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BEFORE THE STATE WATER RESOURCES CONTROL BOARD

HEARING IN THE MATTER OF CALIFORNIA DEPARTMENT OF WATER RESOURCES AND UNITED STATES BUREAU OF RECLAMATION REQUEST FOR A CHANGE IN POINT OF DIVERSION FOR CALIFORNIA WATERFIX

TESTIMONY OF DOUG OBEGI IN PART 2 OF THE HEARING

I, Doug Obegi, do hereby declare:

INTRODUCTION:

I am a senior attorney at the Natural Resources Defense Council (NRDC), which is a protestant in this matter. My Statement of Qualifications is submitted concurrently with my written testimony as Exhibit NRDC-2.

I have been employed at NRDC since 2008. My professional responsibilities during my tenure at NRDC include review and evaluation of legislation, regulations, and planning documents, including agricultural and urban water management plans, regarding water use efficiency, water recycling, stormwater capture, and other local and regional water supply projects. From 2015-2018, I have also served as an individual member on the Board of Trustees of WateReuse California, a 501(c)(3) nonprofit organization advocating for water recycling in California.

Based on my education, experience, and professional position, I have knowledge sufficient to testify as to the matters included in this written testimony, and I am prepared to testify on these matters if called.

SUMMARY OF TESTIMONY:

My testimony will focus on: (1) the potential for increased water supply from local and regional projects, which would reduce reliance on water supplies imported from the Bay-Delta and are also relevant to determining the scope of protections under the Public Trust doctrine; (2) the cost-effectiveness and feasibility of investments in such projects; (3) the WaterFix proponents' "all of the above" strategy purports to include investments in local and regional water supplies like those described in my testimony; and (4) proposed terms and conditions relating to investments in local and regional water supplies, which are necessary to protect the Public Trust and public interest and assure these investments in local and regional water supplies, should the petition be granted.

I. There are Significant Opportunities within the State Water Project and Central Valley Project Service Area to Increase Local and Regional Water Supplies and Reduce Reliance on water imports from the Bay-Delta

Plans, reports, and other information developed by water districts, the State of California, and independent studies demonstrate that there are opportunities to create millions of acre feet of water supply through local and regional water projects within the service areas of contractors of the State Water Project (SWP) and Central Valley Project (CVP). Regional and local water supply projects including improved agricultural and urban water use efficiency, water recycling, and stormwater capture are technically feasible, cost-effective, and would create significant jobs in these communities.

It is my understanding that the feasibility and availability of alternative water supplies (including water generated by water use efficiency, stormwater capture, and water recycling) is relevant to the SWRCB's consideration of protections for Public Trust resources in this proceeding and in the Board's balancing of protecting beneficial uses. I am aware that the SWRCB has the authority to require improvements in local and regional water supply projects to protect instream beneficial uses, and I am aware that the SWRCB has done so in prior water rights hearings. *See, e.g.*, Order WR 2009-0034-EXEC. I am also aware that the terms and conditions included in certain water rights held by the SWP and CVP provide the SWRCB with authority to require water recycling and/or water conservation and efficiency measures. In addition, I have reviewed Decision 1485, the 1979 water rights decision that indicates that in evaluating future permit applications by the CVP and SWP, the SWRCB would carefully scrutinize water conservation and water recycling by the projects.

A. Mismatched: A Comparison of Future Water Supply and Demand for the Metropolitan Water District of Southern California and Its Member Agencies

In 2017, NRDC produced a report entitled *Mismatched: A Comparison of Future Water Supply and Demand for the Metropolitan Water District of Southern California and Its Member*

Agencies. This report compared the 2015 Urban Water Management Plan prepared by the Metropolitan Water District of Southern California (MWD) with the 2015 Urban Water Management Plans prepared by MWD member agencies. The 2015 UWMPs generally include projections of water supply and demand for 2020 to 2040, in average water years, single dry water years, and multiple dry water years. As compared with MWD's UWMP, the report demonstrates that the member agencies' UWMPs consistently estimate lower per capita demand for water, lower demand for imported water, and increased development of local water supplies. A copy of the *Mismatched* report is included as Exhibit NRDC-3.

The *Mismatched* report demonstrates that local water agencies in Southern California are preparing for a future with less water from the Delta, and have plans that enable member agencies to reduce demand for imported water by hundreds of thousands of acre feet. It is important to keep in mind that these projections and estimates have been prepared by urban water suppliers as required by state law; they are not projections or estimates created by NRDC. NRDC simply reviewed and synthesized data from the urban water management plans of the local water agencies within the service area of MWD.

The *Mismatched* report provides compelling evidence that continued improvement in water use efficiency and investments in local and regional water supply projects will enable the region to significantly reduce demand for water from the Delta, leaving more water for fish and wildlife.

1. Per Capita Demand for Water

The *Mismatched* report demonstrates that throughout the 2020 to 2040 period, MWD projects higher per capita demand for water than the member agencies in average water years. MWD's UWMP projects per capita demand will be approximately 20 gallons per capita per day (GPCD) higher than the member agencies' UWMP projections. This is due in part because MWD projects extremely high per capita demand in Riverside County and San Bernardino County, where MWD's estimates exceed those of the member agencies by 40 to 80 gallons per

capita per day. Across the MWD service area, in 2020 MWD predicts demand will be over 190 GPCD, whereas the member agencies project that demand will be 165 GPCD. By comparison, in 2015 per capita demand was 171 GPCD. MWD projects a significant increase in per capita demand compared to current historic levels and as compared to its member agencies' estimates, as shown in Figure 1 below.

	2020		2025		2030		2035		2040	
County	MWD	Water Agencies	MWD	Water Agencies	MWD	Water Agencies	MWD	Water Agencies	MWD	Water Agencies
Los Angeles	165	146	160	147	157	147	155	145	153	144
Orange	188	167	187	172	184	172	182	170	178	168
Riverside	292	217	293	208	289	208	284	207	277	204
San Bernadino	302	240	301	243	295	243	289	243	285	245
San Diego	182	157	182	166	178	166	176	166	174	168
Ventura	225	230	225	231	223	231	219	230	216	227

TABLE 1. COMPARISON OF TOTAL PROJECTED PER CAPITA DEMAND FOR THE MWD SERVICE AREA, REPRODUCED FROM THE *MISMATCHED* REPORT.

2. Local Water Supply Development

The *Mismatched* report demonstrates that MWD estimates significantly less development of local and regional water supplies than its member agencies. While MWD and the member agencies estimate similar local water supplies available in 2020, by 2025 local water agencies estimate approximately 154,000 AF more than MWD does. By 2040, this difference increases to more than 229,000 AF, primarily due to increased production from groundwater and recycled water sources. For instance, MWD's UWMP estimates that recycled water production only will increase from 436,000 acre feet in 2020 to 509,000 acre feet by 2040. In contrast, the local agency UWMPs collectively estimate that recycled water production will increase from 431,896 acre feet in 2020 to 572,128 acre feet in 2040.

MWD's estimate is very conservative, because its UWMP only includes projects currently producing water, projects under construction, and local supply targets identified in its Integrated

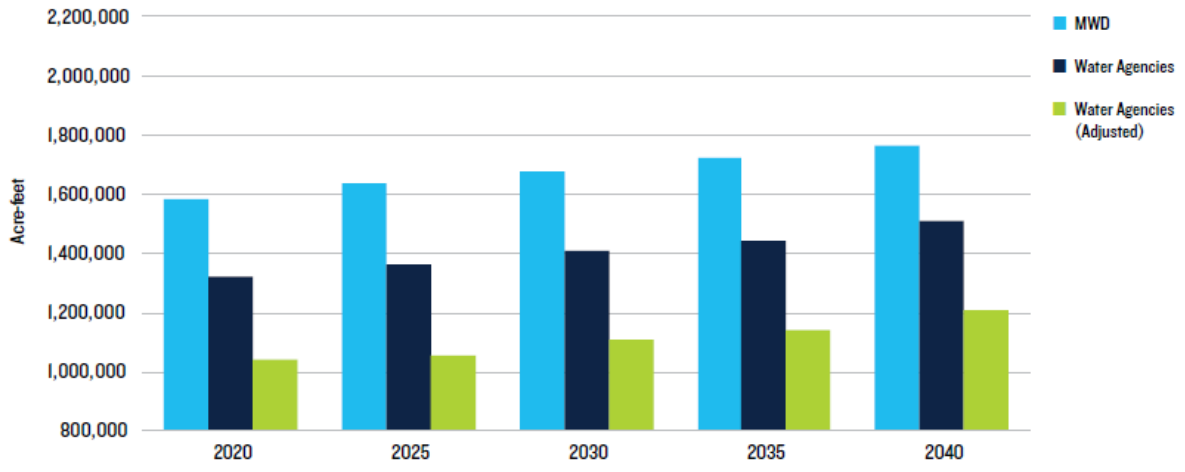
Water Resources Plan. As a result, MWD's UWMP does not include numerous planned or proposed water supply projects in the region, such as the proposed water recycling project in Carson (168,000 acre feet per year) or the PURE Water San Diego water recycling project (93,000 acre feet per year). MWD's UWMP includes an appendix that identifies specific potential projects with an estimated water supply yield of 680,000 acre feet per year, but those projects are not included in MWD's estimates of local water supply. Some, but far from all, of these projects are included in local agency UWMPs.

3. Total Demand for Water

MWD's UWMP projects that future annual water demands are 335,000 to 554,000 acre-feet higher than what is predicted by the local agencies over the next 25 years. This is largely due to MWD's higher estimate of per capita demand for water, as the member agencies' UWMPs estimate higher population growth than MWD does by 2040.

4. Demand for Imported Water

On the basis of these higher demand projections and the expectation of less local water supply, MWD anticipates far greater sales of imported water than the local agencies. In average water years, MWD projects 259,000 to 281,000 AF more in annual imported water sales than the water agencies plan to purchase, according to their UWMPs. However, local water agency UWMPs often only report MWD water supplies available for purchase, not how much water they actually intend to purchase; 14 of the UWMPs report that total available local water supplies exceed forecasted demand, suggesting that they could reduce or eliminate purchases of imported water altogether in average water years. If all of the local water supplies in the local agencies UWMPs were used before any imported water was purchased from MWD, demand for imported water from MWD would be more than 500,000 acre feet lower than MWD projects in its UWMP.



Data sources: 2015 UWMPs of the MWD and local water agencies. Projected sales in light blue are reported by the MWD. Projected sales in dark blue are reported by local agencies and are either supplies available from the MWD or intended purchases from the MWD. In contrast, adjusted projected sales in green assume that all local supplies are used entirely before MWD purchases are made by local agencies.

FIGURE 1: TOTAL PROJECTED ANNUAL MWD WATER SALES TO LOCAL WATER AGENCIES IN YEARS WITH AVERAGE HYDROLOGIC CONDITIONS FOR 2020-2040, REPRODUCED FROM THE *MISMATCHED* REPORT

Total Projected Annual MWD Sales—Adjusted (acre-feet)			
Year	**MWD**	**Water Agencies**	**Difference**
2020	1,586,000	1,039,239	**+546,761**
2025	1,636,000	1,051,117	**+584,883**
2030	1,677,000	1,104,412	**+572,588**
2035	1,726,000	1,140,631	**+585,369**
2040	1,765,000	1,205,505	**+559,495**

TABLE 2: COMPARISON OF TOTAL PROJECTED ANNUAL MWD SALES FOR YEARS WITH AVERAGE HYDROLOGIC CONDITIONS IF ALL AVAILABLE LOCAL SUPPLIES ARE USED BEFORE PURCHASES OF IMPORTED WATER ARE MADE, REPRODUCED FROM THE *MISMATCHED* REPORT

During single and multiple dry year periods, MWD's UWMP also predicts higher demand for imported water than the UWMPs of its local agencies. For a single dry year, in 2040 MWD's UWMP overestimates demand for imported water by 83,000 acre feet compared to the local UWMPs. for multiple dry years, local agencies' UWMPs anticipate purchasing 53,000 to 187,000 acre feet of water less than MWD's UWMP anticipates.

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B. The Untapped Potential of California's Water Supply

In 2014, NRDC and the Pacific Institute authored a report entitled *The Untapped Potential of California's Water Supply: Efficiency, Reuse, and Stormwater* ("Untapped Potential"), which provided a technical evaluation of the statewide water supply potential of four water supply tools: improved agricultural water use efficiency, improved urban water use efficiency, water recycling, and stormwater capture in urban areas. The methodology used in the report ensures that there is no double counting of water supply benefits; for instance, the potential water supply from water recycling was evaluated assuming the implementation of improved urban water use efficiency. The primary conclusions of that report are summarized below, and a copy of that report is included as Exhibit NRDC-4.

Tool	**Potential Water Supply**
Improved Urban Water Use Efficiency	2.9 – 5.2 million acre feet per year
Improved Agricultural Water Use Efficiency	5.6 – 6.6 million acre feet per year (total) 0.6 – 2.0 million acre feet per year (reduction in consumptive use)
Water Recycling	1.2 – 1.8 million acre feet per year
Stormwater Capture	400,000 – 600,000 acre feet per year

TABLE 3: POTENTIAL WATER SUPPLY FROM IMPROVED WATER USE EFFICIENCY, WATER RECYCLING, AND STORMWATER CAPTURE, REPRODUCED FROM *UNTAPPED POTENTIAL*

1. Improving Urban Water Use Efficiency

The *Untapped Potential* report developed its estimate of potential water savings from improved urban water use efficiency by combining the potential water savings for indoor water use, outdoor water use, and commercial, industrial, and institutional (CII) water use. The report also estimated that cost-effective actions to reduce system losses could save 0.35 million acre feet per year (40% of the estimate 0.87 million acre feet per year lost as a result of leaks and breaks in distribution systems), but did not include these estimates in the totals presented in the paper.

For indoor water use efficiency, the authors used two methods to evaluate potential water savings, as explained in the report.

First, the authors evaluated water savings if every household upgraded to water efficient fixtures and appliances (such as toilets, clothes washers, and showerheads), using current estimates of market penetration for various appliances and fixture and average uses of such appliances and fixtures. It also evaluated the effect of eliminating water loss from leaks in the home. This method resulted in an estimated savings of 33 gallons per capita per day (GPCD), or 1.3 million acre feet per year.

Second, the authors evaluated water savings using a water budget approach, based on a home with water efficient appliances and average household use of these appliances and fixtures, which resulted in an indoor water use estimate of 32 GPCD. Water savings were calculated by comparing this estimate to the official estimates of GPCD by hydrologic region, multiplied by the population within each hydrologic region. This method resulted in an estimated savings of 40 GPCD, or 1.6 million acre feet per year.

For outdoor water use efficiency, the authors used the landscape water budget method, based on the average water use factor of 0.7, the maximum level allowed under the Model Water Efficient Landscape Ordinance. The authors also performed a second analysis using an average water use factor of 0.3, which assumes landscapes are replanted with drought tolerant plants. The report estimates that outdoor water use would be reduced by 30% under the first method, and by 70% under the second method.

For CII indoor water use efficiency, the authors estimated commercial indoor water efficiency could be improved by 30 to 50 percent, and industrial efficiency could be improved by 25 to 50 percent. CII outdoor water use was estimated using the same method for household outdoor water use.

Taken together, the *Untapped Potential* report estimates that improvements in urban water use efficiency have the technical potential to reduce water use by 2.9 – 5.2 million acre feet per year. Of that total, 1.4 to 2.4 million acre feet per year could be saved within the South Coast Hydrologic Region, which is largely encompassed by the service area of the Metropolitan Water

District of Southern California, the largest State Water Project contractor. The report identifies significant additional water savings through improved urban water use efficiency in the service areas of other SWP contractors, including that of the Santa Clara Valley Water District.

2. Water Recycling

To estimate potential water supply from water recycling, *Untapped Potential* assumed that the technical potential for water reuse in California is equivalent to the state's indoor water use. Based on data from the California Department of Water Resources, the authors estimated indoor urban water use of 4.2 million acre feet per year. After implementing indoor water use efficiency improvements described above, total indoor water use would decline to 1.9 to 2.5 million acre feet per year, with 64% of that use from residences. After subtracting the State's 2009 estimate of water recycling (670,000 acre feet), total potential water supply from water recycling would be 1.2 to 1.8 million acre feet per year. The Untapped Potential report estimates that two thirds of that new supply would be created in coastal areas where wastewater is discharged to the ocean, although the report did not break out the results by hydrologic region. The report explicitly acknowledges that this is a very conservative estimate because it assumes a very high level of indoor water use efficiency, did not account for population growth, and assumes that water could only be recycled once. There would be greater potential for recycled water production if indoor water use efficiency did not reach its maximum technical potential as described above.

3. Stormwater Capture

To estimate the potential water supply from expanded stormwater capture in urban areas, *Untapped Potential* utilized a GIS analysis of land use and impervious surface cover in order to calculate potential runoff under average annual precipitation (as well as from dry weather runoff from over-irrigation and other sources). Land use was evaluated to determine whether development overlaid a groundwater aquifer used for municipal supply, as well as to determine

likely potential infiltration of stormwater into groundwater based on soil types. Where infiltration was not feasible, the report estimated potential for rainwater harvesting using rain barrel(s). The report only estimated runoff that could be captured on developed lands, and because it excludes potential stormwater capture on open space, it underestimates the total potential for stormwater capture.

Based on these calculations, the report estimated 420,000 to 630,000 acre feet of potential increases in stormwater capture for the nine county San Francisco Bay Area and portions of Southern California. Of this total amount, 365,000 to 440,000 would be from groundwater recharge in areas overlying aquifers used for municipal supply, and up to 190,000 from rooftop rainwater capture. Unpublished data from the *Untapped Potential* report provides county level estimates of stormwater capture potential, including the following data for counties that are partially or entirely within the service area of the CVP and SWP:

County	**Average Stormwater Capture Potential (AFY)**
Alameda	17,937
Santa Clara	58,000
Los Angeles	188,514
Orange	46,605
Riverside	37,159
San Diego	17,918
Ventura	18,304
Santa Barbara	64,651
Total	449,088

TABLE 4: AVERAGE STORMWATER CAPTURE POTENTIAL PER COUNTY, REPRODUCED FROM UNPUBLISHED DATA USED IN DEVELOPING THE UNTAPPED POTENTIAL REPORT

4. Agricultural Water Use Efficiency

Finally, the *Untapped Potential* report analyzed potential water savings from improving agricultural water use efficiency. This portion of the report evaluated several prior studies of potential water supply savings from improved agricultural efficiency, including two studies by

CALFED (2000, 2006) and the 2009 Pacific Institute study entitled *Sustaining California Agriculture in an Uncertain Future*. The 2006 CALFED study concluded that irrigation water diversions could be reduced by 6.3 million acre feet, of which 2.0 million acre feet would be reductions in consumptive use.[1] The 2009 study from the Pacific Institute evaluated potential water use efficiency improvements associated with: (1) improved on farm irrigation (shifting 1.1 million acres utilizing flood irrigation to drip irrigation and shifting 2.2 million acres utilizing sprinkler irrigation to drip); (2) irrigation scheduling; and (3) regulated deficit irrigation to wine grape, raisin, almond, and pistachio acreage during the drought-tolerant growth stages. Pacific Institute's 2009 study estimated applied water savings of 4.5 million acre feet (wet year) to 6.0 million acre feet (dry year). Although the report did not calculate total reductions in consumptive use from improved water use efficiency, it did conclude that widespread adoption of regulated deficit irrigation could reduce consumptive use by 1.1 million acre feet per year. The largest potential reductions in applied water use were from better irrigation scheduling. On the basis of these three studies, the Untapped Potential report estimated a reduction in applied water use of 5.6-6.6 million acre feet per year (17-22% reduction in irrigation water use), of which 0.6 million to 2.0 million would be reductions in consumptive water use. The report did not evaluate the extent to which these reductions in water use would occur in the service areas of the CVP and SWP South of the Delta.

C. 2013 Portfolio Alternative for the Bay-Delta

In January 2013, a coalition of conservation groups and urban water agencies proposed a Portfolio Alternative for the Bay-Delta. This Portfolio Alternative included a smaller, 3,000 cfs single tunnel diversion facility in the North Delta, operated in accordance with protective criteria developed by state and federal biologists that would reduce diversions from the Delta (estimated

[1] The WaterFix FEIS/FEIR, Chapter 1C, also referenced and summarized the CALFED 2006 study and the Pacific Institute's 2009 report.

to yield an annual average of 4.0 to 4.3 million acre feet per year). The Portfolio Alternative included nearly 40,000 acres of habitat restoration, similar to that required under existing biological opinions. In addition, the Portfolio Alternative proposed to invest much of the cost savings from a smaller, single tunnel alternative in local and regional water supply projects including recycling, conservation, and south of Delta storage. A copy of the Portfolio Alternative is included as Exhibit NRDC-5.

With respect to the development of local and regional water supplies, the Portfolio Alternative used capital cost information from the 2009 California Water Plan Update and a draft of the 2013 California Water Plan Update (the most recent version available at the time) to estimate potential water supply yield from investing $2 billion (2012 dollars) in water recycling, using both high and low end cost estimates. This estimate included all capital costs for recycled water projects, consistent with the analysis in the Water Plan Update. For urban water use efficiency, the Portfolio Alternative evaluated potential water supply created from investing $3 billion (2012 dollars) in water use efficiency, and it used cost estimates from the Water Plan Update (2009 and 2013 draft, using both high and low end cost estimates). For both water recycling and water use efficiency, the Portfolio Alternative also evaluated cost information from a variety of other sources.

Based on the cost information provided by the State, the appendix to the Portfolio Alternative estimated that investing $5 billion in water recycling and urban water use efficiency would generate between 900,000 and more than 1.2 million acre feet of water.

	Investment Amount ($)	Cost estimate ($/af)	Water yield (af)
Recycled water	2,000,000,000	6,430 - 6,470	309,119.01 – 311,041.99
Urban Efficiency	3,000,000,000	3,230 – 4,860	617,283.95 – 928,792.57
		Total	**926,402.96 – 1,239,834.56**

TABLE 5: WATER YIELD PRODUCTION WITH $5 BILLION INVESTMENT, REPRODUCED FROM *PORTFOLIO ALTERNATIVE 2013*

D. Conclusion

These reports demonstrate that there is a tremendous potential to increase water supplies in the service areas of the CVP and SWP, particularly urban areas, through improved water use efficiency and investments in local water supply projects like water recycling and stormwater capture. These kinds of investments could yield more than a million acre feet of new water supplies, which could enable reduced diversions from the Bay-Delta estuary to better protect the environment while sustaining the economy.

In addition, these kinds of local water supply projects create additional local benefits. First, they create local jobs, such as constructing new water recycling facilities, installing new water efficiency fixtures, removing turf, or constructing stormwater capture projects. For instance, in 2011 the Economic Roundtable released a report on the economic effects of investments in stormwater, greywater, water use efficiency, and water recycling projects in Los Angeles, based on a review of more than $1.2 billion in such projects in the Los Angeles area. That report, which was underwritten by the City of Los Angeles, estimated that a $1M investment in water conservation, water recycling, and related local water supply and efficiency projects would create between 12.6 and 16.6 jobs, which is a better rate of job creation than many other industries in Southern California.[2] The report also concluded that every dollar invested in these water supply projects generated economic activity that was double the initial investment. Second, these projects also improve water supply reliability in Southern California, as WaterFix does not address seismic risks along the 400+ mile long California Aquaduct or within Southern California. Los Angeles' Resilience by Design plan, developed by scientists with the U.S. Geological Survey and staff from the City of Los Angeles, emphasizes that, "Increased use of local water reduces the risk posed by reliance on water imported via fault-crossing aqueducts.

[2] Patrick Burns and Daniel Fleming 2011. Water Use Efficiency and Jobs. Economic Roundtable. Available online at: https://economicrt.org/publication/water-use-efficiency-and-jobs/

Initiatives to improve local water supplies through storm water capture, water conservation, water recycling, and San Fernando Valley Groundwater Basin contamination remediation provide the best possible protection and should be supported as fundamental earthquake resilience measures."[3] Water Recycling is also a relatively drought resistant supply, unlike imported water from Northern California. Third, these options generally reduce greenhouse gas emissions and energy use, particularly when water from these local sources in Southern California replaces water that would otherwise be imported from the Delta. For instance, a 2016 peer reviewed study concluded that expanded use of recycled water was the best water conservation strategy to reduce water use, energy use, and greenhouse gas emissions.[4] That study (Sokolow et al 2016) estimated that, "If just 10% of the water that is currently imported from the State Water Project were shifted to recycled water, California would save approximately 80 million kWh of energy annually and reduce carbon emissions by nearly 42 000 metric tons per year."

II. The Cost-Effectiveness and Feasibility of Investments in Local and Regional Water Supply Projects

In addition to the reports cited above, several specific projects within the service areas of the CVP and SWP South of the Delta have demonstrated that these kinds of local and regional water supply projects are feasible and cost effective.

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[3] Available online at: http://www.lamayor.org/sites/g/files/wph446/f/article/files/Resilience%20by%20Design%20%281%29.pdf

[4] *See, e.g.*, Sharona Sokolow, Hilary Godwin, and Brian L. Cole 2016. *Impacts of Urban Water Conservation Strategies on Energy, Greenhouse Gas Emissions, and Health: Southern California as a Case Study*. Am. J. Public Health 2016; 106:941-948. doi:10.2105/AJPH.2016.303053.

A. Cost and Feasibility Information for Southern California

The table below shows the cost and water supply yield information for specific local water supply projects in Southern California, based on published information from local, state and federal agencies.

Project	Cost	Water Supply Yield (average)	Source
Carson Regional Water Recycling Project	$2.7 billion capital cost $129M annual O&M cost $1,600 per acre foot	168,000 AF/year (150 MGD)	*Metropolitan Water District of Southern California*[5]
Pure Water San Diego	$1,700-$1,900 per acre foot	90,000 AF/year (83 MGD)	*City of San Diego*[6]
Tillman Groundwater Replenishment Project	$400M capital cost $19M annual O&M Cost	30,000 AF/year	*Los Angeles Department of Water and Power*[7]
OCWD Groundwater Replenishment System, Phase III	$252M	33,000 AF/year (30 MGD)	*Source: Orange County Water District*[8]
Inland Empire Recycled Water Distribution System	$81.8M capital cost $3.6M annual O&M cost	20,000 AF/year	*MWD 2015 UWMP; IEUA 2015 UWMP*
LA Basin Regional Stormwater Capture	$1,300 per acre foot	43,300 AF/year	*Los Angeles County Public Works, LA County Flood Control District, U.S. Bureau of Reclamation*[9]
LA County Flood Control Dams modification (stormwater capture)	$183 per acre foot	150,000 AF/year	*Los Angeles County Public Works, LA County Flood Control District, U.S. Bureau of Reclamation*[10]

B. Cost and Feasibility Information for Santa Clara Valley Water District

The Santa Clara Valley Water District also has evaluated the cost-effectiveness of investments in local water supplies, including increased water recycling, as part of its evaluation of the Bay-Delta Conservation Plan and WaterFix. In 2013, staff prepared an analysis of the cost of developing an additional 30,000 acre feet per year of recycled water for direct potable reuse,

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[5] Available online at: http://www.mwdh2o.com/PDF_NewsRoom/RRWP_FeasibilityStudyRelease.pdf

[6] Available online at: https://www.sandiego.gov/sites/default/files/legacy/water/pdf/purewater/2015/faq_purewater.pdf

[7] Available online at: https://www.lacitysan.org/cs/groups/public/documents/document/mhfh/mdax/~edisp/qa001440.pdf

[8] Available online at: https://www.ocwd.com/media/5404/gwrs-fe-leg-handout_v13.pdf

[9] Available online at: https://www.usbr.gov/lc/socal/basinstudies/AppendixB.pdf

[10] Available online at: https://www.usbr.gov/lc/socal/basinstudies/AppendixB.pdf.

and concluded that capital cost would be $277, and the 50 year present value cost, including capital and O&M, would be approximately $548M. This was near the midpoint of the District's estimated costs for BDCP ($504-583M). Staff also evaluated the cost of developed 30,000 acre feet per year of new water supply through additional water conservation, and estimated that the present value cost would be $540M. Again, this was near the midpoint of the District's estimated costs for BDCP.

	Incremental Cost		
	BDCP Proposed Project	30,000 AF of Additional Conservation*	30,000 AF of Additional Portable Reuse
Total District Costs- Present Value	$504-583	$540	$548
Groundwater charge increase in FY29 ($/AF)			
north county	$132- $172	$272	$259
south county	$87 - $114	$58	$118
SWP tax increase in FY29, average single family ($/year)			
north county	$28 - $31	$0	$0
south county	$22 - $24	$0	$0
Total increase per average household in FY29 ($/month)			
north county	$7 - $8	$9	$9
south county	$3 - $4	$2	$4

* Groundwater charges and total monthly cost per average household in the Conservation Scenario include the impact of reduced revenue due to reduced water usage.

TABLE 6: COMPARISON OF SCENARIOS TO MITIGATE BDCP FUTURE "NO ACTION" SCENARIO WITH BDCP PROPOSED PROJECT, REPRODUCED FROM EXHIBIT NRDC-6.

A copy of the Santa Clara Valley Water District's December 9, 2013 Memo is included as Exhibit NRDC-6. As the cost per acre foot of WaterFix increases because of increased costs and reduced water supply yield, the costs of water recycling and water conservation will be even more attractive to the District.

In addition, in 2016 a review of the Santa Clara Valley Water District's 2015 Urban Water Management Plan was performed for NRDC. That review of SCVWD's UWMP reached the following conclusions:

First, that SCVWD was projecting to increase recycled water use (both recycled water and potable reuse) from 21,000 acre feet in 2015 (Actual) to 48,700 acre feet in 2025, but thereafter there would be minimal increases in water recycling by 2040 (53,700 acre feet in 2040;

Second, as compared to the 2010 UWMP, SCVWD was projecting nearly identical levels of water demand in 2025-2040, despite the fact that total demand in 2015 was dramatically lower than projected in the 2010 UWMP and despite the fact that population growth was projected to be lower in the 2015 UWMP.

	2010	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Total demand – 2010 UWMP (AF)	332,900	375,720	384,810	396,420	409,370	**422,920**	--
Total demand – 2015 UWMP (AF)	--	285,000	371,200	391,400	408,600	**425,600**	435,100
Population Projections – 2010 UWMP	1,822,000	1,945,300	2,063,100	2,185,800	2,310,800	**2,431,400**	--
Population Projections – 2015 UWMP	--	1,877,700	1,977,900	2,080,600	2,188,500	**2,303,500**	2,423,500

Sources: SCVWD 2010 UWMP, Tables 2-1, 4-1, Section 4.1; SCVWD 2015 UWMP, Tables 3-2, 4-1, Figure 3-5.

TABLE 7: COMPARISON OF DEMAND AND POPULATION PROJECTIONS BETWEEN SANTA CLARA VALLEY WATER DISTRICT'S 2010 AND 2015 URBAN WATER MANAGEMENT PLANS.

Third, SCVWD's projections of per capita water demand in the 2015 UWMP assumed that reductions in water use during the drought were completely eliminated by 2020, with increased demand of more than 30% from 2015 to 2020. After 2020, per capita demand projections in the 2015 UWMP were higher than per capita demand projections from the 2010 UWMP.[11]

[11] According to recent research by Steven Buck, Hilary Soldati, and David Sunding, urban water agencies often overestimate future demand for water. Their 2015 paper, which uses water demand from single family homes in Southern California as a case study, shows that using models based on out of sample criteria are more accurate than standard techniques, as the standard techniques typically overestimate demand. Their paper estimates that using these out of sample models, which were most accurate in predicting future demand, forecast a significant reduction in aggregate single family water demand in 2035 compared to today. Steven Buck,

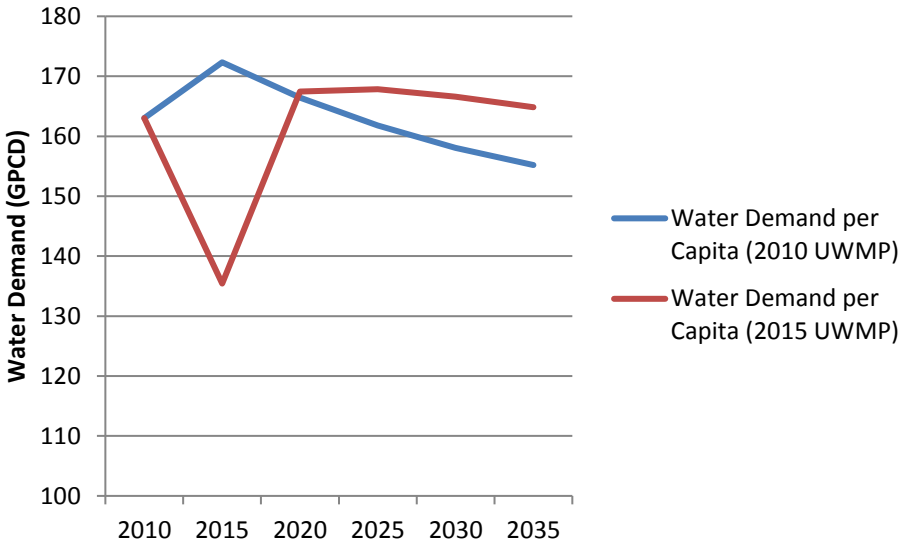

FIGURE 2: COMPARISON OF PER-CAPITA WATER DEMAND FROM SANTA CLARA VALLEY WATER DISTRICT'S 2010 AND 2015 URBAN WATER MANAGEMENT PLANS

Fourth, SCVWD's 2015 UWMP was projecting significantly higher demand for water than many of its member agencies projected in their UWMPs. This conclusion regarding SCVWD's UWMP is similar to the conclusion from the *Mismatched* report reviewing MWD's UWMP.

Retailer	2015 Total Demand	2020 Total Demand	2025 Total Demand	2030 Total Demand	Total Demand 2035
California Water Service Company - Los Altos[a]	10,188	14,376	14,451	14,579	14,741
SCVWD Projection		15,200	15,500	15,800	16,100
Difference		824	1,049	1,221	1,359
City of Gilroy[b]	8,139	11,775	13,439	15,292	16,581
SCVWD Projection		11,700	13,400	15,000	16,000
Difference		-75	-39	-292	-581
Great Oaks Water Company[b]	8,479	9,452	10,106	10,833	11,613
SCVWD Projection		17,800	19,800	21,900	24,600
Difference		8,348	9,694	11,067	12,987
City of Milpitas[b]	9,560	12,347	15,585	18,222	20,861
SCVWD Projection		17,800	19,800	21,900	24,600
Difference		5,453	4,215	3,678	3,739

Hilary Soldati, and David Sunding, 2015. Forecasting Urban Water Demand in California: Rethinking Model Evaluation, included as Exhibit NRDC-8.

City of Morgan Hill	5,379	8,549	9,242	9,934	10,627
SCVWD Projection		8,600	9,800	11,000	12,100
Difference		51	558	1,066	1,473
City of Mountain View	8,611	12,307	12,577	12,844	13,160
SCVWD Projection		12,500	12,700	13,000	13,300
Difference		193	123	156	140
City of Palo Alto	11,542	12,733	12,261	11,982	11,729
SCVWD Projection		12,000	11,600	11,400	11,100
Difference		-733	-661	-582	-629
San Jose Municipal Water	19,314	28,268	31,794	35,504	39,400
SCVWD Projection		35,200	38,500	42,100	45,800
Difference		6,932	6,706	6,596	6,400
San Jose Water Company[b]	108,543	144,679	152,097	158,502	163,848
SCVWD Projection		144,600	152,100	158,400	163,800
Difference		-79	3	-102	-48
City of Sunnyvale	21,653	23,054	24,879	25,484	26,370
SCVWD Projection		22,800	24,300	24,900	25,700
Difference		-254	-579	-584	-670
Sum of Differences		**20,659**	**21,070**	**22,224**	**24,171**

Total of SCVWD Projections for the 10 Retailers		298,200	317,500	335,400	353,100
Percent of SCVWD Total Countywide Demand Projections[c]		80.3%	81.1%	82.1%	83.0%
Percent of SCVWD Total Retailer Demand Projections		92.3%	92.5%	93.1%	93.6%

Sources: California Water Service Company – Los Altos 2015 UWMP, Tables 4-1, 4-3; City of Gilroy 2015 UWMP, Table 4-3; Great Oaks Water Company 2015 UWMP, Table 4-3; City of Milpitas 2015 UWMP, Table 4-3; City of Morgan Hill 2015 UWMP, Table 4-3; City of Mountain View 2015 UWMP, Tables 4-1, 4-5; City of Palo Alto 2015 UWMP, Table 16; San Jose Municipal Water System 2015 UWMP, Table 4-4; San Jose Water Company 2015 UWMP, Table 4-3; City of Sunnyvale 2015 UWMP, Table 4-2; Santa Clara Valley Water District 2015 UWMP, Table 4-1.
NOTE: Purissima Hills Water District, City of Santa Clara, and Stanford University do not have available 2015 UWMPs, and are not included in this table. Additionally, several retailers do not include demand projections for 2040 in their 2015 UWMP; 2040 data is not included in this table. This data represents total retailer demand, not the portion specific to SCVWD-controlled supplies. Demand from retailers' UWMPs includes recycled water demand.
[a] The SCVWD 2015 UWMP just lists "Cal Water Service Company" in their demand projections; Cal Water Service Company – Los Altos appears to be the only portion of the California Water Service Company within Santa Clara County.
[b] Converted to AF from units in retailer's UWMP.
[c] Includes agricultural groundwater pumping, independent groundwater pumping, raw water, and losses.

TABLE 8: COMPARISON OF DEMAND PROJECTIONS BETWEEN SANTA CLARA VALLEY WATER DISTRICT AND RETAIL URBAN WATER MANAGEMENT PLANS (AF)

Taken together, this information demonstrates significant opportunities for Santa Clara Valley Water District to reduce per capita water use and invest in water recycling and other local water supply projects, and that reductions in water yield from WaterFix to protect the Bay-Delta estuary are economically feasible.

C. Statewide information on Costs and Yield from the California Department of Water Resources

Similarly, the California Department of Water Resources' Water Plan Update 2013 also provides financial information that informs discussions of the feasibility of investments in these kinds of projects. The Introduction to Volume 3 of the Water Plan Update identifies potential yield and cost for various water supply strategies, including:

	Water Supply Benefits by 2030, in millions of acre feet	Accumulated Cost by 2030, in billions
Agricultural Water Use Efficiency	0.1-1.0 (net water savings / reduction in consumptive use)	$0.3-0.5
Urban Water Use Efficiency	1.2-3.1	$2.5-6.0
Recycled Municipal Water	1.8-2.3	$6.0-9.0

TABLE 9: POTENTIAL WATER SUPPLY BENEFITS AND COSTS BY 2030, REPRODUCED FROM CALIFORNIA WATERPLAN UPDATE 2013

As with the information above, this information from the State of California helps to demonstrate that reduced diversions from the Bay-Delta as part of terms and conditions on WaterFix are feasible. A copy of the introduction to Volume 3 of the California Water Plan Update 2013, from which the table above was prepared, is included as Exhibit NRDC-7.

D. Feasibility of Water Recycling Based on the SWRCB's recent data on Wastewater Discharges to Oceans and Bays

Finally, data from the SWRCB on wastewater discharges to the ocean also demonstrates the potential for significant improvements in water recycling, particularly in Southern California. Even during the peak of the drought, data from the SWRCB's electronic Self-Monitoring Reports module of the California Integrated Water Quality System (eSMR) demonstrated that in 2014 more than 1.42 million acre feet per year of wastewater was discharged to the ocean or bays across the State (more than 1,268 million gallons per day, or MGD). In 2015, more than 1.3

million acre feet of wastewater was discharged to the ocean or bays. This included significant discharges within the service area of the CVP and SWP, including the following wastewater treatment plants in the SWP service area in Southern California:

	2014 Flow (MGD)	2015 Flow (MGD)
Hyperion	185.14	202.68
LA County Joint WWTP	263.33	258.42
Orange County SD, RP #1 and TP #2	132.98	99.77
Point Loma WWTP	139.27	131.58

TABLE 10: DISCHARGES OF WASTEWATER TO OCEAN AND BAYS IN 2014 AND 2015, REPRODUCED FROM eSMR DATA

Even with urban water use significantly reduced due to drought and SWRCB water conservation requirements, there were significant discharges of wastewater directly to oceans and bays that could have been recycled. Many of these wastewater treatment plants have planned or proposed water recycling projects that are anticipated to reduce discharges and increase reuse of this water. There were substantial additional wastewater discharges to rivers and creeks in the service areas of the CVP and SWP, which could also be available for water recycling provided that doing so would avoid impacts to downstream water rights and the environment.

III. WaterFix Proponent's "All of the Above" Strategy Purports to Include Investments in Local and Regional Water Supplies

WaterFix proponents have repeatedly claimed that the project is part of an "all of the above" strategy that includes investments in local and regional water supply projects. A small sample of these claims includes the following:

- John Laird, Resources Secretary, op-ed in the San Diego Union Tribune dated September 13, 2017, available online at: http://www.sandiegouniontribune.com/opinion/commentary/sd-utbg-california-water-delta-tunnels-20170913-story.html ("Critics argue that the money invested in WaterFix would be better spent paying for more recycling or desalination plants.

While these supplies are important, they cannot fully replace water San Diego receives from the State Water Project. This is not an either-or situation. All programs and alternatives are needed to secure the region's water supply future.");

- John Laird, Resources Secretary, op-ed in the San Jose Mercury News dated October 14, 2017 ("The state's plan to modernize existing infrastructure, coupled with existing groundwater management and more recycling and conservation, is that future."), available online at: http://www.mercurynews.com/2017/10/14/opinion-waterfix-is-santa-clara-countys-best-solution/ ;
- MWD fact sheet, Why a California Water "Fix" ("How California WaterFix is Part of Southland's 'All of the Above' Water Strategy"), http://mwdh2o.com/PDF_About_Your_Water/MWD_CAWaterFix_Top5_SouthBay.pdf
- Santa Clara Valley Water District, Resolution 17-68, conditional support for California WaterFix

While not always using the exact phrase "all of the above," the project proponents have repeatedly claimed that investments in WaterFix will be in addition to investments in local and regional water supply projects, rather than displacing those investments.

However, despite the claims that WaterFix is part of this "all of the above" water supply strategy, the proposed project does not include any funding for local and regional water supply projects such as water use efficiency, stormwater capture, or water recycling. There are significant, well founded concerns that the money spent to construct WaterFix will preclude investments in these local and regional water supply projects, including a report from the University of Southern California in 2012 that reached this very conclusion.

In addition, experience has shown that mandatory requirements to improve water management have generally been more successful than purely voluntary approaches. For

instance, the SWRCB reported that voluntary water conservation efforts only achieved an approximate 9% reduction in urban water use in 2014, far less than the 20% sought; in contrast, after adopting mandatory water conservation regulations, the SWRCB reported that statewide water savings greatly increased, exceeding 20% in 2015. The same is true with respect to recycled water. For instance, the State has never achieved the volumetric targets for the production of recycled water established in state law or in the SWRCB's recycled water policy using purely voluntary approaches. Similarly, it does not appear that the water recycling in Los Angeles or Southern California achieved the levels identified in SWRCB Water Rights Decision 1631 (1994) (which noted that the Los Angeles Department of Water and Power intended to recycle 40 percent of its wastewater and to use recycled water to displace 10 percent of its potable supply by 2010, and that a witness for the Metropolitan Water District of Southern California testified that water recycling in Southern California will reach as high as 670,000 acre feet in the next twenty years).

By claiming that WaterFix is part of an "all of the above" strategy on water, proponents cannot complain that they lack the funding to implement these local and regional water supply projects after spending billions to construct the California WaterFix project.

IV. Summary of Testimony and Proposed Terms and Conditions to Protect the Public Trust and Public Interest

Based on the information and data summarized in my testimony:

1) There are substantial opportunities to reduce reliance on water supplies from the Bay-Delta through investments in local and regional water supply projects in the SWP and CVP service areas, which could generate millions of acre feet of new water from improved agricultural and urban water use efficiency, stormwater capture, and water recycling;

2) Investments in local and regional water supplies are feasible, cost-effective, and create additional benefits for local water districts, communities and the State in terms of improved water supply reliability, local jobs, and reduced greenhouse gas emissions;
3) WaterFix proponents claim that the billions of dollars spent on the tunnels are part of an "all of the above" strategy on water, in which case they will be spending ratepayer funding on these other projects as well as the tunnels; and,
4) The local and regional water supply projects will require financial investments, which are threatened by spending on the California WaterFix project in the absence of terms and conditions to require such investments.

Based on the information in this testimony, if the SWRCB approves the petition, the following terms and conditions should be included in the amended water rights in this proceeding, applicable to all CVP and SWP water contractors south of the Delta who financially participate in the WaterFix project or obtain water from the project:

1) **Water recycling:** by the year 2030, require that wastewater discharges to oceans and bays within the service area of the CVP and SWP be reduced to 50% below 2015 levels, through investments in wastewater recycling and improvements in urban water use efficiency that reduce wastewater flows;
2) **Urban water use efficiency:** By the year 2030, require that urban water use within the CVP and SWP service areas participating in WaterFix improve urban water use efficiency in an amount equivalent to achieving the following targets:
    a. **Indoor water use budget:** 45 GPCD
    b. **Outdoor water use budget:** An updated MWELO standard that uses a ETo factor of 0.55 for outdoor landscape areas in 2030.
    c. **Commercial, Industrial, and Institutional ("CII") water use:** require installation of dedicated irrigation meters on all CII landscapes larger than 500 square feet by 2024,

and establish performance based metrics for major CII water use categories (such as cooling towers) by 2025.

3) **Agricultural water use efficiency:** by the year 2030, require that water districts served by the CVP and SWP achieve a 15% increase in agricultural water use efficiency compared to current levels during Above Normal, Below Normal, Dry, and Critically Dry water year types, as measured by Crop Consumptive Use Fraction ("CCUF") at the water supplier scale.

4) **Stormwater capture:** By 2030, require urban water suppliers within the service area of the CVP and SWP to increase stormwater capture by at least 420,000 acre feet per year above current levels, under average annual precipitation levels.

Additional notes regarding proposed terms and conditions:

1. These proposed terms and conditions for urban water use efficiency use the general framework identified in the State of California's April 2017 final report entitled Making Conservation a Way of Life, which is included as Exhibit NRDC-9. We proposed using 0.55 ETo factor for estimating the outdoor water use budget, which is higher than that report's estimate of ETo for water efficient outdoor landscaping (0.2 or 0.3 ETo factor).
2. We proposed an urban indoor water use budget of 45 GPCD for 2030. According to the Water Research Foundation, indoor water use at water efficient homes nationwide is currently estimated to be 36.7 GPCD, and the Water Research Foundation estimates that "Per capita use of 58.6 gpcd is expected to reduce to 36.7 gpcd in the coming years." *See* Water Research Foundation, April 2016, Residential End Uses of Water, Version 2, Executive Report, which is included as Exhibit NRDC-10.

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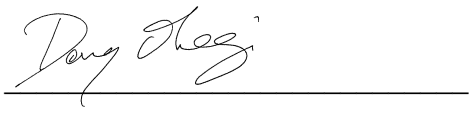
Operation of new conveyance should not be permitted until these terms and conditions are fully implemented and achieved.

Executed on November 28, 2017 in San Francisco, California.



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