Resources
Representative: Richard Sanchez
1416 9th Street, Room 406-8
Sacramento, California 95814
Phone: (916) 653-3927
Fax: (916) 653-2467
Email: richs@water.ca.gov

Washington Division of URS Corporation
Representative: Joseph Ehasz
2870 Gateway Oaks Drive Suite 150
Sacramento, CA 95833
Phone: (916) 835-5200
Fax: (916) 679-2900
Email: Joseph.Ehasz@wgint.com

DOE's Contract Manager for all administrative purposes for this contract is Teresa Engstrom at (916) 653-1993 or tengstro@water.ca.gov. Contract Managers may be changed by written notice to the other party.

DISABLED VETERAN BUSINESS ENTERPRISE (DVBE) PROGRAM REQUIREMENTS

A. The State of California's mandated DVBE Participation Program is an element of this contract and shall be included in all future contract amendments. DVBE program requirements may be required relevant to specific Task Orders and will be at the discretion of the Department to be determined on a Task Order-by-Task Order basis. Amendments to Task Orders with DVBE requirements shall also be subject to continued DVBE subcontracting requirements.

B. DVBE Program Participation Goals of 3 percent have been set for this contract effort and will be the goal of each Task Order issued.

Exhibit 2

COVENANTS

Background:

Washington Group International, Inc., d/b/a Washington Division of URS Corporation ("URS—WD"), has been performing program management services and engineer support services for the Delta Habitat Conservation and Conveyance Program ("DHCCP") since May 2008 under Agreement No. 4600008104 ("the Agreement") with the California Department of Water Resources ("DWR"). The Agreement is administered by DWR's Department of Engineering ("DOE"). URS—WD must transition a new individual into the Program Manager role due to demands related to its current employee's career phase. DWR has directed URS—WD to engage Mr. Charles Gardner, president of Hallmark Group, Inc. ("Hallmark"), to fill the position of Program Manager by subcontracting with Hallmark for this purpose. Mr. Gardner will be providing general direction to URS—WD in coordination with DWR, while at the same time being subject to contractual obligations under a URS—WD subcontract with Hallmark, which will give URS—WD control of subcontract payments. To clarify the roles and responsibilities of the parties and subcontractor Hallmark, and in order to avoid the appearance of or any actual conflicts of interest that might arise from such an arrangement (the "Conflict"), the parties have agreed to amend the Agreement. The covenants set out below are for the purposes of preventing any actual or apparent conflicts from arising, and to permit work under the Agreement to proceed effectively. URS—WD agrees to subcontract with Hallmark for Mr. Gardner's services as Program Manager under the terms and conditions set forth in this Amendment.

Covenants:

1. Hallmark Subcontract.

   a. Upon agreement and execution by DWR and URS—WD of this Amendment, DWR will issue a Task Order which directs URS—WD to enter into a subcontract with Hallmark to provide the services of Mr. Gardner to function as the Program Manager on a full time basis as well as other Hallmark personnel as reasonably required to effectively perform the Program Manager function, all in accordance with the terms and conditions of this Amendment. URS-WD shall make good faith efforts to enter into such a subcontract (Subcontract) with Hallmark on terms and conditions reasonably acceptable to URS—WD.

   b. The Subcontract shall specify that Hallmark is an independent contractor and is not the agent or employee of DWR or URS—WD. Except as otherwise provided for in this Amendment, all other terms and conditions of the Subcontract shall be in accordance with the terms and conditions of the Agreement.

2. Hallmark Invoices.

   a. To maintain transparency in all matters related to the Conflict, DWR shall make the sole and final determination as to the payment to Hallmark of any and all amounts invoiced by Hallmark.

   b. The Subcontract will require Hallmark to submit each invoice for payment to URS-WD and to simultaneously send a copy directly to DOE's Contract Manager. Promptly upon receipt of the invoice, URS-WD shall submit an invoice to DWR consisting solely of the amount invoiced by Hallmark and with a copy of Hallmark's invoice attached. After receipt of the URS—WD invoice for Hallmark services, DWR shall provide written notice to URS-WD of those portions of Hallmark's invoice that are approved for payment, and the details and rationale for those portions of the invoice that are questioned or not approved for payment by DWR.

   c. The time period for payment of URS-WD's invoices for amounts invoiced by Hallmark shall start at the date received from URS—WD by DOE's Contract Manager. DWR will perform the review and approval function and provide the written notice that are specified in paragraph 2.b. of this Amendment, in accordance with the timelines stated in Exhibit B of the Agreement and subject to the Budget Contingency Clause of Exhibit B of the Agreement.

   d. Hallmark's right to payment for services performed under the subcontract between URS-WD and Hallmark, is subject to the prior approval by DWR of the invoices submitted by Hallmark to URS-WD. URS-WD shall make payment to Hallmark for any services rendered only to the extent that the invoice for those services has been approved by DWR. This condition precedent to payment of a URS-WD subcontractor under this Agreement shall be effective only as to Hallmark and not to any other subcontractor under this Agreement.

   e. Except as otherwise provided for in this section 2, the payment terms of the Subcontract shall be substantively the same as the payment terms of the Agreement.

3. Conflict of Interest.

   a. Each party shall promptly notify the other upon the discovery or realization of any actual or potential act or omission by any party, including Hallmark, against the interests arising from the Agreement, and the parties shall promptly implement all reasonable measures to eliminate or satisfactorily mitigate the conflict of interest and any actual or potential impact thereof. Such mitigating measures shall not extend to termination of URS-WD.

b. Except to the extent URS-WD fails or refuses to follow the requirements of this Amendment or of any measures implemented pursuant to paragraph 3.a above, DWR and the State of California hereby waive any claim that URS-WD is in breach of the Agreement or is not entitled to compensation for services, due to any actual or apparent conflict of interest arising in any way out of or in connection with the circumstances described in the Background paragraph of this Amendment.

4. Hallmark Authority.

a. Mr. Gardner will be reporting directly to and receive direction from DWR. Chief of DOE Richard Sanchez will remain DWR's signatory and authorized representative for purposes of the Agreement.

b. Neither Mr. Gardner nor the Hallmark Group is authorized to make any binding commitment for or on behalf of DWR or URS-WD. By way of example and without limiting the generality of the foregoing, neither Mr. Gardner nor the Hallmark Group is authorized to do any of the following in connection with the Agreement or any other agreement to which DWR is a party: (i) approve or execute Task Orders, Task Order Amendments or Amendments to this Agreement; (ii) authorize or approve any increase or decrease in compensation; or (iii) authorize, approve or waive any deviation from any contractual requirements, including but not limited to, any change in scope of work or time of performance.

c. Mr. Gardner is authorized to provide general direction to URS-WD on behalf of DWR, within the boundaries of the Agreement, by communicating and coordinating with URS-WD's Assistant Program Manager. Neither Mr. Gardner nor Hallmark are authorized to dictate the means or methods of URS-WD's personnel performing the work under the Agreement, but are authorized to communicate with, exchange information with and make such specific requests to such personnel that will, in their judgment, effectively coordinate DHCCP activities and contribute to achieving schedule milestones. URS-WD shall cooperate with Mr. Gardner in his role as Program Manager and shall promptly notify DWR of any issue or concern regarding direction received from or other interaction with Mr. Gardner.

d. DWR shall notify and/or make arrangements with DWR's other DHCCP contractors that provides for Mr. Gardner to perform Program Manager authority with respect to their operations that is similar to the authority specified above with respect to URS-WD's operations.

5. Limitation of Liability and Indemnity.

   a. URS-WD's liability to DWR in any manner arising out of or in connection with any act, omission, negligence or any other aspect of Mr. Gardner's or Hallmark's performance that is the subject of this Amendment shall be strictly limited to whatever damages or other relief URS-WD actually obtains from Mr. Gardner or Hallmark. This limitation shall apply to claims in contract, tort (including negligence), indemnity, warranty or any other legal theory. This section 5 is a material provision of this Amendment. However, nothing in this section 5 shall relieve URS-WD from liability to the proportionate extent of URS-WD's own fault or negligence (excluding fault or negligence arising from a duty based on URS-WD's employment of Hallmark as a subcontractor, such as but not limited to failure to properly supervise a subcontractor or any claim based on a master-servant relationship, *respondent superior*, or breach of a non-delegable duty).

   b. DWR will defend and indemnify URS-WD against third party claims based on or concerning any actual or alleged conflict of interest arising out of or in connection with this Amendment or its implementation.

Exhibit 3

State of California Department of Water Resources The Resources Agency

Contract # 4600008104
Exhibit D
Page 1 of 3

Special Terms and Conditions for Department of Water Resources (Over $5,000 Standard Payable)

1. EXCISE TAX: The State of California is exempt from Federal Excise Taxes, and no payment will be made for any taxes levied on employees' wages.

2. RESOLUTION OF DISPUTES: In the event of a dispute, Contractor shall file a "Notice of Dispute" with the Director or the Director's Designee within ten (10) days of discovery of the problem. The State and Contractor shall then attempt to negotiate a resolution of such claim and, if appropriate, process an amendment to implement the terms of any such resolution. If the State and Contractor are unable to resolve the dispute, the decision of the Director or the Director's Designee shall be final, unless appealed to a court of competent jurisdiction.

   In the event of a dispute, the language contained within this agreement shall prevail over any other language including that of the bid proposal.

3. PAYMENT RETENTION CLAUSE: ~~Ten~~ *Five* percent of any progress payments that may be provided for under this contract shall be withheld ~~per Public Contract Code Section 10346 pending satisfactory completion of all services under the contract~~ *and paid on a quarterly basis after receipt of invoice for retention amount.*

4. AGENCY LIABILITY: The Contractor warrants by execution of this Agreement, that no person or selling agency has been employed or retained to solicit or secure this Agreement upon agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty, the State shall, in addition to other remedies provided by law, have the right to annul this Agreement without liability, paying only for the value of the work actually performed, or otherwise recover the full amount of such commission, percentage, brokerage, or contingent fee.

5. POTENTIAL SUBCONTRACTORS: Nothing contained in this Agreement or otherwise shall create any contractual relation between the State and any subcontractors, and no subcontract shall relieve the Contractor of its responsibilities and obligations hereunder. The Contractor agrees to be as fully responsible to the State for the acts and omissions of its subcontractors and of persons either directly or indirectly employed by any of them as it is for the acts and omissions of persons directly employed by the Contractor. The Contractor's obligation to pay its subcontractors is an independent obligation from the State's obligation to make payments to the Contractor. As a result, the State shall have no obligation to pay or enforce the payment of any moneys to any subcontractor.

6. SUBCONTRACTING: The Contractor is responsible for any work it subcontracts. Subcontracts must include all applicable terms and conditions of this Agreement. Any subcontractors, outside associates, or consultants required by the Contractor in connection with the services covered by this Agreement shall be limited to such individuals or firms as were specifically identified in the bid or agreed to during negotiations for this Agreement, or as are specifically authorized by the Contract Manager during the performance of this Agreement. Any substitutions in, or additions to, such subcontractors, associates or consultants shall be subject to the prior written approval of the Contract Manager. Contractor warrants, represents and agrees that it and its subcontractors, employees and representatives shall at all times comply with all applicable laws, codes, rules and regulations in the performance of this Agreement. Should State determine that the work performed by a subcontractor is substantially unsatisfactory and is not in substantial accordance with the contract terms and conditions, or that the

7. RENEWAL OF CCC: Contractor shall renew the Contractor Certification Clauses or successor documents every three (3) years or as changes occur, whichever occurs sooner.

8. REPORT OF RECYCLED CONTENT CERTIFICATION: In accordance with Public Contract Code Sections 12200, 12205, 12209, and 12156(e), the contractor will complete and return the form DWR 9557, Recycled Content Certification, for each required product to the Department at the conclusion of services specified in this contract. Form DWR 9557 is attached to this Exhibit and made part of this contract by this reference.

9. TERMINATION CLAUSE: The State may terminate this contract without cause upon 30 days advance written notice. The Contractor shall be reimbursed for all reasonable expenses incurred up to the date of termination.

10. COMPUTER SOFTWARE: For contracts in which software usage is an essential element of performance under this Agreement, the Contractor certifies that it has appropriate systems and controls in place to ensure that state funds will not be used in the performance of this contract for the acquisition, operation or maintenance of computer software in violation of copyright laws.

11. PRIORITY HIRING CONSIDERATIONS: For contracts, other than consulting services contracts, in excess of $200,000, the Contractor shall give priority consideration in filling vacancies in positions funded by the contract to qualified recipients of aid under Welfare and Institutions Code Section 11200 (Public Contract Code Section 10353).

12. EQUIPMENT RENTAL AGREEMENTS: This provision shall apply to equipment rental agreements. The State shall not be responsible for loss or damage to the rented equipment arising from causes beyond the control of the State. The State's responsibility for repairs and liability for damage or loss to such equipment is restricted to that made necessary or resulting from the negligent act or omission of the State or its officers, employees, or agents.

13. CONFLICT OF INTEREST:

a. Current and Former State Employees: Contractor should be aware of the following provisions regarding current or former state employees. If Contractor has any questions on the status of any person rendering services or involved with the Agreement, the awarding agency must be contacted immediately for clarification.

(1) Current State Employees: (PCC §10410)

(a) No officer or employee shall engage in any employment, activity or enterprise from which the officer or employee receives compensation or has a financial interest and which is sponsored or funded by any state agency, unless the employment, activity or enterprise is required as a condition of regular state employment.

(b) No officer or employee shall contract on his or her own behalf as an independent contractor with any state agency to provide goods or services.

(2) Former State Employees: (PCC §10411)

(a) For the two-year period from the date he or she left state employment, no former state officer or employee may enter into a contract in which he or she engaged in any of the negotiations, transactions, planning, arrangements or any part of the decision-making process relevant to the contract while employed in any capacity by any state agency.

(b) For the twelve-month period from the date he or she left state employment, no former state officer or employee may enter into a contract with any state agency if he or she was employed by that state agency in a policy-making position in the same general subject area as the proposed contract within the 12-month period prior to his or her leaving state service.

b. Penalty for Violation:

(a) If the Contractor violates any provisions of above paragraphs, such action by Contractor shall render this Agreement void. (PCC §10420)

c. Members of Boards and Commissions:

(a) Members of boards and commissions are exempt from this section if they do not receive payment other than payment of each meeting of the board or commission, payment for preparatory time and payment for per diem. (PCC §10430 (e)

d. Representational Conflicts of Interest:

The Contractor must disclose to the DWR Program Manager any activities by contractor or subcontractor personnel involving representation of parties, or provision of consultation services to parties, who are adversarial to DWR. DWR may immediately terminate this contract if the contractor fails to disclose the information required by this section. DWR may immediately terminate this contract if any conflicts of interest cannot be reconciled with the performance of services under this contract.

e. Financial Interest in Contracts:

Contractor should also be aware of the following provisions of Government Code §1090:

"Members of the Legislature, state, county district, judicial district, and city officers or employees shall not be financially interested in any contract made by them in their official capacity, or by any body or board of which they are members. Nor shall state, county, district, judicial district, and city officers or employees be purchasers at any sale or vendors at any purchase made by them in their official capacity."

f. Prohibition for Consulting Services Contracts:

For consulting services contracts (see PCC §10335.5), the Contractor and any subcontractors (except for subcontractors who provide services amounting to 10 percent or less of the contract price) may not submit a bid/SOQ, or be awarded a contract, for the provision of services, procurement of goods or supplies or any other related action which is required, suggested, or otherwise deemed appropriate in the end product of such a consulting services contract (see PCC §10365.5).

Exhibit 4

GTC 307

EXHIBIT C

GENERAL TERMS AND CONDITIONS

1. APPROVAL: This Agreement is of no force or effect until signed by both parties and approved by the Department of General Services, if required. Contractor may not commence performance until such approval has been obtained.

2. AMENDMENT: No amendment or variation of the terms of this Agreement shall be valid unless made in writing, signed by the parties and approved as required. No oral understanding or Agreement not incorporated in the Agreement is binding on any of the parties. *This term is subject to the provisions of Exhibit A, Item K.*

3. ASSIGNMENT: This Agreement is not assignable by the Contractor, either in whole or in part, without the consent of the State in the form of a formal written amendment.

4. AUDIT: Contractor agrees that the awarding department, the Department of General Services, the Bureau of State Audits, or their designated representative shall have the right to review and to copy any records and supporting documentation pertaining to the performance of this Agreement. Contractor agrees to maintain such records for possible audit for a minimum of three (3) years after final payment, unless a longer period of records retention is stipulated. Contractor agrees to allow the auditor(s) access to such records during normal business hours and to allow interviews of any employees who might reasonably have information related to such records. Further, Contractor agrees to include a similar right of the State to audit records and interview staff in any subcontract related to performance of this Agreement. (Gov. Code §8546.7, Pub. Contract Code §10115 et seq., CCR Title 2, Section 1896).

5. INDEMNIFICATION: *To the extent of the Contractor's negligent errors or omissions or willful misconduct,* Contractor agrees to indemnify, defend and save harmless the State, its officers, agents and employees from any and all claims and losses accruing or resulting to any and all contractors, subcontractors, suppliers, laborers, and any other person, firm or corporation furnishing or supplying work services, materials, or supplies in connection with the performance of this Agreement, and from any and all claims and losses accruing or resulting to any person, firm or corporation who may be injured or damaged by Contractor in the performance of this Agreement.

6. DISPUTES: Contractor shall continue with the responsibilities under this Agreement during any dispute.

7. TERMINATION FOR CAUSE: The State may terminate this Agreement and be relieved of any payments should the Contractor fail to perform the requirements of this Agreement at the time and in the manner herein provided. In the event of such termination the State may proceed with the work in any manner deemed proper by the State. All costs to the State shall be deducted from any sum due the Contractor under this Agreement and the balance, if any, shall be paid to the Contractor upon demand.

8. INDEPENDENT CONTRACTOR: Contractor, and the agents and employees of Contractor, in the performance of this Agreement, shall act in an independent capacity and not as officers or employees or agents of the State.

9. RECYCLING CERTIFICATION: The Contractor shall certify in writing under penalty of perjury, the minimum, if not exact, percentage of post consumer material as defined in the Public Contract Code Section 12200, in products, materials, goods, or supplies offered or sold to the State regardless of whether the product meets the requirements of Public Contract Code Section 12209. With respect to printer or duplication cartridges that comply with the requirements of Section 12156(e), the certification required by this subdivision shall specify that the cartridges so comply (Pub. Contract Code §12205).

10. NON-DISCRIMINATION CLAUSE: During the performance of this Agreement, Contractor and its subcontractors shall not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, physical disability (including HIV and AIDS), mental disability, medical condition (cancer), age (over 40), marital status, and denial of family care leave. Contractor and subcontractors shall insure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment. Contractor and subcontractors shall comply with the provisions of the Fair Employment and Housing Act (Gov. Code §12990 (a-f) et seq.) and the applicable regulations promulgated thereunder (California Code of Regulations, Title 2, Section 7285 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code Section 12990 (a-f), set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations, are incorporated into this Agreement by reference and made a part hereof as if set forth in full. Contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other Agreement.

Contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the Agreement.

11. CERTIFICATION CLAUSES: The CONTRACTOR CERTIFICATION CLAUSES contained in the document CCC 307 are hereby incorporated by reference and made a part of this Agreement by this reference as if attached hereto.

12. TIMELINESS: Time is of the essence in this Agreement.

13. COMPENSATION: The consideration to be paid Contractor, as provided herein, shall be in compensation for all of Contractor's expenses incurred in the performance hereof, including travel, per diem, and taxes, unless otherwise expressly so provided.

14. GOVERNING LAW: This contract is governed by and shall be interpreted in accordance with the laws of the State of California.

15. ANTITRUST CLAIMS: The Contractor by signing this agreement hereby certifies that if these services or goods are obtained by means of a competitive bid, the Contractor shall comply with the requirements of the Government Codes Sections set out below.
a. The Government Code Chapter on Antitrust claims contains the following definitions:
1). "Public purchase" means a purchase by means of competitive bids of goods, services, or materials by the State or any of its political subdivisions or public agencies on whose behalf the Attorney General may bring an action pursuant to subdivision (c) of Section 16750 of the Business and Professions Code.
2). "Public purchasing body" means the State or the subdivision or agency making a public purchase. Government Code Section 4550.

b. In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder. Government Code Section 4552.

c. If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery. Government Code Section 4553.

d. Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action. See Government Code Section 4554.

16. CHILD SUPPORT COMPLIANCE ACT: "For any Agreement in excess of $100,000, the contractor acknowledges in accordance with Public Contract Code 7110, that:

a). The contractor recognizes the importance of child and family support obligations and shall fully comply with all applicable state and federal laws relating to child and family support enforcement, including, but not limited to, disclosure of information and compliance with earnings assignment orders, as provided in Chapter 8 (commencing with section 5200) of Part 5 of Division 9 of the Family Code; and

b) The contractor, to the best of its knowledge is fully complying with the earnings assignment orders of all employees and is providing the names of all new employees to the New Hire Registry maintained by the California Employment Development Department."

17. UNENFORCEABLE PROVISION: In the event that any provision of this Agreement is unenforceable or held to be unenforceable, then the parties agree that all other provisions of this Agreement have force and effect and shall not be affected thereby.

18. PRIORITY HIRING CONSIDERATIONS: If this Contract includes services in excess of $200,000, the Contractor shall give priority consideration in filling vacancies in positions funded by the Contract to qualified recipients of aid under Welfare and Institutions Code Section 11200 in accordance with Pub. Contract Code §10353.

Exhibit 5

AGREEMENT SUMMARY
STD 215 (Rev 4/2003)

☒ CHECK HERE IF ADDITIONAL PAGES ARE ATTACHED

AGREEMENT NUMBER	AMENDMENT NUMBER
4600006104	5

1. CONTRACTOR'S NAME: URS Energy & Construction, Inc.
2. FEDERAL I.D. NUMBER: 34-0217470
3. AGENCY TRANSMITTING AGREEMENT: Department of Water Resources
4. DIVISION, BUREAU, OR OTHER UNIT: Division of Engineering
5. AGENCY BILLING CODE: 81000
6. NAME AND TELEPHONE NUMBER OF CONTRACT ANALYST FOR QUESTIONS REGARDING THIS AGREEMENT
7. HAS YOUR AGENCY CONTRACTED FOR THESE SERVICES BEFORE?
☒ NO ☐ YES (*If YES, enter prior contractor name and Agreement Number*)
8. BRIEF DESCRIPTION OF SERVICES - LIMIT 72 CHARACTERS INCLUDING PUNCTUATION AND SPACES
Amend to add money, new subcontractor, and additional Task Order template
9. AGREEMENT OUTLINE *(Include reason for Agreement; Identify specific problem, administrative requirement, program need or other circumstances making the Agreement necessary; include special or unusual terms and conditions.)*

See Std. 215, Page 3 of 4

10. PAYMENT TERMS *(More than one may apply.)*
☐ MONTHLY FLAT RATE ☐ QUARTERLY ☐ ONE-TIME PAYMENT ☐ PROGRESS PAYMENT
☒ ITEMIZED INVOICE ☐ WITHHOLD ____ % ☐ ADVANCED PAYMENT NOT TO EXCEED
☐ REIMBURSEMENT/REVENUE $ ____ or ____ %
☒ OTHER *(Explain)* No more often than monthly, in arrears

11. PROJECTED EXPENDITURES FUND TITLE	ITEM	F.Y.	CHAPTER	STATUTE	PROJECTED EXPENDITURES
WRRF	3860-902-0691	12/13	186/86	Sec. 135 WC	$10,000,000.00
					$

OBJECT CODE: Unknown / GL Acct 9032640200
AGREEMENT TOTAL $ 70,000,000.00
OPTIONAL USE: Contract Manager: Allan Davis (916) 952-2779
AMOUNT ENCUMBERED BY THIS DOCUMENT $ 10,000,000.00
I CERTIFY upon my own personal knowledge that the budgeted funds for the current budget year are available for the period and purpose of the expenditure stated above.
PRIOR AMOUNT ENCUMBERED FOR THIS AGREEMENT $ 60,000,000.00
ACCOUNTING OFFICER'S SIGNATURE: See attached funding strip
DATE SIGNED:
TOTAL AMOUNT ENCUMBERED TO DATE $ 70,000,000.00

12, AGREEMENT	TERM From	TERM Through	TOTAL COST OF THIS TRANSACTION	BID, SOLE SOURCE, EXEMPT
Original	5/27/08	12/31/15	$ 60,000,000.00	RFQ
Amendment No. 1	5/27/08	12/31/15	$ 0.00	Exempt – add personnel
Amendment No. 2	5/27/08	12/31/15	$ 0.00	Exempt – add personnel
Amendment No. 3	5/27/08	12/31/15	$ 0.00	Exempt – add personnel and testing rates
Amendment No. 4	5/27/08	12/31/15	$ 0.00	Exempt – add personnel and rates
Amendment No. 5	5/27/08	12/31/15	$ 10,000,000.00	Exempt – add subcontractor
		TOTAL	$ 70,000,000.00	

(Continue)

STATE OF CALIFORNIA
AGREEMENT SUMMARY
STD. 215 (Rev. 4/2002)

13. BIDDING METHOD USED:
☐ REQUEST FOR PROPOSAL (RFP) ☐ INVITATION FOR BID (IFB) ☐ USE OF MASTER SERVICE AGREEMENT
(Attach justification if secondary method is used)
☐ SOLE SOURCE CONTRACT *(Attach STD. 821)* ☐ EXEMPT FROM BIDDING *(Give authority for exempt status)* ☐ OTHER *(Explain)* 23CCR387 and GC 4525 et seq.
NOTE: *Proof of advertisement in the State Contracts Register or an approved form STD. 821, Contract Advertising Exemption Request, must be attached*

14. SUMMARY OF BIDS *(List of bidders, bid amount and small business status) (If an amendment, sole source, or exempt, leave blank)*
N/A - Amendment

15. IF AWARD OF AGREEMENT IS TO OTHER THAN THE LOWER BIDDER, PLEASE EXPLAIN REASON(S) *(If an amendment, sole source, or exempt, leave blank)*
N/A - Amendment

16. WHAT IS THE BASIS FOR DETERMINING THAT THE PRICE OR RATE IS REASONABLE?

See Std. 215, page 4 of 4

17. JUSTIFICATION FOR CONTRACTING OUT *(Check one)*
☐ Contracting out is based on cost savings per Government Code 19130(a). The State Personnel Board has been so notified. ☐ Contracting out is justified based on Government Code 19130(b) Justification for the Agreement is described below.
Justification:
N/A - RFQ pursuant to Government Code Section 4525 et seq.

18. FOR AGREEMENTS IN EXCESS OF $5,000, HAS THE LETTING OF THE AGREEMENT BEEN REPORTED TO THE DEPARTMENT OF FAIR EMPLOYMENT AND HOUSING?	19. HAVE CONFLICT OF INTEREST ISSUES BEEN IDENTIFIED AND RESOLVED AS REQUIRED BY THE STATE CONTRACT MANUAL SECTION 7.10?	20. FOR CONSULTING AGREEMENTS, DID YOU REVIEW ANY CONTRACTOR EVALUATIONS ON FILE WITH THE DGS LEGAL OFFICE?
☐ NO ☒ YES ☐ N/A	☐ NO ☒ YES ☐ N/A	☐ NO ☐ YES ☐ NONE ON FILE ☒ N/A

21. IS A SIGNED COPY OF THE FOLLOWING ON FILE AT YOUR AGENCY FOR THIS CONTRACTOR?
A. CONTRACTOR CERTIFICATION CLAUSES ☐ NO ☒ YES ☐ N/A
B. STD. 204, VENDOR DATA RECORD ☐ NO ☒ YES ☐ N/A

22. REQUIRED RESOLUTIONS ARE ATTACHED ☐ NO ☐ YES ☒ N/A

23. ARE DISABLED VETERANS BUSINESS ENTERPRISE GOALS REQUIRED? *(If an amendment, explain changes, if any)*
☐ NO *(Explain below)* ☒ YES *(If YES complete the following)*
DISABLED VETERAN BUSINESS ENTERPRISES: 3 % OF AGREEMENT
☐ Good faith effort documentation attached if 3% goal is not reached.
☐ We have determined that the contractor has made a sincere good faith effort to meet the goal.
Explain:
Exemption from DVBE participation (#35) was approved on March 19, 2008. DVBE Program requirements will be applied on a Task Order basis for this contract.

24. IS THIS A SMALL BUSINESS CERTIFIED BY OSBCR? ☐ NO ☐ YES *(Indicate Industry Group)* SMALL BUSINESS REFERENCE NUMBER

25. IS THIS AGREEMENT (WITH AMENDMENTS) FOR A PERIOD OF TIME LONGER THAN ONE YEAR? *(If YES, provide justification)* ☐ NO ☐ YES
The DHCCP - when finalized - will provide essential environmental restoration and water supply to California. This multi-year contract provides the engineering support services and program management services that will assist in the DHCCP completion. In order for the DHCCP to be successful, continual engineering support services and program management services need to be in place; therefore, this multi-year contract is in the best interest of the state.

I certify that all copies of the referenced Agreement will conform to the original Agreement sent to the Department of General Services.

SIGNATURE/TITLE	TITLE	DATE SIGNED
	Richard Sanchez, Chief	10/11/17

Contract No. 4600008104, Am. 5
Std. 215
Page 3 of 4

9. AGREEMENT OUTLINE

The purpose of this Amendment is to add ten million dollars to the contract and add the firm McKinsey & Company as a subcontractor. Additionally, this Contract Amendment provides for the development of governance and organizational structures for the DHCCP using Deliverables Paid Task Orders (DPTO). The DHCCP has been delayed due to issues related to completing the public draft of the EIR/EIS. Furthermore, the DHCCP organizational structure is very cumbersome and has left a need for additional program management support in the form of new subcontractor. Additional funds are needed to insure that the program management effort remains at the current levels through the completion of the environmental documentation preparation phase and for the new subcontractor to develop the DHCCP governance and organizational structure.

The DHCCP has progressed to a phase where the organizational structure and governance have become increasingly critical to the future success for design and construction of the project. Since January of 2012 attempts have been made to create a governance structure that addresses the issues of organization, governance, decision rights, and project implementation. These efforts had limited success and were costly in terms of real dollars and lost productivity. It was requested by the DHCCP Business Committee that highly specialized consultants be retained and tasked with resolving these fundamental issues.

Bringing on McKinsey & Company to be a subcontractor to Hallmark will allow for the successful completion of the governance and organizational structure of the DHCCP. Two phases as DPTO may be initiated under this contract. Phase one will provide the development of the DHCCP governance options, and phase two will contain the decision rights and implementation. DPTO will be used in order to better meet the governance and organizational needs for this contract as well. URS will not be legally responsible for McKinsey's work product. DWR releases URS Energy & Construction, Inc. from any claims for any loss, liability, or damages arising out of or in connection with any act omission, negligence or any other aspect of McKinsey & Company's performance and Hallmark Group Inc.'s performance under the McKinsey DPTO, regardless of the legal theory under which the claim is made. DWR will defend and indemnify URS Energy & Construction, Inc. against any claims from any party other than DWR arising out of or in connection with the performance of McKinsey & Company and Hallmark Group Inc. under the McKinsey DPTO.

Due to the limited success of the extensive effort that has already taken place, and the diverse nature of the stakeholders, it is not practical to estimate the number of consultant hours that will be required. The structure of the contract, fixed fee based on deliverables, is beneficial to both DWR and the stakeholders that will ultimately pay the costs for this consultant, since the consultant is only authorized to bill the fixed price for deliverables that have been accepted and approved, as opposed to hourly labor each month.

This Amendment is also updating Exhibit E, Attachment 1 - Travel and Per Diem Expenses.

16. WHAT IS THE BASIS FOR DETERMINING THAT THE PRICE OR RATE IS RESONABLE?

This Contract Amendment adds the ability to do Deliverable Paid Task Orders (DPTO) for the development of governance and organizational structures of the DHCCP only. Each DPTO will be independently reviewed and a fair and reasonable price will be determined for each deliverable. Ten million dollars total will be added to the Contract through this Amendment. Two million six hundred thousand dollars of the money being added to the Contract will be specifically assigned to DPTOs. The remaining amount of the funding is to insure that the program management effort stays at the current levels through the completion of the environmental documentation preparation phase.

Services provided by McKinsey & Company through DPTOs – also called "McKinsey DPTOs" - will not exceed $2,691,000. This Contracts' DPTOs will not exceed $2,691,000. Two phases will break-up the $2,691,000 and are listed below. The DWR Contract Manager will determine if Phase II is necessary.

a. Phase I - Developing DHCCP Governance Options: $1,345,500 (which includes the 3.5% mark-up to URS Energy & Construction, Inc.)

b. Phase II - Decision Rights and Implementation: $1,345,500 (which includes the 3.5% mark-up to URS Energy & Construction, Inc.)

Since January of 2012 attempts have been made by DWR Management, DWR DHCCP Program Manager, and State Water Project contractors to create a governance structure that addresses the issues of organization, governance, decision rights, and project implementation. For the last nine (9) months, these efforts produced limited success and were costly in terms of real dollars and lost productivity to the DHCCP Program. Due to the unique and immensely important nature of the DHCCP governance structure, the price negotiated for McKinsey is fair and reasonable because McKinsey will be able to finalize a governance structure for the DHCCP that addresses the issues above by using a Deliverables Paid Task Order method where payment is dependent on deliverables completed.

The non-DPTO funding will be billed using the rate schedule originally negotiated per Exhibit B, Attachment 1 or original Contract. The originally negotiated rates were deemed fair and reasonable after comparing them to existing contracts for similar services. No hourly rates are being changed or added by this Contract Amendment.

COMMENTS

CALIFORNIA STATE AUDITOR'S COMMENTS ON THE RESPONSE FROM DWR

To provide clarity and perspective, we are commenting on DWRs' response to our audit. The numbers below correspond to the numbers we have placed in the margin of DWR's response.

While preparing our draft report for publication, some page numbers shifted. Therefore, the page numbers DWR cites in its response do not correspond to the page numbers in our final report. ①

DWR incorrectly asserts that all activities for the planning of the project were paid for by the public water agencies. In Figure 5 on page 15 we show that $81.2 million of the funding for the conservation and conveyance program, or 31 percent—the largest portion of funding—came from the U.S. Bureau of Reclamation. ②

We stand by our conclusion that DWR did not follow state law in selecting the program manager. As described on pages 25 through 29, and in exhibit 2 in DWR's response on page 69, it directed URS to "subcontract" with the president of Hallmark without demonstrating DWR assessed his qualifications, including that he was a licensed engineer. The purported "subcontract" created operational inefficiencies that led DWR to eventually award Hallmark a direct contract through an assignment. ③

We address the issues in this summary in the "Findings" section of DWR's response. ④

Although DWR states that it received excellent value from Hallmark, the fact remains that the current program manager that DWR directed URS to hire as a subcontractor does not possess the qualifications DWR sought when it initially awarded the contract to URS. Furthermore, as we state on page 29, the cost of Hallmark's contract increased from $4.1 million to $13.8 million. ⑤

We disagree that the project was conceived as just an engineering enterprise. DWR's request for qualifications and its contract with URS included more than just engineering; they also required program management services for which URS initially identified an individual as its program manager. DWR's statement seems to indicate that URS' program manager did not have the management expertise requisite for the scale and complexity of the project. However, that statement contradicts the letter we reviewed that DWR sent to URS disapproving the program manager. As we ⑥

state on page 24, DWR replaced the URS program manager apparently because he was not working full-time on the project, not because he lacked the necessary expertise.

⑦ DWR mischaracterizes the services for which Hallmark was "subcontracted." DWR and the former director attempt to narrowly define the responsibilities of Hallmark, when, in fact, the "subcontract" made Hallmark responsible for the entire scope of work for program management services. Further, the description of Hallmark's role provided by the former director was based on assertions that neither he nor DWR was able to support. In addition, nowhere in DWR's exhibit 2 contract language directing URS to subcontract with Hallmark's president to fill the position of program manager, or in the scope of work in DWR's exhibit 1—its agreement with URS describing the tasks it expected the project manager to perform—does it specify that Hallmark or its president was hired exclusively to provide cost control as DWR claims. For example, as stated in item 7 of exhibit 1 appearing on page 63, Hallmark was also responsible for coordinating, overseeing, and monitoring other contractors including, but not limited to, environmental, engineering and construction services.

⑧ DWR states that Hallmark was hired to provide its "proven management skills." However, DWR was unable to demonstrate that it assessed Hallmark's qualifications. As we state on page 25, our review of DWR's contract file for Hallmark found no evidence that DWR evaluated Hallmark's qualifications for the program manager role.

⑨ It is unclear to us what budget projection DWR is referring to. As we state on page 20, in 2012 DWR signed agreements with water contractors for an additional $100 million—a 71 percent increase to the initial $140 million budget—to fund the remaining planning phase activities. Additionally, as we also state on page 20, DWR ultimately exhausted this $100 million augmentation and had to contribute $15 million in surplus revenues in 2015 and 2016 along with an extra $6.8 million contribution from Reclamation and the Authority to fund additional planning costs.

⑩ We do not misunderstand the contract. Although we agree that the scope of work included multiple elements, one of the main elements was construction project management services, which include services like those included in exhibit 1 on pages 59 and 60 in DWR's response and many of the deliverables listed on pages 62 through 66. By law these services must be performed by a licensed architect, registered engineer, or licensed general contractor; and DWR's request for qualifications required the program manager to have a professional engineering license.

While we do not dispute that subcontracting is permitted, as we explain on pages 27 and 28, and as shown in exhibit 2 in DWR's response on pages 69 through 72, the arrangement DWR created was not a true contractor-subcontractor arrangement. Specifically, URS was not overseeing Hallmark's work products, it was not determining payment to Hallmark, and it was not legally responsible for Hallmark's work. Additionally, we expected DWR to require URS to provide an equally qualified replacement program manager or for DWR to have used a competitive process to select a replacement program manager. Finally, because the program management services DWR was seeking included construction project management, state law requires the program manager to be a licensed architect, registered engineer, or licensed general contractor. (11)

DWR describes in its response the inherent conflict the unusual arrangement created, and the contract terms it had to include to protect against this precarious situation. As we describe on page 28, DWR also eventually changed this arrangement to address the inefficient workflow that resulted from the subcontract. Furthermore, the asserted success of the arrangement does not justify the manner in which DWR procured Hallmark's services as program manager. (12)

Our report does not narrowly focus on the request for qualifications process. On pages 24 and 25 we state that because of the size, cost, complexity, and significance to the State of WaterFix, we expected DWR to have required URS to provide an equally qualified replacement program manager. Because DWR included a requirement in its request for qualifications that the program manager work full-time on the project it is unclear to us why DWR did not enforce this requirement, but instead directed URS to "subcontract" with Hallmark who lacked some of these qualifications. By requiring URS to provide a qualified program manager who is able to work full-time on the project, as required by the request for qualifications, DWR would have avoided the 5-month delay it asserts would have occurred if it had used a competitive process to replace its program manager. (13)

Despite DWR's assertion, the "subcontract" makes it clear that Hallmark is the firm responsible for the entire scope of program management services. The "subcontract" did not identify any overlap between Hallmark and URS in the work of the program management services to be provided by Hallmark that would suggest a "team" approach. In fact, in DWR's exhibit 2 on page 69 directing URS to subcontract with Hallmark and its president specifies that "Hallmark is an independent contractor and is not the agent or employee of DWR or URS". (14)

⑮ We stand by our conclusion. As described on page 27 and 28, the relationship established between URS and Hallmark was not truly a "subcontract," and Hallmark did not have the required qualifications or license to provide the services. Further, assigning the work, although provided for by the contract, avoids the competitive process that is favored in state contracting law. In addition, by assigning the contract to Hallmark, DWR contradicts its earlier assertion that it used a team approach for program management. Finally, Hallmark and URS do not operate as a team if URS is no longer a party to the contract for program management services.

⑯ As we state on pages 28 and 29, when we asked for its rationale, DWR told us that the assignment provided its staff direct access to Hallmark while saving the 5 percent markup URS charged under the subcontract. However, we question this reasoning because DWR created the difficulties in the first place, and we are not convinced DWR is saving money because Hallmark has had to subcontract many of its program management functions and DWR is generally paying a 5 percent markup for invoices from these subcontractors.

⑰ DWR has not provided evidence describing how the fee was established or that it was fair and reasonable with price comparisons or a market survey. As we state on page 30, DWR did not justify adequately the $2.69 million cost. Further, on page 30 we also explain that DWR staff raised the same concern because the justification from Hallmark simply stated that the price "is worth it because McKinsey has such a great track record," which we do not consider to be adequate assurance the price was fair and reasonable.

⑱ Contrary to DWR's assertion, our report does not imply that no governance structure exists or that a lack of such a structure is contrary to legal requirements. Our report on pages 34 and 35 states that DWR has not fully implemented a governance structure for the design and construction phase of WaterFix. In addition, we conclude that it is essential that DWR develop an appropriate governance structure so that it is prepared to oversee the design and construction of WaterFix in the event the project is ultimately approved. This conclusion parallels DWR's perspective as shown in exhibit 5 on page 85 of the contract amendment that added $10 million dollars to the contract and added McKinsey as a subcontractor. The amendment language states that the "conservation and conveyance program has progressed to a phase where the organizational structure and governance have become increasingly critical to the future success for design and construction of the project." This section is to inform the reader that the governance structure for which DWR paid $2.69 million has not been fully implemented.

DWR misunderstands the report. We do not suggest that DWR must assess each water agency's needs and provide a final financial analysis before the decision to opt into WaterFix is made. On pages 34 and 35 we include the statement from DWR officials that the final financial analysis report cannot be prepared until the contractors desiring to participate in WaterFix are identified. We also include on page 35 DWR officials' statement that its contractor, Public Finance Management, modeled a wide range of financing options for WaterFix that were shared with water contractor boards. Finally, these officials stated that once individual agencies decide to participate, the financing will be tailored to meet each agency's needs. (19)

We disagree that the documents DWR has maintained serve the same planning function as the program management plan. As the text box on page 36 shows, the management plan includes staffing requirements, reporting relationships, and participant roles and responsibilities, among other things. Additionally, the management plan incorporates that information together in one cohesive document. Our review of Aconex found a document repository (essentially a digital filing cabinet) with numerous, disparate, historical and current documents that DWR staff had to pour through in an effort to locate something that was responsive to our request for the management plan. (20)

Our recommendation does not presuppose that time delays have a negative consequence, rather that they should be thoroughly justified and vetted. The recommendation does not limit DWR's ability to be responsive to stakeholder input, but would require DWR to consciously and transparently consider that input before making decisions that affect project cost and schedule, whether during planning or other phases of the project. (21)

We disagree with DWR's revision to the recommendation because it introduces the risk that DWR will direct contractors to select specific subcontractors, which undermines the intent of the recommendation to have the contractor put forth the subcontractor it believes will best perform the work required by the contract and require DWR to verify the qualifications of the subcontractor before approving the selection. (22)

Appendix D

Testimony on Water Availability Analysis for Trinity, Sacramento, and San Joaquin River Basins Tributary to the Bay-Delta Estuary
C-WIN Report on the Quantification of the Consumptive Water Available in the Delta Watershed

California Water Impact Network Produces First Study Quantifying Central Valley "Paper Water"

The California Water Impact Network (C-WIN) has completed the first analysis comparing Central Valley water availability with water rights claims. **Consumptive water rights claims are 5.5 times more than the available water supply.**

This study (online at http://www.c-win.org/webfm_send/265) was submitted as testimony to a State Water Resources Control Board (SWRCB) workshop on the possible revision of the Bay Delta Water Quality Control Plan (BDCP). C-WIN's testimony documents the disparity between the availability of water and existing water rights claims in the Sacramento, San Joaquin and Trinity Rivers and their tributaries. Further, the report demonstrates that the federal Central Valley Project (CVP) and the State Water Project (SWP) lack adequate water to service promised contract deliveries.

C-WIN's testimony shows that water rights account for up to five times the water that is available in the Sacramento and San Joaquin Rivers. For the Trinity River, water rights claims exceed available supply by a factor of seven. The difference between claimed water rights and average river flows is summarized below from the report.

River Basin	Annual Flows	Water Rights***	Ratio
Sacramento R. Basin*	21.6 MAF	120.5 MAF	5.58
San Joaquin R. Basin**	6.2 MAF	32.7 MAF	5.28
Trinity R. Basin*****	1.283 MAF	8.725 MAF	6.70

The problem facing our rivers and the Delta is thus clarified when annual flows are compared to the water rights that are claimed. This disparity between real and contractual water is known as "paper water." It is water, in other words, that exists only in state or federal documents, not in California's rivers.

The CVP and SWP are predicated on junior water right claims; they can only divert water after stakeholders with senior water rights have taken their shares. The projects therefore cannot provide full contract deliveries, especially during drought. Water rights are a form of property. They entitle an owner to use water from a specific point at a specific stream at a specific time. But disaster looms when the state authorizes far more water rights than nature and human engineering can provide. California's water code has evolved – or metastasized – over the course of 150 years. It is a jumble of prior practices, dueling lawsuits, conflicting legislation, and water projects that consistently have performed under expectations. The current over-allocation of water is the end result of this ad hoc, and ultimately unworkable, process.

808 Romero Canyon Road, Santa Barbara, CA 93108, email: caroleekrieger7@gmail.com, Phone: 805.969.0824, Fax: 805.565.3394

This over-allocation is similar to the "clouded titles" problem in real estate: a lack of clarity in legal rights that leads to continuous dispute. In the case of water, this ratchets up the pressure on water agencies to "produce" water that doesn't exist. The CVP and the SWP water rights are essentially "clouded titles" for water in the Sacramento and San Joaquin Rivers and their tributaries. The SWP was predicated on damming the state's North Coast Rivers, with their waters delivered to the Delta for export. These streams ultimately were declared off-limits due to Wild and Scenic designations in the 1980s. Five million acre feet of water from the North Coast never made it to the CVP and SWP, but the operators of these projects distributed contracts and exported from the Delta as though the water was in the pipeline. They were, in short, creating "paper water." The Delta's ecological collapse has been the result.

If Wild and Scenic River protections remain in place, senior water rights are honored and water quality standards are met, there will be little if any "surplus" water available for export south of the Delta. In plain language, this means that there is scant water available to the CVP and the SWP at any time – especially during drought. While the C-WIN Paper Water Availability Analysis did not discuss the implications of the Twin Tunnels, it is clear that the inadequate water rights of the CVP and the SWP would make it legally difficult to operate such a conveyance system. Any rights the state could acquire to operate the tunnels on the lower Sacramento River would be at least as junior as current rights. Also, there is insufficient water to fill the tunnels. Reduced snowpack due to climate change will exacerbate an already untenable situation. Water ratepayers and taxpayers should not be expected to expend billions of dollars for a system that will provide no extra water, and could actually result in reduced deliveries.

Further, the Bay Delta Conservation Plan (BDCP) and the Twin Tunnels would reduce Bay-Delta outflows, conflicting with the SWRCB's 2010 Bay-Delta outflow recommendations, which were developed to determine the flows necessary for the recovery of listed fish populations. Decreased flows will also concentrate and increase the persistence of contaminants such as selenium and pesticides in the Bay-Delta. The C-WIN analysis thus recommends that the SWRCB enforce water rights and water quality standards as a priority, and provides suggestions to that end; indeed, the Board's public trust and beneficial uses mandate requires such action.

The C-WIN report clearly documents the great and growing gap that separates water rights claims from available water. It is a fact that the state and federal water projects are at the back of the line in water rights seniority. They face the most immediate cut-backs in the event of decreasing snowpack, increasing drought, and dedication of water to meet public trust and beneficial use obligations. The State Water Resources Control Board clearly has been unable or unwilling to reign in paper water claims. It would be catastrophic to compound the error with a massive, ruinously expensive and environmentally destructive project like the Twin Tunnels.

#

Appendix E

100 Years of California's Water Rights System: Patterns, Trends and Uncertainty

UC Davis Report on the Quantification of the Consumptive Water Available in California

OPEN ACCESS
IOP Publishing
Environmental Research Letters
Environ. Res. Lett. 9 (2014) 084012 (10pp)
doi:10.1088/1748-9326/9/8/084012

100 years of California's water rights system: patterns, trends and uncertainty

Theodore E Grantham[1] **and Joshua H Viers**[2]

[1] Center for Watershed Sciences, University of California, 1 Shields Avenue, Davis, CA 95616, USA
[2] School of Engineering, University of California, 5200N. Lake Road, Merced, CA 95343, USA

E-mail: tgrantham@ucdavis.edu and jviers@ucmerced.edu

Received 26 February 2014, revised 19 June 2014
Accepted for publication 18 July 2014
Published 19 August 2014

Abstract

For 100 years, California's State Water Resources Control Board and its predecessors have been responsible for allocating available water supplies to beneficial uses, but inaccurate and incomplete accounting of water rights has made the state ill-equipped to satisfy growing societal demands for water supply reliability and healthy ecosystems. Here, we present the first comprehensive evaluation of appropriative water rights to identify where, and to what extent, water has been dedicated to human uses relative to natural supplies. The results show that water right allocations total 400 billion cubic meters, approximately five times the state's mean annual runoff. In the state's major river basins, water rights account for up to 1000% of natural surface water supplies, with the greatest degree of appropriation observed in tributaries to the Sacramento and San Joaquin Rivers and in coastal streams in southern California. Comparisons with water supplies and estimates of actual use indicate substantial uncertainty in how water rights are exercised. In arid regions such as California, over-allocation of surface water coupled with trends of decreasing supply suggest that new water demands will be met by re-allocation from existing uses. Without improvements to the water rights system, growing human and environmental demands portend an intensification of regional water scarcity and social conflict. California's legal framework for managing its water resources is largely compatible with needed reforms, but additional public investment is required to enhance the capacity of the state's water management institutions to effectively track and regulate water rights.

S Online supplementary data available from stacks.iop.org/ERL/9/084012/mmedia

Keywords: water rights, water resources management, surface water, rivers

1. Introduction

Recent droughts and increasing hydroclimatic volatility in western USA are testing the ability of water managers to meet diverse and growing demands for supply reliability, improved water quality, and healthy ecosystems (Gleick and Chalecki 1999, Christensen *et al* 2004, Wilhite *et al* 2007). Despite evidence that human water demands have begun to stabilize, decreasing surface water availability has caused high levels of water stress throughout much of the western USA (Averyt *et al* 2013). Climate models predict that much of arid and semi-arid western North America is likely to become warmer and perhaps drier in the future (Stewart *et al* 2005, Westerling *et al* 2006, Barnett *et al* 2008), suggesting that major changes in water use and allocation patterns will be required. In California, for example, projections of decreasing snowpack and population growth will make it difficult to meet growing urban demands while maintaining agricultural deliveries and needed water for the environment (Hayhoe *et al* 2004, Tanaka *et al* 2006, Medellín-Azuara *et al* 2008). These trends are commensurate with global projections for other regions with semi-arid or Mediterranean-type climates (Klausmeyer and Shaw 2009), which are characterized by extremes in seasonal and interannual variability in precipitation, large scale development of irrigated

agriculture, and higher human population density (Grantham *et al* 2013).

Emerging water management challenges in semi-arid regions of the world are typified by California—the world's tenth largest economy—which must satisfy water demands for 38 million people, a US$40 billion agricultural economy, and freshwater ecosystems (DWR 2009). Recent studies indicate that the state is ill-prepared to adopt measures required for the sustainable management of water resources (Hanak *et al* 2011, California Natural Resources Agency 2014). For example, California's water rights system is the primary regulatory framework under which surface water is allocated yet the amount of water actually used by water rights holders is poorly tracked and highly uncertain (Little Hoover Commission 2010). The lack of accurate accounting thus represents a critical challenge to the allocation of water among competing users in a cost-efficient and sustainable manner.

California's water rights administration system was legislatively established in 1914 with the creation of a Water Commission, which later would become the State Water Resources Control Board (Water Board) (Littleworth and Garner 2007). The Water Board administers the water rights system and is responsible for allocating available water supplies for beneficial uses in an orderly manner (Water Board 2014b). However, since its establishment a century ago, the Water Board has issued water rights that amount to over five times the state's average annual supply (Little Hoover Commission 2010). Today, over-allocation of available supplies, coupled with uncertain water use by individual water right holders, has become a significant handicap for water policy and management reform (Hanak *et al* 2011). As regional drought and growth reduce available supplies, inaccurate water use accounting has also intensified conflicts over water (Wines 2014, Dearen and Burke 2014) and made it difficult to secure adequate water allocations for freshwater ecosystems (Gillilan and Brown 1997, Water Board 2014c). Consequently, the water rights system has been identified by water managers as one of the state's most important long-term water problems (Null *et al* 2012).

Accurate quantification of water supply and use is an essential first step towards sustainable water management. Yet, a comprehensive assessment of surface water allocations of the state's rivers and streams has not been conducted. Furthermore, the extent to which water right allocations approach, or exceed, natural surface-water supplies has not been systematically evaluated in rivers throughout the state. Here, we analyze the state's water rights database to estimate the degree of water appropriation in approximately 4000 catchments in California by comparing water rights allocation volumes with modeled predictions of unimpaired, surface water availability. The water right holder, intended uses, and dates of water rights records are also examined to compare allocations among ownership and use-classes and to examine trends in water allocation volumes from 1914 to 2013. Finally, we analyze county-level water use data to quantify the disparity between water rights allocations and estimated surface water withdrawals. These analyses highlight deficiencies in the water rights system that should be addressed as part of state water management reforms (e.g., California Natural Resources Agency 2014) and can be used to identify river basins where inaccuracies in water rights records may impede local efforts to efficiently and sustainably manage water resources.

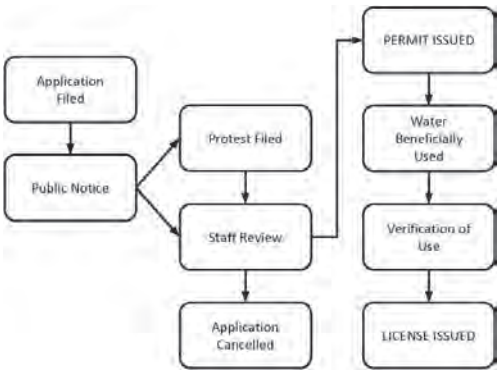


Figure 1. Simplified diagram of appropriative water rights review process by the State Water Board, modified from permitting and licensing flow charts (Water Board 2014b).

2. Background and methods

2.1. California's water rights system

California water management is a highly complex amalgamation of laws, policies and institutions derived from Roman, Spanish, English and indigenous governance systems, which has been described in detail by others (e.g., Hundley 2001, Hanak *et al* 2011). Here, we provide a brief overview of the state water rights system, summarized from Littleworth and Garner (2007) and Water Board documents (2014b). California's modern water rights system began to take form in the mid 19th century and early 20th century with the influx of settlers from the eastern USA. Initially, competing claims for water in the water scarce state were settled through litigation and court decisions. But as the number of claims and scale of water projects grew, a more comprehensive system for regulating water rights was required. In 1914, the state legislature established a Water Commission, which would later become the Water Board. Because of political pressures, several types of water rights including groundwater, riparian and pre-1914 appropriations were excluded from the Water Board's authority. However, the Water Board was given primary responsibility for administering post 1914 appropriative water rights, which were required for the state's major agricultural and water supply systems developed in the 20th century. In addition, the Water Board retains broad authority in enforcing the state's reasonable use and public trust doctrines (Littleworth and Garner 2007).

Any person or entity wishing to appropriate surface water must file an application with the Water Board, which initiates a permit review process (Water Board 2014b) (figure 1). Decisions to issue a water right permit are based on availability of water, satisfaction of reasonable use requirements, and preservation of environmental uses (e.g., fish and wildlife resources). Once an application is approved, the right must be exercised according to permit terms and conditions, which may include a maximum seasonal or annual allocation volume, limits on timing and rates of diversion, specifications on where the water can be used, and other measures to minimize environmental impacts. The 'face value' amount of water granted by a permit is an estimate of the maximum possible volume required by the applicant; actual amounts used vary by year but may be significantly less than the face value (Littleworth and Garner 2007).

Following a monitoring period, typically ten or more years, the Water Board confirms terms and conditions of the permitted water use, and may issue a license to the appropriator (figure 1). The Water Board has limited authority over non-appropriative water rights (Littleworth and Garner 2007). However, in 2009, the Board implemented new reporting requirements for groundwater, riparian and pre-1914 surface water rights, with penalties for failing to file statements of use (California Water Code section 5101). This has led to an increase in water use reporting, although reports are not systematically audited for accuracy and have been filed only for a small fraction of non-appropriative water users (personal correspondence with Phil Crader, Division of Water Rights, 28 June 2013).

2.2. Analysis of water rights database

The Water Board maintains a public water rights database, the electronic Water Rights Management System (eWRIMS), to track and share water rights information (Water Board 2014a). The database contains information on water rights and statements of use and is the basis for our assessment, focusing on all active, appropriative water rights records. These are the most common types of surface water right in the database and account for the greatest allocation volumes. The records used in our analysis consisted of pending, permitted and licensed water rights filed since 1914, and included information on face-value allocations, year of filing, right holder, use types, and geographic location. We did not consider statements of use, which have been filed for some riparian and pre-1914 water rights claims because the data are incomplete and of uncertain quality.

Based on the water rights records, appropriative water rights holders were classified into private and public entities. For privately held rights, individuals were distinguished from corporate entities (e.g., corporations, associations, private power utilities, and partnerships). Public water rights holders included federal, state, and municipal agencies and irrigation and reclamation districts. Purpose of use was also evaluated, based on use-designations for individual water rights (e.g., hydropower, agriculture, domestic, industrial, recreation, and environmental).

2.3. Assessment of spatial allocation patterns

Locations of surface water diversions have been mapped in a Geographic Information System (GIS) by the Water Board. Water rights may have multiple points of diversion (PODs), which collectively divert an annual volume up to the face value of the permit or license. Because diversion volumes are not reported for individual PODs, we selected a single POD for each water right and attributed the entire face value to that location. Next, total face-value allocations were calculated at the 12-digit Hydrologic Unit (HUC12) scale (USGS 2012) for 4108 catchments in California. Finally, water allocations were accumulated downstream to determine the cumulative annual water allocation for each catchment. To visualize the HUC12 drainage network, line segments were created between HUC12 centroids to represent directional flow paths to receiving catchments. Because most of the Colorado River basin occurs outside of California, we did not evaluate allocation volumes for the Colorado River.

To evaluate water right allocation volumes in relation to water availability, we used an empirical modeling approach to predict mean annual flows for California's HUC12 catchments. Models were developed using Random Forests (RF) (Breiman 2001), a statistical approach used for prediction and classification. Following methods described in Carlisle *et al* (2010), a RF model to predict expected (E), annual natural flow was trained with data from 180 USGS reference gages (e.g., those minimally affected by land- and water-management activities) and catchment predictor variables (e.g., climate, topography, soils and geology) in the Gages-II database (Falcone 2011). The RF model was implemented in *R* with the randomForest package (Liaw and Wiener 2002).

Model performance was assessed by comparing predictions with randomized subsets of observed data (O) withheld during RF model development. Several performance metrics were calculated (Moriasi *et al* 2007), including coefficient of determination (r^2), Nash–Sutcliffe coefficient, and percent bias. In addition, predictive performance was assessed in a jack-knife technique by sequentially excluding individual reference gages and re-running the model to evaluate observed against predicted (O/E) values at the omitted site. To predict monthly flows at ungaged HUC12 catchments, the same set of catchment predictor variables used in model training was calculated for each HUC12 catchment including the upstream drainage area. The trained RF model was then used to predict expected mean annual flows in each catchment from 1950 to 2010, from which a long-term average was calculated and compared with water rights allocation volumes.

2.4. Comparison of water rights allocations with surface water withdrawals

To compare water rights allocations with actual water use, total face value water right volumes were calculated at the county level and compared with estimates of actual surface water withdrawals. Water rights used exclusively for hydropower generation were excluded from the face-value

Table 1. Summary of active surface water right records in State Water Rights Database (Water Board 2014a).

Water Rights type	Count	Face-value total (10^6 m^3)
Appropriative		
Licensed	10 810	123 517
Permitted	1 466	263 647
Pending	345	11 038
Subtotal	12 621	398 202
Statements of Diversion and Use	10 885	40 571
State & Federal Filings	2152	15 986
Stockpond	5613	7
Small Domestic	611	3
Adjudicated (pre-1914 and Riparian)	8	0.3
Total	31 890	454 770

calculations. Gross water use estimates were obtained from US Geological Survey Water Use Data for California, 1985–2005 (USGS 2014). Average, county-level use was calculated by the sum of reported self-supplied, surface water withdrawals for public supply, domestic, industrial, livestock, and irrigation purposes.

3. Results

3.1. Appropriative water right allocations

We obtained 31 890 active, surface water rights records from the eWRIMS database (Water Board 2014a), representing approximately 450 000 million cubic meters (Mm^3) (table 1). Records included 12 621 active appropriative water rights, accounting for 398 202 Mm^3 of water. Most (85%) appropriative water rights are licensed, although permitted water rights account for two-thirds of the volume allocated. In addition, most water is granted to a relatively small number of appropriative water rights (figure 2(a)). For example, of the top 1% water rights by count account for over 80% of the total water volume allocated.

Based on the water rights records analyzed in this study, the volume of water allocated per right has declined since the early 20th century (figure 2(b)). Ten-year average volumetric water allocations peaked in the early 1930s (>120 Mm^3 per right), but has fluctuated between 5 and 40 Mm^3 per right since the 1950s. However, the number of water rights filed has steadily increased over time (figure 3(a)). Following a period of relatively slow growth in the early 1900s, the number of rights filed accelerated in the late 1940s. The rate of water rights filings slowed in the 1990s, but has remained stable at approximately 60 water rights filed per year. Since the 1970s, most new water rights have been issued to individuals and private entities, while holdings by federal, state and other public agencies has not appreciably changed (figure 3(a)).

Although private entities hold the vast majority (78%) of water rights filed, most water by volume is allocated to public entities (figure 3(b)). Notable increases in water allocation volumes occurred in 1927, when the appropriative water rights were filed for major federal dam projects on the Sacramento River (Shasta Dam) and Trinity River (Trinity Dam), and in 1933, when water rights were filed by the Imperial Irrigation District to divert water from the Colorado River. Currently, over 80% of the water rights issued by volume are held by federal (32%), state (10%), municipal (15%) and other public entities (24%). Private corporations hold approximately 18% of all water allocated, while individuals hold rights to less than 1% of water by volume.

Of 12 621 appropriative water rights in the eWRIMS database, nearly 70% have PODs with agricultural use designations (figure 4). Other common designations were domestic (35%) and recreation (27%) uses. Approximately 3% of applications are designated for hydropower, although they account for 68% of total water right allocations by volume. Other uses associated with high water allocation volumes are domestic (42%), agricultural (34%), and recreation (26%).

3.2. Spatial distribution of water rights

To quantify the spatial distribution of water right allocations, local and cumulative face value totals were calculated at the HUC12 watershed scale. Trends in the extent and intensity of water allocations were also evaluated by mapping water allocations to catchments since 1914 (figure S1). Currently, face value allocation volumes are greatest for the Sacramento and San Joaquin Rivers and their major tributaries (figure 5(a)). When water rights used exclusively for hydropower generation are excluded (because hydropower is a non-consumptive use), allocation volumes significantly decrease (figure 5(b)). Excluding hydropower water allocations, the total volume allocated to appropriative water rights in the Sacramento-San Joaquin Delta is 109 000 Mm^3, approximately three times the average unimpaired outflow of the system (35 000 Mm^3) (DWR 2007).

Cumulative water allocation volumes were evaluated relative to predicted, unimpaired surface water availability for all HUC12 catchments (figure S2). The model performed well in predicting mean annual flow based on several performance metrics ($r^2 = 0.95$, NSE = 0.94, PBIAS = 1.2). Assessment of predictive performance using jack-knife removal of individual reference gages yielded a mean O/E ratio of 0.94, suggesting high accuracy in predicting unimpaired annual flow (a value of 1.0 indicates perfect model performance).

Water right allocations exceed average local surface water supplies in much of the drainage network (figure S3 and figure 6) and allocation percentages increase with river size. Among catchments with annual runoff of less than 100 Mm^3 ($n = 685$), mean allocation is 1% and nearly three-quarters of the small catchments have allocations levels below 10%. In contrast, catchments with runoff greater than 1000 Mm^3 and 5000 Mm^3 are predominately allocated at levels above 100%. Excluding water allocations for hydropower (figure 6), catchments with annual runoff of 500–1000 Mm^3, 1000–5000 Mm^3 and greater than 5000 Mm^3 have mean allocation values of 41%, 107%, and 158%, respectively.

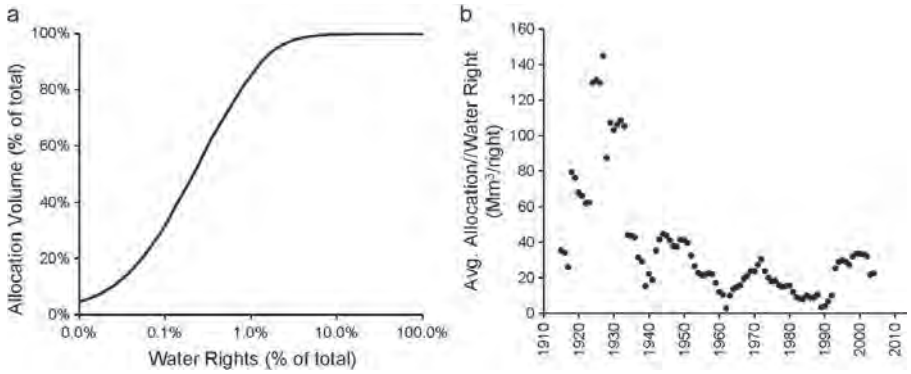


Figure 2. Water allocation volumes (a) by water right count and (b) over time (10-year rolling average), based on appropriative water rights records (Water Board 2014a).

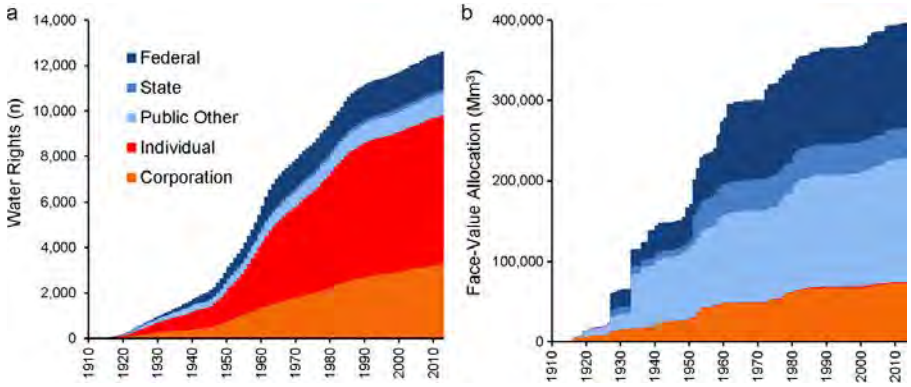


Figure 3. (a) Water rights and (b) face value allocation volumes issued to public and private entities since 1915, based on appropriative water rights records (Water Board 2014a). Note, volumetric allocations to water rights held by individuals (in (b)) is negligible.

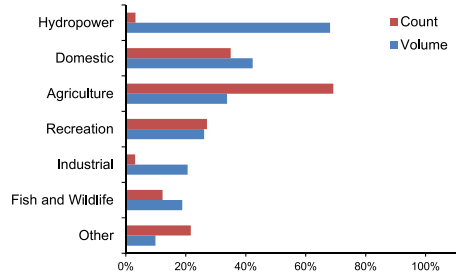


Figure 4. Water rights use designations, expressed as percentage of total water right count and volumetric water allocation.

Most of California's major river basins have water rights allocations that exceed their natural, unimpaired annual supply (table 2; figure S4). Among 27 major rivers, 16 had allocation levels greater than 100% of natural supplies. Excluding hydropower water rights, catchments with the highest water allocation levels are the San Joaquin River (861%), Salton Sea basin (705%), Putah Creek (673%), Kern River (631%) and Stanislaus River (391%). Large river basins with relatively low allocation levels are the Smith River (<1%) and Cottonwood Creek (2%). The Owens River basin, which is a primary water supply source for the City of Los Angeles, has a low water allocation percentage (4%). However, when water rights associated with hydropower use are included, allocation percentage increases to 224%, indicating that water rights designated for hydropower are used for water supply. Public entities hold nearly all of the water allocated by appropriative water rights in California's major river basins (table 2).

3.3. Comparison of water rights allocations with surface water use

Face value allocations (excluding hydropower use) were compared with estimates of annual surface water withdrawals

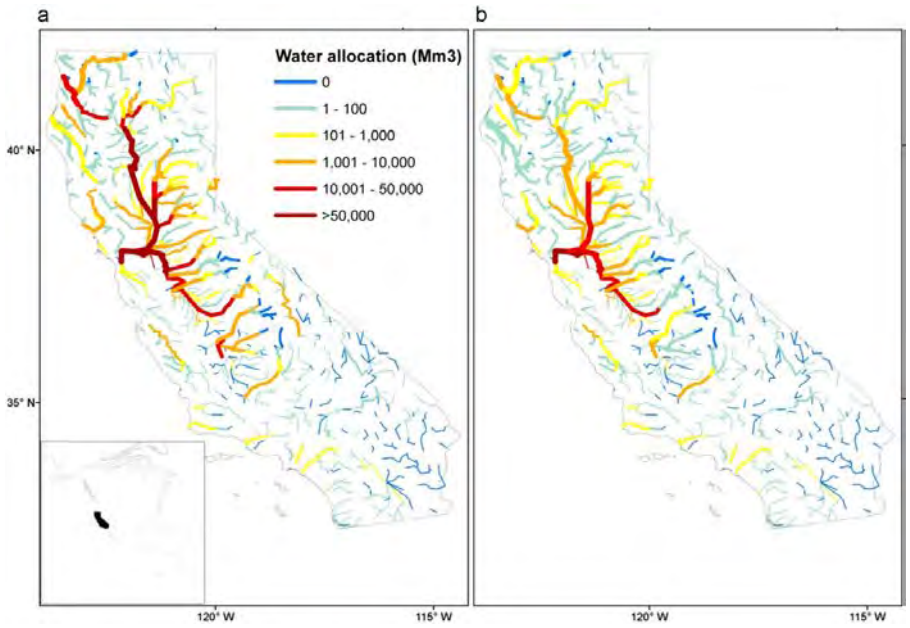


Figure 5. Cumulative water allocation volumes (a) for all water rights and (b) excluding water rights used exclusively for hydropower generation.

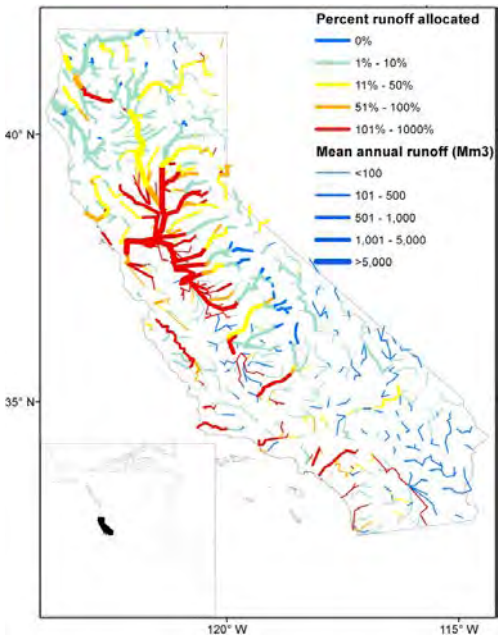


Figure 6. Cumulative water right allocations relative to mean annual runoff, excluding water rights for hydropower generation.

at the state and county scale (USGS 2014). Statewide, appropriative water rights filed for consumptive uses (totaling 149 400 Mm^3) are approximately five times greater than estimated annual surface water withdrawals (30 350 Mm^3). At the county scale, volumetric allocations of water rights are poorly correlated with ($r = 0.16$) and generally over-predict surface water withdrawals (figure 7). This, in part, is explained by differences in water diversion locations and place of use. For example, major intake facilities for the State Water Project and Central Valley Project are located Contra Costa County and are associated with water rights exceeding 40 000 Mm^3. Nearly all of the water diverted at this location is delivered south of Contra Costa County. The discrepancy between local water rights allocations and use is compounded by the fact that the water projects are known to deliver a small fraction of their entitlements (Littleworth and Garner 2007). Although water rights allocations generally exceed estimated annual surface water use, there are several counties that use more water than their local water right entitlement. These include counties in southern California that import significant volumes of water for agricultural production (e.g., Tulare and Fresno) and urban water supply (e.g., San Diego and Los Angeles) (figure 7; figure S5).

4. Discussion

This assessment indicates that water allocated through the state appropriate water rights system exceeds overall mean

Table 2. Water allocation volumes for California's major rivers. See figure S4 for river locations.

River	Drainage area (km^2)	Annual natural runoff (Mm^3)[a]	Water rights allocation[b] (Mm^3)	Percent runoff allocated	Percent allocated to public[c]
Smith River	1864	3659	8	0.2% (0.2%)	82%
Klamath River	31 402	18 213	5833[d]	32% (100%)[d]	99%
Trinity River	7692	6006	5635	94% (250%)	100%
Eel River	9536	8330	42	1% (2.6%)	31%
Russian River	3846	2194	1141	52% (113%)	89%
Salinas River	11 082	431	1032	239% (343%)	99%
Sacramento River	67 830	23 282	35 336	152% (655%)	92%
Pit River	14 220	3454	217	6% (500%)	62%
Cottonwood Creek	2444	702	11	2% (2%)	57%
Stony Creek	2012	494	268	54% (484%)	98%
Feather River	15 350	9027	16 934	188% (633%)	98%
Yuba River	3483	2966	3613	122% (431%)	97%
Cache Creek	2971	714	1149	161% (213%)	98%
Putah Creek	1694	471	3171	673% (886%)	98%
San Joaquin River	45 877	7949	68 473	861% (1585%)	97%
Mokelumne River	5157	1646	2335	142% (436%)	96%
Consumnes River	2460	576	304	53% (53%)	88%
Stanislaus River	3100	1342	5246	391% (1787%)	99%
Tuolumne River	4851	2022	3273	162% (438%)	99%
Merced River	3288	1170	1285	110% (583%)	99%
Kings River	5046	1799	1412	78% (520%)	0%
Kern River	6322	801	5057	631% (1185%)	100%
Owens River	9004	539	19	4% (224%)	34%
Salton Sea	15 219	227	1601	705% (710%)	96%
Santa Ynez	2322	249	831	334% (334%)	99%
Santa Clara River	4165	264	417	158% (196%)	99%
Santa Ana River	6370	306	559	183% (183%)	85%

[a] Mean annual runoff at outlet, predicted from statistical model (1951–2010 average).
[b] Water right allocations percentages, excluding water rights for hydropower. Allocations levels including hydropower shown in parentheses.
[c] Proportion of cumulative water right allocation (excluding hydropower), that are held by public entities including federal, state, and municipal agencies.
[d] Klamath River water rights calculations do not account for water allocations in upper river basin located in the State of Oregon.

water supplies by approximately five times. Our findings also highlight river basins where significant over-allocation of surface water supplies is likely to lead to conflicts among water users, particularly during periods of water scarcity when insufficient water is available to satisfy all face-value water right demands. For example, the results underscore the challenge of balancing human and ecosystem water needs in the Sacramento-San Joaquin Delta, the hub of California's water management system and source of its greatest vulnerability (Hanak *et al* 2011), where cumulative rights allocations are approximately three times greater than average natural supplies. Allocation levels tend to increase with river size, although many small rivers, particularly on the south coast, are also subject to high water demands. In recent years, new water rights applications have been concentrated in small river basins (figure S1), suggesting that appropriation levels will continue to intensify throughout the river network.

The face values of appropriative water rights reflect the degree to which surface water supplies have been allocated, but must be interpreted with caution. For example, the appropriative water rights system incentivizes permit holders to over-report water use to protect the face-value amount of their water right and therefore represents a generous estimate of actual water use. In addition, return flow (e.g., from irrigation runoff or canal leakage) can be re-used by downstream appropriators, allowing for 'double-counting' of the same volume of water. Nevertheless, the large magnitude of water right allocation volumes relative to natural supplies and poor correlation between county-level allocations and estimates of actual use provide strong evidence that the state has over-allocated water in many, if not most, river basins. Furthermore, allocation volumes only account for post-1914 appropriative water rights; other types of water rights (e.g., riparian claims) make the total amount of surface water allocated significantly higher than estimates provided here.

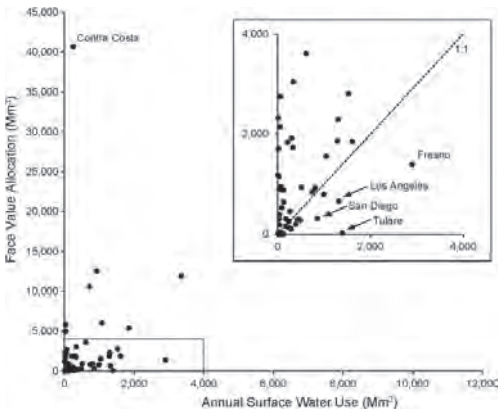


Figure 7. Total face-value allocations for California counties ($n = 58$) compared with mean annual surface-water withdrawals (USGS 2014).

In a well-functioning appropriative water rights system in which allocation volumes are accurately tracked and verified, over-allocation of water supplies is not necessarily a problem. During periods of water scarcity, junior appropriators have to forego their entitlement, but when water is abundant, most water rights holders should be able to exercise their claims. However, inaccurate accounting threatens the value and security of water right entitlements, particularly when curtailments are required during times of scarcity. For example, the current drought in California has led the Water Board to issue emergency curtailments of all water users in specific watersheds to protect fishery resources (Water Board 2014c). Such blanket curtailments would not be necessary if the Water Board had accurate water-use information, which could potentially be used to target specific water users and develop cooperative strategies to reduce water diversion impacts on environmental flows.

In over-allocated systems, water to satisfy new demands will likely require re-allocation of existing water rights. While modification of water rights represents a potential threat to right holders, the disproportionate control of the state's water supply by state and federal agencies indicates that impacts to private water rights will be limited. This is because improvements in water rights accounting will have a much greater effect on large, publically held entitlements (that are probably over-prescribed) than on relatively small entitlements held by individuals. Furthermore, most dedicated water by volume is held as water rights permits (not licenses) by state and federal agencies, and thus could be curtailed to better reflect actual use through the licensing process. Therefore, there is significant flexibility in the current water rights system to support re-allocation of water to uses that support the public interest.

California water law also authorizes the re-allocation of water rights to address evolving societal needs and changing environmental conditions (Shupe *et al* 1989, Littleworth and Garner 2007). For example, the public trust doctrine establishes that the government has an ongoing duty to safeguard the long-term preservation of natural resources (Frank 2012). In California, Fish and Game Code 5937 is an expression of the public trust doctrine, which requires that flows be provided below dams to maintain fish in good condition, and has been used to limit water rights in order to preserve environmental resources (Börk *et al* 2012). In addition, the state's reasonable use doctrine requires that all water rights be exercised in a reasonable manner, which is determined in the context of broader public interest in water supply reliability, ecosystem health, and other public trust values (Littleworth and Garner 2007).

Improving the scope and implementation of the state's water rights system is one of many challenges that California must overcome to adapt its water management system to 21st century conditions (Hanak *et al* 2011). Foremost, efforts to reform surface water rights administration must be coupled with improved monitoring and quantification of riparian and pre-1914 appropriative rights. In addition, the archaic separation of surface and groundwater rights and absence of state-level groundwater regulation prevents the development of conjunctive-use schemes (e.g., groundwater banking and water marketing), while contributing to overdraft of the state's major groundwater basins (Faunt 2009). Dysfunctional groundwater management also threatens surface water supplies and freshwater ecosystems in many of the state's rivers (Zektser *et al* 2005, Howard and Merrifield 2010).

Chronic under-funding of state regulatory agencies is a critical constraint to modernizing the state water rights system. Water rights administration has long suffered from low levels of staffing, contributing to decades-long backlogs in processing water rights applications (Little Hoover Commission 2010). Underfunding, in part, reflects political opposition to action by those who benefit from lax enforcement. However, population growth, hydroclimatic volatility, and changing societal values are expected to disrupt state water management and to be potential catalysts for policy innovation, as has occurred in other Mediterranean-climate regions of the world. In Australia, for example, an unprecedented 13-year dry period led government to undertake major water reforms in the 1990s, which included restructuring the national water rights system. Under the new policy, water rights were separated from land title, quantified, and restricted to 'environmentally sustainable levels of extraction' (2004 National Water Initiative). A similar overhaul of the water rights system occurred in South Africa in the 1990s (Backeberg 2005). In California, the legal framework for managing water resources is largely compatible with needed reforms, as described above, and significant legislative actions is probably not necessary. Rather, political will and sufficient funding are the essential elements for improving the state's capacity to perform its water rights administrative, monitoring and enforcement functions.

After 100 years since its establishment, California's water rights system is struggling to adapt to 21st century realities of increasing water stress, changing climate, and societal demands for water supply security and a healthy

environment. Innovative solutions have been proposed to address these challenges, including market schemes, institutional reforms, and new approaches to ecosystem management (Renwick and Green 2000, Gleick 2003, Hanak *et al* 2011). However, the effectiveness of these strategies fundamentally relies on our ability to accurately measure and track water availability, movement, and uses. Recognizing that addressing deficiencies in the water right system will not alone be sufficient for ensuring reform, without improved quantification and regulation of water rights, such reform will be impossible. To date, the state simply does not have accurate knowledge of how much water is being used by most water rights holders. As such, it is nearly impossible to curtail or re-allocate water in an equitable manner among water users and to effectively manage for environmental water needs. Quantifying spatial patterns and uncertainty in the water rights allocations is an important first step for developing strategies to reconcile and sustainably manage competing water demands in a water-stressed region. California's legal framework for managing water resources is largely compatible with needed reforms, but without additional public investment, the capacity of the state's water management institutions to effectively regulate water rights will remain weak. This is a situation that urgently needs correcting to meet water management challenges arising from drought, population growth and climate change.

Acknowledgements

We greatly appreciate support and feedback from Jeanette Howard, Leo Winternitz, Laci Videmsky, Chacha Sikes, Phil Crader, Sam Boland and State Water Resources Control Board staff. Jay Lund provided helpful comments on an earlier draft of this manuscript. We also thank Daren Carlisle, David Wolock, Eric Holmes, Kurt Fessenmyer and Nick Santos for data analysis and modeling assistance. This research was supported by funding from the S D Bechtel, Jr Foundation.

References

Averyt K, Meldrum J, Caldwell P, Sun G, McNulty S, Huber-Lee A and Madden N 2013 Sectoral contributions to surface water stress in the coterminous US *Environ. Res. Lett.* **8** 035046

Backeberg G R 2005 Water institutional reforms in South Africa *Water Policy* **7** 107–23

Barnett T P, Pierce D W, Hidalgo H G, Bonfils C, Santer B D, Das T, Bala G, Wood A W, Nozawa T and Mirin A A 2008 Human-induced changes in the hydrology of the western US *Science* **319** 1080–3

Börk K S, Krovoza J F, Katz J V and Moyle P B 2012 The rebirth of Cal. fish & game code 5937: water for fish *UC Davis Law Rev.* **45** 809–913

Breiman L 2001 Random forests *Mach. Learn.* **45** 5–32

California Natural Resources Agency 2014 California water action plan. (accessed 3 June 2014 at http://resources.ca.gov/california_water_action_plan)

Carlisle D M, Falcone J, Wolock D M, Meador M and Norris R H 2010 Predicting the natural flow regime: models for assessing hydrological alteration in streams *River Res. Appl.* **26** 118–36

Christensen N, Wood A, Voisin N, Lettenmaier D and Palmer R 2004 The effects of climate change on the hydrology and water resources of the Colorado river basin *Clim. Change* **62** 337–63

Dearen J and Burke G 2014 California's flawed water system can't track usage. May 27, 2014 Associated Press. (accessed 1 June 2014 at http://bigstory.ap.org/article/californias-flawed-water-system-cant-track-usage)

Department of Water Resources (DWR) 2007 *California Central Valley, Unimpaired Flow Data* 4th edn (Sacramento, CA: Bay-Delta Office)

Department of Water Resources (DWR) 2009 *California Water Plan, 2009 update.* Bulletin 160–09 (Sacramento, CA: Department of Water Resources)

Falcone J A 2011 GAGES-II: Geospatial attributes of gages for evaluating streamflow (digital spatial data set retrieved from http://water.usgs.gov/GIS/metadata/usgswrd/XML/gagesII_Sept2011.xml)

Faunt C C (ed) 2009 *Groundwater Availability of the Central Valley Aquifer, California* (Reston, VA: US Geological Survey)

Frank R M 2012 The public trust doctrine: assessing its recent past and charting its future *UC Davis Law Rev.* **45** 665–92

Gillilan D M and Brown T C 1997 *Instream Flow Protection: Seeking a Balance in Western Water use* (Washington DC: Island Press)

Gleick P H 2003 Global freshwater resources: soft-path solutions for the 21st century *Science* **302** 1524–8

Gleick P H and Chalecki E L 1999 The impacts of climatic changes for water resources of the Colorado and Sacramneto-San Joaquin river basins *J. Am. Water Resour. Assoc.* **35** 1429–41

Grantham T, Figueroa R and Prat N 2013 Water management in mediterranean river basins: a comparison of management frameworks, physical impacts, and ecological responses *Hydrobiologia* **719** 451–82

Hanak E, Lund J, Dinar A, Gray B, Howitt R, Mount J, Moyle P and Thompson B B 2011 *Managing California's Water: From Conflict to Reconciliation* (San Francisco, CA: Public Policy Institute of California)

Hayhoe K *et al* 2004 Emissions pathways, climate change, and impacts on California *Proc. Natl. Acad. Sci. USA* **101** 12422–7

Howard J and Merrifield M 2010 Mapping groundwater dependent ecosystems in California *PLoS One* **5** e11249

Hundley N 2001 *The Great Thirst: Californians and Water—A History* (Berkeley, CA: University of California Press)

Klausmeyer K R and Shaw M 2009 Climate change, habitat loss, protected areas and the climate adaptation potential of species in mediterranean ecosystems worldwide *PLoS One* **4** e6392–6392

Liaw A and Wiener M 2002 Classification and regression by randomforest *R News* **2** 18–22

Little Hoover Commission 2010 *Managing for Change: Modernizing California's Water governance* (Sacramento, CA: Little Hoover Commission)

Littleworth A L and Garner E L 2007 *California Water II* (Point Arena, CA: Solano Press Books)

Medellín-Azuara J, Harou J J, Olivares M A, Madani K, Lund J, Howitt R E, Tanaka S K, Jenkins M W and Zhu T 2008 Adaptability and adaptations of California's water supply system to dry climate warming *Clim. Change* **87** 75–90

Moriasi D, Arnold J, Van Liew M, Bingner R, Harmel R and Veith T 2007 Model evaluation guidelines for systematic quantification of accuracy in watershed simulations *Trans. ASABE* **50** 885–900

Null S E, Bartolomeo E, Lund Jr and Hanak E 2012 Managing California's water: insights from interviews with water policy experts *San Francisco Estuary Watershed Sci.* **10** 1–24

Renwick M E and Green R D 2000 Do residential water demand side management policies measure up? an analysis of eight California water agencies *J. Environ. Econ. Manage.* **40** 37–55

Shupe S J, Weatherford G D and Checchio E 1989 Western water rights: the era of reallocation *Nat. Resour. J.* **29** 413–34

Stewart I T, Cayan D and Dettinger M D 2005 Changes toward earlier streamflow timing across western north America *J. Clim.* **18** 1136–55

Tanaka S K, Zhu T, Lund Jr, Howitt R E, Jenkins M W, Pulido M A, Tauber M, Ritzema R S and Ferreira I C 2006 Climate warming and water management adaptation for California *Clim. Change* **76** 361–87

United States Geological Survey (USGS) 2012 Hydrologic unit maps. (accessed 16 January 2014 at http://water.usgs.gov/GIS/huc.html)

United States Geological Survey (USGS) 2014 USGS water use data for California. (accessed 17 January 2014 at http://waterdata.usgs.gov/ca/nwis/wu)

Water Board (State Water Resources Control Board) 2014a eWRIMS - Electronic water rights information management system (accessed 3 January 2014 at waterboards.ca.gov/waterrights/water_issues/programs/ewrims/index.shtml)

Water Board (State Water Resources Control Board) 2014b The water rights process (accessed 15 January 2014 at waterboards.ca.gov/waterrights/board_info/water_rights_process.shtml)

Water Board (State Water Resources Control Board) 2014c Emergency curtailment of diversions based on insufficient flow to meet all needs on Mill and Deer Creeks. (accessed 15 June 2014 at waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/mill_deer_antelope_creeks/2014_0523_05e.pdf)

Westerling A L, Hidalgo H G, Cayan D and Swetnam T W 2006 Warming and earlier spring increase western US forest wildfire activity *Science* **313** 940–3

Wilhite D A, Diodato D M, Jacobs K, Palmer R, Raucher B, Redmond K, Sada D, Helm-Smith K, Warwick J and Wilhelmi O 2007 *Managing Drought: A Roadmap for Change in the United States (Conf. Proc. 18–20 September 2006)* (Longmont, CO: Geological Society of America)

Wines M 2014 West's drought and growth intensify conflict over water rights. 16 March 2014 New York Times (accessed 17 March 2014 at http://nyti.ms/1gJZSC3)

Zektser S, Loáiciga H A and Wolf J T 2005 Environmental impacts of groundwater overdraft: selected case studies in the southwestern US *Environ. Geol.* **47** 396–404

Appendix F

References

References

Click document name to open link.

Central Coast Water Authority
- Comprehensive Annual Financial Reports, Fiscal Years 1998-2011
- Budgets, Fiscal Years 1998-2011
- 2010 Urban Water Management Plan Update

Goleta Water District
- 2010 Urban Water Management Plan Update
- Water Rates & Meter Charges
- Budgets

Montecito Water District
- 2005 Urban Water Management Plan Update
- Water Rates and Meter Charges
- Budgets & Comprehensive Annual Financial Reports

Carpinteria Valley Water District
- 2010 Urban Water Management Plan Update
- Water Rates & Meter Charges
- Water District Budgets

City of Santa Barbara
- 2010 Urban Water Management Plan Update
- Water and Sewer Rates
- Budgets
- Comprehensive Annual Financial Reports

California Department of Water Resources
- Bulletin 132, "Management of the California State Water Project"
- "The State Water Project Delivery Reliability Report 2007", published August 2008

Madrid, Carlos. 1985. Santa Barbara County State Water Project alternatives. Los Angeles, Calif. Dept. of Water Resources, Southern District and Santa Barbara County Flood Control and Water Conservation District.

Santa Barbara County Grand Jury 2006-07 Report: "Carpinteria Valley Water District — Is Improved Direction Needed?"

Edited by Alan Lufkin, "California's Salmon and Steelhead — The Struggle to Restore an Imperiled Resource", Chapter 17 - The North Coast Water Wars: An Interview with Peter Behr. UC Press Ebooks selection.

Carollo Engineers. City of Santa Barbara, California Seawater Desalination Rehabilitation Project. March 2009.

David M. Rosenbaum, "Coastal Aqueduct Lessons to Guide Next Pipeline Project". Engineering News-Record, June 30, 1997. Volume 238, No. 26.

Business Forecasting Center, Eberhardt School of Business, University of the Pacific, 2012. "Benefit-Cost Analysis of Delta Water Conveyance Tunnels".

ECONorthwest. "Analysis of a cost of a Bay-Delta Conveyance structure: Rate Impacts to Santa Barbara County". July 2012.

Central Coast Water Authority
- Comprehensive Annual Financial Report, June 2015.
- 2010 Urban Water Management Plan, June 2011.