BAWSCA
Bay Area Water Supply & Conservation Agency

March 29, 2013

LATE COMMENT

Jeanine Townsend, Clerk to the Board
Executive Office
State Water Resources Control Board
Cal/EPA Headquarters
1001 "I" Street, 24th Floor
Sacramento, CA 95814
commentletters@waterboards.ca.gov

Re: Comment Letter – Bay-Delta Plan SED

Dear Ms. Townsend:

The Bay Area Water Supply and Conservation Agency ("BAWSCA") submits the following comments regarding the draft Substitute Environmental Document ("SED") on the proposed update to the Water Quality Control Plan for the San Francisco Bay / Sacramento-San Joaquin Delta Estuary ("Bay-Delta Plan").

BAWSCA is a special district that represents the interests of twenty-four cities and water districts and two private utilities that purchase water wholesale from the San Francisco Regional Water System ("SFRWS"). These entities provide water to 1.7 million people, businesses and community organizations in Alameda, Santa Clara and San Mateo counties, a total of two-thirds of the water delivered by the SFRWS. The BAWSCA agencies are long-term wholesale purchasers of water from San Francisco. BAWSCA's governing board includes representatives from each of its twenty-six member agencies.

The SED proposes substantial changes to flow objectives for the Tuolumne River. These changes are anticipated to result in reduced surface water available for diversions, thereby causing significant, potentially unavoidable impacts to water supply. The SED contemplates that some portion of this water supply impact will be borne by operational changes at the New Don Pedro Dam and reductions to the water bank utilized by the Modesto Irrigation District and Turlock Irrigation District (collectively, "the Districts") and City and County of San Francisco ("CCSF") in the New Don Pedro Reservoir to manage Tuolumne River deliveries. Socioeconomic conditions in the communities served by BAWSCA's twenty-six member agencies are affected by operations at the Don Pedro Hydroelectric Project and its influence on the operation of the water bank in the New Don Pedro Reservoir. Any future flow objectives required by the Bay-Delta Plan that change the current operation of the Don Pedro Hydroelectric Project or otherwise reduce the availability of water to BAWSCA member agencies must consider the effects that a reduction in water supply reliability would have on Bay Area communities.

There is an important connection between release flow requirements for the Don Pedro Hydroelectric Project and water supply in the Bay Area. Water from the Tuolumne River is essential to supply BAWSCA's member agencies with water for domestic, municipal, commercial and industrial needs. The SFRWS is dependent on and obtains 85 percent of its water supply from the Hetch Hetchy facilities located on the Tuolumne River upstream of the

Don Pedro Hydroelectric Project. The water bank in the New Don Pedro Reservoir is an accounting mechanism that affords CCSF more flexibility to optimize the timing of its upstream Tuolumne River diversions while still satisfying its obligation not to interfere with the senior water rights owned by Modesto Irrigation District and Turlock Irrigation District (collectively, "the Districts"). When upstream flows are large, CCSF sometimes allows water that it is entitled to divert to flow downstream to New Don Pedro Reservoir instead. This water is then "banked" in the reservoir for later use by the Districts to make up the difference during times of lower flows when CCSF's diversions exceed what would otherwise be available without impacting the Districts' senior water rights. Although not directly a source of water supply for the Bay Area, the water bank thus functions as important tool for effective management of the SFRWS.

Current operation of the Don Pedro Hydroelectric Project balances the competing needs of the many water users and natural resources that depend on the Project for water supply. Although the SED explicitly disclaims any intent to alter water rights at this time, the changes it proposes will impact water supply reliability. The SED concludes that the proposed changes "would likely not interfere with the CCSF diversions" or require the construction of new water supply or treatment infrastructure, apparently on the basis that "[CCSF]'s share of water rights is usually greater than the aqueduct diversions." (*See* SED, p. 13-33 and 13-34.) However, other than the brief discussion of San Francisco's direct interest as a water supply provider, the current draft SED fails to consider the effects of reduced water supply reliability on the communities served by BAWSCA's member agencies.

It cannot be assumed that changes in operation of the water bank will not have a significant impact on water supply reliability for BAWSCA wholesale customer communities. Indeed, the potential impact is magnified by the fact that these communities have already implemented conservation practices that make them among the most efficient users of water in the state. Over the past 25 years, despite population growth upwards of 20 percent, the total consumptive water use by BAWSCA wholesale customer communities has remained relatively constant. (*See* Enclosure 1, Exhibit No. BAW-1.) There may be little flexibility to accommodate additional reductions in water supply reliability without incurring substantial costs.

Accordingly, it is important during this developmental stage of the updated Bay-Delta Plan both to recognize that alternative operating scenarios for the Tuolumne River, and specifically the Don Pedro Hydroelectric Project, would affect the reliability of the water supply for existing Bay Area water users, and also to give consideration to the scope and severity of the resulting impacts to the regional economy. Such considerations will inevitably confront the Implementation Workgroup and Coordinated Operations Group when tasked with devising specific plans for making the proposed flow objective feasible.

To document the potentially severe impacts to Bay Area communities that could result from reductions in water supply reliability, BAWSCA refers to and incorporates by reference BAWSCA's CEO/General Manager's answer testimony and two related exhibits from the 2009 Administrative Law Judge Proceeding for Federal Energy Regulatory Commission ("FERC") Projects Nos. 2299-065 and 2299-053. These documents describe BAWSCA's interests in FERC's relicensing of the Don Pedro Hydroelectric Project as well as the specific socioeconomic effects that would result from a reduction in water deliveries to Bay Area communities. (*See* Exhibit No. BAW-1, Answer Testimony of Arthur R. Jensen on Behalf of the Bay Area Water Users Association (10/6/2009, Accession No. 20091129-0088); Exhibit No. BAW-2, Resume for Arthur R. Jensen (10/6/2009, Accession No. 20091129-0089); Exhibit No.

BAW-3, An Economic Evaluation of the Water Supply Reliability Goal in the SFPUC Water System Improvement Plan (10/6/2009, Accession No. 20091129-0090).) For convenience and to ensure that they are fully incorporated into the record for the current proceedings, a copy of these documents is enclosed herein.

Additionally, CCSF is currently preparing an updated study of the socioeconomic effects on Bay Area communities related to potential changes in release flow requirements at the Don Pedro Hydroelectric Project for the FERC relicensing of that Project. When it is made available, BAWSCA encourages the State Water Resources Control Board to rely on that study for the evaluation of any potential flow-related changes to the Bay-Delta Plan.

BAWSCA appreciates the opportunity to provide these comments and looks forward to further development of an updated Bay-Delta Plan that fully considers the importance of maintaining a reliable water supply for one of the most populous, economically vibrant, and water-efficient regions of California.

Sincerely,

Arthur R. Jensen
Chief Executive Officer/General Manager

Enclosures

CC: Harlan Kelly, SFPUC
Nicole Sandkulla, BAWSCA

ENCLOSURES LIST

March 29, 2013 BAWSCA Comment Letter re: Bay-Delta Plan SED

1. Exhibit No. BAW-1, Answer Testimony of Arthur R. Jensen on Behalf of the Bay Area Water Users Association (10/6/2009, Accession No. 20091129-0088)

2. Exhibit No. BAW-2, Resume for Arthur R. Jensen (10/6/2009, Accession No. 20091129-0089)

3. Exhibit No. BAW-3, An Economic Evaluation of the Water Supply Reliability Goal in the SFPUC Water System Improvement Plan (10/6/2009, Accession No. 20091129-0090)

ENCLOSURE 1

EXHIBIT BAW-1

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Turlock Irrigation District and Modesto Irrigation District	)	Project Nos. 2299-065 2299-053

ANSWER TESTIMONY OF ARTHUR R. JENSEN
ON BEHALF OF BAY AREA WATER USERS ASSOCIATION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Arthur R. Jensen. My business address is 155 Bovet Road, Suite 302 in San Mateo, California.

Q. WHAT IS YOUR JOB TITLE AND POSITION?

A. I am the President and General Manager of the Bay Area Water Users Association (BAWUA). I am also the Chief Executive Officer and General Manager of the Bay Area Water Supply and Conservation Agency (BAWSCA). I am testifying on behalf of these organizations and their members, the 26 cities, water districts and water companies that purchase water from San Francisco on a wholesale basis for delivery to 1.7 million residents, over 30,000 businesses and countless community organizations in Alameda, Santa Clara and San Mateo Counties (Wholesale Customers).

Q. PLEASE SUMMARIZE YOUR BACKGROUND AND EXPERIENCE.

A. I have over 30 years of experience in the water industry, including 15 years in my current position. I have served as manager of the San Francisco Water Department and, as a consultant, performed engineering and planning studies of the regional water

system. I have a doctorate in Environmental Engineering Science, with research in water management and I am a registered engineer in the State of California. In my current position I have successfully pursued State legislation to ensure the San Francisco Regional Water System is rebuilt to protect the health and safety of residents and workers in the Bay Area, negotiated a new 25-year water agreement with San Francisco on behalf of the Wholesale Customers, and initiated long-term water conservation water supply programs for these agencies.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

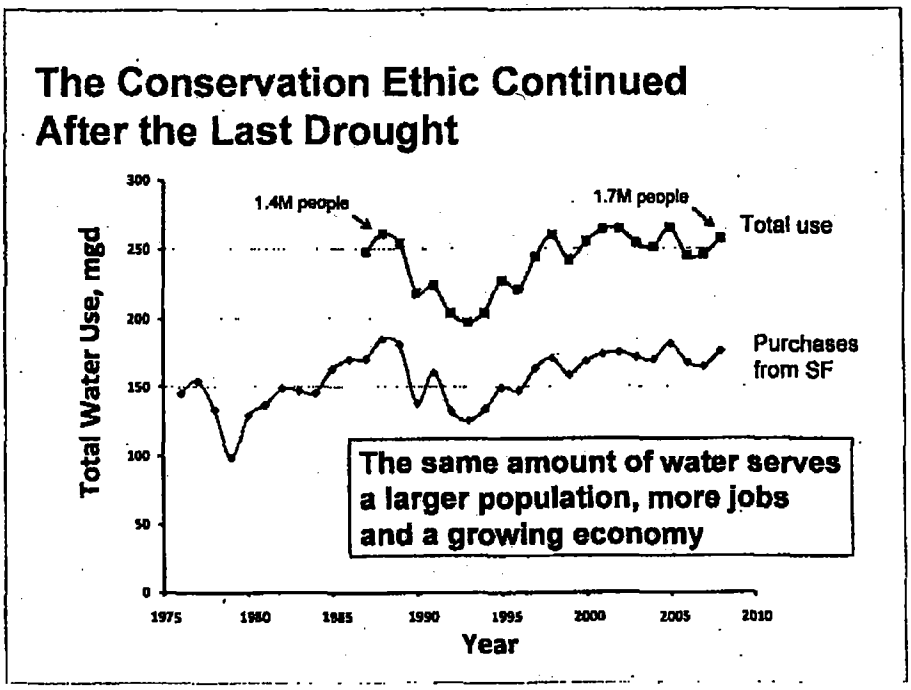
A. To respond to statements made in direct testimony provided by Ellen Levin and Daniel B. Steiner, Exhibits No. CSF-6 and 10, respectively.

Q. HAVE YOU READ THE DIRECT TESTIMONY OF ELLEN LEVIN SUBMITTED SEPTEMBER 14, 2009?

A. Yes.

Q. DO YOU HAVE ANYTHING TO ADD TO MS. LEVIN'S TESTIMONY CONCERNING THE WHOLESALE CUSTOMERS' WATER USE EFFICIENCY MEASURES ON PAGE 16?

A: Yes I do. The Wholesale Customers' water use has remained relatively constant for the last 25 years.



This graph illustrates that although the population has increased over the last few decades, total water use and, more importantly for these proceedings, Wholesale Customer purchases from the San Francisco Regional Water System, have remained flat. For example, since 1986, population increased by 22% in the Wholesale Customer service area while total water use remained nearly unchanged. During this same period of time, residential per capita use decreased 12%, from 102 gallons per capita per day (GPCPD) to 89 GPCPD.

In addition, in order to extend existing supplies, the Wholesale Customers are implementing conservation based on a list of 28 measures that include practices that go above and beyond the 14 Best Management Practices identified by the California Urban Water Conservation Council.[1] These additional measures include the adoption of local

[1] BAWUA is a founding member of the California Urban Water Conservation Council and an original signatory of the 1991 Memorandum of Understanding Regarding Urban Water Conservation in California.

ordinances to mandate indoor and outdoor water use efficiency in all new construction, distribution of low-flow spray nozzles, and a series of residential water-efficient landscaping and efficient irrigation classes.

Q. DO YOU HAVE ANYTHING TO ADD TO MS. LEVIN'S TESTIMONY CONCERNING HOW THE SFPUC PLANS TO MEET THE FUTURE DEMANDS OF ITS WHOLESALE CUSTOMERS ON PAGES 12 AND 17 OF HER TESTIMONY?

A. Yes. Actually, the SFPUC has not yet decided to meet the Wholesale Customers' future demands. The SFPUC unilaterally elected to limit sales from the regional system watersheds to the Wholesale Customers collectively to 184 million gallons per day (MGD) through 2018 (San Francisco Public Utilities Commission Resolution approving "Phased WSIP Goals and Objectives," October 30, 2008). That decision was made notwithstanding a joint analysis conducted by the SFPUC and the Wholesale Customers which identified a total Wholesale Customer demand on the San Francisco Regional Water System of 209 MGD in the year 2030[2], resulting from planned growth in population and employment of 1% a year until 2030 (SFPUC Wholesale Customer Water Demand Projections Technical Report, URS, November 2004). However, as a result of San Francisco's decision to limit sales, the Wholesale Customers will have an unmet demand of 10 MGD in 2018. Unless San Francisco decides otherwise in 2018, the Wholesale Customers' unmet demand will grow to 25 MGD by 2030.

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[2] This amount takes into account (and is net of) 38 MGD of conservation savings and efficiency measures through 2030 that the Wholesale Customers have already committed to.

It is unclear at this time how the Wholesale Customers projected water needs in 2018 and 2030 will reliably be met.

Q. DO YOU HAVE ANYTHING TO ADD TO MS. LEVIN'S DESCRIPTION ON PAGE 24 OF THE ECONOMIC IMPACT OF WATER RATIONING AND SHORTAGES IN THE WHOLESALE CUSTOMER SERVICE AREA?

A. Yes. In 2005, I engaged the natural resource economist William Wade, PhD, to analyze the economic impacts of San Francisco's proposed 20% drought rationing goal. (An Economic Evaluation of the Water Supply Reliability Goal in the SFPUC Water System Improvement Plan, May 2005, attached as Exhibit No. BAW-3). Dr. Wade's report included two significant findings that are instructive for analyzing reductions in water supply:

1. A small number of industrial sectors, for which water is a critical component of the production process, represent over 80% of the total manufacturing output in the region. Chief among these industries are computer/electronic products and food and beverage products ($207 billion in 2001). The emerging biotech industry is also water dependent.
2. The impact of a 20% water supply deficiency on shipments from these water-sensitive industries is estimated as a loss of nearly $7.7 billion annually.

Dr. Wade's results are limited to only a 20% shortage, and do not include an analysis of the substantially more dramatic water supply shortages indicated in Mr. Steiner's testimony.

Q. DO YOU HAVE ANYTHING TO ADD TO MR. STEINER'S STATEMENT ON P. 10 THAT IN ORDER TO MEET THE FLOW SCHEDULE

RECOMMENDED BY THE RESOURCE AGENCIES THE SAN FRANCISCO REGIONAL WATER SYSTEM COULD EXPERIENCE SHORTAGES OF UP TO 53% ?

A. Yes. First, a 53% shortage in the San Francisco Regional Water System would result in significant impacts to public health and safety. Although the Wholesale Customers have not analyzed the economic impacts of such a dramatic reduction in supply, some customers have analyzed the water supply impacts of a 50% shortage as part of the preparation of their Urban Water Management Plans, updated and adopted every 5 years.

For example:

- The City of Burlingame's 2005 Urban Water Management Plan provides that, in response to a 50% reduction in supply from San Francisco "the City will prohibit all water use except as required for public health and safety (50 GPCPD)." (City of Burlingame, Urban Water Management Plan, 2005, p. 57)
- The City of Redwood City's plan foresees equally severe measures being necessary to cope with a 50% or greater shortfall in supply:

  "- If the system is operational, the City will prohibit all but water used for basic drinking, cooking and necessary human hygiene.

  - If the system is not operational, the City will establish basic water distribution stations/nodes for essential living conditions."

  (City of Redwood City, Urban Water Management Plan, 2005, Table 5-2, pp.5-7.)

The imposition of a 50% reduction in supply from the San Francisco Regional Water System would make it impossible for some communities in the wholesale service area to deliver a minimum of 50 gallons per day to their residents, even if they were to

completely shut off water to commercial and industrial customers, and institutional users such as schools, hospitals, and parks. A community without any functioning industry, hospitals or public institutions, is not sustainable.

The communities that would experience these severe restrictions include:

- North Coast County Water District (Pacifica), which would need to restrict residential water use to 38 GPCPD;
- Westborough Water District (in South San Francisco), which would need to restrict residential water use to 37 GPCPD;
- City of East Palo Alto would need to restrict its residential water use to 32 GPCPD.

These figures are 33% less than the basic domestic water requirements for a moderately industrialized nation. (Peter H. Gleick, *Basic Water Requirements for Human Activities: Meeting Basic Needs*, Water International, 21 (1996) Table 9, p.88.) Dr. Gleick identifies 200 liters per person per day, or 52 GPCPD, for solely drinking, sanitation, bathing and cooking in moderately industrialized countries.

Furthermore, the severity of the required reduction in deliveries to the San Francisco Regional Water System in order to meet the resource agencies' proposed flows is disproportionate to San Francisco's share of the diversion from the Tuolumne River. On average, 60% of the river flow is diverted, but only 12% of that share is delivered to the San Francisco Bay Area and only 8% is delivered to Wholesale Customers. (Turlock Irrigation District.) If the increased flows are implemented, the reduction in deliveries to the Bay Area would have an extreme impact on public health and safety and cause severe economic impacts.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes it does.

EXHIBIT BAW-1

AFFIDAVIT

I, Arthur R. Jensen, being first duly sworn, hereby declares under penalty of perjury that I am the same Arthur R. Jensen whose Answer Testimony on behalf of the Bay Area Water Users Association accompanies this Affidavit; that I have read the foregoing questions and answers constituting that testimony, and that if asked such questions, my answers in response would be as shown; that the facts set forth therein are true and correct to the best of my knowledge, information and belief; and that I adopt the same as my sworn testimony in this proceeding.

Arthur R. Jensen, President and General Manager
Bay Area Water Users Association

Dated: September 22, 2009

* * * * * * * * * * *

STATE OF CALIFORNIA)
)
COUNTY OF SAN FRANCISCO)

On September 22, 2009 before me, NINA ZENTNER, Notary Public, personally appeared Arthur R. Jensen, who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

Witness my hand and official seal.

Signature Nina Zentner

NINA ZENTNER
COMM. #1767962
NOTARY PUBLIC-CALIFORNIA
SAN FRANCISCO COUNTY
My Comm. Expires Oct. 8, 2011

(seal)

EXHIBIT LIST FOR TESTIMONY OF
SAN FRANCISCO BAY AREA WATER USERS ASSOCIATION
IN PROJECT P-2299

Exhibit Number	*Description*
BAW-1	Answer Testimony of Arthur Jensen, Ph.D.
BAW-2	Curriculum Vitae, Arthur Jensen
BAW-3	William Wade, Ph.D., "An Economic Evaluation of the Water Supply Reliability Goal of the SFPUC Water System Improvement Plan" (May 2005)

ALLISON C. SCHUTTE
PARTNER
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HansonBridgett

September 22, 2009

VIA ELECTRONIC FILING

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Turlock Irrigation District and Modesto Irrigation District; Project Nos. 2299-065 and 2299-053

Dear Secretary Bose:

Enclosed for filing in the above-referenced proceeding on behalf of the Bay Area Water Users Association are the Answer Testimony of Arthur R. Jensen (Exhibit BAW-1) and accompanying exhibits (Exhibits BAW-2 and BAW-3).

Sincerely,

Allison C. Schutte

Allison C. Schutte
Attorney for Bay Area Water Users Association

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Enclosures

ENCLOSURE 2

Curriculum Vitae

ARTHUR (ART) R. JENSEN

Education:
Ph.D., Environmental Engineering Science, California Institute of Technology
M.S., Environmental Engineering Science, California Institute of Technology
B.S., Engineering Physics, University of California at Berkeley

Professional Licenses:
Professional Engineer in the State of California

Positions held:

Date	Title	Agency
1995 to present	President and General Manager	Bay Area Water Users Association (BAWUA)
2003 to present	Chief Executive Officer and General Manager	Bay Area Water Supply and Conservation Agency (BAWSCA)
2003 to present	General Manager	San Francisco Bay Area Regional Water System Financing Authority (RFA)
1990 to 1995	Assistant General Manager and Director of Planning	Contra Costa Water District
1984 to 1990	Deputy General Manager and Acting General Manager	San Francisco Water Department
1977 to 1984	Senior Engineer	Brown and Caldwell Consulting Engineers, performing studies of the San Francisco regional water supply, treatment and delivery system; taught undergraduate engineering course at University of California at Berkeley
1976-1977	Acting Assistant Professor	Stanford University - teaching graduate and undergraduate courses in water management, hydrology, hydrologic modeling and hydraulic engineering

Current Associations, Committees and Boards:
Sustainable Silicon Valley - Member of the Advisory Board
San Francisco Public Utilities Commission – Member of the Citizens Advisory Committee appointed by San Francisco Mayor Gavin Newsom to represent wholesale customer interests

ENCLOSURE 3

AN ECONOMIC EVALUATION OF THE WATER SUPPLY RELIABILITY GOAL IN THE SFPUC WATER SYSTEM IMPROVEMENT PLAN

Report to the

San Francisco Bay Area Water Supply & Conservation Agency

By

William W. Wade, Ph.D.

Energy and Water Economics

May 2005

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LIST OF TABLES, FIGURES AND EXHIBITS

AN ECONOMIC EVALUATION OF THE WATER SUPPLY RELIABILITY GOAL IN THE SFPUC WATER SYSTEM IMPROVEMENT PLAN

William W. Wade

1. Introduction and Executive Summary

In February 2005, the San Francisco Public Utilities Commission (SFPUC) authorized its General Manager to forward to the San Francisco Planning Commission a draft report summarizing the principal goals of its Water System Improvement Plan. The final version of the document, "Water System Improvement Plan: Prepared for the Programmatic Environmental Impact Report," (WSIP) was sent to the Planning Commission and publicly released on February 28, 2005.

The Bay Area Water Supply & Conservation Agency (BAWSCA) is a regional government agency established in 2003. It comprises the 28 cities, water districts and other water suppliers in San Mateo, Santa Clara and Alameda counties that purchase some or all of their water from the SFPUC.

BAWSCA commissioned Energy and Water Economics to review the portion of the WSIP that addresses water supply reliability during drought, specifically, the goal of providing no more than 80 percent of normal demand during a "design drought."

The principal findings of this report are:

(a) The process by which the SFPUC selected the goal of 80 percent reliability was superficial and far below the analytic standard employed by comparable urban water agencies in California and the United States.

(b) SFPUC's analytic process failed to consider the costs to Bay Area communities of the water shortages that would be imposed through mandatory rationing to accommodate a 20 percent system-wide supply shortfall.

(c) Even a preliminary review of published economic literature shows that the loss of production from water-intensive Bay Area industries resulting from a 20 percent cutback in their water supply would far exceed the estimated cost of improving the SFPUC system's reliability from 80 percent to 90 percent.

Based on these findings, this report recommends that the SFPUC revisit the WSIP's reliability goal. In doing so, it should employ economic principles commonly used in water supply planning to identify the most efficient level of water reliability. In the short run, this reconsideration should focus on the relative cost-benefit ratios of the provisionally selected 80 percent goal in comparison with a goal of a 90 percent reliable supply.

2. The SFPUC Adopted its Drought Reliability Goal Without Considering the Costs of Water Shortages to its Customers

Reliable delivery of basic utility services (electricity, natural gas, communications, water and sewer) is an expected part of contemporary urban life -- at least in developed industrial societies such as California.

There are a variety of definitions of reliability. The CalFed Bay Delta program formalized water reliability as:

> ". . . the probability that a system does not fail, or conversely, it is the probability of a system failure subtracted from one."

More simply put, reliability is the measure of a utility's ability to deliver uninterrupted service. It is apparent that the larger the investment in long-term reliability, the less frequent and less severe will be the shortages experienced.

The objectives of water supply reliability planning are (1) to determine the most effective way of achieving an additional increment of reliability at the least cost, and (2) to ascertain whether the benefits, in terms of avoided shortage costs and losses, justify the costs of adding that increment. This is commonly referred to in the utility planning literature as Least Cost Planning (LCP). LCP has been embraced widely in California.

The approach uses information about the costs and losses associated with shortages of varying severity and duration as well as the costs of long-term and contingency water management options. In order to make an informed judgment about the appropriate level of supply reliability, the decision-maker needs to know not merely the cost of providing an increment of additional supply, but the costs to society of NOT providing that supply increment -- the economic impacts and other costs of shortage.

The SFPUC adopted its 80 percent reliability goal with very limited information about the costs of achieving three levels of reliability:

Option A	Option B	Option C
100 percent	90 percent	80 percent

and no information about the costs of providing less than 100 percent reliability.

The goals of these alternatives appear on a one-page chart entitled "Water Supply Matrix" that was presented to the SFPUC but is not included in the WSIP. It is attached as Exhibit A. The facilities or other measures associated with the incremental costs of 90 percent or 100 percent reliability are not identified clearly, but apparently reflect the cost of increasing the height of Calaveras Dam in Alameda County and/or various mixes of options including desalination, recycling, groundwater, transfers and conservation.

The cost of each level, in millions of dollars, was estimated as follows:

Option A	Option B	Option C
100 percent	90 percent	80 percent
$1,222	$803	$422

Thus, the difference between achieving an 80 percent level of reliability and a 90 percent level was estimated at $181 million, over 25 years.

SFPUC did not attempt to quantify the economic costs and losses of a 20 percent shortage, nor the costs of the less demanding levels of rationing that would be required to cope with less severe, but more frequent, droughts. Neither does the

SFPUC anticipate how shortages would be distributed geographically. In the 1987-1992 drought, the SFPUC imposed different levels of rationing on its in-City retail customers and its wholesale customer agencies in the neighboring counties.[1]

The WSIP is fatally flawed, from the perspective of economic analysis, by its failure to include the effect of shortage costs in its evaluation process. Determining an efficient level of reliability requires consideration of two curves – one representing the incremental costs of reliability improvements and the other representing the costs of incrementally more severe water shortages. The intersection of these two curves – the point where incremental costs are equal – is the least cost mix of resources, the efficient level of reliability management.

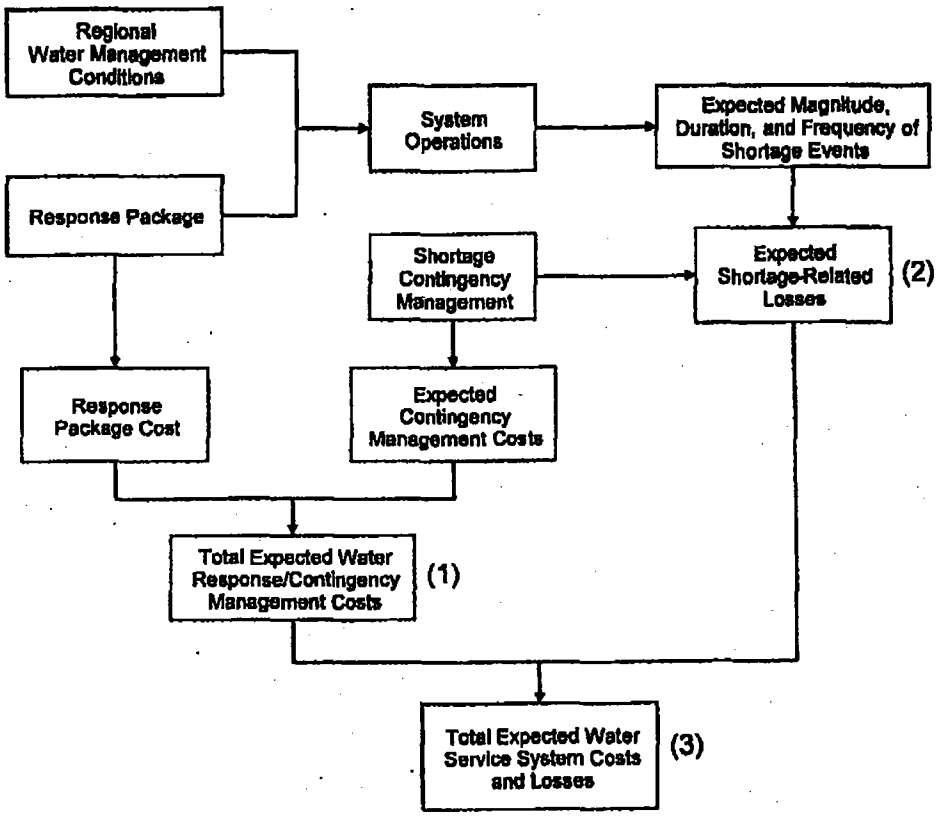
This can be illustrated by a simple figure, drawn from a recent California Department of Water Resources publication.[2]

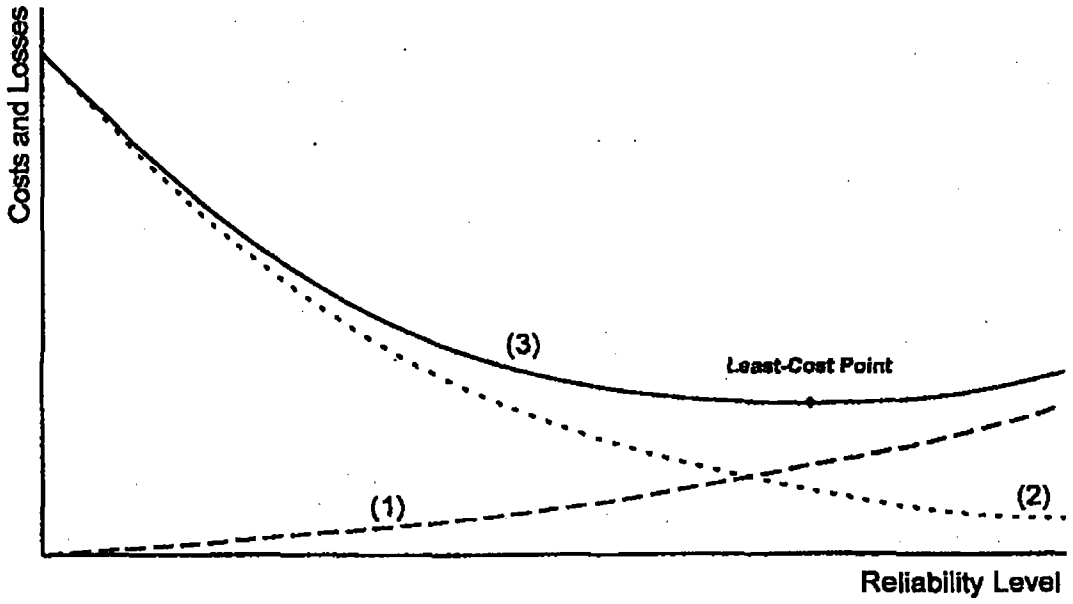
Figure 1 contains three cost curves. Curve 1 is the cost of increasing reliability, which includes both the cost of supply augmentation and the agency's costs of managing the drought. Curve 2 is the societal cost of enduring water shortages. Both the total expected water management and contingency management costs (Curve 1) and the expected shortage-related losses (Curve 2) are a function of the level of demand reduction or supply enhancement response options implemented. Both curves are affected by the availability, cost, and effectiveness of contingency management (e.g., transfers, rationing programs, etc.). While the total cost of the management and response options increases as reliability increases, the expected shortage-related losses decrease as a consequence of the increased reliability. The total expected water service system cost (Curve 3) is the sum of these costs and losses. The lowest point

[1] In general, inside City use was to be reduced by approximately 14 percent, while wholesale communities faced an aggregate 27 percent reduction, under the 10/60 formula employed by SFPUC to achieve a system wide 22 percent goal.

[2] CDWR, LCPSIM Background, 2002.

Figure 1. Least Cost Planning Conceptual Diagram





on this curve represents the level of reliability provided by the most economically efficient mix of resource costs and remaining shortage costs.[3]

The SFPUC did not attempt to determine the costs of shortage. Without both reliability enhancement costs and shortage costs imposed on society, SFPUC is unable to make even the most rough-cut approximation of the balance between the costs of improved reliability and its benefits. Without this information, no economic basis exists to find the least cost point among the three options.

3. The Economic Costs to the Bay Area of Water Shortages Can be Determined

The State Water Resources Control Board began its hearings on water quality standards for the Bay Delta in 1987. The extended California drought began at approximately the same time. Together, these two events became the impetus for a substantial effort by economists to quantify the costs of urban water shortages and, reciprocally, the value of reliable water supplies. The California Urban Water Agencies (CUWA), a consortium of major California urban water suppliers including the SFPUC, played an important role in this process.

Examples of the economic literature that emerged at the time of the Bay Delta hearings and the last drought are included in the references to this Report. Two studies in which the author of this report participated addressed the economic effects of water shortage on the two major customer segments of urban water suppliers: residential and industrial.

In a study commissioned by the Metropolitan Water District of Southern California, the author estimated the economic value of landscape losses based on a scientific horticultural survey of drought effects on Santa Barbara vegetation.[4] Research sponsored by CUWA into industrial water use revealed that shortages of

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[3] The minimum point of the two cost curves is equivalent to the intersection of the incremental cost curves.

[4] William Wade, Mary Renwick, et al., "The Cost of Water Shortages: Case Study of Santa Barbara," Metropolitan Water District of Southern California, 1991.

between 15 to 30 percent produced extremely large economic losses due to decreased production in water-intensive industries.[5]

The water shortage cost literature generated by the last drought evolved into more formalized water reliability valuation studies and eventually led to the modeling process called Least Cost Planning, described by the above Figure 1. Least Cost Planning methodologies today underlie Integrated Resource Planning.

More immediately relevant, SFPUC relied on the work done by the author to estimate the regional economic costs to the Bay Area from water shortages. In a report submitted in 1993 to the Federal Energy Regulatory Commission (FERC),[6] the SFPUC utilized the output elasticities of water identified in CUWA's 1991 report to correlate an industrial firm's change in production to a reduction in water supply.[7]

The SFPUC report to FERC estimated the direct economic impact, as measured by the reduced value of shipments, of a 15 percent cutback in supply to the largest water using industrial sectors in the SFPUC service area at $305 million per year.

When the secondary impacts[8] of the reduced industrial output are taken into account, SFPUC estimated the total loss would increase to $397 million per year.

Some of the key findings in SFPUC's 1993 report include:

- The economic impact resulting from a water supply cutback will be concentrated in two industries: electronic components and accessories, and computer and office equipment. Other industries could experience larger production cutbacks, but their economic impact will be small by comparison, except for the beverage industry.

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[5] William Wade, Julie Hewitt, et al., "Cost of Industrial Water Shortages," Spectrum Economics Report to CUWA, November 1991.

[6] Hetch Hetchy Water and Power Department, Response to Data Request Concerning FERC Opinion 420: New Don Pedro Project, June 8, 1993.

[7] The output elasticity of water estimates the percentage change in production due to the percentage change in water input.

[8] Secondary impacts reflect reduced economic activity in other sectors of the economy due to reduced spending by firms and employees of the industry directly affected.

- A 15 percent cutback in water supply could reduce direct shipments from the electronic component industry by $68,000,000, and $163,000,000 from the computer equipment industry. The secondary impact could increase the loss from these two industries to $294,000,000.

- A 15 percent cutback in water supply could result in more than 2,000 jobs lost in the two industries and their ancillary service areas.

- At a 15 percent cutback in water supply, the beverage industry would experience the largest production cutback of 10.4 percent and lost sales of approximately $72,400,000."

The direct economic cost of a 15 percent reduction in deliveries to key water-dependent industries ($305 million in 1990 dollars) is itself larger than the cost ($181 million, apparently in 2005 dollars) of enhancing the SFPUC's reliability level from 80 percent to 90 percent. The direct loss figure does not take into account indirect losses in other industrial sectors. Nor does it include the costs to government in terms of reduced sales tax and income tax revenues.

Nearly 15 years have passed since the data on which the SFPUC's 1993 report was based were collected. Is there any reason to think that a comparable reduction in water deliveries in, for example, 2010 would have less serious economic impacts?

Based on more recent published economic analyses of water supply and on the author's preliminary review of water use and census data, the answer is "NO." In fact, recent production values for a similar subset of water-dependent industries shows that the costs of water shortage will be greater than during the last drought.

4. The Cost of a Renewed Water Shortage, Measured Solely in Terms of Reduced Industrial Output, Will Greatly Exceed the Cost of Improving System Reliability to 90 Percent

In the Bay Area, a higher percentage of water is used for industrial, commercial and governmental operations (38%) than is the case in California generally (32%).[9] This allocation is a bit more pronounced in the SFPUC wholesale service area, where, in 2001 for example, 39% of the water distributed was devoted to these non-residential

[9] CDWR, Urban Water Use in California, Bulletin 166-4 (August 1994).

uses. In those wholesale communities where significant industrial activity is concentrated, the percentage of water devoted to industrial/commercial/institutional use is even higher, as can be seen in Table 1.

Table 1: High Non-Residential Water Use Areas

	Residential	Non-Residential	Purchases from SFPUC (MGD)
Guadalupe Valley M.I.D.	13%	87%	0.3
San Jose (North)	19%	81%	4.9
Menlo Park	40%	60%	3.8
Santa Clara (North)	44%	56%	4.0
South San Francisco (CWS)	44%	56%	8.3
Milpitas	45%	55%	11.2
Brisbane	50%	50%	0.4
Mountain View	51%	49%	11.0
Palo Alto	58%	42%	13.3
Sunnyvale	60%	40%	9.7

Source: SFPUC Water Demand Forecast, Appendix C, 2004

The companies that account for the majority of industrial sector water use are those in the computer equipment and electronic component manufacturing categories.[10] These water-dependent industries that are the backbone of the Bay Area economy. The significance of their contribution to the regional economy has grown dramatically since the CUWA survey was completed in 1991, as can be seen from a comparison of Table 2 and Table 3.

[10] Hetch Hetchy Water and Power Department Report, pp. 106-07.

Table 2: Value of Manufacturing Shipments - 1990 (in millions of dollars)				
	Alameda	**San Mateo**	**Santa Clara**	**Total**
Total Manufacturing	$15,300	$4,400	$36,600	$56,300
Water Critical Industries	$9,700	$1,600	$273,00	$38,600
Percentage of County	63%	36%	75%	69%
Source: CUWA, Cost of Industrial Shortages, Appendix C, 1991				
Note: Census of Manufacturers 1987 forecast to 1990 by the Center for Continuing Study of the California Economy.				

The share of total manufacturing output represented by water critical industries in the three counties for 1990 was 69 percent. This rose to 83 percent in 2001.

Table 3: Estimated Value of Manufacturing Shipments - 2001 (in millions of dollars)				
	Alameda	**San Mateo**	**Santa Clara**	**Total**
Total Manufacturing	**$38,346**	**$13,116**	**$155,875**	**$207,336**
Fabricated metal products	$1,972	$562	$2,352	$4,886
Computer and electronic products	$16,297	$6,214	$125,346	$147,857
Electrical equipment and appliances	$908	$175	$2,191	$3,274
Food products	$2,498	$806	$1,397	$4,701
Beverage products	$2,154	$362	$712	$3,228
Paper manufacturing	$749	$171	$616	$1,535
Chemical manufacturing	$2,000	$2,328	$3,262	$7,590
Water Critical Industries Subtotal	**$26,578**	**$10,617**	**$135,876**	**$173,072**
Percent of County	**69%**	**81%**	**87%**	**83%**

Note: Estimated value of shipments based on ratio of wages and salaries to shipments from 1997 Census of Manufacturing and wages and salaries provided for 2001. Placeholder values until publication of 2002 Census of Manufacturing.

Table 3 shows that the total value of manufacturing shipments nearly quadrupled between 1990 and 2001, (from $56.3 Billion to $207.3 Billion) while the value of shipments from water critical manufacturing industries more than quadrupled (from $38.6 Billion to $173.1 Billion).

In some industries, water is an essential element of the production process, not ancillary to plant production for employee use. For example, about 75 percent of water use in the food products industry is employed directly in the process. Water essentially is the product for many beverage processors. Microchips are manufactured in a wet environment with much necessary rinsing. Biotechnology, an emerging industry in the Bay Area, requires water. Genentech, for example, is the largest industrial user of water in South San Francisco. Over 75% of the water used in its South San Francisco plant is employed directly in the manufacturing process, while R&D uses account for most of the remainder. Genentech's explanation of the importance of water is short and to the point:

"What are our raw materials?
- Genetically modified cells
- Water"[11]

What would be the effects of a new round of water rationing imposed on these industries? The 1991 CUWA study estimated the impact of 15% and 30% water supply reductions on the water critical industries in six Northern California counties. Using the same methodology employed in the CUWA study, it is possible to estimate the effect of 10%, 15% and 20% cutbacks on the water critical industries of Alameda, San Mateo and Santa Clara counties, benchmarked to 2001 revenues. The results are shown on Table 4.

Table 4 shows that the estimated value of current production losses in these water critical industries ranges from $2.5 billion to $7.7 billion per year. The estimates are based on the countywide values in Table 3, adjusted to reflect the portion of each county's industrial customers served by the SFPUC, as presented in the Bay Area

[11] Genentech – A Biotech Case Study: Water Sustainability in Silicon Valley (May 2004).

Economic Forum 2002 report "Hetch Hetchy and the Bay Area Economy." The figures are San Mateo 100%, Alameda 50% and Santa Clara 80%.

Table 4: Effect of Water Shortage on BAWSCA Water Critical Industries

	Output Elasticities of Shortage		Lost Value of Shipments – 2001 (in millions of dollars) Imposed Supply Shortage		
	15%	30%	10%	15%	20%
Fabricated metal products	0.15	0.41	$51	$211	$281
Computer and electronic products	0.18	0.27	$2,064	$4,643	$6,191
Electrical equipment and appliances	0.18	0.27	$43	$96	$129
Food products	0.27	0.35	$86	$167	$222
Beverage products	0.69	1.14	$139	$343	$458
Paper manufacturing	0.40	0.70	$42	$109	$145
Chemical manufacturing	0.12	0.20	$71	$178	$238
Subtotal: Water Critical Industries	na	na	**$2,495**	**$5,747**	**$7,663**

Note: BAWSCA industry is assumed to be 100% of San Mateo; 80% of Santa Clara; 50% of Alameda; following the assumption in Sunding et al., p. 23.

These estimates are conservative in that they use the production relationships developed 15 years ago in the CUWA study. In the intervening years, water use efficiency in these industries has improved as companies have invested in water conservation. The industrial water use survey reported in the CUWA study found ongoing conservation projects aimed at reuse and recirculation of water costing many thousands of dollars for each acre-foot saved.[12] The SFPUC 1993 study for FERC reported that "managers interviewed felt they had squeezed most of the potential water savings out of cooling, personal and landscape uses."[13] These improvements in efficiency have "hardened" demand. As a result, a reduction in water supply today will produce a greater loss in production than the corresponding reduction would have done 15 years ago.

[12] See Section 6 of Cost of Industrial Water Shortages.

[13] Hetch Hetchy Water and Power Department Report, p. 115.

Moreover, the estimated losses in Table 4 do not include the secondary economic impacts – the "ripple" effects that the loss of output and wages in these water critical industries would have on other sectors of the economy. Nor do they account for the loss in sales and income tax revenue to local governments.

Additionally, water shortages will impose costs on the commercial sector of the economy. Two of the most important components of this sector in the Bay Area are hotels/motels and restaurants. Those two categories are among the largest users of water in the region – accounting for over 40% of all commercial water use.[14] Most of the water use in the hospitality/tourism sector is "indoor" use: very little is devoted to landscape irrigation. Costs to the commercial sector are not included in the $2.5 - $7.7 billion cost estimate, nor are the effects of rationing on hospitals, schools and other institutional users.

5. The SFPUC Also Failed to Take the Costs of Shortages to Residential Customers into Account

Costs that water shortages impose on residential customers should not be overlooked. The value of water supplies for residential uses can be estimated by residential customers' "willingness to pay." Economists measure a person's willingness to pay for a good with reference to the demand curve. The aggregate demand curve allows estimates of how much people are willing to pay for each additional unit of the good or service. Consumers pay a charge for water that can be seen as a lower bound estimate of their willingness to pay. We know that consumers are willing to pay at least that much because they *do* pay that much. They may be willing to pay considerably more than this—particularly if the alternative were water shortages. The difference between what they are *willing to pay* and what they are charged is the *consumer surplus*, also known as the net benefit.

The California Department of Water Resources has developed a data base of consumer surplus values, which represent an amount each household would be willing to pay in addition to its existing water bill to avoid a shortage of a given size. (See

[14] Hetch Hetchy Water and Power Department Report, p. 104.

Appendix Table 1.) A preliminary calculation using CDWR values, updated to 2005 dollars, the Association of Bay Area Governments just-completed census of households, and residential water use data compiled by SFPUC and BAWSCA suggests that residential customers in the SFPUC wholesale service area attach high values to greater reliability. Table 5 shows the magnitude of annual residential values at stake but omitted in the WSIP planning process. The number of projected households from ABAG's 2005 projections is multiplied by the percentage of Single Family and Multi-Family Households and then by the respective willingness to pay values from Appendix Table 1. The results are shown at the bottom of Table 5.[15]

These numbers show that, given today's population, the value to residents in the SFPUC wholesale service area territory of avoiding a 20 percent shortage is approximately $97 million per year. Any supply portfolio that could improve that reliability with an annualized cost of less than that amount would be of benefit to the residential customers in the region. The values on Table 5 may be low.[16] As shown in the table, the benefit from improving reliability increases over time, as the population grows.

[15] Costs on Table 5 assume that a single-family housing unit uses, on average, 0.3 AF of water per year while a multi-family housing unit uses, on average, 0.2 AF per year. They also assume that 95% of residential water use in San Mateo County is supplied by the SFPUC, with the corresponding percentages being 31% and 23% in Alameda and Santa Clara counties, respectively.

[16] Rationing systems adopted during a drought could shift a larger burden of a system-wide shortfall to the residential sector. Hence, a system-wide 20% shortfall might impose the cost of a 25% shortage on residential customers. Moreover, CDWR adjusts upward the values for both demand hardening and for multiyear events.

Table 5: Residential Reliability Values for BAWSCA Households							
Households	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
San Mateo	254,104	261,280	268,450	278,650	289,550	298,260	305,390
Santa Clara	565,863	595,550	628,670	660,850	692,440	725,090	762,720
Alameda	523,366	542,540	564,780	590,880	618,870	647,370	677,400
Total	1,343,333	1,399,370	1,461,900	1,530,380	1,600,860	1,670,720	1,745,510
Source: ABAG Projections 2005							
Single Family Housing	72.4%						
Multi-Family Housing	27.6%						
Source: SFPUV 2004 Demand Forecast							
Annual Reliability Values BAWSCA Area - (in millions of dollars)							
WTP to avoid 15% shortage	$63	$65	$68	$71	$74	$77	$80
WTP to avoid 20% shortage	$93	$97	$101	$105	$110	$114	$118
WTP to avoid 25% shortage	$132	$136	$142	$148	$154	$160	$166
Source: CDWR WTP * 2005 ABAG Household Projection adjusted to reflect percentages of county population served by SFPUC [0.95 for San Mateo; 0.23 for Santa Clara; 0.31 for Alameda].							

6. Conclusion: The SFPUC Should Reconsider the Water Reliability Goal in the WSIP, Taking Economics Into Account

The industrial and residential shortage cost estimates provided in this report are preliminary and approximate. They are starting points used simply to illustrate that SFPUC has omitted them from the WSIP, that they are large, and that they far exceed the SFPUC's estimates of incremental costs to improve system reliability to 90%, or, for that matter, 100%. They could be used, along with estimates of the cost of reliability options, to develop lifecycle benefits to compare with lifecycle costs of proposed options, in order to assess whether the improvement in reliability is beneficial from the point of view of avoided social and economic costs. The analytic process is more complicated than simply comparing values in Tables 4 and 5 to engineering and construction costs. To fully develop the analysis, the SFPUC would have to develop the costs of an array of reliability management alternatives, together with the expected shortage in each year of the project life of those supply alternatives. The California Department of Water Resources and the Metropolitan Water District of Southern

California have been employing analytic methods of this kind for nearly 20 years. References cited in this paper will lead the interested reader to the appropriate tools and approaches.

APPENDIX

Table 1: Residential Reliability Values

Willingness to Pay to Avoid Event (2005 Dollars)			Value per Acre-Foot (2005 Dollars)
	AF/Year/Household		
Foregone Use	0.3	0.2	
0%	$0	$0	$0
5%	$23	$15	$76
10%	$68	$45	$226
15%	$130	$87	$434
20%	$205	$137	$685
25%	$289	$193	$964
30%	$376	$251	$1,254
35%	$463	$309	$1,544

Source: LCPSIM II, Feb 2005, updated with CPI.

Based on Carson and Mitchell. SWRCB Bay-Delta Hearings, State Water Contractors Exhibit 51. "Economic Value of Reliable Water Supplies." June 1987.

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EXHIBIT A

WATER SUPPLY MATRIX

Water Supply Options 2030

	A 100% Delivery	B 90% Delivery	C 80% Delivery
Amount Delivered During Designed Drought	300	277	254
Existing Firm Yield	226	226	226
Difference (Amount Delivered During Designed Drought minus Firm Yield)	74	51	28
Increased Surface Storage			
Increased Calaveras (420,000)	30		
Increased Calaveras (200,000)		10	10
SFPUC System Water Supply Options			
Desalination	14		
WSIP Cost of Project Bundles ($M)	$734	$167	$167
Non WSIP SFPUC System Water Supply Options			
Conservation	5.6	5.6	5.6
Recycling	19	14	
Ground Water	7	7	7
Transfers	15	15	15
Supply Options	90.6 MGD	51.6 MGD	37.6 MGD
Total 25 Year Cost for Non WSIP Options ($M)	$488	$436	$255

Baseline Assumptions:

1) Assumes consistency with Stewardship Policy and Principles.
2) Meet Purchase Requests.
3) Calaveras rebuilt at 97,000 acrefeet (minimum at original capacity).
4) Design drought of 8 1/2 years.
5) Existing yields assumes annual average of 86 mgd for fish flows at O'Shaughnessy, Cherry, Eleanor and Moccasin. Does not include payments for flows nor recreational releases.

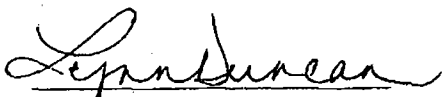
CERTIFICATION OF SERVICE

Modesto Irrigation District and Turlock Irrigation District
(P-2299-065, -053)

I, Lynn Duncan, hereby certify that I have this day served the foregoing document, "Answer Testimony of Arthur R. Jensen on Behalf of Bay Area Water Users Association" upon each person designated on the official service list compiled by the Secretary of the Federal Energy Regulatory Commission in this proceeding.

Dated: September 22, 2009

By:



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