Dec. 31, 2015

State Water Resources Control Board
Division of Water Rights
ATTN: California WaterFix Hearing Staff
P. O. Box 2000
Sacramento, CA 95812-2000

By Hand Delivery/UPS: Joe Serna Jr. CalEPA Building, 1001 "I" Street, 2nd Floor, Sacramento CA 95814 (ALL PERSONAL DELIVERIES must be timestamped at delivery on the 2nd Floor by the Division of Water Rights).

Via email: CWFhearing@waterboards.com

Subject: California WaterFix Hearing (Change Petition) - Protest of the City of Antioch
Dear State Water Resources Control Board:

Thank you for allowing the City of Antioch to submit the following information in support of its Protest to the Change Petition for the WaterFix Project. The City of Antioch has read the proposed Change Petition as well as the RDEIR/SDEIS for the WaterFix Project. The City's Protest is based upon Antioch's rights to water from the San Joaquin and Sacramento Rivers (and Delta) and our concern and belief that the WaterFix Project will adversely impact the City's beneficial rights to use water from these sources.

1. Basis of Antioch's Claim of Right to Use Water

Antioch has pre-1914 appropriative water rights. (Statement of Diversion and Use #S009352) The City of Antioch, located along the San Joaquin River in the western portion of the Sacramento and San Joaquin River Delta ("Delta"), is one of the oldest towns in California. Since at least the 1860s, Antioch has obtained all or part of its freshwater supply directly from its intake on the San Joaquin River (and from the tributary flow of the Sacramento River) pursuant to a pre-1914 appropriative water right with a priority of at least 1868. Antioch's water rights are adjudicated. In Antioch v. Williams Irrigation District (1922) 188 Cal. 451 ("Antioch case") the California Supreme Court confirmed the validity of Antioch's pre-1914 water rights to the San Joaquin and Sacramento Rivers holding:

> The City of Antioch, continuously and under a claim of right, for more than five years before the action was begun, has been diverting from said river, at a point immediately above the city limits, and applying to said public use ...
>
> The status of the city of Antioch in this action, therefore, and its rights in the San Joaquin River are those of a diverter and user of the water thereof for beneficial purposes . . .
>
> The fact that the city has never posted a notice of appropriation, as provided in section 1415 of the Civil Code, is likewise immaterial. "Where there has been actual appropriation of water, a right to it is acquired, without following the course laid down in the code. Id. At 454-456

Antioch's date of priority is at least 1868.[1] In 1968, the State of California by way of a substitute water agreement recognized both the validity Antioch's Pre-1914 appropriative water rights and the priority date of at least 1868.[2] The Department of Water Resources is bound to recognizing the validity of the City's water rights and the date of priority as a signatory to this agreement. (The 1968 Agreement is attached to this Protest separately as **Attachment C** to the City's **"Technical Comments"** from Exponent).

1968 Water Agreement with the State of California: As noted above, Antioch entered into an agreement with the State of California (via the Department of Water Resources) in 1968 (**Attachment C** to the City's **"Technical Comments"** from Exponent). The purpose of the Agreement was to mitigate impacts to the City from the operation of the State Water Project by reimbursing the City for substitute water purchases made necessary when the salinity levels are too elevated for the City to use its own water rights. The original Agreement was in effect for 40 years from 1968 and was recently

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1 Although individuals had diverted water from the San Joaquin River and the Delta since the City was first established in 1850, the first known facilities intended to serve the entire City for municipal purposes appear to have been constructed in the mid-1860s (e.g. a private water company pump and municipal reservoir to store and serve river water in the City). Antioch was formally incorporated in 1872. In 1903-1904, the City by ordinance formed its own municipal water department constructing a water diversion and acquiring long existing privately owned municipal water facilities and rights including those belonging to the Belshaw Water Company (City of Antioch Ordinance 61, 1903).

2 The 1968 Agreement provides: "Whereas, for over 100 years [from 1968] water has been diverted from the San Joaquin River for municipal and industrial use in and around the area which is not in the corporate limits of the City."

extended for another 15 years on October 29, 2013.[3] There are however significant issues with respect to the WaterFix Project's adverse impacts on the 1968 Agreement:

- The 1968 Agreement has a remaining term of less than 15 years and the Waterfix Project is anticipated to extend indefinitely;
- The 1968 Agreement is not based on the projected additional adverse impacts from the WaterFix Project (which again will continue beyond the agreement's 15-year term);
- The 1968 Agreement between Antioch and DWR does not obligate the federal government (e.g. United States Bureau of Reclamation), and does not mitigate whatsoever for impacts from any CVP operations;
- The 1968 Agreement anticipated some continuing opportunity by the City to use its own water rights in many years and during certain times of any given year. However, based on the WaterFix Project's impacts and flawed modeling (see attached **"Technical Comments"** from Exponent) it is not possible for the City to determine the impacts to the City's ability to use its own water rights under the Agreement. It is possible that such impacts could be so extensive as to eliminate all the City's benefits under the 1968 Agreement.
- The analysis of the impacts from the WaterFix Project (see attached **"Technical Comments"** from Exponent) indicate potential impacts to Antioch's primary substitute water source (Contra Costa Water District) in the form of diminished flow and adverse water quality impacts, which would affect the City's ability to purchase substitute water possibly thus nullifying all benefits of the 1968 Agreement.

Salinity Protection: Antioch is also the beneficiary of the various salinity protection statutes found in the water code. These protections were put in place in part following the adverse impacts to the City from upstream water diversions early 1900s and from the anticipated impacts of water exports by way of the CVP and SWP. See for example Water Code sections 12202 and 11207(c). In United States v. State Water Resources Control Bd., (1986) 182 Cal. App. 3d 82 (commonly referred to as the "Racanelli" decision after the appellate justice who wrote the opinion) the court held that the SWRCB was mandated by law to protect the beneficial uses of water from saltwater intrusion in the Delta:

3 In 2013, the City requested the extension of the Agreement include mitigation for the Central Valley Project impacts and an extension of up to 80 years but the Department of Water Resources declined to agree to these terms.

> ***existing constitutional and legislative authorities encompass the Board's obligation to protect the quality of the Delta waters from saltwater intrusion***. As mentioned above, the water quality legislation unmistakably requires the Board to formulate water quality standards to provide salinity control to "ensure the reasonable protection of beneficial uses" (§ 13241),

Public Resource Code section 29702: sets forth the dual/co-equal goals of providing a more reliable water supply and "protecting, restoring, and enhancing the Delta ecosystem." Section 29702, as part of the Delta Reform Act of 2009 provides further that achieving the co-equal goals shall include protecting and enhancing the "unique cultural, recreational, natural resource" values of the Delta. Notably, the Delta Reform Act does not limit water supply reliability to the Project alone, and protection of in-delta water supply reliability is a critical component of complying with the co-equal goals. The City is a direct and intended beneficiary of the "co-equal" goals as a Delta community and water supplier. However, as discussed in the City's attached **"Technical Comments"** from **Exponent**, the WaterFix Project will adversely impact the City's water supply reliability and the unique cultural and recreational resources of the City as a fresh water-based community for the past 150 years.

Reasonable use: Antioch is entitled to the protection of the Constitutional provision prohibiting the unreasonable use of water. The Proposed WaterFix Project is Unreasonable in that it will harm Antioch's senior municipal and domestic use water rights (See attached **"Technical Comments"** from **Exponent**) and cause uncertainty. The WaterFix Project indicates that certain studies and certain operational aspects of the Project remain incomplete and will be analyzed at some unknown point in the future:

- The recent Change Petition for the WaterFix Project submitted to the SWRCB references additional studies regarding the operation and design of the project that are as yet uncompleted (see pg. 14 of the original *Supplemental Information Attachment* to the WaterFix Change Petition). Because these studies will "inform design and operation of the diversion structures," the proposed Project is currently incomplete and fails to properly inform Antioch of the scope of the actual harm from the Project.

- Adaptive management and operating scenarios for the Project are indicated in the RDEIR/SDEIS to be developed at a later time, thus improperly deferring a critical

aspect of the project.[4] It is impossible to know the full extent of water quality and flow impacts on the City's water supply and Delta public trust resources without this critical information being fully disclosed and analyzed in the Project's description and environmental impact analysis.

The fact that these details of WaterFix Project design and operation are currently unknown or not yet disclosed indicates that the Project's description and impact analysis are incomplete, because all the potential impacts of the Project to water users and to fish and wildlife remain unknown and therefore undisclosed at this time. The uncertainty of such future operational impacts in relation to the City's superior water rights for municipal and domestic purposes (a City of over 100,000), renders the Project unreasonable per se under the California Constitution and Water Code section 100. See generally *In re Waters of Long Valley Creek Stream System* (1979) 25 Cal.3d 339 [creating uncertainty with respect to the exercise of water rights is unreasonable].

2. Scope of Antioch's use of water (Statement of Diversion and Use #S009352)

The basis of Antioch's diversion of water under the rights set forth above are for Municipal, Industrial and Domestic use on a year-round basis. As noted above, the source of the City's water diversion is the San Joaquin River and the tributary flow of the Sacramento River.[5] Antioch has a present estimated population of 108,930 (2014).

The City can divert up to 16 million gallons of water per day with an average of 10,500 gallons per minute during a typical year. Total diversions yearly vary depending on salinity levels and a number of other factors. Antioch's Statements of Diversion and Use (#S009352) illustrate the City's diversion amounts in different year types due to salinity

4 As noted by the Delta Independent Science Board in comments submitted to the Delta Stewardship Council on September 30, 2015 **(attachment D** to Exponents Technical Comments attached to this Protest) and in the DSC's WaterFix Comments: "There is a very general and brief mention of the steps in the adaptive management process in Section 4 (p. 4.1-6 to 4.1-7), but nothing more about the process... We did not find examples of how adaptive management would be applied to assessing—and finding ways to reduce—the environmental impacts of project construction and operations... The current draft of the RDEIR/SDEIS defers details on how adaptive management will be made to work: 'An adaptive management and monitoring program will be implemented to develop additional scientific information during the course of project construction and operations to inform and improve conveyance facility operational limits and criteria' (p. ES-17). This is too late." The City agrees.

5 Antioch's rights to the tributary flow of the Sacramento River via Georgiana and Three Mile Sloughs was determined as a matter of law by the California Supreme Court in the case of *Town of Antioch v. Williams Irrigation District et al.* (1922) 188 Cal. 451, 455.

and other water quality issues. Below is a table showing diversions in recent years and substitute water purchases from Contra Costa Water District (CCWD) made necessary due to salinity levels:

	Water Rights	**CCWD purchase**
YEAR	MG	MG
1998	4,110.167	1,219.007
1999	2,689.806	3,164.606
2000	2,061.592	4,236.095
2001	1,484.193	5,047.222
2002	2,298.523	4,513.649
2003	2,848.746	3,882.856
2004	1,795.688	5,050.868
2005	2,606.593	3,918.041
2006	2,653.585	3,731.479
2007	1,566.797	5,248.175
2008	1,783.915	4,665.788
2009	1,675.600	4,332.902
2010	2,481.360	3,069.813
2011	3,575.551	2,207.148
2012	1,673.851	4,006.599
2013	1,537.816	3,400.644
2014	583.852	4,716.501
2015	408.723 (YTD)	3,419.396 (Jan – Oct)

The City's diversion facility is located within the City's boundaries at: NW ¼ of SW ¼; Sec. 18; T2N; R2E; MDB&M. The City's diversion facilities are located downstream of the proposed WaterFix Project diversion.

The City's place of use is within its municipal boundaries and sphere of influence in Contra Costa County (approx. 29 to 30 square miles). The City's place of use is shown in the map attached to the 2013 extension of the 1968 Agreement (attached separately to this protest as **Attachment C** to the City's **"Technical Comments"** from Exponent).

3. Harm to the City from the WaterFix Project

The City and its citizens have diverted water from the Delta for over 150 years. Antioch was able to use its water rights prior to the 1920s year-round, and 208 to 225 days or more a year on average since the 1930s and often year around. The harm to the City from the

WaterFix Project is set forth in detail in the **"Technical Comments"** from **Exponent** attached to the City's protest. This harm includes the Project's impacts to the City's 1968 Agreement, the impacts of uncertainty from the WaterFix Project to the City's water use and supply to a population of over 100,000 citizens, and the adverse impacts to water supply reliability as mandated in the Delta Reform Act discussed above.

4. Conditions under which this Protest may be dismissed

Antioch could potentially consider dismissing its Protest if the impacts were fully mitigated. This could occur through modifications to the existing 1968 Agreement to extend the length of that agreement and to increase the amount of reimbursement to the City under that agreement, as were previously proposed to DWR by the City. This could also occur through reimbursement to the City for the construction of a brackish water treatment plant.

Thank you again. If you have any questions or need additional information, please contact Ron Bernal at (925) 779-6820 or rbernal@ci.antioch.ca.us.

Sincerely,

Ron Bernal. P.E.
Public Works Director/City Engineer

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Info: (916) 341-5300, FAX: (916) 341-5400, Web: http://www.waterboards.ca.gov/waterrights

PROTEST– PETITION

This form may also be used for objections

PETITION FOR TIME EXTENSION, CHANGE, TEMPORARY URGENT CHANGE OR TRANSFER ON

APPLICATION _____ **PERMIT** Attached **LICENSE** _____

OF WaterFix Project

I (We) have carefully read the notice (state name): City of Antioch

Address, email address and phone number of protestant or authorized agent:
P.O. Box 5007, Antioch, CA 94531-5007; (925) 779-6820 Attn: Ron Bernal

Attach supplemental sheets as needed. To simplify this form, all references herein are to protests and protestants although the form may be used to file comments on temporary urgent changes and transfers.

Protest based on ENVIRONMENTAL OR PUBLIC INTEREST CONSIDERATIONS (Prior right protests should be completed in the section below):

- the proposed action will not be within the State Water Resources Control Board's jurisdiction ☐
- not best serve the public interest ☐
- be contrary to law ☐
- have an adverse environmental impact ☐

State facts which support the foregoing allegations _____

Under what conditions may this protest be disregarded and dismissed? (Conditions should be of a nature that the petitioner can address and may include mitigation measures.)

Protest based on INJURY TO PRIOR RIGHTS:

To the best of my (our) information and belief the proposed change or transfer will result in injury as follows: See the City of Antioch's attachements and in particular the technical analysis of the City's consultant, Exponent

Protestant claims a right to the use of water from the source from which petitioner is diverting, or proposes to divert, which right is based on (identify type of right protestant claims, such as permit, license, pre-1914 appropriative or riparian right):: Ajudicated pre-1914 appropriative right See attachments

List permit or license or statement of diversion and use numbers, which cover your use of water (if adjudicated right, list decree). Statement of Diversion #S 009352

Where is your diversion point located? NW¼ of SW ¼ of Section 18, T 2N, R 2E, MD B&M

If new point of diversion is being requested, is your point of diversion downstream from petitioner's proposed point of diversion? Yes

The extent of present and past use of water by protestant or his predecessors in interest is as follows:

a. Source San Joaquin and Sacramento Rivers
b. Approximate date first use made 1868
c. Amount used (list units) 16 million gallons per day
d. Diversion season Year-round
e. Purpose(s) of use Municipal, domestic, industrial

Under what conditions may this protest be disregarded and dismissed?

Mitigation of harm from the WaterFix project, which could include modification of an existing substitute water purchase agreement or funding to construct a brackish water treatment plant

All protests must be signed by the protestant or authorized representative:

Signed: Don Bransford Date: 12/31/15

All protests must be served on the petitioner. Provide the date served and method of service used: Hard copy subimttal by FEDEX to arrive on Jan. 4 or earlier (email submittal as well)

DWR AND RECLAMATION WATER RIGHTS INVOLVED IN THE PETITION

The Projects operate pursuant to water right permits and a license issued by the State Water Board that authorize the Projects to either (1) divert water to storage, which is released later in the year and re-diverted downstream or (2) directly divert water for beneficial use, or both. The Petition involves four of DWR's six permits for the SWP and 11 of Reclamation's 32 permits and one license for the CVP. Tables 1 and 2 below summarize DWR's and Reclamation's subject permits, respectively and the permit changes requested in the Petition.[9]

Table 1
Summary of DWR's Subject Water Rights and Requested Changes[10]

App No.	Permit No.	Source(s)	Direct Diversion Amount (cfs)	Direct Diversion Season	Diversion to Storage Amount (TAF)	Diversion to Storage Season	Combination Export Amounts (cfs)	Complete Use Date[11]	Petition Request to Add:
5630	16478	Feather R.	1,400	Year-Round	380	9/1 - 7/31	10,350	12/31/09	PORD
14443	16479	Feather R.	1,360	Year-Round	3,500	9/1 - 7/31	10,350	12/31/09	PORD
		Delta Channels	6,185	Year-Round	42.1	Year-Round			POD
14445A	16481	Old River[12] & Delta Channels	2,115	Year-Round	44.0	Year-Round	10,350	12/31/09	POD
17512	16482	Old River,[12] Delta Channels, & San Luis Cr.	--	--	1,100	Year-Round	10,350	12/31/09	POD

[9] Tables 1 and 2 do not reflect any regulatory constraints that may limit the Projects' ability to exercise their water rights to the fullest extent, including D-1641, the USACE's River and Harbors Act permits, or the 2008 USFWS and 2009 NMFS Biological Opinions on the coordinated operations of the Projects.

[10] TAF refers to thousand acre-feet; TAFA refers to thousand acre-feet annually, and cfs refers to cubic feet per second.

[11] Water right permits issued by the State Water Board specify a development schedule to complete construction and beneficial use of water. When a permit development schedule has elapsed, no further development of water use may occur. The permittee is limited to the maximum annual quantity put to use during the permit development schedule unless the permittee is granted an extension of time to extend the development schedule. DWR's time to complete construction and beneficial use of water for its subject permits elapsed on December 31, 2000, and December 31, 2009, respectively. On December 31, 2009, DWR filed petitions to extend the development schedule until December 31, 2015, for the subject four permits and two additional DWR permits. The State Water Board noticed all six DWR petitions on August 19, 2010, and received eight protests. The protests have not been resolved and the petitions for time extensions are still pending.

[12] On Page 2 of the addendum and errata to the Petition, DWR and Reclamation list Italian Slough as an existing source of water for Permits 16481 and 16482. In D-1641, the State Water Board approved the addition of the intake to Clifton Court Forebay on Old River to Permits 16481 and 16482 as a point of diversion. Therefore, D-1641 also added Old River as an additional source to these permits even though it is not expressly listed in the permit. DWR has not developed Italian Slough as a source of water under these permits.

Table 2
Summary of Reclamation's Subject Water Rights and Requested Changes[10]

App No.	Permit No.	Source(s)	Direct Diversion Amount (cfs)	Direct Diversion Season	Diversion to Storage Amount (TAF)	Diversion to Storage Season	Combination Exports Amounts (cfs / TAFA)	Complete Use Date[13]	Petition Request to Add:
5626	12721	Sacramento R.	8,000	9/1 - 6/30	3,190	10/1 - 6/30	--	12/1/90	POD and PORD
9363	12722	Sacramento R.	1,000	Year-Round	310	10/1 - 6/30	--	12/1/90	POD and PORD
9364	12723	Sacramento R.	9,000	Year-Round	1,303	10/1 - 7/1	--	12/1/90	POD and PORD
13370	11315	American R.	8,000	11/1 - 8/1	1,000	11/1 - 7/1	--	12/1/90	PORD
13371	11316	American R.	700	11/1 - 8/1	300	11/1 - 7/1	--	12/1/90	PORD
5628	11967	Trinity R.	2,500	Year-Round	1,540	Year-Round	3,200 cfs / 2,500 TAFA	12/1/90	PORD
15374	11968	Trinity R.	300	Year-Round	200	Year-Round	3,200 cfs / 2,500 TAFA	12/1/90	PORD
15375	11969	Trinity R.	1,700	Year-Round	1,800	Year-Round	3,200 cfs / 2,500 TAFA	12/1/90	PORD
16767	11971	Trinity R.	--	--	700	Year-Round	3,200 cfs / 2,500 TAFA	12/1/90	PORD
17374	11973	Trinity R.	1,500	Year-Round	--	--	3,200 cfs / 2,500 TAFA	12/1/90	PORD
17376	12364	Clear Cr.	3,600	11/1 - 4/1	250	11/1 - 4/1	--	12/1/90	PORD

The State Water Board has issued various water right decisions and orders conditioning the Projects' permits and license. Most notable of the State Water Board decisions is D-1641, which placed conditions on Project operations necessary to implement the Bay-Delta Plan. Project operations also are subject to ESA and CESA, and USACE permitting requirements. DWR and Reclamation have stated in their Petition that they are not proposing to modify any of these requirements as part of the California WaterFix Project. It is anticipated that there will be new operational requirements for the Projects associated with the CESA and ESA process, as discussed above, and possibly the USACE permit.

COMPLIANCE WITH CEQA, ESA AND CESA

As stated in the introduction, in July 2015, DWR and Reclamation released a RDEIR/SDEIS pursuant to CEQA and NEPA that analyzes the California WaterFix portion of the former BDCP. CEQA requires the State Water Board, as a responsible agency with jurisdiction over the water rights and water quality in the Bay-Delta, to consider the environmental effects of the project identified in the Final EIR certified by the lead agency prior to reaching a decision on whether and under what conditions to approve the project. To the extent feasible, the State Water Board is responsible for mitigating or avoiding the significant environmental impacts identified in the resource areas within the State Water Board's jurisdiction, specifically for the water right petition components of the California WaterFix Project. (Cal. Code Regs., tit. 14, §15096.) When considering the Petition, the State Water Board must make independent findings concerning significant environmental effects within the State Water Board's jurisdiction, and may require additional or different mitigation measures for impacts in those resource areas.

[13] Water right permits issued by the State Water Board specify a development schedule to complete construction and beneficial use of water. When a permit development schedule has elapsed, no further development of water use may occur. The permittee is limited to the maximum annual quantity put to use during the permit development schedule unless the permittee is granted an extension of time to extend the development schedule. Reclamation's time to complete construction for the subject permits elapsed on a range of dates from December 1, 1964 through December 1, 1985. Reclamation's time to complete beneficial use of water for its subject permits elapsed on December 1, 1990. On September 19, 1985, Reclamation filed a petition for an extension of time to the year 2030. On June 26, 2009, Reclamation filed a petition to extend the development schedule until December 1, 2030, for the subject 11 permits and 21 other Reclamation permits. The June 26, 2009 petition superseded the September 19, 1985 petition. The State Water Board noticed all 32 Reclamation petitions on September 3, 2009, and received 17 protests, of which 11 were accepted, in whole or in part, as valid protests. The protests have not been resolved and the petitions requesting time extensions are still pending.

NOTICE OF INTENT TO APPEAR

City of Antioch plans to participate in the water right hearing regarding

CALIFORNIA WATERFIX HEARING
California Department of Water Resources and U.S. Bureau of Reclamation
The Public Hearing scheduled to commence on **Thursday, April 7, 2016**

1) Check all that apply:
☒ I/we intend to participate in Part I of the hearing
☒ I/we intend to participate in Part II of the hearing

2) Check the applicable boxes below. Be sure to accurately describe your participation in the hearing. (Please refer to Enclosure D of the October 30, 2015 Notice of Petition, Public Hearing, and Pre-Hearing Conference (Hearing Notice) for descriptions of "parties" and "interested persons"):

☐ I/we intend to participate in the hearing as an interested person and present a policy statement **only**. ☐ Part I ☐ Part II

☐ I/we intend to participate in the hearing as a party by cross-examination and/or rebuttal only and may present an opening statement.
☐ Part I ☐ Part II

☒ **Part I:** I/we plan to participate in Part I as a party and call the following witnesses to testify at the hearing. (Fill in the following table for Part I of the hearing **only**)

NAME	SUBJECT OF PROPOSED TESTIMONY (Please indicate Application Number if Appropriate)	ESTIMATED LENGTH OF DIRECT TESTIMONY	EXPERT WITNESS (YES/NO)
Susan Paulsen	Harm to Antioch; Analysis of water quality and flaws in WaterFix Modeling	20 mins	Yes
Ryan Thacher	Harm to Antioch; modeling	10 mins	Yes
Matthew Emrick	Antioch's Water Rights	10 mins	Yes
Ron Bernal	Antioch's water supply system and harm to Antioch	10 mins	Percipient/ expert
Tim Coley	Antioch's water supply system and harm to Antioch	10 mins	Percipient/ expert

(If more space is required, please add additional pages.)

☒ **Part II:** I/we plan to participate in Part II as a party and will call witnesses to testify at the hearing. Please note that you will be required to submit a Supplemental Notice of Intent to Appear at a date to be determined for Part II of the hearing that lists your witnesses, subject of proposed testimony, etc.

3) Check if applicable:
☒ I/we have also protested the Petition in accordance with Water Code section 1703.2.

Note: If have protested the Petition, you must also fill out sections 1 and 2 of this form above and indicate your intent to appear at the hearing to present evidence in support of your protest. If you do not resolve your protest with the petitioners prior to the hearing, and then do not

*present a case supporting your protest at the hearing, your protest will be dismissed. It is **not** necessary to file a protest to participate in the hearing.*

Continued to next page

4) Fill in the following information of the Participant, Party, Attorney, or Other Representative:

Name (Print): Ron Bernal for the City of Antioch
Mailing Address: P. O. Box 5007, Antioch, CA 94531-5007

Phone Number: (925) 779-6820 Fax Number: (925) 779-6897

E-mail: _rbernal@ci.antioch.ca.us

Optional:

☐ ~~I/we **decline** electronic service of hearing-related materials. If you are unable to accept electronic service for any reason, please contact the hearing team by Tuesday, January 5, 2016, at 916-319-0960 or by email at CWFhearing@waterboards.ca.gov.~~

Signature: _____ **Date**: DECEMBER 31, 2015
RON BERNAL, CITY OF ANTIOCH

EXTERNAL MEMORANDUM

TO: California State Water Quality Control Board, California Department of Water Resources, and U.S. Bureau of Reclamation

FROM: Susan Paulsen, Ph.D., P.E.

DATE: December 31, 2015

PROJECT: 1405064.000

SUBJECT: Change Petition Protest, Technical Comments Regarding Harm to Antioch and its Water Rights

1. Executive Summary — Harm to Antioch from the WaterFix Project

The City of Antioch (the City) retained Exponent to evaluate the Notice of Petition requesting changes (the Change Petition) in water rights of the Department of Water Resources (DWR) and U.S. Bureau of Reclamation for the California WaterFix Project. Exponent has also assisted the City in evaluating and preparing comments on the Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS) for the WaterFix Project. As detailed below, Exponent's analysis of the WaterFix Project and the Change Petition included a review of the RDEIR/SDEIS documentation, and analysis of the modeling performed to support the technical evaluation of potential impacts. Also, Exponent reviewed historical information related to the City's operations at its drinking-water intake, and the City's Agreement with the State, which partially reimburses the City for water that the City must purchase when water quality at its intake is insufficient for municipal use a result of the operations of the State Water Project.

Exponent has concluded that, although it is difficult to assess the impacts of the proposed project on water quality at Antioch, the proposed project will have significant impacts on water quality at the City's intake. The difficulty in assessing the impacts of the proposed WaterFix Project arises because the proposed project was not modeled, and there are major differences between the model runs used to assess impacts and the features of the proposed WaterFix Project. In addition, neither the Change Petition nor the RDEIR/SDEIS provides sufficient detail to understand how the proposed WaterFix Project will be operated initially, or how the adaptive management process will be employed to change project operations in the future.

Even based on incomplete information, it is clear that the water quality impacts at the City's intake will result in the need to purchase additional water from the Contra Costa Water District (CCWD), and that the City's Agreement with the State is insufficient to reimburse the City for these purchases. Our preliminary calculation indicates that the present value of the excess water that will have to be purchased by the City from CCWD to meet demand over a 50-year period will range from $6 million to $39.5 million, depending on WaterFix Project operations.

2. Introduction

The City of Antioch (the City) retained Exponent to evaluate and prepare technical comments on the Notice of Petition requesting changes (the Change Petition) in water rights of the Department of Water Resources (DWR) and U.S. Bureau of Reclamation for the California WaterFix Project (WaterFix). The Change Petition would add three new points of diversion and/or points of rediversion of water to specific water rights permits for the State Water Project (SWP) and the Central Valley Project (CVP). Exponent evaluated whether the proposed WaterFix Project would be likely to result in significant impacts on water quality at Antioch's drinking-water intake on the San Joaquin River.

The change in point of diversion would result in changes to the hydrodynamics of the Delta, because water would be diverted from the Delta at locations within the Sacramento River—i.e., Sacramento River water that would have flowed into and through the Delta would be removed from the Delta far upstream of the current points of diversion. Not only would diversions from the Delta contain a higher proportion of Sacramento River water, but overall flow and mixing patterns within the Delta would change as well. The changes in mixing within the Delta that would be caused by the proposed project would result in water quality impacts that otherwise would not have occurred. In addition, if more water is exported and/or diverted from the system than under current conditions, greater volumes of saline water will enter the Delta from San Francisco Bay than would otherwise, absent the project. Although future sea-level rise will also affect water quality at the City's intake, changes in the point of diversion will result in impacts independent of, and in addition to, impacts caused by sea-level rise.

The City's analysis of the impacts of the WaterFix Project relies on the City's prior analyses of the modeling of Alternative 4, which was conducted in 2013 by DWR, and which formed the basis for the current RDEIR/SDEIS. We have referred to those prior comments, which are attached to the City's comment package in Attachments A and B, rather than repeat our concerns with the 2013 modeling exercise, and its application within the 2015 RDEIR/SDEIS, in their entirety here. For the purpose of the City's information in support of its Protest of the WaterFix Project, the term RDEIR/SDEIS shall be used occasionally to refer to the WaterFix Project, because this environmental document forms the basis for the WaterFix Project subject to the Change Petition.

3. Antioch's Water Rights

The City is located along the San Joaquin River in the western portion of the Sacramento and San Joaquin River Delta (Delta). Since the 1960s, Antioch has obtained all or part of its freshwater supply directly from its intake on the San Joaquin River,[1] pursuant to a pre-1914 appropriative water right with a priority of 1867.[2] Contrary to incorrect statements contained in the RDEIR/SDEIS, Antioch continues to obtain much of its water supply from its own diversion facility.[3] Antioch has an agreement with the Department of Water Resources (DWR) that partially compensates the City for supplemental water that must be purchased from the Contra Costa Water District (CCWD) when the operations of the State Water Project degrade water quality at the City's intake to a point where that water is not suitable for diversion and use. That agreement currently has a 15-year term, which will end at approximately the same time the BDCP is anticipated to begin operations.[4]

4. The evaluation of the proposed project is inadequate.

4.1. The baseline condition used to evaluate the proposed project is flawed and inappropriate, and results in an underestimation of project impacts.

The WaterFix Project's analysis of adverse impacts to water quality relies on a flawed and inappropriate baseline condition for analyzing such impacts. This results in harm to Antioch, in that the number of usable days for the City to divert water is underpredicted by about 15 days per year (more than 9%), or about 245 days during the simulation period. As explained below,

[1] Much of the water in the western Delta (including the City's water supply) comes from the Sacramento River. Historically, significant amounts of Sacramento River water flowed into the San Joaquin River east of Antioch at Three Mile and Georgiana Sloughs. Sacramento River water also reaches Antioch where the river merges with the San Joaquin River just west of the City, and via tidal action.

[2] Antioch has vested pre-1914 water rights to water from the San Joaquin River, as well as to the tributary flow of the Sacramento River via Georgiana and Three Mile Sloughs. This was determined as a matter of law by the California Supreme Court in the case of *Town of Antioch v. Williams Irrigation District et al*. (1922) 188 Cal. 451,455.

[3] The City of Antioch uses water from its intake as its main source of supply when salinity at the intake is below specified thresholds. The 2013 EIR/EIS stated that Antioch's intake is "seasonal" and used "infrequently" (EIR/EIS Chapter 8 at p. 8-185, lines 13-14), which is not true. Rather than address the impact of reduced water quality on the City's ability to use water at its intake, the 2015 RDEIR/SDEIS states, for example (see p. 4.3.4-10), that "the use of seasonal intakes at Antioch and Mallard Island is largely driven by acceptable water quality, and thus has historically been opportunistic, and opportunity to use these intakes would remain. Thus, these increased bromide concentrations would not be expected to adversely affect MUN beneficial uses, or any other beneficial use, at these locations." Thus, it appears that the RDEIR/SDEIS both misrepresents the facts with respect to Antioch's use of its intake, and further downplays the effect of any worsening of water quality on the City's ability to use its intake.

[4] On October 29, 2013, the term of the agreement between the State of California and the City of Antioch was extended through September 30, 2028.

this failure to implement a Fall X2 condition in the "Existing Conditions" model runs artificially biases the model results with respect to the current condition at Antioch's intake, and in effect gives the proposed project an unwarranted "free pass" for 245 days during the 17-year model simulation period.

The RDEIR/SDEIS indicated that two baselines were used in the current analysis: the "Existing Conditions" baseline defined in the 2013 Draft EIR/EIS was used for the CEQA impact analysis, and the "No Action Alternative Early Long-Term" (NAA-ELT) scenario was used for the NEPA impact analysis. The 2013 Draft EIR/EIS used a model run previously called "EBC1" to simulate the existing condition, and the 2015 RDEIR/SDEIS continues to use the same "Existing Conditions" model run (i.e., "EBC1").

As noted by the City and its technical consultants in prior documentation (see Attachment A), the EBC1 existing conditions scenario used to evaluate project impacts is flawed and does not accurately represent existing conditions with respect to salinity at Antioch. In contrast, a second existing conditions model run, called "EBC2," was also conducted and was available for use at the time the 2013 Draft EIR/EIS was prepared, and more accurately represents existing conditions.[5] The primary difference between EBC1 and EBC2 is whether Delta outflows are managed to achieve the Fall X2 provision (hereafter referred to as "Fall X2") of the 2008 U.S. Fish and Wildlife Service Biological Opinion (the "2008 BiOp"): the EBC1 scenario does <u>not</u> operate to Fall X2, whereas the EBC2 scenario <u>does</u> operate to Fall X2.

As described in the City's prior comments (see Attachment A), the City's consultants obtained from DWR the modeling results from the Delta Simulation II (DSM2) model, which was used to simulate hydrodynamics and water quality throughout the Delta for a range of model scenarios. Model results for EBC2 agree well with salinity measurements made near Antioch. By contrast, the EBC1 scenario (the 2015 and 2013 "Existing Conditions" scenario) showed poor agreement, particularly in the fall of 1974, 1975, 1978, 1980, 1984, and 1986, or 6 of the 17 years modeled, when modeled salinity values were significantly greater than measured salinity values.[6]

[5] The March 2013 Revised Administrative Draft used both EBC1 and EBC2, while both the 2013 Draft EIR/EIS and the 2015 RDEIR/SDEIS use only the EBC1 scenario, which has been renamed as the "existing conditions" scenario.

[6] Note that the time period evaluated in the RDEIR/SDEIS appears to have changed. Whereas the 2013 EIR/EIS evaluated the full modeled period, the current 2015 RDEIR/SDEIS appears to have evaluated a shorter time period, as indicated on p. ES-26: "Chloride modeling results were updated: New calculation of exceedances of the 150 mg/L chloride objective were prepared based on calendar years 1976-1990 of the original modeled results (i.e., 15 years instead of 16) because the objective applies on a calendar year basis." The City's prior analysis evaluated model results provided by DWR for the 1974–1991 time period.

To further illustrate the impacts of selecting a biased and incorrect baseline, Table 4-1 shows the conditions that were modeled for each scenario and the number of usable days[7] for each scenario. For example, the incorrect "Existing Conditions" baseline (EBC1) predicts that, for the modeled time period of 1974–1991, usable water will be available for 149 days, while the correct "Existing Conditions" baseline (EBC2) predicts that usable water will be available for 164 days; thus, the incorrect choice of the baseline conditon means that the number of usable days is underpredicted by about 15 days per year (more than 9%), or about 245 days during the 17-year simulation period. The failure to implement a Fall X2 condition in the "Existing Conditions" model runs artificially biases the model results with respect to the current condition at Antioch's intake, and in effect gives the proposed project an unwarranted "free pass" for 245 days during the 17-year period.

Failing to include Fall X2 in the Existing Conditions scenario makes the baseline condition appear to be more saline than it actually is, so that the potential impacts of the BDCP appear to be significantly smaller than they would be with an appropriate baseline.

Table 4-1. Description of available baseline scenario model runs, together with DSM2 model results showing the number of days Antioch will be able to use water at its intake under EBC1, EBC2, and NAA ELT scenarios (1974–1991) by year type

Year Type	EBC1 2015 CEQA Baseline Existing Condition Does not include Fall X2 No sea-level rise	EBC2 "Correct" Existing Condition Includes Fall X2 No sea-level rise	NAA_ELT NEPA baseline condition in 2015 RDEIR/SDEIS Includes Fall X2 15-cm sea-level rise
	Model Results (number of usable days)		
All years	149	164	155
Critical years	56	64	59
Dry years	123	145	133
Above- and below-normal years	177	188	171
Wet years	246	265	257

* Salinity threshold 976 µS/cm.

[7] Consistent with the City's Agreement with DWR, water at the City's intake was defined as usable when salinity is below 250 ppm chloride, equivalent to an electrical conductivity of about 976 µS/cm. This conversion was made using the relationship between chloride concentration and EC for "normal" years in Guivetchi (1986). See Attachment C for detail.

4.2. The proposed project was not modeled.

As discussed below, the preferred Alternative 4A—the project scenario upon which the Change Petition and WaterFix Project are based—was not modeled. As a result, the harm to the City and other downstream beneficial uses, and the environmental impacts of the WaterFix Project (Alternative 4A), cannot be determined based on the existing modeling. For the purpose of the Protest process, the SWRCB does not have sufficient information on which to base any determination of harm. In addition, harm will reach beyond Antioch and its population, as the City will become more reliant on water supplied by CCWD with the implementation of the proposed project. This will place additional stress on CCWD and Central Valley Projects water.

The RDEIR/SDEIS identifies Alternative 4A, also known as the "WaterFix" and presented for the first time in the 2015 RDEIR/SDEIS, as the preferred alternative. However, Alternative 4A was not explicitly modeled. Instead, the environmental impacts of Alternative 4A were assessed using modeling of Alternative 4 (first presented in the 2013 Draft RDEIR/SDEIS) and a limited sensitivity analysis.

Although the RDEIR/SDEIS states, "Lead agencies have determined that they may reasonably rely on modeling conducted for Alternative 4 to accurately predict the environmental effects of Alternative 4A,"[8] the differences between Alternative 4 and proposed project Alternative 4A are significant, as shown in Table 4-2. As detailed in Section 5.3, three of the differences between the models—the amount of tidal restoration, the salinity objective compliance location, and the operation of the Suisun Marsh salinity control gates—have direct and immediate impacts on the salinity levels predicted to occur at Antioch's intake. In addition, salinity within the Delta often behaves in a non-linear fashion, such that without being modeled, it is not possible to reliably infer the effects of multiple changes in model assumptions on model output.

In summary, the differences between Alternative 4A and Alternative 4 are significant, such that the environmental impacts of Alternative 4A cannot be determined based on the existing modeling.

[8] See *New Alternatives: Alternatives 4A, 2D and 5A* (Chapter 4 of the Bay Delta Conservation Plan/California WaterFix RDEIR/SDEIS) at page 4.1-43, lines 17–19 ("Physical Modeling").

Table 4-2. Comparison of modeled conditions and conditions of proposed project Alternative 4A

Condition	Model Parameters for Alternative 4 (2013)	Proposed Project Alternative 4A (2015)
CEQA baseline	Existing conditions (EBC1)	Existing conditions (EBC1)
NEPA baseline	NAA ELT	NAA ELT
Sea level rise	15 cm (ELT)	15 cm (ELT)
Fall X2	Included	Included
Conservation measures/ Environmental commitments	25,000 acres of tidal restoration of wetlands (at ELT), and 65,000 acres at LLT	Up to 59 acres of tidal wetland restoration
Yolo Bypass Restoration	8,000 acres of restoration included	0 acres
EcoRestore	No separate project — Alternative 4 included restoration commitment	Separate project
Salinity objective compliance location	Three Mile Slough	Emmaton
Suisun Marsh salinity control gates	Not operated	Operated

4.3. Operations of the proposed project, Alternative 4A, are not defined.

One of the major problems with the WaterFix Project, as proposed and as analyzed in the RDEIR/SDEIS, is that it does not define or disclose certain Operating Scenarios. This failure by the WaterFix Project makes it impossible for the City to analyze the potential impacts of the Project on its water rights and water supply. This failure also makes it impossible for the SWRCB to make a proper determination of harm to downstream beneficial uses.

The RDEIR/SDEIS states that operational scenario H3+, which is bounded by Operations Scenarios H3 and H4 from the 2013 Alternative 4, is representative of the operations proposed under Alternative 4A. As with Alternative 4 Operations Scenarios H3 and H4, the operations scenario described for the proposed project includes both Fall X2 operations and criteria for spring outflow, bounded by the criteria associated with H3 and H4.

However, these operations will be modified via the use of an Adaptive Management and Monitoring Plan (AMMP). The AMMP is to be implemented to develop additional science during the course of project construction and operation, to inform and improve conveyance facilities operational limits and criteria, and the AMMP is anticipated to result in modifications to operations of the North Delta bypass flows, South Delta export operations, head of the Old

River barrier operations, spring Delta outflows, and the Rio Vista minimum flow standard in January through August.[9] No operational "limits" are provided in the RDEIR/SDEIS that would inform the City regarding how the project may be operated, and no additional model runs are provided that would indicate the water quality impacts that may result from modified operations. Thus, the operational conditions described for Alternative 4A are essentially unconstrained, providing an undefined degree of flexibility that can be expected, based on model runs for Alternative 4 Operations Scenarios H1 and H2 (which do not include Fall X2) to result in significant impacts to water quality at Antioch's intake.

Further, the criteria for some operational parameters, such as winter and summer outflow, are worded vaguely: "Flow constraints established under D-1641 will be followed if not superseded by criteria listed above."[10] It is difficult to discern the proposed water operations flow criteria with this lack of clarity in description.

Particularly noteworthy to the City is the fact that the very limited discussion of operational flexibility that does exist indicates that operations will be modified based solely on impacts to fish species, including critically important operations parameters for both spring outflow (to be managed for longfin smelt)[11] and Fall X2 (to be managed for delta smelt).[12] No mention is made of the importance of spring outflow and Fall X2 to water quality in the western Delta, and no indication is given that operations would be constrained to avoid a worsening of water quality in the western Delta.

As detailed below, operations criteria are vitally important as a determinant of water quality at Antioch's intake. For this reason, the City requests that project proponents make a direct and binding commitment to operate the project in such a manner that water quality degradation in the western Delta is limited to the range evaluated in the RDEIR/SDEIS, or to full mitigation of any potential impacts from such operations.

[9] RDEIR/SDEIS at p. ES-18.

[10] RDEIR/SDEIS at p. 4.1-10, regarding the operations parameter "winter and summer outflow."

[11] For example, p. 4.1-9 of the RDEIR/SDEIS indicates that, for spring outflow, "To ensure maintenance of longfin smelt abundance, initial operations will provide a March-May average outflow bounded by the requirements of Scenario H2, which are consistent with D-1641 standards, and Scenario H, which would be scaled to Table 3-24 in Chapter 3, Section 3.6.4.2 of the Draft EIR/EIS… Adjustments to the criteria above and these outflow targets may be made using the Adaptive Management Process and the best available scientific information available [*sic*] regarding all factors affecting longfin smelt abundance."

[12] For example, p. 4.1-9 of the RDEIR/SDEIS indicates that "September, October, November implement the USFWS (2008) BiOp Fall X2 requirements. However, similar to spring Delta outflow and consistent with the existing RPA adaptive management process, adjustments to these outflow targets may be made using the Adaptive Management and Monitoring Program described below and the best available scientific information regarding all factors affecting delta smelt abundance."

4.4. The Adaptive Management and Monitoring Program is undefined.

The Adaptive Management and Monitoring Program (AMMP) is undefined, and is likely to produce adverse environmental impacts, including impacts to water quality. The AMMP is included within the RDEIR/SDEIS as a means to accommodate flexibility in the proposed project that is required due to the "considerable scientific uncertainty… regarding the Delta ecosystem, including the effects of CVP and SWP operations and the related operational criteria."[13] It is well established that there is substantial uncertainty in the Delta ecosystem, and an adaptive management strategy is necessary. However, an adaptive management strategy should not be used as a means to circumvent project planning.

Proposed project Alternative 4A relies heavily on the AMMP to dictate changes in operation of water conveyance facilities, habitat restoration, and other factors during project construction and operation. The AMMP is a central component of Alternative 4A, yet remains almost wholly undefined. Beyond an introduction to basic principles of adaptive management, there is little discussion of how the AMMP will be implemented, nor does it appear that there will be a review process for the considerable changes that may be recommended as a result of the AMMP. Although the AMMP is described as a means of making adjustments to operations criteria, there is no discussion of how this iterative process will occur. In addition, no operational boundaries are defined with regard to potential application of the AMMP within Alternative 4A that would operate to reduce increased salinity caused by WaterFix and the operations of the State and Federal Projects.[14]

The RDEIR/SDEIS indicates that "collaborative science and adaptive management will, as appropriate, develop and use new information and insight gained during the course of project construction and operation to inform and improve… the operation of the water conveyance facilities under the Section 7 biological opinion and 2081b permit…"[15] As with the discussion of project operations, the RDEIR/SDEIS appears to indicate that the only factor that will be considered in modifying operations will be impacts to fish. The City is concerned that an AMMP focused solely on fish will fail to consider the potentially substantial water quality impacts that could be induced by even modest changes to project operations.

[13] RDEIR/SDEIS at p. 4.1-18, line 17.

[14] See also the September 30, 2015, report of the Delta Independent Science Board, which noted at p. 5, "There is a very general and brief mention of the steps in the adaptive management process in Section 4 (p. 4.1-6 to 4.1--7), but nothing more about the process… We did not find examples of how adaptive management would be applied to assessing—and finding ways to reduce—the environmental impacts of project construction and operation… To be effective in addressing unexpected outcomes and the need for mid-course corrections, an adaptive-management team should evaluate a broad range of actions and their consequences from the beginning, as plans are being developed, to facilitate the early implementation and effectiveness of mitigation activities." The Delta Independent Science Board report is attached to the City's comments as Attachment D.

[15] RDEIR/SDEIS at p. 4.1-18.

Considering the previous discussion, it is unreasonable and without foundation for the RDEIR/SDEIS to state, "For the purposes of analysis, it is assumed that the Collaborative Science and Adaptive Management Program (AMMP) developed for Alternative 4A would not, by itself, create nor contribute to any new significant environmental effects."[16]

4.5. The appropriate timeframes for the proposed project were not evaluated.

The RDEIR/SDEIS indicated that two baselines were used in the current analysis: the "Existing Conditions" baseline defined in the 2013 Draft EIR/EIS was used for the CEQA impact analysis, and the "No Action Alternative Early Long-Term" (NAA-ELT) scenario was used for the NEPA impact analysis. The impacts of the proposed project were evaluated quantitatively only in the Early Long-Term (ELT) timeframe. Long-term impacts of the proposed project were evaluated only qualitatively, even though the 2013 EIR did evaluate Alternative 4 (the 2013-proposed project) for a Late Long-Term (LLT) timeframe quantitatively, even though the project documents note that the project "would continue indefinitely."[17] As detailed below, the City's consultants previously evaluated water quality impacts for the LLT using DSM2 model runs provided by DWR, and those model results at LLT (see Attachment B) showed significant water quality impacts at LLT, which would have significant impacts on the City's ability to utilize its intake. Because the project "would continue indefinitely," a quantitative analysis of the long-term impacts of the project is needed, and the SWRCB cannot properly determine harm to beneficial uses such as Antioch (or compliance with D-1641) until such analysis is performed.

5. Even given concerns with the modeling analysis, it is clear that water quality impacts to Antioch are significant.

5.1. Salinity Thresholds and Relevance

Three salinity thresholds were used to evaluate the potential impacts of the WaterFix Project on the City:

1) 486 µS/cm (equivalent to 100 mg/L chloride)

[16] RDEIR/SDEIS at p. 4.1-18.

[17] The RDEIR/SDEIS states, on p. 4.1-42, "The same 'Existing Conditions' baseline defined in the Draft EIR/EIS applies to Alternatives 4A, 2D, and 5A, for the purposes of the CEQA impact analysis… Because Alternatives 4A, 2D, and 5A, contemplate a shorter permit period for project implementation than the other alternatives, the new "No Action Alternative Early Long-Term" (No Action Alternative ELT) is used as the NEPA point of comparison for these alternatives. The No Action Alternative ELT is described and analyzed in Section 4.2. However, because the project would continue indefinitely, the analysis qualitatively examines impacts at the Late Long-Term timeframe for Alternative 4A, 2D, and 5A, but does not make a CEQA or NEPA conclusion based off the No Action Alternative LLT baseline" (emphasis added).

2) 642 µS/cm (150 mg/L chloride)

3) 976 µS/cm (250 mg/L chloride)[18].

The 100- and 250-mg/L chloride thresholds are based on a simplified and preliminary evaluation of the City's intake operations, as follows:

- At chloride levels of 100 mg/L of less, it was assumed that the City would use only water from the intake at the San Joaquin River
- At chloride levels of 250 mg/L or greater, it was assumed that the City would stop using the intake entirely
- At chloride levels between 100 and 250 mg/L, it was assumed that the City would blend water from the intake with water purchased from CCWD.

In addition, a chloride level of 250 mg/L (equivalent to 976 µS/cm as EC) is identified as the threshold for usable water in the City's agreement with DWR. An analysis to describe the City's operations in greater detail, and to refine the evaluation of impacts and harm, will follow this submission.

Finally, the 150 mg/L chloride threshold is the water quality objective for municipal and industrial beneficial uses described by the State Water Resources Control Board (SWRCB) in Water Right Decision 1641 (D-1641), "Implementation of Water Quality Objectives for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary."[19] The principal however that D-1641 protects all beneficial uses, particularly the 150 mg/L standard for urban water use is questionable given the drinkability of the water with this level of chlorides.

5.2. Evaluation of Water Availability at Salinity Thresholds

Operational scenarios H3 and H4, together referred to as H3+, are discussed in the RDEIR/SDEIS as representative of the proposed WaterFix Project. Because scenario H3+ was not modeled explicitly, scenarios H3 and H4 were considered to represent the potential range of operations of the project. Operational scenarios H1 and H2 were included in the 2013 DEIR and are discussed in the 2015 RDEIR/SDEIS; however, they are not discussed in the context of the WaterFix Project. Exponent used model results from scenarios H1 and H2 to illustrate the range of water quality impacts that may result from changes in project operations.

[18] Conversions between chloride concentration and electrical conductivity (EC) were made using the relationship for "normal" years in Guivetchi (1986).

[19] Table 1 of D-1641 includes chloride thresholds to be met at either Contra Costa Pumping Plant #1 or the San Joaquin River at Antioch Water Works Intake. Table 1 of D-1641 requires the maximum mean daily 150- mg/L Cl^- threshold to be met for a specified number of days, depending upon the hydrologic classification of the water year, in time periods of no less than two continuous weeks.

As discussed in Section 4.1, Exponent used the EBC2 scenario as the appropriate benchmark for evaluating water quality impacts of various operational scenarios. Tables 5-2 through 5-5 provide the number of days, calculated from DWR's model results, that water quality is predicted to be *above* the specific chloride benchmark value of either 100 mg/L or 250 mg/L evaluated for early long-term (ELT) and late long-term (LLT) conditions.[20] Under the baseline scenario, salinity is above the 100-mg/L chloride threshold 65% of the time, and water is above the 250-mg/L usability threshold 55% of the time.

Table 5-1 Number of days per year chloride is above 100 mg/L for the ELT condition from DWR model results for the time period 1974–1991

Year Type	EBC2	H1	H2	H3	H4	NAA
All	237	248	244	235	232	249
Critical	337	345	338	345	342	341
Dry	277	280	280	281	280	286
Normal	206	210	206	203	197	217
Wet	125	151	146	116	114	145

Table 5-2 Number of days per year chloride is above 100 mg/L for the LLT condition from DWR model results for the time period 1974–1991

Year Type	EBC2	H1	H2	H3	H4	NAA
All	237	263	259	247	245	258
Critical	337	347	347	338	341	341
Dry	277	299	297	282	281	299
Normal	206	225	216	216	211	225
Wet	125	173	167	147	141	160

[20] As detailed in the RDEIR/SDEIS, the early long- term (ELT) scenario corresponds to conditions during years 11 through 15 following project implementation, and incorporates 15 cm of sea- level rise. The late long- term (LLT) scenario corresponds to conditions during years 16 through 50.

Because Alternatives 4A, 2D, and 5A, contemplate a shorter permit period for project implementation than the other alternatives, the new "No Action Alternative Early Long-Term" (No Action Alternative ELT) is used as the NEPA point of comparison for these alternatives. The No Action Alternative ELT is described and analyzed in Section 4.2. However, because the project would continue indefinitely, the analysis qualitatively examines impacts at the Late Long-Term timeframe for Alternative 4A, 2D, and 5A, but does not make a CEQA or NEPA conclusion based off the No Action Alternative LLT baseline" (emphasis added).

Table 5-3 Number of days per year chloride is above 250 mg/L for the ELT condition from DWR model results for the time period 1974–1991

Year Type	EBC2	H1	H2	H3	H4	NAA
All	201	214	209	194	190	211
Critical	302	311	301	313	307	306
Dry	220	231	229	230	227	232
Normal	177	188	184	166	161	194
Wet	100	124	148	78	75	107

Table 5-4 Number of days per year chloride is above 250 mg/L for the LLT condition from DWR model results for the time period 1974–1991

Year Type	EBC2	H1	H2	H3	H4	NAA
All	201	225	223	203	202	216
Critical	302	308	309	301	305	303
Dry	220	249	250	217	218	247
Normal	177	190	187	174	169	187
Wet	100	145	138	111	105	116

Using the data from Tables 5-1 through 5-4, the difference in the number of days per year that water quality is above threshold values for various operational scenarios relative to the EBC2 scenario was calculated. The difference in number of days per year is shown in Tables 5-5 and 5-6 for both ELT and LLT conditions. A positive value indicates that salinity will remain *below* the threshold for that many more days per year under the specific scenario—i.e., model results predict an improvement in water quality relative to the baseline scenario. A negative value indicates that salinity will be *above* the threshold for that many more days—i.e., model results predict adverse impacts relative to the baseline scenario.

Tables 5-5 and 5-6 show that, during dry and critical years, operational scenarios H3 and H4 are predicted to result generally in degradation of water quality relative to the EBC2 scenario. The analysis shows that, overall, under the ELT condition, the threshold values will be exceeded less frequently than the under the baseline condition, and under the LLT condition, the threshold values will be exceeded more frequently. More specifically, analysis of the 100-mg/L benchmark (Table 5-5) shows the following:

- Water quality degradation for H3 and H4 operational scenarios during dry and critical years
- Water quality improvement for above-normal, below-normal, and wet years for operational scenarios H3 and H4 for the ELT condition

- Water quality degradation for above-normal, below-normal, and wet years for operational scenarios H3 and H4 for the LLT condition
- NAA always results in water quality degradation, exacerbated by LLT condition.

Analysis of the 250-mg/L benchmark (Table 5-6) shows the following:

- Salinity exceeds the threshold value more frequently during dry and critical years for the ELT condition than for the LLT condition
- Salinity exceeds the threshold value more frequently during wet, above-normal, and below-normal years for the LLT condition than for the ELT condition
- During wet and above- and below-normal years, operational scenarios H3 and H4 maintain salinity below the threshold value between 11 and 25 more days per year than the baseline scenario
- NAA always results in water quality degradation, exacerbated by LLT condition.

Table 5-5. The difference in number of days per year total chlorides are under 100 mg/L (equivalent to 486 µS/cm) between the EBC2 scenario and operational scenarios H3, H4, and NAA for sea-level rise of 15 cm (ELT) and 45 cm (LLT)

	Difference in number of days $[Cl^-]$ <100 mg/L between operational scenario given and EBC2 for ELT condition			Difference in number of days $[Cl^-]$ <100 mg/L between operational scenario given and EBC2 for LLT condition		
Water Year Type	H3	H4	NAA	H3	H4	NAA
All	3	6	-11	-10	-7	-20
Critical	-8	-4	-4	-1	-3	-4
Dry	-4	-3	-9	-5	-4	-23
Above and Below Normal	3	10	-11	-10	-5	-19
Wet	9	11	-20	-22	-16	-35

*(No. of days/year below threshold at H3, H4, or NAA) - (No. of days/year below threshold at EBC2) = No. of days/year difference. A positive value indicates that salinity will remain *below* the threshold for that many more days per year under the specific scenario—an improvement in water quality. A negative value indicates that salinity will be *above* the threshold for that many more days, showing adverse impacts relative to the baseline scenario.

Table 5-6. The difference in number of useable per year (days total chlorides are under 250 mg/L, equivalent to 976 µS/cm, the benchmark for water usability) between the EBC2 scenario and operational scenarios H3, H4, and NAA for sea-level rise of 15 cm (ELT) and 45 cm (LLT)

	Difference in number of days [Cl^-] < 250 mg/L between operational scenario given and EBC2 for ELT condition			Difference in number of days [Cl^-] < 250 mg/L between operational scenario given and EBC2 for LLT condition		
Water Year Type	H3	H4	NAA	H3	H4	NAA
All	7	11	-9	-2	0	-15
Critical	-11	-6	-5	1	-3	-8
Dry	-11	-7	-12	3	2	-27
Above and Below Normal	11	16	-17	3	8	-10
Wet	22	25	-7	-11	-5	-16

*(No. of days/year below threshold at H3, H4, or NAA) - (No. of days/year below threshold at EBC2) = No. of days/year difference. A positive value indicates that salinity will remain *below* the threshold for that many more days per year under the specific scenario—an improvement in water quality. A negative value indicates that salinity will be *above* the threshold for that many more days, showing adverse impacts relative to the baseline scenario.

As discussed in Section 4.4, operations may be adjusted under the proposed AMMP. If operations were adapted to resemble operational scenarios H1 or H2, more severe adverse impacts to water quality at Antioch would be observed. The analysis below supports the previous discussion regarding the importance of modeling the proposed project, and shows that operational changes have a substantial impact on water quality in the Delta.

Tables 5-7 and 5-8 show the number of days below threshold values of 100 and 250 mg/L chloride for scenarios H1 and H2 compared with the number of days below threshold values for the EBC2 condition at ELT and LLT. As discussed previously, values indicate additional (positive numbers) or fewer (negative numbers) days per year that water quality meets the threshold value). Tables 5-7 and 5-8 show that, under all scenarios (with two exceptions), the benchmark chloride values will be exceeded by as many as 48 days per year (13.2% of the time) for a 100-mg/L threshold, and 47 days (12.8% of the time) for a 250-mg/L threshold.

Table 5-7. The difference in number of days per year total chlorides are under 100 mg/L (equivalent to salinity of 486 µS/cm) between the EBC2 scenario and operational scenarios H1, H2, and NAA for sea-level rise of 15 cm (ELT) and 45 cm (LLT)

	Difference in number of days [Cl^-]<100 mg/L between operational scenario and EBC2 for ELT condition			Difference in number of days [Cl^-]<100 mg/L between operational scenario and EBC2 for LLT condition		
Year Type	H1	H2	NAA	H1	H2	NAA
All	-11	-7	-11	-26	-22	-20
Critical	-8	-1	-4	-10	-10	-4
Dry	-4	-3	-9	-23	-20	-23
Normal	-4	0	-11	-19	-10	-19
Wet	-26	-21	-20	-48	-41	-35

*(No. of days/year below threshold at H1, H2, or NAA) - (No. of days/year below threshold at EBC2) = No. of days/year difference. A positive value indicates that salinity will remain *below* the threshold for that many more days per year under the specific scenario—an improvement in water quality. A negative value indicates that salinity will be *above* the threshold for that many more days, showing adverse impacts relative to the baseline scenario.

Table 5-8. The difference in number of useable per year (days total chlorides are under 250 mg/L, equivalent to 976 µS/cm, the benchmark for water usability) between the EBC2 scenario and operational scenarios H1, H2, and NAA for sea level rise of 15 cm (ELT) and 45 cm (LLT)

	Difference in number of days [Cl^-]<250 mg/L between operational scenario and EBC2 for ELT condition			Difference in number of days [Cl^-]<250 mg/L between operational scenario and EBC2 for LLT condition		
Year Type	H1	H2	NAA	H1	H2	NAA
All	-13	-8	-9	-24	-22	-15
Critical	-9	0	-5	-7	-7	-8
Dry	-11	-9	-12	-29	-31	-27
Normal	-11	-7	-17	-13	-10	-10
Wet	-24	-47	-7	-45	-38	-16

*(No. of days/year below threshold at H1, H2, or NAA) - (No. of days/year below threshold at EBC2) = No. of days/year difference. A positive value indicates that salinity will remain *below* the threshold for that many more days per year under the specific scenario-an improvement in water quality. A negative value indicates that salinity will be *above* the threshold for that many more days, showing adverse impacts relative to the baseline scenario.

5.3. Water quality impacts are expected to be more significant than shown by modeling.

As noted throughout this memo, there are significant differences between the 2013 Alternative 4 (which was modeled) and the proposed project (2015 Alternative 4A, which was not modeled). However, the 2013 EIR/EIS identified "significant and unavoidable" impacts with respect to chloride concentrations in the western Delta as a result of implementing Alternative 4 (the 2013 proposed project).[21] Even though the current RDEIR/SDEIS envisions that Alternative 4A would use preliminary project operations based on Operations Scenarios H3 and H4 (which would have lesser impacts on salinity than Operations Scenarios H1 and H2), these scenarios were part of the original project modeling, and thus, the basis for a shift from "significant and unavoidable impacts" to "no significant impacts" is unclear. (In fact, effects on chloride concentrations are listed as "LTS," or "less than significant," for Alternative 4 in the RDEIR/SDEIS Executive Summary,[22] even though the same alternative was determined, using the same model runs, to have "significant and unavoidable" impacts to salinity in the western Delta in 2013; the basis for this change relative to the findings for Alternative 4 in the 2013 EIR/EIS is also unclear.)

As noted in previous comments (see Attachment A), the severity of impacts at Antioch's intake is concealed, because the RDEIR/SDEIS presents model results as daily, monthly, or yearly averages. Antioch's use of its intake does not rely on average salinity, but rather, on salinity measured at each instant in time. Thus, it is only through a detailed examination of model results that Antioch can evaluate the water quality impacts that the proposed project is expected to induce.

In addition, the sensitivity analyses performed in support of the RDEIR/SDEIS appear to indicate significant increases in chloride concentrations in the western Delta, including at Antioch, under certain conditions. For example, the Supplemental Modeling for New Alternatives indicates that the proposed project (Alternative 4A, Operations Scenario H3) would cause increases in chloride concentrations at Antioch relative to the existing condition run (which, as noted above, is biased toward higher-than-actual salinity) in drought years during the months of March (19% higher), April (+25%), May (+22%), June (+11%), July (+6%), August (+20%), and September (+14%). Similarly, in all year types during the 1976–1991 simulation period, salinity would increase in the months of March (+9%), April (+16%), May (+9%), June (+2%), and August (+9%). Even relative to the No Action Alternative-Early Long Term, salinity would increase at Antioch in nearly all of these months by as much as +15% (in August of drought years).[23]

[21] See prior comments submitted by the City in Attachment A, and p. 8-429 of the 2013 EIR/EIS.

[22] RDEIR/SDEIS at p. ES-43.

[23] See RDEIR/SDEIS Appendix B at p. B-94.

In addition to increases in chloride concentrations (i.e., salinity), the City is concerned about increases in bromide concentrations that will be caused by the proposed project. The RDEIR/SDEIS notes that "multiple interior and western Delta assessment locations would have an increased frequency of exceedance of 50 µg/L, which is the CALFED Drinking Water Program goal for bromide as a long-term average applied to drinking water intakes… These locations [include] San Joaquin River at Antioch… Similarly, these locations would have an increased frequency of exceedance of 100 µg/L, which is the concentration believed to be sufficient to meet currently established drinking water criteria for disinfection byproducts… The greatest increase in frequency of exceedance of 100 µg/L would occur at Franks Tract (6% increase) and San Joaquin River at Antioch (4-5% increase depending on operations scenario)."[24] Appendix B to the RDEIR/SDEIS presents the results of sensitivity studies showing estimated bromide concentrations at Antioch for "periods of historically acceptable water quality for withdrawal." The sensitivity studies show that bromide concentrations would increase significantly at Antioch; for example, in February through April of wet and above-normal year types, model analyses indicate that bromide concentrations are expected to increase from below the 100-µg/L threshold for both the Existing Conditions and the No Action Alternative-ELT scenarios to levels well above the 100-µg/L threshold for Alternative 4 Operations Scenarios H3 and H4, respectively.[25] Yet the RDEIR/SDEIS concludes that impacts due to bromide are "less than significant."[26] This conclusion is not credible.

Two differences between the model runs and the proposed project will have particularly significant impacts on salinity at Antioch's intake, and these are not disclosed in the RDEIR/SDEIS. The first is the impact of tidal marsh restoration. The model runs for the proposed project include 25,000 acres of tidal marsh restoration at the ELT timeframe and 65,000 acres of tidal marsh restoration at the LLT timeframe, but this restoration is not part of the proposed project (Alternative 4A includes only "up to 59 acres" of marsh restoration; see Table 1). Model runs were conducted in 2013 as part of the 2013 EIR/EIS process to evaluate the impact of tidal marsh restoration on salinity levels within the Delta; those model runs determined that tidal marsh restoration under ELT conditions is expected to <u>decrease</u> tidally

[24] RDEIR/SDEIS at p. 4.3.4-9. The RDEIR/SDEIS discussion regarding bromide states (incorrectly) that "the use of seasonal intakes at these locations is largely driven by acceptable water quality, and thus has historically been opportunistic. Opportunity to use these intakes would remain, and the predicted increases in bromide concentrations at Antioch and Mallard Slough would not be expected to adversely affect MUN beneficial uses, or any other beneficial use, at these locations."

[25] See RDEIR/SDEIS Appendix B at p. B-87. Note that two methods were used to evaluate bromide concentrations (the "mass-balance modeling approach" and the "EC to chloride and chloride to bromide" modeling approach), and results from the two methods differ. However, 18 of 24 entries in Tables Br-5 and Br--6 at RDEIR/SDEIS Appendix B at p. B-87 show predicted bromide concentrations for Alternative 4, Scenarios H3 and H4 (ELT) greater than 100 µg/L, with the highest value of 178 µg/L; only 6 of 24 entries for either the Existing Conditions or No Action Alternatives show concentrations greater than 100 µg/L. Despite differences in results obtained using the two methods, it is clear that bromide concentrations are expected to increase significantly and to exceed applicable thresholds a much greater percentage of the time.

[26] RDEIR/SDEIS at p. ES-43.

averaged EC (surrogate for salinity) by 5.49% at Antioch, compared to the base case.[27] In contrast, because the proposed Alternative 4A ELT does not include 25,000 acres of the tidal marsh, it is reasonable to assume that salinity levels at Antioch during the subject time period would be at least 5% higher than disclosed in the RDEIR/SDEIS. This inaccuracy in predicted salinity levels would apply to bromide as well. Thus, salinity and bromide impacts that are disclosed in the RDEIR/SDEIS are almost certainly underestimated because of the failure to conduct model runs that accurately represent the limited tidal marsh restoration contemplated by the proposed project.

A second major concern with the modeling is the treatment of the Suisun Marsh Salinity Control Gates. The RDEIR/SDEIS indicates that "Modeling of all alternatives assumed no operation of the Suisun Marsh Salinity Control Gates, but the project description for all alternatives now assumes continued operation of the Salinity Control Gates, consistent with assumptions included in the No Action Alternative."[28] Chapter 2 of the RDEIR/SDEIS states that a sensitivity analysis was conducted to evaluate the impacts of operational Suisun Marsh Salinity Control Gates on EC (a surrogate for salinity) under Existing Conditions and the No Action Alternative for several locations in the Marsh and for several months. The sensitivity analysis found that operating the Suisun Marsh Salinity Control Gates resulted in freshening (lower salinity) within the Suisun Marsh. However, model results describing predicted salinity in the western Delta were not provided, to our knowledge, anywhere within the RDEIR/SDEIS. Our evaluation of those model runs indicates that salinity at Antioch is higher when the Suisun Marsh Salinity Control Gates are operated. If actual Suisun Marsh Salinity Control Gate operations had been modeled, salinity values at Antioch would almost certainly be higher than disclosed in the RDEIR/SDEIS. Once again, salinity and bromide impacts in the RDEIR/SDEIS have been underestimated because of the failure to conduct model runs that included operation of the Suisun Marsh Salinity Control Gates.

6. Compliance with Water Right Decision 1641

Water quality objectives for municipal and industrial beneficial uses described in SWRCB D-1641 states that water quality at Contra Costa Canal at Pumping Plant #1 or San Joaquin River at Antioch Water Works Intake must meet specific criteria for chloride. The "maximum mean daily" chloride concentration must be below the threshold of 150 mg/L for at least 240 days during wet water years, 190 days during above-normal water years, 175 days for below-normal water years, 165 days for dry water years, and 155 days for critical water years. As noted previously, the 150 mg/L standard is questionable given the drinkability of the water with this high of salinity. In addition, the compliance point at Contra Costa Canal is east of Antioch and is less affected by tidal salinity, thus compliance with the standard is likely achieved at that location and not at Antioch.

[27] See Figure 6-26 in the 2013 Draft BDCP EIR/EIS Appendix 5A, Section D, Attachment 2, which presents the percent increase in tidally averaged EC for the ELT scenario compared to baseline for September 2002.

[28] RDEIR/SDEIS Chapter 2 at p. 2-8, lines 30-32.

The DSM2 model runs performed by DWR were used to calculate the number of days per calendar year that compliance is achieved at Antioch by water year for the 17-year record from 1974 to 1991 for each operational scenario, including both baseline conditions and the no-action-alternatives. Tables 6-1 and 6-2 show that only occasionally during wet years for any operational scenario is water quality in compliance with D-1641 at Antioch. For critical, dry, and above- and below-normal years, water quality is never in compliance with D-1641 at Antioch.

Table 6-1. Number of years meeting salinity criteria (<150 mg/L) for baseline and SLR15 scenarios based on DWR model results for the 17-year time period 1974–1991

		Model Scenarios						
Water Year Type	Total Years	EBC1	EBC2	H1	H2	H3	H4	NAA
All	17	2	2	2	2	2	4	2
Critical	5	0	0	0	0	0	0	0
Dry	4	0	0	0	0	0	0	0
Normal	3	0	0	0	0	0	0	0
Wet	5	2	2	2	2	2	4	2

Table 6-2. Number of years meeting salinity criteria (<150 mg/L) for baseline and SLR45 scenarios based DWR model results for the 17-year time period 1974–1991

		Model Scenarios						
Water Year Type	Total Years	EBC1	EBC2	H1	H2	H3	H4	NAA
All	17	2	2	2	2	2	2	2
Critical	5	0	0	0	0	0	0	0
Dry	4	0	0	0	0	0	0	0
Normal	3	0	0	0	0	0	0	0
Wet	5	2	2	2	2	2	2	2

7. Anticipated Harm to Antioch

As shown in Section 5, the salinity will increase at the City's intake as a result of the WaterFix Project. When the salinity at Antioch's intake exceeds the threshold value for domestic water use, the City must purchase water from CCWD. Because the number of days per year the City can use water at its intake will decrease with the WaterFix Project, the City will be compelled to purchase more water each year as a direct consequence of the WaterFix Project.

It is difficult to determine the impacts of the proposed project on water quality; however harm will be caused to Antioch with every small increase in salinity that occurs-regardless of compliance with D-1641or fish and habitat protection criteria. With increasing salinity, harm is caused to Antioch based on their need to purchase more water from CCWD for blending, and also from customer response to saltier tasting water. To evaluate the expected harm to Antioch, Exponent performed a preliminary calculation of the present value of additional water that will need to be purchased over a 50-year period as a result of the WaterFix Project.

Antioch's operations were simplified for this preliminary analysis. Specifically, it was assumed that Antioch purchases 100% of the City's water supply from CCWD when chloride is above 250 mg/L at the City's intake on the San Joaquin River. When chloride is between 100 and 250 mg/L at their intake, it was assumed that the City's supply would consist of 50% water from the City's intake and 50% water purchased from CCWD. Finally, it was assumed that the City's supply would be pumped entirely (100%) from the City's intake when chloride is less than 100 mg/L. In reality, the City's operations are more complex, and calculations will be refined in the future to more accurately reflect the City's operations.

The present-value calculation relies on the following assumptions:

- The base cost of purchasing water from CCWD in 2015 (C_{2015}) was $2,300 per million gallons (i.e., $766 per acre-foot)[29]
- The cost of water will increase 3% annually. This uniform rate of change defines a geometric gradient series of cash flows, which was used to calculate the present value of the cost of purchasing water over a 50-year period.
- Because a city may invest in other capital projects, a municipal bond rate was used as the discount rate (or interest rate) in this calculation. Municipal bond rates vary depending on issuer credit rating and maturity range of the bond. Currently, these values range from about 2.0% to 3.5%. A 3.0% discount rate was used, which represents the yield for a 30-year national municipal bond.[30]
- The annual water demand for the City will remain constant at 5,000 million gallons (MG).[31]
- Water quality impacts, as shown in Section 5.2, were used as the basis for the cost computations, which were performed, as follows:

[29] Value provided by the City of Antioch based on average amount paid in 2015.

[30] Bond yield quote from http://www.bloomberg.com/markets/rates-bonds/government-bonds/us retrieved on December 29, 2015.

[31] Based on average water usage provided by the City for years 2013, 2014, and 2015 (year to date for 2015, through November 2015)

  - The number of days that water must be purchased by the City under each operational scenario (call this value D) is equivalent to the amount of time (in days) the average chloride concentration exceeds 250 mg/L, and 0.5 times the number of days chloride falls between 100 and 250 mg/L.[32]
  - The cost for water in the year 2028 (C_{2028}) was calculated as $C_{2028} = D \times (C_{2015} \times 1.03^{13})$
  - Estimated costs were calculated for a 50-year period beginning in 2028, when the WaterFix project may become operational. The 2028 value of the cost of water (PV_{2028}) was calculated as[33] $PV_{2028} = 50 \times C_{2028} \div 1.03$
  - The PV_{2028} value for each operational scenario was subtracted from the PV_{2028} value for the EBC2 scenario to determine the cost difference from the baseline ($PV_{2028, diff}$)
  - $PV_{2028, diff}$ for each operational scenario was discounted to present (2016) value as $PV_{2016} = PV_{2028,diff} \div 1.03^{12}$

- Section 5.3 shows that WQ impacts were likely underestimated because of differences between the model results and the proposed project, and thus, these values should be regarded as minimum additional expenditures that will result from the project.
- Each operational scenario was evaluated for the ELT (sea-level rise of 15 cm) and LLT (sea-level rise of 45 cm) condition.
- Because the City's current Agreement with DWR will expire in 2028, it was assumed that no reimbursement would be received by the City pursuant to this Agreement.

Table 7-1 presents the difference in cost between the EBC2 baseline scenario and each of the operational scenarios. Positive numbers indicate that the operational scenario will result in costs greater than the baseline scenario, and negative numbers indicate the opposite—that money will be saved relative to the baseline scenario. The results show that, for any operational scenario evaluated at LLT (sea-level rise of 45 cm), Antioch will incur additional costs ranging from about $6M to $39.5M over the 50-year period. For operational scenarios H1 and H2, evaluated

[32] DSM2 simulations performed by DWR for the period 1974-1991 provide salinity data at 15 minute intervals, and intervals in exceedance of threshold values were summed for all water year types over the 17 year period, converted to days, then divided by 17 to get an average annual number of days.

[33] Expression for present value of a geometric gradient where the geometric gradient factor (annual water rate increase) is equivalent to the discount rate

at ELT (sea-level rise of 15 cm), Antioch would expect to pay an additional $12-18M, however would save on the order of $8-14M for operational scenarios H3 and H4. Sea-level rise is a consequential factor in the determination of harm based on DSM2 model results. This calculation is based on the known and disclosed impacts—these amounts could be far greater but cannot be determined based on the modeling flaws, invalid baseline condition, and undisclosed operating scenarios. Because the 1968 Agreement with DWR does not compensate for impacts from the Central Valley Project Operations, and is set to expire in 13 years, such impacts on the City will not be mitigated.

Table 7-1. Present value of minimum anticipated incurred costs for purchased water relative to the EBC2 scenario (millions of dollars)

All WYT	H1-EBC2	H2-EBC2	H3-EBC2	H4-EBC2
LLT	$39.5	$34.5	$9.1	$6.2
ELT	$18.6	$11.6	-$7.7	-$13.5

8. Summary

It is difficult, if not impossible, to assess the impacts of the proposed project on water quality at Antioch, because the proposed project was not modeled, and because there are major differences between the model runs used to assess impacts and the proposed project. Even so, our analysis of the modeling indicates that the proposed project will have significant impacts on water quality at Antioch's intake, and these impacts are not disclosed in the RDEIR/SDEIS. The diversion of fresh Sacramento River water from the Delta will result in additional saltwater entering the Delta through Suisun Marsh. Compounded with anticipated sea-level rise, this will result in substantial impacts to water quality in the western Delta. In addition, the removal of flow from the Sacramento River to the Delta will impact Delta hydrodynamics, resulting potentially in further adverse impacts.

The modeling performed to support the proposed project used an inaccurate baseline condition; because the CEQA "Existing Conditions" model run does not include Fall X2 operations, the baseline is not representative of current conditions and results in worse water quality in the western Delta than actually occurs, thereby masking the impacts of the proposed project. These comments have been provided previously but have not been addressed to date, despite the fact that an accurate "Existing Conditions" model run was conducted by DWR and has been available for use since at least 2013.

In addition, certain features of the proposed project that were not evaluated (e.g., the model runs include 25,000 acres of tidal marsh restoration that is not part of the proposed project, and the model runs did not simulate operation of the Suisun Marsh Salinity Control Gates) are expected to result in significantly higher salinity in the western Delta than is shown in the model runs.

Finally, the proposed project operations are not defined, and the Adaptive Management and Monitoring Program (AMMP) that will be used to modify project operations has not been defined. There appear to be no constraints that would be imposed on project operations, and modifications to operations appear to be designed to protect fish species, without consideration of water quality impacts. As detailed in prior comments, and as is apparent from existing model runs, even small changes in project operations can cause significant impacts to water quality in the western Delta, including at Antioch's intake.

The water quality impacts at the City's intake will result in the need to purchase additional water from CCWD. The present value of the anticipated excess water that will need to be purchased by the City from CCWD to meet demand over a 50-year period was calculated to range from $39.5M to $6.2M, depending on WaterFix Project operations.

Attachment A

Technical Comments on the BDCP and Associated EIR/EIS Letter Prepared by Flow Science Incorporated

Antioch-218

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July 17, 2014

BDCP Comments
Ryan Wulff, NMFS
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Via email: BDCP.Comments@noaa.gov

Subject: Appendix A to the City of Antioch Comment Letter
Technical comments on the Draft Bay Delta Conservation Plan (BDCP) and associated Draft Environmental Impact Report and Environmental Impact Statement (EIR/EIS)

Dear Mr. Wulff:

On behalf of the City of Antioch (the City), Flow Science is pleased to submit comments on the Bay-Delta Conservation Plan (BDCP) and Associated Environmental Impact Report/Environmental Impact Statement (EIR/EIS) during the public review period. These technical comments constitute **Appendix A** to the City's comment letter.

SUMMARY OF TECHNICAL COMMENTS

Flow Science has reviewed the BDCP Plan and EIR/EIS, and has evaluated the impacts that are likely to occur at the City of Antioch. Flow Science's key findings regarding the technical analysis presented in the EIR/EIS can be summarized as follows:

- The baseline condition ("Existing Conditions") scenario used to evaluate project impacts is flawed and inappropriate, and does not accurately represent current salinity conditions at Antioch. Use of an incorrect baseline conditions results in an understatement of the impacts of the BDCP Proposed Project.
- The BDCP Proposed Project will cause salinity at Antioch to increase significantly, and will significantly reduce the City's ability to use its intake to supply water within its service area. Contrary to assertions in the EIR/EIS, these impacts will result from the Proposed Project and not from sea level rise.

- The BDCP Proposed Project assumes a change in water quality standards that has not yet happened and that would require State Water Board action. Given that historical, natural salinity in the western Delta was far lower than current levels, Antioch believes that changes in water quality standards would be inappropriate and detrimental to the health of the Delta.
- Because project operations have not been clearly defined, it is not possible to determine with any certainty the impacts of the Proposed Project.
- Mitigation for the significant impacts that are expected to occur at Antioch is not detailed within the EIR/EIS. The EIR/EIS finds that water quality impacts are "considered to remain significant and unavoidable." Despite statements in the EIR/EIS that the assistance provided by BDCP proponents is intended to "fully offset" increased treatment or delivery costs, the BDCP and EIR/EIS suggest no concrete measures that will be implemented to accomplish this.

Additional detail is provided below and in **Appendix C** to the City's comment letter.

BACKGROUND

As detailed in the City's comment letter, the City is located along the San Joaquin River in the western portion of the Sacramento and San Joaquin River Delta (Delta). Since the 1860s, Antioch has obtained all or part of its freshwater supply directly from its intake on the San Joaquin River[1] pursuant to a pre-1914 appropriative water right with a priority of 1867.[2]

Contrary to incorrect statements contained in the EIR/EIS, Antioch continues to obtain much of its water supply from its own diversion facility.[3] Antioch has a substitute

[1] Much of the water in the western Delta (including the City's water supply) comes from the Sacramento River. Historically, significant amounts of Sacramento River water flowed into the San Joaquin River east of Antioch at Three Mile and Georgiana Sloughs. Sacramento River water also reaches Antioch where the river merges with the San Joaquin River just west of the City.

[2] Antioch has vested pre-1914 water rights to water from the San Joaquin River as well as to the tributary flow of the Sacramento River via Georgiana and Three Mile Sloughs. This was determined as a matter of law by the California Supreme Court in the case of Town of Antioch v. Williams Irrigation District et al. (1922) 188 Cal. 451,455.

[3] The City of Antioch uses water from its intake as its main source of supply when salinity at the intake is below specified thresholds. Although the EIR/EIS states that Antioch's intake is "seasonal" and used "infrequently" (EIR/EIS Chapter 8 at p.8-185, lines 13-14), this is not true.

water agreement with the Department of Water Resources (DWR) that partially compensates the City for water purchases from Contra Costa Water District (CCWD). That agreement presently has a 15-year term, which will end at approximately the same time the BDCP is anticipated to begin operations.[4]

Because of its position in the western Delta and its legacy as a fresh water Delta town, the City is also particularly concerned with the ecological health of the Delta, the City's long-term viability as a recreational destination, and the potential significant adverse impacts of urban decay resulting from the BDCP.

DETAILED TECHNICAL COMMENTS RELATED TO WATER QUALITY IMPACTS

The baseline condition used to evaluate the BDCP Proposed Project is flawed and inappropriate. A modeling study was used to delineate the potential effects of the proposed BDCP project on salinity at locations throughout the Delta, including at Antioch's drinking water intake in the western Delta. Our review of the impacts to water quality (Chapter 8 of the EIR/EIS) indicates that two different baseline scenarios were used—the "Existing Conditions" scenario was used to represent baseline for the CEQA evaluation, and the "No Action Alternative" (NAA) was used to represent baseline for the NEPA evaluation. The main differences between these two scenarios appear to be (a) whether Delta outflows are managed to achieve the Fall X2 provision (hereafter referred to as "Fall X2") of the 2008 US Fish and Wildlife Service Biological Opinion (the "2008 BiOp"); and (b) whether the impacts of sea level rise are included. The Existing Conditions scenario does not include Fall X2 or sea level rise, while the No Action Alternative includes both. As detailed below, failing to include Fall X2 in the Existing Conditions scenario makes the baseline condition appear to be more saline than it actually is, so that the potential impacts of the BDCP appear to be significantly smaller than they would with an appropriate baseline.

As noted in prior comments submitted by the City and its consultants to the BDCP and to the State Water Resources Control Board (SWRCB)[5], the western Delta historically exhibited freshwater conditions. In 1928, "Carquinez Strait marked

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[4] On October 29, 2013, the term of the agreement between the State of California and the City of Antioch was extended through September 30, 2028.

[5] See **Appendix D** to the City's comment letter.

approximately the boundary between salt and fresh water under natural conditions," and "[p]rior to diversions for irrigation, Suisun Bay was brackish in the late summer and salt water may have penetrated as far as Antioch, but only for a few days at a time in years of lowest run-off"[6]. Such conditions no longer exist, as saline water is now common at Antioch. However, historic salinity conditions should be considered when assessing the impacts of proposed actions on the fish and wildlife that live in the Delta and that were historically adapted to fresher conditions.

The City asserts that Fall X2 should be included in both baseline conditions, including the Existing Conditions. Legally, the 2008 BiOp represents the requirement to operate to achieve Fall X2, and predates the NOP for the BDCP. Technically, and as discussed further below and in **Appendix C** to the City's comments, simulated water quality is more representative of measured (historic) data with the inclusion of Fall X2.

Antioch and its consultants have received from DWR modeling results[7] obtained from the Delta Simulation Model II (DSM2) model, which was used to simulate hydrodynamics and water quality throughout the Delta for a range of model scenarios. These model runs included two scenarios that were representative of "existing conditions." The "existing biological conditions 1" (EBC1) scenario included current sea levels but not Fall X2, while the "existing biological conditions 2" (EBC2) scenario included current sea levels and Fall X2. The March 2013 Revised Administrative Draft made use of both EBC1 and EBC2, while the current BDCP EIR/EIS utilizes only EBC1, which is renamed as the "Existing Conditions" scenario. Model results for the EBC2 scenario agree well with salinity measurements made near Antioch (see **Figure 1**, **Appendix C**), while the EBC1 scenario showed poor agreement, particularly in the fall of 1974, 1975, 1978, 1980, 1984, and 1986, or 6 out of the 17 years modeled. The plots of EBC1 shown in **Appendix C** are consistent with Figures 5C.A-104 through 5C.A.-107 of Attachment 5C.A to Appendix 5C of the Draft BDCP (confirming that EBC1 is the "Existing Conditions" scenario defined in the EIR/EIS), which show substantial increases in salinity in the western Delta in the fall of 1978, 1980, 1984, and 1986. These periods

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[6] Means, Thomas. "Salt Water Problem: San Francisco Bay and Delta of Sacramento and San Joaquin Rivers. San Francisco, CA: Thos. H. Means, Consulting Engineer - 1928. p. 57.

See also CCWD, 2010, Historical Fresh Water and Salinity Conditions in the Western Sacramento-San Joaquin Delta and Suisun Bay: A summary of historical reviews, reports, analyses and measurements; Technical Report WR10-001, available at http://www.ccwater.com/salinity/HistoricalSalinityReport-2010Feb.pdf.

[7] Flow Science Incorporated received modeling results from DWR via mailed hard-drives in January 2012, April 2013, and May 2013.

of higher salinity are not consistent with field measurements, further confirming that the omission of Fall X2 from the Existing Conditions scenario is not technically appropriate to represent the existing water quality in the Delta.

The data contained in Appendix 8G of the EIR/EIS show a significant difference in chloride concentrations in the San Joaquin River at Antioch between the Existing Conditions and the No Action Alternative (NAA) scenarios. Specifically, the average chloride concentrations are higher under the Existing Conditions, particularly in the late summer and fall. Table C1-1 shows that the mean chloride concentration is higher under the Existing Conditions scenario than under the NAA scenario by 447 mg/l and 382 mg/l in October and November, respectively. Because there are two significant differences between these scenarios—i.e., Fall X2 and sea level rise—the data do not indicate which of these factors is responsible for the differences in simulated salinity levels.

Generally, the impact of a project is determined by comparing the Proposed Project scenario and the Existing Conditions scenario, and the impacts of non-project factors are determined by comparing the NAA scenario and the Existing Condition scenario. Here, we cannot make the latter comparison, as the Existing Conditions and No Action Alternative scenarios are not on common ground regarding Fall X2. In order to determine the impacts of sea level rise alone, the NAA scenario must be compared to the EBC2 scenario, since both the NAA scenario and the EBC2 scenario include operations to meet Fall X2. Once the impact of sea level rise has been determined, the impacts of BDCP could be more accurately delineated.

While the EBC2 scenario was not provided in the December 9, 2013 DRAFT BDCP and EIR/EIS, it was previously provided to Flow Science by DWR. **Figure 3** of **Appendix C** shows that, from September through November of above normal, below normal, and wet years, the availability of usable water at Antioch is higher under the EBC2 scenario than under the Existing Conditions (EBC1) and NAA scenarios; this is expected, as EBC2 includes Fall X2. These same plots also show that usability is greater under the NAA than under Existing Conditions (EBC1). Thus, the exclusion of Fall X2 (Existing Conditions) decreases usability more than sea level rise (captured in the NAA) during the fall of above normal, below normal, and wet years. This comparison highlights the importance of Fall X2, and further supports that it should be included in the CEQA baseline scenario.

As the City has noted in prior comments on the BDCP process and in testimony to the SWRCB, salinity levels in the western Delta, including at Antioch's intake, will be

substantially higher if Fall X2 is not included in the Existing Conditions model runs. (See **Appendix D** to the City's comments.) The exclusion of Fall X2 from the Existing Conditions will increase the salinity simulated under this condition and thus downplay the impacts of the BDCP Proposed Project on salinity in the western Delta; in fact Table Cl-28 in Appendix 8G of the EIR/EIS shows that annual mean chloride concentrations decrease relative to Existing Conditions (i.e., EBC1) for all Operational Scenarios, which is misleading—relative to EBC2, mean annual usability decreases at Antioch for all year types under Scenarios Alt4-H1 and Alt4-H2. Ultimately, the use of the Existing Conditions scenario without Fall X2 would be neither legally nor technically appropriate, and misrepresents the anticipated impacts of the BDCP project.

In summary, Flow Science's analysis shows that the "Existing Conditions" scenario used to represent baseline conditions in the EIR/EIS does not accurately represent current conditions because it does not include Fall X2. Even though model scenario EBC2, which does include Fall X2, was used in prior drafts of the EIR/EIS and was made available to Flow Science and others as early as 2012, it was not used in the CEQA analysis. Because the incorrect existing conditions baseline scenario was used in the CEQA analysis, impacts to the City of Antioch have been underestimated significantly.

Thus, Antioch requests that Fall X2 be included in all modeling scenarios used to describe baseline conditions.

Please note that, because the City asserts that the Existing Conditions scenario is an inappropriate baseline, the impacts of BDCP in this comment letter will be assessed compared to the EBC2 and the No Action Alternative scenarios.

The BDCP will cause salinity at Antioch to increase and will reduce the City's ability to use its intake significantly. Appendix 8G of the EIR/EIS shows the predicted impact to chloride concentrations in the San Joaquin River at Antioch, both in terms of the monthly and daily mean concentration and in terms of compliance with the Bay-Delta Water Quality Objective (250 mg/l as a daily average). However, these metrics do not describe Antioch's ability to use the water[8], as its ability depends only on the instantaneous chloride concentration and not on daily or monthly averages. Thus, the

[8] The 1968 Agreement defines "usable river water" as occurring when the "chloride ion content in the surface zone at slack current after daily higher high tide (HHT) is 250 parts per million [ppm] or less." Throughout these comments, "usable water" is the term applied to water with a chloride content of 250 ppm or less.

potential impacts described in Appendix 8G significantly underestimate the impacts to Antioch.

To determine the actual impacts to the City's municipal water supply, Antioch and its consultants evaluated salinity impacts using DSM2 model results obtained from DWR. Specifically, Flow Science assessed the instantaneous salinity concentration (i.e., model results at 15-minute intervals) to determine how the BDCP Proposed Project is predicted to impact the usability of water at the City's intake. Flow Science compared the percent of time that water can be diverted under the worst-case project conditions (Scenario Alt4-H1) to the EBC2 scenario and to the No Action Alternative. (As noted above, the EBC2 scenario is most representative of existing conditions and should be used as the baseline for CEQA analysis of the BDCP project.)

The increased salinity in the western Delta that is predicted to occur due to the BDCP Proposed Project will significantly impact Antioch's ability to use water. However, the severity of this impact is concealed in the EIR/EIS because model results are presented in the form of annual, monthly and daily averages. For example, Table Cl-28 of the EIR/EIS shows that, under worst-case operations and evaluated as a long-term average, compliance with the chloride objective will decrease by only 2% (the difference between Scenario Alt4-H1 and the No Action Alternative). However, as demonstrated below and in **Appendix C** to the City's comments, the decrease in usable water will be far more severe. On an annual basis, the impacts to usability at Antioch are significant. Over the 17 years modeled, the availability of usable water decreased by 6%, or 9.2 days per year on average as a result of BDCP Proposed Project Scenario Alt4-H1. The availability of usable water is expected to decrease even more during wet years; in these years, usability could decrease by 12%, or over 28 days per year. Importantly, and as detailed in **Appendix C**, these changes result from the BDCP Proposed Project alone, not from sea level rise.

The BDCP Proposed Project is simulated to have the most significant impacts during the fall months, where on average the availability of usable water at Antioch may decrease by up to 64% (**Appendix C**) with Operational Scenario Alt4-H1 relative to the No Action Alternative (i.e., without the impacts of non-project factors such as sea level rise). Evaluating results by month indicates potentially even greater effects. Under all year types, usability during September is simulated to decrease from 5.3 days to 0.8 days, an 85% decrease. The largest loss of usable days is predicted to occur in October, and totals 6.6 days on average.

Breaking the results down by year type also shows significant impacts during the fall months. For example, excluding wet years, the availability of usable water under Operational Scenario H1 from September through November is predicted to decrease from 13.1 to 1.7 days[9], a loss of 11.4 days relative to the NAA; in non-wet years, there are only 0.3 to 3 days of usability in the fall under Proposed Operational Scenario Alt4-H1. The percent difference is most significant during critical and dry years, at 97% and 93% of usable days lost, respectively, in the September through November time period (**Table 4, Appendix C**). The most significant losses are simulated to occur during dry and wet years, when 23.0 and 22.7 days of usable water, respectively, are anticipated to be lost over this three-month period. Thus, the impacts of the BDCP Proposed Project to the City of Antioch, especially during the fall, are much greater than reported in the EIR/EIS.

The modeling performed to assess the water quality impacts of BDCP assumes full implementation of restoration measures—that is, 65,000 acres of tidal marsh restoration. This amount of tidal restoration is expected to occur in year 2060 and beyond, if at all. None of the model results characterizes the potential impacts of restoration on salinity in the years prior to 2060. Because the tidal marsh restoration will be phased, there will be several intermediate conditions during which the hydrodynamics may differ significantly from both the current conditions and the conditions under full tidal marsh restoration. Depending on the design and location of restoration efforts, and the sequence in which restoration is conducted, the volume of water that "sloshes" into and out of the Delta on every tidal cycle may be increased, thus increasing salinity in the western Delta.

Although the City's primary concern is with salinity at its intake, the City would like to incorporate by reference the comments of others that suggest that concentrations of other water quality constituents (e.g., bromide, mercury) may increase as a result of implementation of the Proposed Project. The City is concerned with any degradation of water quality at its intake. In addition, changes in water quality may affect the treatment options available to the City.

[9] These numbers are the arithmetic averages of the non-wet years (i.e., critical, dry, above and below normal years) from **Table 4**, **Appendix C**

The BDCP Proposed Project assumes a change in water quality standards that has not yet happened and that would require State Water Board action. One aspect of the Proposed Project (represented by Scenarios H1 through H4) is the proposed change of "water quality requirements criteria" in the Delta. The Draft BDCP document states that the BDCP operations "include water operations in accordance with State Water Board D-1641 related to north Delta and western Delta agricultural and municipal and industrial requirements, except that the Sacramento River compliance point for the agreement with the North Delta Water Agency would be moved from Emmaton to Threemile Slough" (p. 3-188, emphasis added). Moving the compliance point landward by about 2.5 miles (the approximate distance from Emmaton to Threemile Slough), as proposed, would allow salinity in the western Delta to increase and thus would further impair Antioch's ability to use the water for municipal purposes. Further, the 2008 BiOps include requirements to meet Fall X2 under certain conditions, as described above, and two of the operational scenarios (Scenarios Alt4-H1 and Alt4-H2) eliminate the Fall X2 requirement; eliminating the Fall X2 requirement would also allow salinity to increase still farther in the western Delta.

Given the fact that historical, natural salinity in the western Delta has been far lower than current levels, and given the serious impacts that may occur to Antioch's water supply and to the ecosystem if salinity is allowed to increase further, Antioch asserts that such a change in water quality standards would be inappropriate. For this reason, the BDCP EIR/EIS should be amended to include scenarios that do not involve changes in water quality standards.

Because project operations have not been clearly defined, it is not possible to determine the impacts of the Proposed Project. Under the Proposed Project as described in the Plan and EIR/EIS, Delta outflow requirements in the spring and fall would be determined using a decision tree. There are four possible combinations of spring and fall outflow criteria, which define four operational scenarios (H1 through H4). Model runs were performed for each of these scenarios, as any of the four may be used each year. However, the decision tree that describes Operational Scenario H—specifically, what "triggers" each operational scenario—has not been defined in the Draft BDCP nor in the EIR/EIS and is "subject to a new determination by the fish and wildlife agencies" (p 3-207). Regarding spring outflows, the EIR/EIS states that "uncertainty exists regarding the mechanism through which higher Delta outflow improves the production and survival of early life stages of longfin smelt. Results of [future] investigations, including those directly related to the decision-tree process, will continue

to be revealed and considered in the coming years" (p 3-208). However, neither the future studies nor their potential outcomes are discussed.

Regarding fall outflows, the EIR/EIS presents two hypotheses: first, that the fall habitat objective will be accomplished by providing flows necessary to position X2 in or near Suisun Bay in wet years; alternatively, that the new shallow-water habitat areas created through restoration of tidal communities (CM4) could accomplish this objective with lower outflows during the fall. Additional "scientific research to test each of these hypotheses will be conducted before initial operations of the north Delta facility" (p 3-208). Ultimately, neither the spring nor the fall portions of the outflow decision tree have been determined for the proposed BDCP project; thus, the potential impacts of the project cannot be determined with confidence.

Mitigation for water impacts is not provided. Chapter 8 of the EIR/EIS proposes mitigation measures for each foreseeable impact. For chloride (a surrogate for salinity), however, the proposed mitigation strategy consists entirely of additional study, with actions to be taken if identified. Because salinity in the western Delta originates primarily from the ocean, with salty water brought into the estuary by tidal action, Antioch and its consultants know of no such actions that would directly mitigate the impacts of the project on salinity in the western Delta, and none are identified in the EIR/EIS. In fact, the EIR/EIS states that, "because the effectiveness of [Mitigation Measure WQ-7] to result in feasible measures for reducing water quality effects is uncertain, this impact is considered to remain significant and unavoidable" (p, 8-429, emphasis added).

At the same time, and contrary to assertions that impacts are significant and unavoidable, the EIR/EIS expresses BDCP proponents' commitment to "assisting in-Delta municipal, industrial, and agricultural water purveyors that will be subject to significant water quality effects … The assistance provided by the BDCP proponents is intended to fully offset any increased treatment or delivery costs attributable to CM1" (p. 3B-42, emphasis added). For municipal users, the proposed assistance includes providing funding assistance to acquire alternative in-basin water supplies, storage, conjunctive uses, or develop water transfers; develop water supply connections to SWP facilities or BDCP intertie; or develop demand management and/or conservation/recycling projects to extend available water supplies.

However, the methods to "fully offset" any water quality impacts as a result of CM1 may require changes to contracts already in place between DWR and municipal

agencies. For example, California Department of Water Resources (DWR) has agreement contract with the City in which it has agreed to reimburse the City for *only* one-third of the cost it incurs to import water when water quality at its diversion point is unusable, as specified by formulae contained in the agreement. The EIR/EIS does not reference this contract, nor how it will distinguish BDCP CM1 impacts to water quality (for which the City should be fully compensated) from other instances of water quality degradation (for which the City should be reimbursed one-third, per the Antioch-DWR contract).

Antioch requests that BDCP proponents specify how they intend to identify and to fully offset the impacts of BDCP CM1 in a manner that is fair and just to all parties.

* * *

Please contact me at (626) 304-1134 or al@flowscience.com if you have any questions regarding these comments. We appreciate the opportunity to submit these comments, and we look forward to seeing these comments addressed in the final EIR/EIS for the BDCP.

Sincerely,

Al Preston, Ph.D., P.E.
Project Engineer

Reviewed by:

E. John List, Ph.D., P.E.
Principal

Attachment B

Analysis of Water Quality Impacts to Antioch — Evaluation of DSM2 Modeling Performed in Support of the BDCP Proposed Project by Flow Science Incorporated

As detailed in **Appendix A** to the City of Antioch's comments on the BDCP and associated EIR/EIS, Flow Science has conducted a detailed review of hydrodynamic and water quality modeling performed by DWR to characterize the potential impacts of the BDCP Proposed Project on water quality at the City of Antioch's drinking water intake. This document (**Appendix C** to the City's comments) provides additional detail regarding Flow Science's technical analysis.

DSM2 model results were provided by DWR to Flow Science via hard drive in January 2012, April 2013, and May 2013. Flow Science analyzed these model results in order to assess the effects of the proposed BDCP project on salinity and usability of water at Antioch. The following analyses indicate that a technically inappropriate simulation was used for the baseline condition in the ADEIR, and that the proposed BDCP project is simulated to have significant impacts on the ability of Antioch to draw and use water from the San Joaquin River.

DATA SOURCES

The DSM2 simulation results used in the analyses are listed in **Table 1**. Each simulation used hydrology from WY1975-WY1991. Results for electrical conductivity (EC) at Antioch (RSAN007) were extracted on a 15-minute basis and used for Flow Science's evaluation. In addition to the model results, measured conductivity data[1] were obtained for RSAN008, located approximately one mile from the Antioch intake.

Table 1: DSM2 Simulations

Name	Scenario	Sea Level Rise (SLR) (cm)	Fall X2	Notes
Existing Condition (EBC1)[1]	baseline	0	No	Referred to as EBC1 in April 2013 EIR/EIS.
EBC2[2]	baseline	0	Yes	Not used in December 2013 EIR/EIS.
NAA[2]	No Action	15[4], 45	Yes	
Alt4-H1[3]	Low Outflow	15[4], 45	No	Proposed project can operate within (and beyond) the space defined by these four scenarios.
Alt4-H2[3]	Spring High Outflow	15[4], 45	No	
Alt4-H3[3]	Evaluated Starting Ops.	15[4], 45	Yes	
Alt4-H4[3]	High Outflow	15[4], 45	Yes	

1. Received from DWR on May 6, 2013.

[1] http://www.water.ca.gov/iep/products/data/dssnotice.cfm (accessed 3/7/2012).

2. Received from DWR in January 2012.
3. Received from DWR in April 2013.
4. Results for SLR = 15 cm are not presented here.

ANALYSES

Baseline in EIR/EIS should incorporate Fall X2 provisions

The December 2013 EIR/EIS uses the "Existing Conditions" simulation for baseline purposes. As indicated in **Table 1,** the "Existing Conditions" simulation does not include Fall X2 provisions. By contrast, the "EBC2" simulation (a simulation used in the March 2013 Draft BDCP document, and received by Flow Science from DWR in January 2012) does include Fall X2.

The DSM2 modeling performed to evaluate water quality impacts of the proposed project simulated electrical conductivity (EC), which is a measure of salinity. **Figure 1** presents daily average simulated EC at Antioch for both Existing Conditions (Ex. Cond./EBC1) and EBC2, along with historical measured EC data. Simulation results were compared with historical measured EC. As shown in **Figure 1**, the exclusion of Fall X2 (i.e., the Ex. Cond./EBC1 simulation) results in EC at Antioch that is not representative of historical conditions. Specifically, salinity in the fall of 1974, 1975, 1978, 1980, 1984, and 1986 is substantially overestimated in simulation EBC1, when Fall X2 is excluded.

By contrast, the EBC2 simulation shows good agreement with measured EC at Antioch, indicating that the inclusion of Fall X2 into any baseline scenario is necessary in order to accurately represent current (pre-project) conditions at Antioch. In summary, the EBC2 scenario is the appropriate baseline model simulation for CEQA purposes, and EBC1 does not accurately represent current conditions and should not be used as the CEQA baseline for the BDCP project.

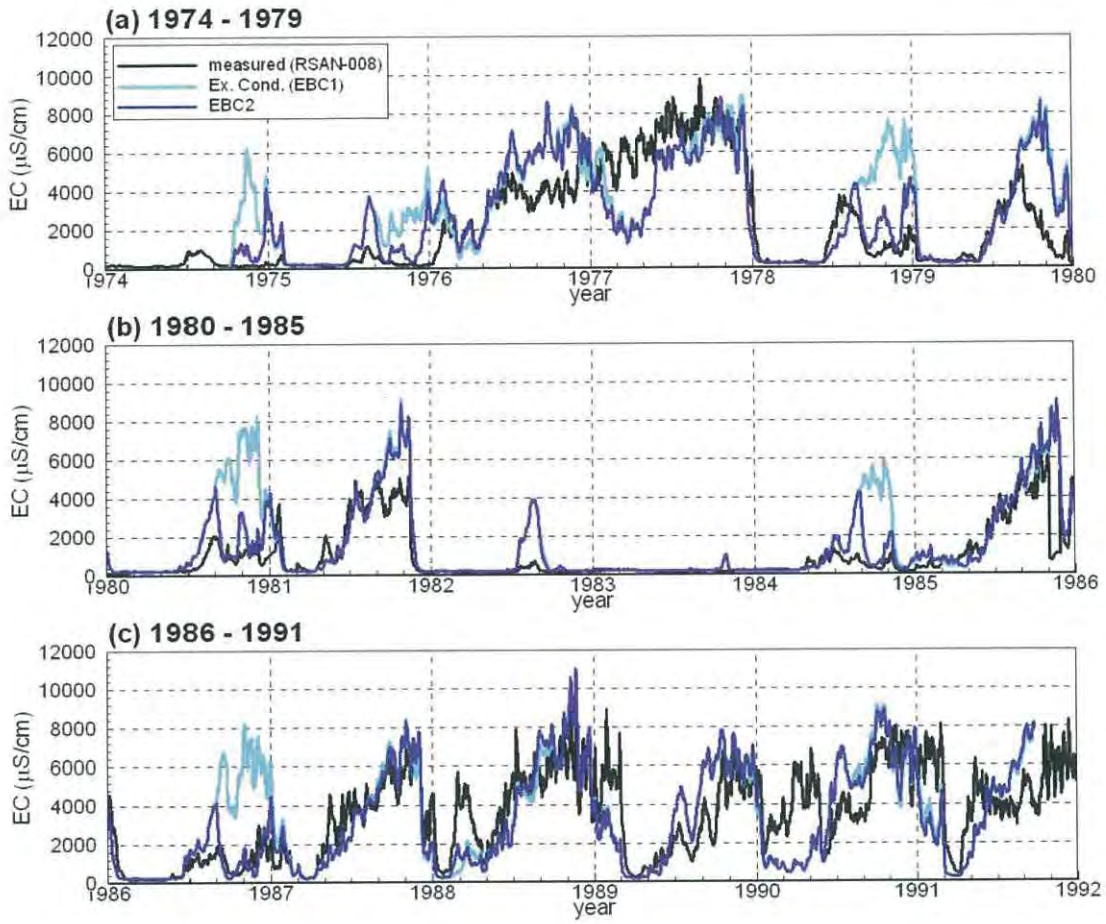


Figure 1. Measured and simulated daily average electrical conductivity (EC) at Antioch. Measured data are from station RSAN-008, located approximately one mile upstream from Antioch's intake. DSM2 simulations (EBC1 and EBC2) were provided by DWR.

BDCP Salinity Impacts at Antioch

In the December 2013 EIR/EIS, the preferred project is represented by the four Alt4 simulation scenarios listed in **Table 1**, with each scenario representing different operating regimes as determined by a "decision-tree" process that has yet to be explicitly defined. The H1 and H2 scenarios do not include Fall X2, whereas the H3 and H4 scenarios do include Fall X2 (**Table 1**).

To evaluate the anticipated impacts of the Proposed Project on salinity at Antioch, Flow Science plotted model results for salinity at Antioch using the EBC2 scenario, the NAA scenario, and the four Alternative 4 (Alt4) scenarios that represent the BDCP Proposed Project. Flow Science's evaluation focused on the EBC2 scenario (the most accurate representation of current conditions because it includes Fall X2), the NAA scenario (which includes both Fall X2 and anticipated sea level rise), and the Alt4 scenarios. The NAA scenario can be compared to the EBC2 scenario to examine the impact of sea level rise (SLR) alone on salinity at Antioch (i.e., without the BDCP Proposed Project). The BDCP Alt4 scenarios can then be compared to the NAA scenario to tease out the difference between increased salinity due to SLR and increased salinity due to the BDCP Proposed Project.

As shown below, the inclusion or exclusion of Fall X2 in the operating rules to be followed by the Proposed Project will have a substantial impact on the salinity at Antioch. DWR's model results indicate that the BDCP project may result in a substantially lower usability of water at Antioch, particularly in the fall months.

Figure 2 plots the percent of time that the salinity at Antioch is less than the usable threshold[2] in each month as computed from the DSM2 simulations for the simulation period 1975-1991[3]. Since the Ex. Cond. (EBC1) simulation is not an appropriate baseline (see above), the effect of sea level rise (SLR) was assessed by comparing the EBC2 and NAA simulations, and the effect of the proposed BDCP project (independent of SLR) was assessed by comparing the NAA and the four Alt4 scenario simulations.

Impact of Sea Level Rise. Comparison of the EBC2 simulation to the NAA simulation indicates that a SLR of 45 cm results in decreased usability in all months except July and October, when the usability under the NAA scenario is slightly higher than under the EBC2 scenario. As a long-term average over the simulation period, a SLR of 45 cm is predicted to result in a 15-day-per-year decrease in usability (i.e., Antioch

[2] Consistent with Antioch's agreement with DWR (first signed in 1968 and extended on October 29, 2013,), the usable threshold is 250 ppm as chloride (Cl^-), which corresponds to an EC of 976 µS/cm. This conversion was made using the relationship between chloride concentration and EC for "normal" years in Guivetchi (1986).

[3] Computed using the 15-minute DSM2 output at Antioch (RSAN007).

will be able to use their intakes 15 days less on average each year, see **Table 2**); as **Figure 2** shows, the decrease in usability is spread relatively uniformly over the year. The impact of sea level rise is most significant during dry years, when it accounts for over 26 days of usability lost, or a 19% decrease in usability.

Table 2. Annual usability at Antioch under EBC2 and the No Action Alternative for the entire simulation period and for different year types within the simulation period

Year Type	# of Usable Days Per Year Under EBC2	# of Usable Days Per Year Under NAA	Usable Days Lost Per Year	Percent Decrease
All Years	163.7	148.5	15.2	9%
Critical Years	63.1	55.6	7.5	12%
Dry Years	144.6	117.9	26.7	19%
Above & Below Normal Years	188.1	177.7	10.4	6%
Wet Years	264.8	248.5	16.3	6%

Impact of BDCP. Figure 2 also shows that, relative to both EBC2 and NAA, BDCP Scenario Alt4-H1 is predicted to result in a significant decrease in usability, particularly during the fall months. The average decrease in usability during the fall months, relative to the NAA, for the entire 17-year simulation period is presented in **Table 3**. On average during the September-November timeframe, simulation results anticipate that usability will decrease by 15.3 days. Simulated usability is almost completely lost during September, which corresponds to an 85% decrease. The largest predicted number of days lost (6.6 days) in one month occurs in October. Note that these impacts of the proposed BDCP project are due entirely to the project, as the effect of SLR has been accounted for by comparing results from Scenario Alt4-H1 to the NAA scenario, which incorporates SLR.

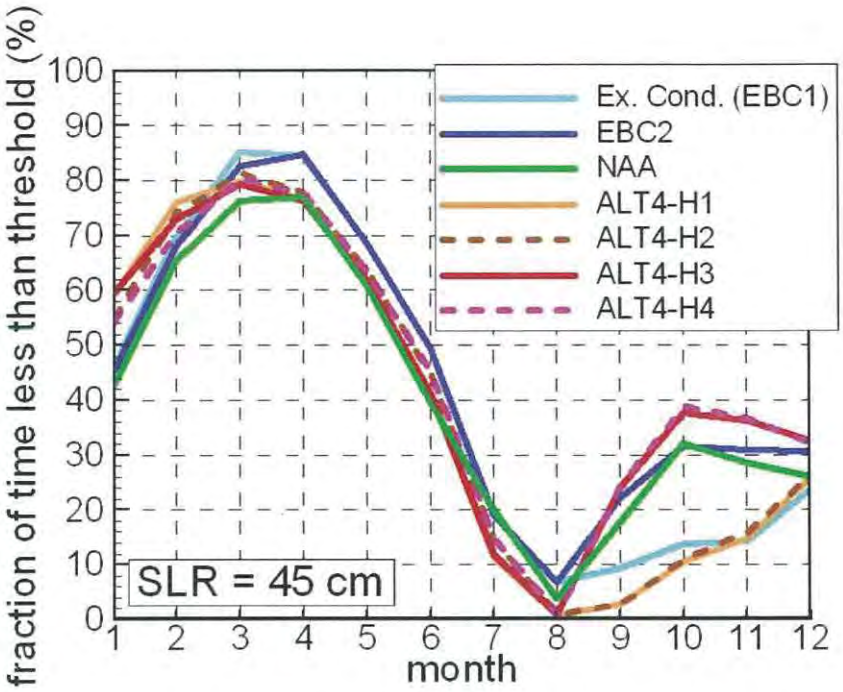


Figure 2. Percent of time water at Antioch's intake can be used for supply (i.e., when the simulated salinity is less than usable threshold at Antioch) by month as computed from DSM2 model results for the simulation period 1975-1991. SLR is zero for Ex. Cond. (EBC1) and EBC2, and 45 cm for all other simulations. Note that Fall X2 provisions are included in EBC2, NAA, Alt4-H3, and Alt4-H4.

Table 3. Decrease in usability at Antioch during the fall months simulated to occur as a result of implementation of the BDCP project (Scenario Alt4-H1)

Month	# of Usable Days/Year Under NAA	# of Usable Days/Year Under Alt4 (Operational Scenario H1)	Usable Days Lost/Year[1]	Percent Decrease[1]
September	5.3	0.8	4.5	85%
October	9.9	3.3	6.6	67%
November	8.5	4.4	4.1	48%
Sept-Nov	23.8	8.5	15.3	64%

[1]Results reflect changes resulting from BDCP project only, and not changes due to SLR. That is, BDCP project simulations with SLR = 45 cm were compared with NAA simulation, which also includes SLR = 45 cm.

Breaking the results down by year type (instead of presenting results in aggregated fashion) reveals that usability is almost completely lost during fall months of all year types except wet years. Also, the predicted salinity impacts, as expressed in terms of the number of days lost, are greatest during dry and wet years. These results are presented graphically in **Figure 3** and numerically in **Table 4**.

Figure 3 shows that usability under scenarios Alt4-H1 and Alt4-H2 during September through November is always less than 10%, and generally less than 5%, for all year types except for wet years. The number of usable days during the September-November simulation period (excluding wet years) ranges from 0.3 to 3 under Scenario Alt4-H1.

Figure 3 shows that the number of usable days during the fall months decreases significantly under Scenario Alt4-H1 compared the NAA, especially in dry and wet years. During dry and wet years, simulated usability decreases by 23 and 22.7 days in the fall, respectively. The largest percent decrease in usability occurs in critical and dry years, when usability decreases by 97% and 93%, respectively. These model results indicate that, in wet and dry year types, the City of Antioch would need to find alternative water supplies (because water at its intake would be unusable) for an additional 23 days in the fall months of each year, likely at significant cost.

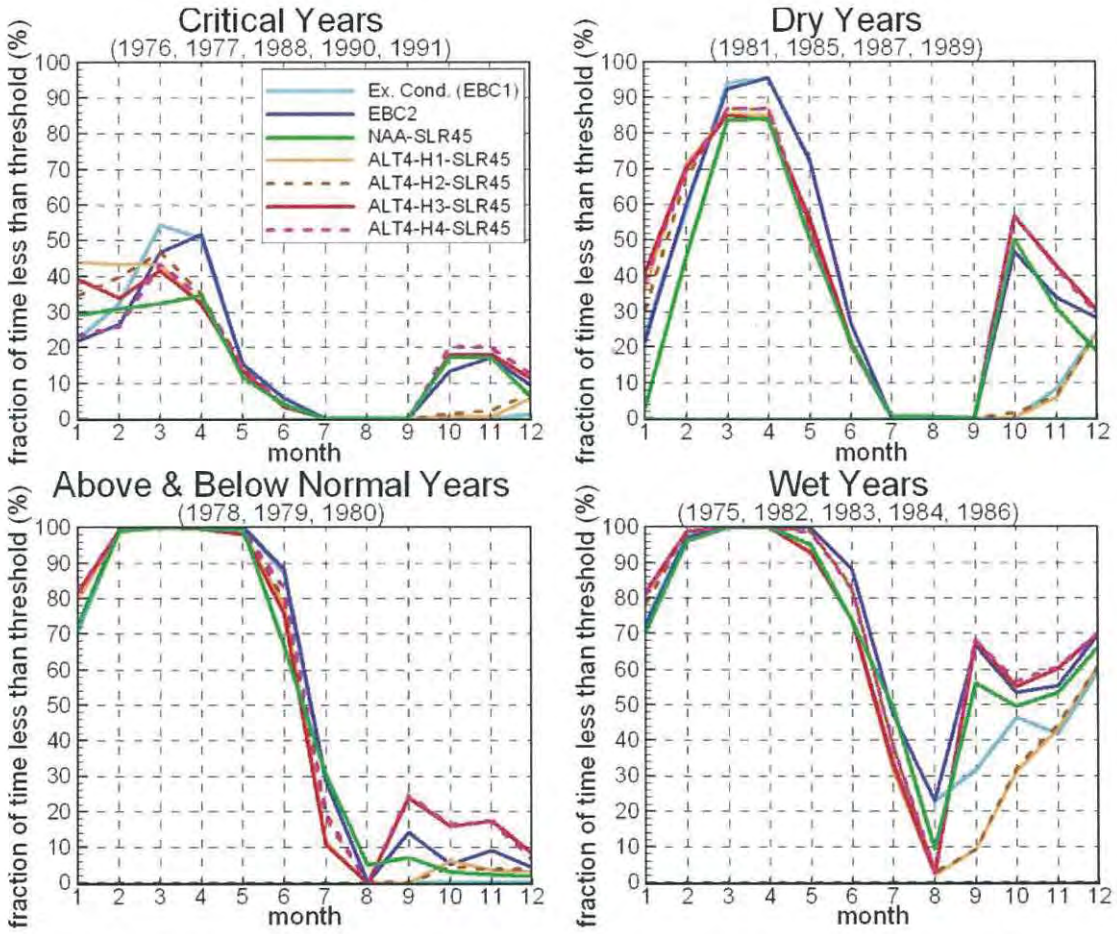


Figure 3. Percent of time water at Antioch's intake can be used for supply (i.e., when the simulated salinity is less than usable threshold at Antioch) by month and by year type as computed from DSM2 model results. SLR is zero for Ex. Cond. (EBC1) and EBC2, and 45 cm for all other simulations.

Table 4. Decrease in usability at Antioch in the Fall (September – November) predicted to occur as a result of the BDCP project scenario Alt4-H1 by year type

Year Type	# of Usable Days/Year Under NAA	# of Usable Days/Year Under Alt4 (Operational Scenario H1)	Usable Days Lost/Year[1]	Percent Decrease[1]
All Years	23.8	8.5	15.3	64%
Critical Years	10.6	0.3	10.3	97%
Dry Years	24.8	1.8	23.0	93%
Above & Below Normal Years	3.8	3.0	0.8	23%
Wet Years	48.1	25.4	22.7	47%

[1]Results reflect changes resulting from BDCP project only, and not changes due to SLR. That is, BDCP project simulations with SLR = 45 cm were compared with NAA simulation, which also has SLR = 45 cm.

Finally, the model results were used to compute the number of days of usable water over the entire simulation period, as an annual average. As **Table 5** indicates, model results show that the BDCP Proposed Project is simulated to cause a significant decrease in annual usability – 9.2 days per year – over all years. The loss is most significant during wet years, when more than 28 days of usability are lost; the highest percent decrease also occurs during wet years.

Table 5. Annual usability at Antioch under EBC2, No Action Alternative, and BDCP project scenario Alt4-H1 by year type

Year Type	# of Usable Days/Year Under NAA	# of Usable Days/Year Under Alt4 (Operational Scenario H1)	Usable Days Lost	Percent Decrease
All Years	148.5	139.3	9.2	6%
Critical Years	55.6	56.4	-0.8	-1%
Dry Years	117.9	115.6	2.2	2%
Above & Below Normal Years	177.7	175.0	2.7	2%
Wet Years	248.5	219.7	28.8	12%

[1]Results reflect changes resulting from BDCP project only, and not changes due to SLR. That is, BDCP project simulations with SLR = 45 cm were compared with NAA simulation, which also has SLR = 45 cm.

Attachment C

Agreement between the State of California and the City of Antioch

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

AMENDMENT NO. 1 TO THE APRIL 11, 1968 AGREEMENT BETWEEN THE STATE OF CALIFORNIA AND THE CITY OF ANTIOCH

THIS AMENDMENT is made and entered into this 29th day of October, 2013, between the Department of Water Resources of the State of California (DWR), and the City of Antioch (City).

AGREEMENT

1. The 1968 Agreement between DWR and the City is amended as follows:

   Article 1 is amended to read in its entirety: "The term of this agreement shall begin on the first day of October 1968, and shall continue in effect until terminated by either party by written notice to the other party given at least 12 months prior to the effective date of such termination. The effective date of termination shall be the last day of a year (September 30) and no termination shall be effective prior to September 30, 2028."

   Article 3 is amended to read: "V is the total quantity of water in acre-feet introduced into the City's transmission facilities, including water diverted by the City and substitute water purchased by the City, for delivery within the City's service area, which shall be the most expansive of the Antioch City Boundary or Antioch Urban Growth Boundary or Antioch Sphere of Influence ("SOI") as shown on Exhibit "A" attached hereto and by this reference made a part hereof from 8:00 a.m. on December 9, to 8:00 a.m. on July 6."

   Article 4 is amended to read: "Such measurements will be made at such intervals as shall reasonably be necessary and as mutually agreed upon. DWR and the City have negotiated and agreed that such measurements will be made at slack current, which shall be deemed to occur two hours after daily higher high tide, effective January 1, 2013."

   Exhibit A is replaced with attached map "City of Antioch Boundary, SOI, and Urban Growth Boundary" as created by the Contra Costa County Community Development, GIS group on 7/13/2009.

2. The parties waive any and all claims either one may have against the other for past actions or activities arising out of this 1968 Agreement.

3. The existing Tolling Agreement, effective May 22, 2013, terminates upon the date of full execution of this Amendment.

4. All other provisions of the 1968 Agreement, except those modified by this Amendment, remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto, by their authorized representatives, have executed this Amendment No. 1 to the to the April 11, 1968 Agreement between the State of California and the City of Antioch, which Amendment becomes effective on the date first set forth above.

Approved as to legal form
and sufficiency

for _____
Chief Counsel
Department of Water Resources

Date 10/28/13

STATE OF CALIFORNIA
DEPARTMENT OF WATER
RESOURCES

_____
Mark W. Cowin
Director

Date 10/29/13

Approved as to legal form
and sufficiency

_____
Name

City Attorney
Title

Date 10-22-13

CITY OF ANTIOCH

_____
Name

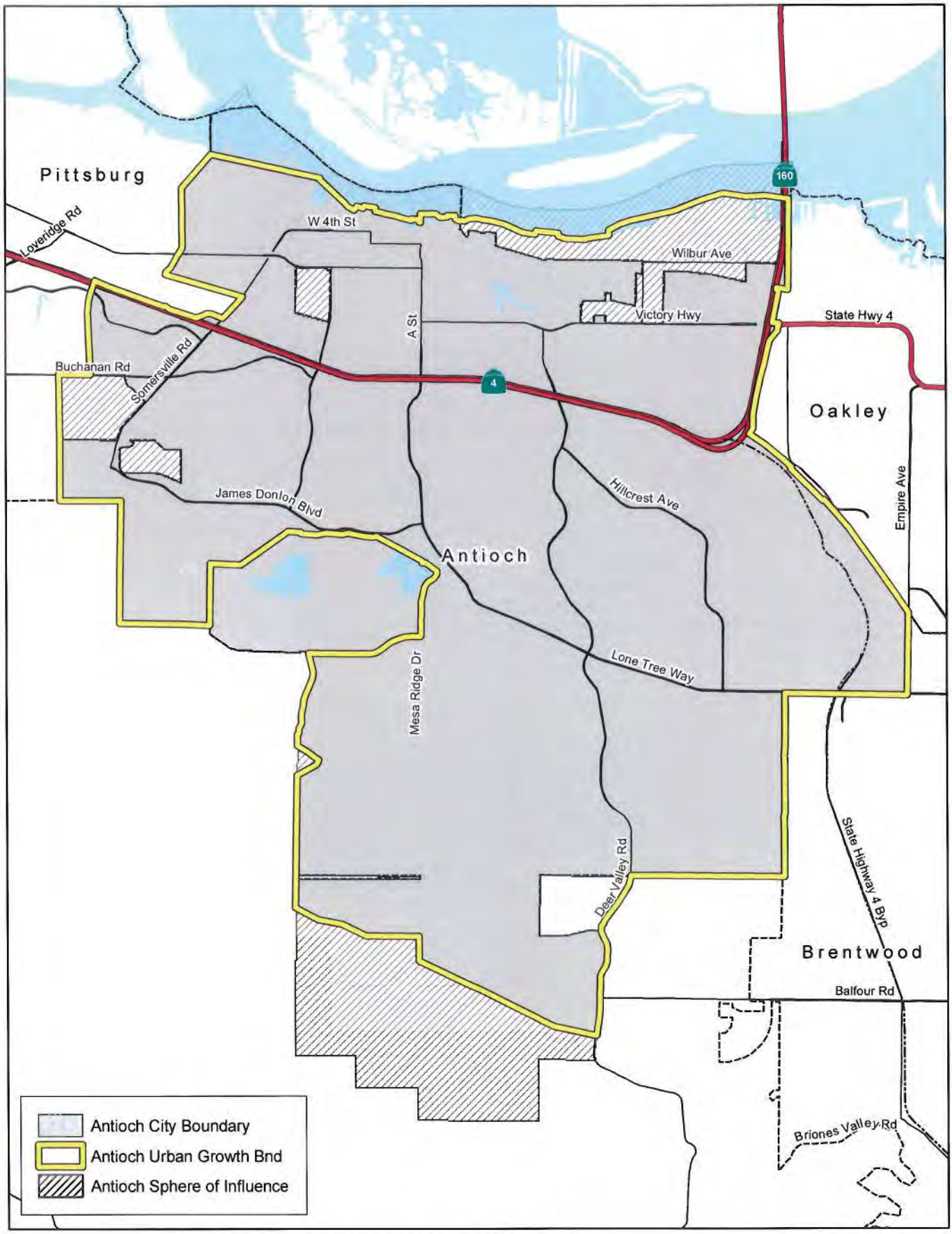
City Manager
Title

Date 10-22-13

Antioch-218

Exhibit A

City of Antioch Boundary, SOI, and Urban Growth Boundary



Map created 7/13/2009
by Contra Costa County Community Development, GIS Group
651 Pine Street, 4th Floor North Wing, Martinez, CA 94553-0095
37.59.46.45N 122.08.35.384W

This map was created by the Contra Costa County Community Development Department with data from the Contra Costa County GIS Program. Some base data, primarily City Limits, is derived from the CA State Board of Equalization's tax rate areas. While obligated to use this data the County assumes no responsibility for its accuracy. This map contains copyrighted information and may not be altered. It may be reproduced in its current state if the source is cited. Users of this map agree to read and accept the County of Contra Costa disclaimer of liability for geographic information.

0 0.5 1 Miles

Antioch-218

AGREEMENT

THIS AGREEMENT made this 11th day of April, 1968, between the STATE OF CALIFORNIA, acting by and through its Department of Water Resources, hereinafter referred to as the "State" and the CITY OF ANTIOCH, a municipal corporation, hereinafter referred to as the "City",

WITNESSETH:

WHEREAS, for over 100 years water has been diverted from the San Joaquin River for municipal and industrial use in and around the area which is now in the corporate limits of the City, and

WHEREAS, since 1904 such water has been diverted at a pumping plant located near the foot of A Street and has been treated and distributed to users by the City, and

WHEREAS, the City diverts such water whenever the chloride ion content in the surface zone at slack current after daily higher high tide (HHT) is 250 parts per million or less, hereinafter called "usuable river water", and

WHEREAS, the average number of days per water year (October 1 to September 30, hereinafter referred to as "year") that usable river water has been available to the City at said point of diversion is 208 and the median period of said availability is from December 9 to July 5, both days inclusive, and

WHEREAS, during each day usable river water has been and will in the future be available to the City the quantity thereof has been and will be adequate to meet the water requirements of

the City during such day, and

WHEREAS, in the future the average number of days per year that usable river water will be available to the City will be caused to decrease, and such decrease will be due in part to operation of the State Water Resources Development System, as defined in Section 12931 of the Water Code, and

WHEREAS, it is contemplated that the Contra Costa Canal, supplemented by the Kellogg Unit or other facilities to be constructed by the Bureau of Reclamation, will meet the City's future water requirements which are not met by usable river water. If such facilities are not constructed by the Bureau of Reclamation, water supply facilities will have to be constructed by another agency or agencies to meet the City's future requirements including a substitute water supply equal to the City's water deficiency entitlement as defined in this agreement.

NOW, THEREFORE, the parties agree as follows:

1. The term of this agreement shall begin on the first day of October 1968, and shall continue in effect until terminated by either party by written notice to the other party given at least 12 months prior to the effective date of such termination. The effective date of termination shall be the last day of a year (September 30) and no termination shall be effective prior to September 30, 2008.

2. The State shall reimburse the City in a manner hereinafter provided for any decrease in availability to the City of usable river water during the term of this agreement caused by

operation of the State Water Resources Development System. Such decrease in availability of usable river water is hereinafter referred to as the City's "water deficiency entitlement".

3. The quantity of the City's water deficiency entitlement shall be determined for each year during the term of this agreement by the formula

$$E = \frac{(208-D)}{3} \quad \frac{(V)}{208}$$

where E is the City's water deficiency entitlement for such year in acre-feet, D is the number of days during such year that usable river water is available to the City in the San Joaquin River at its pumping plant, and V is the total quantity of water in acre-feet introduced into the City's transmission facilities for delivery within the City's service area as shown on Exhibit "A" attached hereto and by this reference made a part hereof from 8:00 a.m. on December 9, to 8:00 a.m. on July 6: Provided, That $\frac{V}{208}$ shall not exceed the maximum diversion rate of the City's San Joaquin River diversion facility in acre-feet/day as such facility exists in such year. If in any year D exceeds 208, the City shall have no water deficiency entitlement for such year and the amount of such excess shall offset any water deficiency entitlement of the City for an equal number of days in the next succeeding year or years when D is less than 208.

4. For the purpose of computing the City's water deficiency entitlement, the City at no cost to the State, shall provide:

(a) A covered facility or facilities wherein

the State can install devices to measure the chloride ion content of water in the San Joaquin River at or in the vicinity of the City's pumping plant,

(b) Sufficient power to operate all necessary measuring devices, and

(c) Sufficient right-of-way to such facilities to enable the State to install, service, remove, and take readings from any such devices.

The size of such facilities and the amount and type of power to be supplied shall be as mutually agreed upon.

The State shall be responsible for the actual measuring of the chloride ion content; all such measurements will be made available to the City.

Such measurements will be made at such intervals as shall be reasonably necessary and as mutually agreed upon.

The City shall have the right, at its expense, to verify the accuracy of the State's measurements and any inaccuracy thus disclosed shall be corrected by the State.

5. Each year during the term of this agreement that the City has a water deficiency entitlement it shall purchase substitute water from a project or projects constructed by an agency or agencies to supply the supplemental water requirements of an area including the City. For the purposes of this agreement, substitute water shall be deemed to have been purchased during the period beginning at 8:00 a.m. on December 9 and ending

at 8:00 a.m. on July 6 of such year and the price paid by the City for substitute water shall be deemed to be the average price per acre-foot paid by the City for all untreated water purchased by it for introduction into its water transmission facilities during said period.

6. Each year during the term of this agreement that the City purchases substitute water for its water deficiency entitlement, the State will pay the City an amount of money computed in accordance with the formula $M = E (C_w + C_e - 4.90)$ where M is the amount in dollars to be paid by the State, E is the City's water deficiency entitlement for such year determined in the manner provided in Section 3 hereof, C_w is the amount per acre-foot paid by the City for substitute water delivered to the City as provided in Section 5 hereof, and C_e is the average amount (if any) per acre-foot paid by the City for electric energy to transport substitute water from the point of delivery thereof to the City to a storage reservoir or treatment plant operated by the City. The State shall pay said amount to the City not later than October 31 of the following year. Such payments are hereby determined to be reasonable costs of the annual maintenance and operation of the State Water Resources Development System and shall be disbursed from the California Water Resources Development Bond Fund pursuant to subsection (b) (1) of Section 12937 of the Water Code.

7. The City, in consideration of the payments by the State herein provided,

releases the State from any liability due to

any change in regimen of flows of water in the Delta or the San Joaquin River and the effects of such changes caused by operation of the State Water Resources Development System: Provided, That nothing herein shall be deemed to be a release of State liability resulting from the utilization by the State of any facilities for removal of drainage water from the San Joaquin Valley.

8. The obligations of the State herein shall not be affected by any modification of the City's facilities to divert river water, except as provided in Section 3 hereof.

9. Nothing herein shall be deemed to be a release or waiver of any right of the City to purchase supplemental water supplies from the State with the priorities established by Water Code Sections 11460, 12201 to 12204 inclusive, and 12931.

10. State agrees that other municipal and industrial entities in the Delta will not be granted compensation for damages caused by the State Water Resources Development System under substantially more favorable terms than those used to Compensate the City hereunder.

IN WITNESS WHEREOF, the parties hereto have executed this agreement by their respective officers thereunto duly authorized on the date first above written.

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

By _____
Director

Approved as to legal form and sufficiency:

By _____
Chief Counsel

CITY OF ANTIOCH

By _____
Mayor

ATTEST:

_____
City Clerk

Antioch-218


SHERMAN
Island
SAN JOAQUIN
RIVER
DUTCH
LOW LANDS
Oakley
SCALE IN FEET
0 2000 4000 6000
LONE TREE VALLEY
SERVICE AREA BOUNDARY
Horse Valley
CITY OF ANTIOCH
EXTENT OF SERVICE AREA

Attachment D

Review by the Delta Independent Science Board of the Bay Delta Conservation Plan/California WaterFix Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement

980 NINTH STREET, SUITE 1500
SACRAMENTO, CALIFORNIA 95814
HTTP://DELTACOUNCIL.CA.GOV
(916) 445-5511

Delta Independent Science Board

September 30, 2015

To: Randy Fiorini, Chair, Delta Stewardship Council
Charlton Bonham, Director, California Department of Fish and Wildlife

From: Delta Independent Science Board

Subject: Review of environmental documents for California WaterFix

We have reviewed the partially Recirculated Draft Environmental Impact Report/ Supplemental Draft Environmental Impact Statement for the Bay Delta Conservation Plan/California WaterFix (herein, "the Current Draft"). We focused on how fully and effectively it considers and communicates the scientific foundations for assessing the environmental impacts of water conveyance alternatives. The review is attached and is summarized below.

The Current Draft contains a wealth of information but lacks completeness and clarity in applying science to far-reaching policy decisions. It defers essential material to the Final EIR/EIS and retains a number of deficiencies from the Bay Delta Conservation Plan Draft EIR/EIS. The missing content includes:

1. Details about the adaptive-management process, collaborative science, monitoring, and the resources that these efforts will require;
2. Due regard for several aspects of habitat restoration: landscape scale, timing, long-term monitoring, and the strategy of avoiding damage to existing wetlands;
3. Analyses of how levee failures would affect water operations and how the implemented project would affect the economics of levee maintenance;
4. Sufficient attention to linkages among species, landscapes, and management actions; effects of climate change on water resources; effects of the proposed project on San Joaquin Valley agriculture; and uncertainties and their consequences;
5. Informative summaries, in words, tables, and graphs, that compare the proposed alternatives and their principal environmental and economic impacts.

The effects of California WaterFix extend beyond water conveyance to habitat restoration and levee maintenance. These interdependent issues of statewide importance warrant an environmental impact assessment that is more complete, comprehensive, and comprehensible than the Current Draft.

Review by the Delta Independent Science Board of the

Bay Delta Conservation Plan/California WaterFix Partially Recirculated Draft Environmental Impact Report/ Supplemental Draft Environmental Impact Statement

September 30, 2015

Contents

EXPECTATIONS FOR IMPACT ASSESSMENT OF CALIFORNIA WATERFIX

The Sacramento – San Joaquin Delta presents interconnected issues of water, biological resources, habitat, and levees. Dealing with any one of these problem areas is most usefully considered in light of how it may affect and be affected by the others. The effects of any actions further interact with climate change, sea-level rise, and a host of social, political, and economic factors. The consequences are of statewide importance.

These circumstances demand that the California WaterFix EIR/EIS go beyond legal compliance. This EIR/EIS is more than just one of many required reports. Its paramount importance is illustrated by the legal mandate that singles it out as the BDCP document we must review.

It follows that the WaterFix EIR/EIS requires extraordinary completeness and clarity. This EIR/EIS must be uncommonly complete in assessing important environmental impacts, even if that means going beyond what is legally required or considering what some may deem speculative (below, p. 4). Further, the WaterFix EIR/EIS must be exceptionally clear about the scientific and comparative aspects of both environmental impacts and project performance (p. 9).

These reasonable expectations go largely unmet in the Bay Delta Conservation Plan/California WaterFix Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement Draft (herein, “the Current Draft”). We do not attempt to determine whether this report fulfills the letter of the law. But we find the Current Draft sufficiently incomplete and opaque to deter its evaluation and use by decision-makers, resource managers, scientists, and the broader public.

BACKGROUND OF THIS REVIEW

The Delta Reform Act of 2009, in §85320(c), directs the Delta Independent Science Board (Delta ISB) to review the environmental impact report of the Bay Delta Conservation Plan (BDCP) and to provide the review to the Delta Stewardship Council and the California Department of Fish and Wildlife. On May 14, 2014, we submitted our review of the BDCP’s Draft Environmental Impact Report/Draft Environmental Impact Statement (herein, the “Previous Draft"), which had been posted for review on December 9, 2013. This review[1] contained three main parts: an extended summary, detailed responses to charge questions from the Delta Stewardship Council, and reviews of individual chapters. Although the Previous Draft considered vast amounts of scientific information and analyses to assess the myriad potential environmental impacts of the many proposed BDCP actions, we concluded that the science in the Previous Draft had significant gaps, given the scope and importance of the BDCP.

The proposed BDCP actions have now been partitioned into two separate efforts: water conveyance under California WaterFix[2] and habitat restoration under California EcoRestore[3]. Environmental documents in support of California WaterFix (the Current Draft) were made available for a 120-day comment period that began July 10, 2015. The Current Draft focuses on three new alternatives for conveying Sacramento River water through the Sacramento – San

[1] http://deltacouncil.ca.gov/sites/default/files/documents/files/Attachment-1-Final-BDCP-comments.pdf
[2] http://www.californiawaterfix.com/
[3] http://resources.ca.gov/ecorestore/

Joaquin Delta. One of them, Alternative 4A, is the preferred alternative, identified as California WaterFix.

The Delta Stewardship Council asked us to review the Current Draft and to provide our comments by the end of September 2015. We are doing so through this report and its summary, which can be found in the cover letter.

The review began in July 2015 with a preliminary briefing from Laura King-Moon of California Department of Water Resources (three Delta ISB members present). The Delta ISB next considered the Current Draft in a public meeting on August 13–14 (nine of the ten members present)[4]. The meeting included a briefing on California EcoRestore by David Okita of California Natural Resources Agency and a discussion of the Current Draft and California WaterFix with Cassandra Enos-Nobriga of California Department of Water Resources (DWR) and Steve Centerwall of ICF International.

The initial public draft of this review was based on our study of Sections 1-4 of the Current Draft and on checks of most resource chapters in its Appendix A. This public draft was the subject of a September 16 meeting that included further discussions with Cassandra Enos-Nobriga[5] and comments from Dan Ray of the Delta Stewardship Council staff. Additional comments on that initial draft were provided by DWR in a September 21 letter to the Delta ISB chair[6]. These discussions and comments helped clarify several issues, particularly on expectations of a WaterFix EIR/EIS.

This final version of the review begins with a summary in the cover letter. The body of the report continues first with a section on our understanding of major differences between the BDCP and California WaterFix. Next, after noting examples of improvement in the Current Draft, we describe our main concerns about the current impact assessments. These overlap with main concerns about the Previous Draft, which we revisit to consider how they are addressed in the Current Draft. Finally, we offer specific comments on several major Sections and Chapters.

DIFFERENCES BETWEEN THE BDCP AND CALIFORNIA WATERFIX

The project proposed in the Current Draft differs in significant respects from what was proposed as the BDCP in December 2013. Here we briefly state our understanding of some main differences and comment on their roles on this review:

- The time period for permitting incidental take under Section 7 of the federal Endangered Species Act (ESA) and Section 2081(b) of the California Endangered Species Act (CESA) is substantially less than the 50 years envisioned as part of a Habitat Conservation Plan (HCP) and Natural Community Conservation Plan (NCCP) in BDCP. As a result, the science associated with many impacts of climate change and sea-level rise may seem less relevant. The permitting period for the project proposed in the Current Draft remains in place unless environmental baseline conditions change substantially or other permit requirements are not met. Consequently, long-term effects of the proposed project remain important in terms of operations and expected benefits (p. 8).

[4] http://deltacouncil.ca.gov/docs/delta-isb-meeting-notice-meeting-notice-delta-isb/delta-independent-science-board-isb-august-13

[5] Written version at https://s3.amazonaws.com/californiawater/pdfs/63qnf_Delta_ISB_draft_statement_-_Enos_-_FINAL.pdf

[6] http://deltacouncil.ca.gov/docs/response-letter-dwr

- In this shortened time frame, responsibility for assessing WaterFix's effects on fish and wildlife would fall to resource agencies (National Marine Fisheries Service, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife). Other impacts would be regulated by a variety of federal and state agencies (Current Draft Section 1).
- The proposed habitat restorations have been scaled back. The Current Draft incorporates elements of 11 Conservation Measures from BDCP to mitigate impacts of construction and operations. Most habitat restoration included in the Previous Draft has been shifted to California EcoRestore. Our review of the Previous Draft contained many comments on the timing of restoration, species interactions, ecological linkages of conservation areas, locations of restoration areas and the science supporting the efficiency and uncertainty of effective restoration. Some of these comments apply less to the Current Draft because of its narrower focus on water conveyance.
- There remains an expected reliance on cooperative science and adaptive management during and after construction.
- It is our understanding that the Current Draft was prepared under rules that disallow scientific methods beyond those used in the Previous Draft. The rules do allow new analyses, however. For example, we noticed evidence of further analyses of contaminants, application of existing methods (e.g. particle tracking) to additional species (e.g., some of the non-covered species), and occasional selection of one model in place of the combined results of two models (e.g., fish life cycle models SALMOD and SacEFT).

IMPROVEMENTS ON THE PREVIOUS DRAFT

A proposed revamping of water conveyance through the Sacramento-San Joaquin Delta involves a multitude of diverse impacts within and outside of the Delta. Unavoidably, the EIR/EIS for such a project will be complex and voluminous, and preparing it becomes a daunting task in its own right. The inherent challenges include highlighting, in a revised EIR/EIS, the most important of the changes.

The new Sections 1 through 4 go a long way toward meeting some of these challenges. Section 1 spells out the regulatory context by discussing laws and agencies that establish the context for the Current Draft. Section 2 summarizes how the Previous Draft was revised in response to project changes and public input. Section 3 describes how the preferred alternative in the Previous Draft (Alternative 4) has been changed. Section 4 presents an impressive amount of detailed information in assessing the sources of habitat loss for various species and discussing how restoration and protection can mitigate those losses. Generally comprehensive lists of "Resource Restoration and Performance Principles" are given for the biological resources that might be affected by construction or operations. For example, page 4.3.8-140 clearly describes a series of measures to be undertaken to minimize the take of sandhill cranes by transmission lines (although the effectiveness of these measures is yet to be determined).

Section 4 also contains improvements on collaborative science (4.1.2.4, mostly reiterated in ES.4.2). This part of the Current Draft draws on recent progress toward collaborative efforts in monitoring and synthesis in support of adaptive management in the Delta. The text identifies the main entities to be involved in an expected memorandum of agreement on a monitoring and adaptive-management program in support of the proposed project.

Appendix A describes revisions to the resource chapters of the Previous Draft. Track-changed versions of the chapters simplify the review process, although this was not done for the

key chapter on aquatic resources (p. 17). We noticed enhanced analyses of contaminants and application of methods such as particle tracking to additional species, including some of the non-covered taxa; a detailed treatment of *Microcystis* blooms and toxicity; more information about disinfection byproducts; improved discussion of vector control arising from construction and operational activities; and revised depiction of surficial geology. Potential exposure of biota to selenium and methylmercury is now considered in greater detail. Evaluations will be conducted for restoration sites on a site-specific basis; if high levels of contaminants cannot otherwise be addressed, alternative restoration sites will be considered (page 4.3.8-118). Incidentally, this is a good example of adaptive management, although it is not highlighted as such. Explanations were provided for why the nitrogen-to-phosphorus ratio was not specifically evaluated, why dissolved vs. total phosphorus was used in the assessment, and how upgrades to the Sacramento Regional Wastewater Treatment Plant would eventually affect phosphorus concentrations.

CURRENT CONCERNS

These and other strengths of the Current Draft are outweighed by several overarching weaknesses: overall incompleteness through deferral of content to the Final EIR/EIS (herein, "the Final Report"); specific incompleteness in treatment of adaptive management, habitat restoration, levees, and long-term effects; and inadequacies in presentation. Some of these concerns overlap with ones we raised in reviewing the Previous Draft (revisited below, beginning on p. 10).

Missing content

The Current Draft lacks key information, analyses, summaries, and comparisons. The missing content is needed for evaluation of the science that underpins the proposed project. Accordingly, the Current Draft fails to adequately inform weighty decisions about public policy. The missing content includes:

1. Details on adaptive management and collaborative science (below, p. 5).
2. Modeling how levee failures would affect operation of dual-conveyance systems (below, p. 7). Steve Centerwall told us on August 14 that modeling of the effects of levee failure would be presented in the Final Report.
3. Analysis of whether operation of the proposed conveyance would alter the economics of levee maintenance (below, p. 7).
4. Analyses of the effects of climate change on expected water exports from the Delta. “[A]n explanation and analysis describing potential scenarios for future SWP/CVP system operations and uncertainties [related to climate change] will be provided in the Final Report” (p. 1-35 of the Current Draft).
5. Potential impacts of climate change on system operations, even during the shortened time period emphasized in the Current Draft (below, p. 8 and 11).
6. Potential effects of changes in operations of the State Water Project (SWP) and Central Valley Project (CVP), or other changes in water availability, on agricultural practices in the San Joaquin Valley (p. 12).
7. Concise summaries integrated with informative graphics (below, p. 9 and 13). The Current Draft states that comparisons of alternatives will be summarized in the Final Report (p. 1-35).

While some of the missing content has been deferred to the Final Report (examples 2, 4, and 7), other gaps have been rationalized by deeming impacts “too speculative” for assessment.

CEQA guidance directs agencies to avoid speculation in preparing an EIR/EIS[7] . To speculate, however, is to have so little knowledge that a finding must be based on conjecture or guesswork. Ignorance to this degree does not apply to potential impacts of WaterFix on levee maintenance (example 3; see p. 7) or on San Joaquin Valley agriculture (example 6; p. 12).

Even if content now lacking would go beyond what is legally required for an EIR/EIS, providing such content could assist scientists, decision-makers, and the public in evaluating California WaterFix and Delta problems of statewide importance (above, p. 1).

Adaptive management

The guidelines for an EIR/EIS do not specifically call for an adaptive-management plan (or even for adaptive management). However, if the project is to be consistent with the Delta Plan (as legally mandated), adaptive management should be part of the design.

The Current Draft relies on adaptive management to address uncertainties in the proposed project, especially in relation to water operations. The development of the Current Draft from the Previous Draft is itself an exercise in adaptive management, using new information to revise a project during the planning stage. Yet adaptive management continues to be considered largely in terms of how it is to be organized (i.e., coordinated with other existing or proposed adaptive-management collaborations) rather than how it is to be done (i.e., the process of adaptive management). Adaptive management should be integral with planned actions and management—the Plan A rather than a Plan B to be added later if conditions warrant. The lack of a substantive treatment of adaptive management in the Current Draft indicates that it is not considered a high priority or the proposers have been unable to develop a substantive idea of how adaptive management would work for the project.

There is a very general and brief mention of the steps in the adaptive management process in Section 4 (p. 4.1-6 to 4.1-7), but nothing more about the process. We were not looking here for a primer on adaptive management. Rather, we expected to find serious consideration of barriers and constraints that have impeded implementation of adaptive management in the Delta and elsewhere (which are detailed in the Delta Plan), along with lessons learned on how adaptive management can be conducted overcome these problems.

The Current Draft contains general statements on how collaborative science and adaptive management under California WaterFix would be linked with the Delta Collaborative Science and Adaptive Management Program (CSAMP) and the Collaborative Adaptive Management Team (CAMT). These efforts, however, have taken place in the context of regulations and permits, such as biological opinions and biological assessments required under the Endangered Species Act. We did not find examples of how adaptive management would be applied to assessing—and finding ways to reduce—the environmental impacts of project construction and operations.

Project construction, mitigation, and operations provide many opportunities for adaptive management, both for the benefit of the project as well as for other Delta habitat and ecosystem initiatives, such as EcoRestore. To be effective in addressing unexpected outcomes and the need for mid-course corrections, an adaptive-management management team should evaluate a broad range of actions and their consequences from the beginning, as plans are being developed, to facilitate the early implementation and effectiveness of mitigation activities.

[7] https://s3.amazonaws.com/californiawater/pdfs/bo0lx_Delta_ISB_Draft_Statement_&_Response_Letter_-_Enos_-_FINAL.pdf

The Current Draft defers details on how adaptive management will be made to work: "An adaptive management and monitoring program will be implemented to develop additional scientific information during the course of project construction and operations to inform and improve conveyance facility operational limits and criteria" (p. ES-17). This is too late. If adaptive management and monitoring are central to California WaterFix, then details of how they will be done and resourced should be developed at the outset (now) so they can be better reviewed, improved, and integrated into related Delta activities. The details could include setting species-specific thresholds and timelines for action, creating a Delta Adaptive Management Team, and capitalizing on unplanned experiments such as the current drought[8]. Illustrative examples could use specific scenarios with target thresholds, decision points, and alternatives. The missing details also include commitments and funding needed for science-based adaptive management and restoration to be developed and, more importantly, to be effective.

The protracted development of the BDCP and its successors has provided ample time for an adaptive-management plan to be fleshed out. The Current Draft does little more than promise that collaborations will occur and that adaptive management will be implemented. This level of assurance contrasts with the central role of adaptive management in the Delta Plan and with the need to manage adaptively as climate continues to change and new contingencies arise.

Restoration as mitigation

Restoration projects should not be planned and implemented as single, stand-alone projects but must be considered in a broader, landscape context. We highlighted the landscape scale in our review of the Previous Draft and also in an earlier review of habitat restoration in the Delta[9]. A landscape approach applies not just to projects that are part of EcoRestore, but also to projects envisioned as mitigation in the Current Draft, even though the amount of habitat restoration included (as mitigation) in the Current Draft has been greatly reduced. On August 13 and 14, representatives of WaterFix and EcoRestore acknowledged the importance of the landscape scale, but the Current Draft gives it little attention. Simply because the CEQA and NEPA guidelines do not specifically call for landscape-level analyses is not a sufficient reason to ignore them.

Wetland restoration is presented as a key element of mitigation of significant impacts (example below in comments on Chapter 12, which begin on p. 18). We noticed little attention to the sequence required for assessing potential impacts to wetlands: first, avoid wetland loss; second, if wetland loss cannot be avoided, minimize losses; and third, if avoidance or minimization of wetland loss is not feasible, compensate. Much of the emphasis in the Current Draft is on the third element. Sequencing apparently will be addressed as part of the permitting process with the US Army Corps of Engineers (USACE) for mitigation related to the discharge of dredged or fill material.[10] However, it is difficult to evaluate the impacts on wetlands in advance of a clarification of sequencing and criteria for feasibility.

Mitigation ratios

Restoring a former wetland or a highly degraded wetland is preferable to creating wetlands from uplands[11]. When an existing wetland is restored, however, there is no net gain of

[8] http://deltacouncil.ca.gov/docs/adaptive-management-report-v-8
[9] http://deltacouncil.ca.gov/sites/default/files/documents/files/HABITAT%20RESTORATION%20REVIEW%20FINAL.pdf
[10] Letter from Cassandra Enos-Nobriga, DWR, September 21, 2015.
[11] http://www.nap.edu/openbook.php?isbn=0309074320

area, so it is unclear whether credits for improving existing wetlands would be considered equivalent to creating wetlands where they did not recently exist.

In view of inevitable shortcomings and time delays in wetland restorations, mitigation ratios should exceed 1:1 for enhancement of existing wetlands. The ratios should be presented, rather than making vague commitments such as "restore or create 37 acres of tidal wetland…." The Final Draft also needs to clarify how much of the wetland restoration is out-of-kind and how much is in-kind replacement of losses. It should examine whether enough tidal area exists of similar tidal amplitude for in-kind replacement of tidal wetlands, and whether such areas will exist with future sea-level rise. We agree that out-of-kind mitigation can be preferable to in-kind when the trade-offs are known and quantified and mitigation is conducted within a watershed context, as described in USACE's 2010 guidance for compensatory wetland mitigation.[12] Since then, many science-based approaches have been developed to aid decision-making at watershed scales, including the 2014 Watershed Approach Handbook produced by the Environmental Law Institute and The Nature Conservancy[13].

Restoration timing and funding

To reduce uncertainty about outcomes, allow for beneficial and economical adaptive management, and allow investigators to clarify benefits before the full impacts occur, mitigation actions should be initiated as early as possible. Mitigation banks are mentioned, but are any operational or planned for operation soon? The potential for landowners to develop mitigation banks could be encouraged so restoration could begin immediately, engendering better use of local knowledge, financial profit, and local support for the project. We are told that the timing of mitigation will be coordinated with other review processes that are currently ongoing.[6]

Levees

A comprehensive assessment of environmental impacts should relate California WaterFix to levee failure by examining the consequences each may have for the other. The interplay between conveyance and levees is receiving additional attention through the Delta Levee Investment Strategy.

On the one hand, the Current Draft fails to consider how levee failures would affect the short-term and long-term water operations spelled out in Table 4.1-2. A rough estimate was proposed under the Delta Risk Management Study[14] and another is part of a cost-benefit analysis for the BDCP[15]. The Final Report should provide analyses that incorporate these estimates.

On the other hand, the Current Draft also fails to consider how implementing the project would affect the basis for setting the State's priorities in supporting Delta levee maintenance. This potential impact is illustrated by a recent scoring system of levee-project proposals that awards points for expected benefits to "export water supply reliability"[16]. Further efforts to quantify these benefits have been recommended as part of a comprehensive risk assessment that

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[12] http://www.sac.usace.army.mil/Portals/43/docs/regulatory/Guidelines_for_Preparing_a_Compensatory_Mitigation_Planf.pdf

[13] https://www.eli.org/sites/default/files/eli-pubs/watershed-approach-handbook-improving-outcomes-and-increasing-benefits-associated-wetland-and-stream_0.pdf

[14] http://www.water.ca.gov/floodmgmt/dsmo/sab/drmsp/docs/Delta_Seismic_Risk_Report.pdf

[15] http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Draft_BDCP_Statewide_Economic_Impact_Report_8513.sflb.ashx

[16] http://www.water.ca.gov/floodsafe/fessro/docs/special_PSP14_final.pdf

would guide the Delta Levees Investment Strategy[17]. Public safety, a focus of the Delta Flood Emergency Management Plan,[18] is just one asset that levees protect. The Current Draft does not evaluate how the proposed project may affect estimates of the assets that the levees protect.

The Current Draft cites levee fragility mainly as a reason to build isolated conveyance for Sacramento River water (examples, p. 1-1, 1-7, 1-9). In a similar vein, the California WaterFix website states, "Aging dirt levees are all that protect most of California's water supplies from the affects [*sic*] of climate change. Rising sea levels, intense storms, and floods could all cause these levees to fail, which would contaminate our fresh water with salt, and disrupt water service to 25 million Californians"[19]. Neither the Previous Draft nor the Current Draft, however, provides a resource chapter about Delta levees. Such a chapter would be an excellent place to examine interacting impacts of conveyance and levees.

Long-term effects

With the shortened time period, several potential long-term impacts of or on the proposed project no longer receive attention. While these effects may not become problematic during the initial permit period, many are likely to affect project operations and their capacity to deliver benefits over the long operational life of the proposed conveyance facilities. In our view, consideration of these long-term effects should be part of the evaluation of the science foundation of the proposed project.

The No-Action alternative establishes the baseline for evaluating impacts and benefits of the proposed alternative(s). It is therefore important to consider carefully how the baseline is established, as this can determine whether particular consequences of the alternatives have costs or benefits. Climate change, for example, is considered under the No-Action alternative in the Current Draft, as is sea-level rise. Climate change is expected to reduce water availability for the proposed northern intakes, and both climate change and sea-level rise are expected to influence tidal energy and salinity intrusion within the Delta[20]. Changes in water temperature may influence the condition of fishes that are highly temperature-dependent in the current analyses. These environmental effects, in turn, are likely to influence environmental management and regulation; from the standpoint of water quality they may even yield environmental benefits if agricultural acreage decreases and agricultural impacts are reduced.

Rather than consider such effects, however, the Current Draft focuses on how the proposed project would affect "the Delta's resiliency and adaptability to expected climate change" (Current Draft section 4.3.25). Quite apart from the fact that "resiliency" and "adaptability" are scarcely operational terms, the failure to consider how climate change and sea-level rise could affect the outcomes of the proposed project is a concern that carries over from our 2014 review and is accentuated by the current drought (below, p. 11).

The Current Draft states that "Groundwater resources are not anticipated to be substantially affected in the Delta Region under the No Action Alternative (ELT) because surface water inflows to this area are sufficient to satisfy most of the agricultural, industrial, and municipal water supply needs" (p. 4.2-16). This conclusion is built on questionable assumptions; the current drought illustrates how agriculture turns to groundwater when surface-water availability diminishes. Groundwater regulation under the recently enacted Sustainable

[17] http://deltacouncil.ca.gov/docs/delta-levee-investment-strategy/dlis-peer-review-technical-memorandum-31
[18] http://www.water.ca.gov/floodmgmt/hafoo/fob/dreprrp/InterdepartmentalDraftDFEMP-2014.pdf.
[19] http://www.californiawaterfix.com/problem
[20] http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0024465

Groundwater Management Act (SGMA) can also be expected to have long-term effects on the proposed project—effects that the Current Draft does not assess. Ending of more than a million acre-feet of overdraft in the southern Central Valley under the SGMA is likely to increase demand for water exports from the Delta in the coming decades. The Current Draft discusses the potential effects of the project on groundwater (for example, in Sections 4.3.3 and 5.2.2.3), but we found only two brief, descriptive mentions of SGMA in the 235 pages of Section 5. The implications of prolonged droughts (e.g., on levee integrity) and of the consequences of SGMA receive too little attention in the Current Draft.

The Current Draft suggests that unnamed "other programs" that are "separate from the proposed project" will use elements of the Previous Draft to implement long-term conservation efforts that are not part of California WaterFix (Current Draft, p. 1-3). The Final Report should provide assurances that such other programs will step in, and could go further in considering their long-term prospects.

Informative summaries and comparisons

According to guidance for project proponents, "Environmental impact statements shall be written in plain language and may use appropriate graphics so that decision-makers and the public can readily understand them" (Code of Federal Regulations, 40 CFR 1502.8). Far-reaching decisions should not hinge on environmental documents that few can grasp.

This guidance applies all the more to an EIR/EIS of the scope, complexity, and importance of the Current Draft. It demands excellent comparative descriptions of alternatives that are supported by readable tables and high-quality graphics, enumeration of major points, well-organized appendices, and integration of main figures with the text. For policy deliberations, the presentation of alternatives should include explicit comparisons of water supply deliveries and reliabilities as well as economic performance. For decision-makers, scientists, and the public, summaries of impacts should state underlying assumptions clearly and highlight major uncertainties. The Current Draft is inadequate in these regards.

The Previous Draft provided text-only summaries for just the two longest of its resource chapters (Chapters 11 and 12). A fragmentary comparison of alternatives was buried in a chapter on "Other CEQA/NEPA required sections" (part 3 of Chapter 31) but fell far short of what was needed. Both the Previous and Current Drafts have been accompanied by a variety of outreach products for broad audiences (e.g., the descriptive overview of the BDCP Draft EIR/EIS[21]). These products do little to compensate for the overall paucity of readable summaries and comparisons in the Previous and Current Drafts.

For over three years, the Delta ISB has been specifically requesting summaries and comparisons: first in June 2012[22], then in June 2013[23], and again in a review of the Previous Draft in May 2014 (footnote 1, p. 1). Appallingly, such summaries and comparisons remain absent in the Current Draft. The generally clear writing in Sections 1 through 4 shows that the preparers are capable of providing the requested summaries and comparisons. Prescriptions in CEQA and NEPA in no way exclude cogent summaries, clear comparisons, or informative graphics. And three years is more than enough time to have developed them.

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[21] Highlights+of+the+Draft+EIS-EIR+12-9-13.pdf

[22] http://deltacouncil.ca.gov/sites/default/files/documents/files/DISB_Letter_to_JMeral_and_DHoffman-Floerke_061212.pdf

[23] http://deltacouncil.ca.gov/sites/default/files/documents/files /DISB%20Comments%20on%20Draft%20BDCP%20Document.doc_.pdf

On August 14, 2015, representatives of California WaterFix assured us that this kind of content would eventually appear, but only in the Final Report. That will be far too late in the EIR/EIS process for content so critical to comprehending what is being proposed and its potential impacts.

PRIOR CONCERNS AND THEIR RELEVANCE TO THE CURRENT DRAFT

The Delta ISB review of May 14, 2014 emphasized eight broad areas of concern about the scientific basis for the Previous Draft. Each is summarized below, followed by a brief appraisal of how (or whether) the concern has been dealt with in the Current Draft. While the reduced scope of the proposed project has reduced the relevance of some issues, particularly habitat restoration and other conservation measures, other concerns persist.

Our persistent concerns include the treatment of uncertainty, the implementation of adaptive management, and the use of risk analysis. These topics receive little or no further attention in the Current Draft. We also found few revisions in response to points we raised previously about linkages among species, ecosystem components, or landscapes; the potential effects of climate change and sea-level rise; and the potential effects of changes in water availability on agricultural practices and the consequent effects on the Delta. Our previous comments about presentation also pertain.

Effectiveness of conservation actions

Our 2014 review found that many of the impact assessments hinged on optimistic expectations about the feasibility, effectiveness, or timing of the proposed conservation actions, especially habitat restoration.

This is arguably less of a concern now, given the substantially shorter time frame of the revised project and narrower range of conservation actions designed for compensatory restoration. Nonetheless, the Current Draft retains unwarranted optimism, as on page 4.3.25-10: “By reducing stressors on the Delta ecosystem through predator control at the north Delta intakes and Clifton Court Forebay and installation of a nonphysical fish barrier at Georgiana Slough, Alternative 4A will contribute to the health of the ecosystem and of individual species populations making them stronger and more resilient to the potential variability and extremes caused by climate change.” A scientific basis for this statement is lacking, and an adaptive or risk-based management framework is not offered for the likely event that such optimism is unfulfilled.

Is it feasible for even the reduced amounts of mitigation and restoration to be completed within the time period proposed? Perhaps yes. Is it feasible that these actions will mitigate impacts over the long term? This is more problematic. To be effective, mitigation actions should deal with both the immediate and long-term consequences of the project. The proposed permitting should allow for monitoring long enough to assess the effectiveness of habitat restoration measures, which will need to extend beyond the initial permitting period.

Uncertainty

The 2014 review found the BDCP encumbered by uncertainties that were considered inconsistently and incompletely. We commented previously that modeling was not used effectively enough in bracketing uncertainties or exploring how they may propagate or be addressed.

In the Current Draft, uncertainties and their consequences remain inadequately addressed, improvements notwithstanding. Uncertainties will now be dealt with by establishing "a robust program of collaborative science, monitoring, and adaptive management" (ES 4.2). No details about this program are provided, so there is no way to assess how (or whether) uncertainties will be dealt with effectively. Although sensitivity modeling was used to address the effects of changes in the footprint and other minor changes of the revised project, full model runs were not carried out to assess the overall effects of the specific changes. Consequently, modeling that would help to bracket ranges of uncertainties or (more importantly) assess propagation of uncertainties is still inadequate.

Many of our prior concerns about uncertainties pertained to impacts on fish. If those uncertainties have now been addressed in Chapter 11, they are difficult to evaluate because changes to that chapter have not been tracked in the public draft (below, p. 17).

There are also uncertainties with the data generated from model outputs, although values are often presented with no accompanying error estimates. This situation could be improved by presenting results from an ensemble of models and comparing the outputs.

Effects of climate change and sea-level rise on the proposed actions

Our 2014 review stated concerns that the Previous Draft underestimated effects of climate change and sea-level rise across the 50-year timeline of the BDCP. With the nominal duration shortened substantially, most of the projected impacts of climate change and sea-level rise may occur later. But climate-related issues remain.

First, the Current Draft is probably outdated in its information on climate change and sea-level rise. It relies on information used in modeling climate change and sea-level rise in the Previous Draft, in which the modeling was conducted several years before December 2013. The absence of the climate-change chapter (Chapter 29) in the Previous Draft from Appendix A in the Current Draft indicates that no changes were made. In fact, the approaches and assumptions in the Current Draft remained unchanged from the Previous Draft in order to ensure consistency and comparability across all the Alternatives, even though newer scientific information had become available.[6] Yet climatic extremes, in particular, are a topic of intense scientific study, illustrated by computer simulations of ecological futures[24] and findings about unprecedented drought[25]. The Current Draft does not demonstrate consideration of recently available climate science, and it defers to the Final Report analysis of future system operations under potential climate and sea-level conditions. In fact, the Current Draft generally neglects recent literature, suggesting a loose interpretation of "best available science."

Second, climate change and sea-level rise are now included in the No-Action Alternative, as they will transpire whether or not WaterFix moves forward. A changed future thus becomes the baseline against which Alternative 4A (and the others) are compared. Changes in outflow from the Delta due to seasonal effects of climate change and the need to meet fall X2 requirements are considered in Section 4.3.1. The difference in outcomes then depends on assumptions about the facility and operations of Alternative 4A and the other Alternatives. Sensitivity analyses indicate that the impacts of the different Alternatives are generally similar in comparison to the No Action Alternative under the range of climate projections considered.[6] Thus, "Delta exports would either remain similar or increase in wetter years and remain similar

[24] http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0024465

[25] Cook, B.I., Ault, T.R., and Smerdon, J.E., 2015, Unprecedented 21st century drought risk in the American Southwest and Central Plains: *Science Advances*, v. 1, doi:10.1126/sciadv.1400082.

or decrease in the drier years under Alternative 4A as compared to the conditions without the project." (p. 4.3.1-4). Such an inconclusive conclusion reinforces the need to be able to adapt to different outcomes. Simply because the Alternatives are expected to relate similarly to a No Action Alternative that includes climate change does not mean that the Alternatives will be unaffected by climate change.

Interactions among species, landscapes, and the proposed actions

The Previous Draft acknowledged the complexities produced by webs of interactions, but it focused on individual species, particular places, or specific actions that were considered in isolation from other species, places, or actions. Potential predator-prey interactions and competition among covered and non-covered fish species were not fully recognized. Confounding interactions that may enhance or undermine the effectiveness of proposed actions were overlooked. In our 2014 review we recommended describing and evaluating the potential consequences of such interactions, particularly in Chapters 11 (Fish and aquatic resources) and 12 (Terrestrial resources).

The Current Draft recognizes that mitigation measures for one species or community type may have negative impacts on other species or communities, and mitigation plans may be adjusted accordingly. But the trade-offs do not seem to be analyzed or synthesized. This emphasizes the need for a broader landscape or ecosystem approach that comprehensively integrates these conflicting effects.

Effects on San Francisco Bay, levees, and south-of-Delta environments

In 2014 we pointed to three kinds of impacts that the Previous Draft overlooked: (1) effects on San Pablo Bay and San Francisco Bay in relation to Delta tides, salinity, and migratory fish; (2) effects of levee failures on the proposed BDCP actions and effects of isolated conveyance on incentives for levee investments; and (3) effects of increased water reliability on crops planted, fertilizers and pesticides used, and the quality of agricultural runoff. The Current Draft responds in part to point 1 (in 11.3.2.7) while neglecting point 2 (above, p. 7) and point 3.

On point 3: Although the Current Draft considers how the project might affect groundwater levels south of the Delta (7.14 to 7.18), it continues to neglect the environmental effects of water use south of (or within) the Delta. Section 4.3.26.4 describes how increased water-supply reliability could lead to increased agricultural production, especially during dry years. Elsewhere, a benefit-cost analysis performed by ICF and the Battle Group[26] calculated the economic benefits of increased water deliveries to agriculture in the Delta. The Current Draft does not fully consider the consequences of these assumptions, or of the projections that the project may enhance water-supply reliability but may or may not increase water deliveries to agriculture (depending on a host of factors). We have been told that to consider such possibilities would be "too speculative" and that such speculations are explicitly discouraged in an EIR/EIS. Yet such consequences bear directly on the feasibility and effectiveness of the project, and sufficient information is available to bracket a range of potential effects. Our previous concerns are undiminished.

The impacts of water deliveries south of the Delta extend to the question of how each intake capacity (3,000, 9,000, or 15,000 cfs) may affect population growth in Southern

[26] Hecht, J., and Sunding, D., Draft Bay Delta Conservation Plan statewide economic impact report, August 2013.

California. Section 4.4.1-9 treats the growth-enabling effects of alternative 2D lightly, saying that additional EIS review would be needed for future developments.

Implementing adaptive management

In the Previous Draft, details about adaptive management were to be left to a future management team. In our 2014 review we asked about situations where adaptive management may be inappropriate or impossible to use, contingency plans in case things do not work as planned, and specific thresholds for action.

Although most ecological restoration actions have been shifted to California EcoRestore (p. 5), we retain these and other concerns about adaptive management under California WaterFix. If the mitigation measures for terrestrial resources are implemented as described, for example, they should compensate for habitat losses and disturbance effects of the project. The test will be whether the measures will be undertaken as planned, be as effective as hoped, and continue long enough to fully mitigate effects. This is where adaptive management and having contingency plans in place becomes critically important. It is not apparent that the mitigation plans include these components.

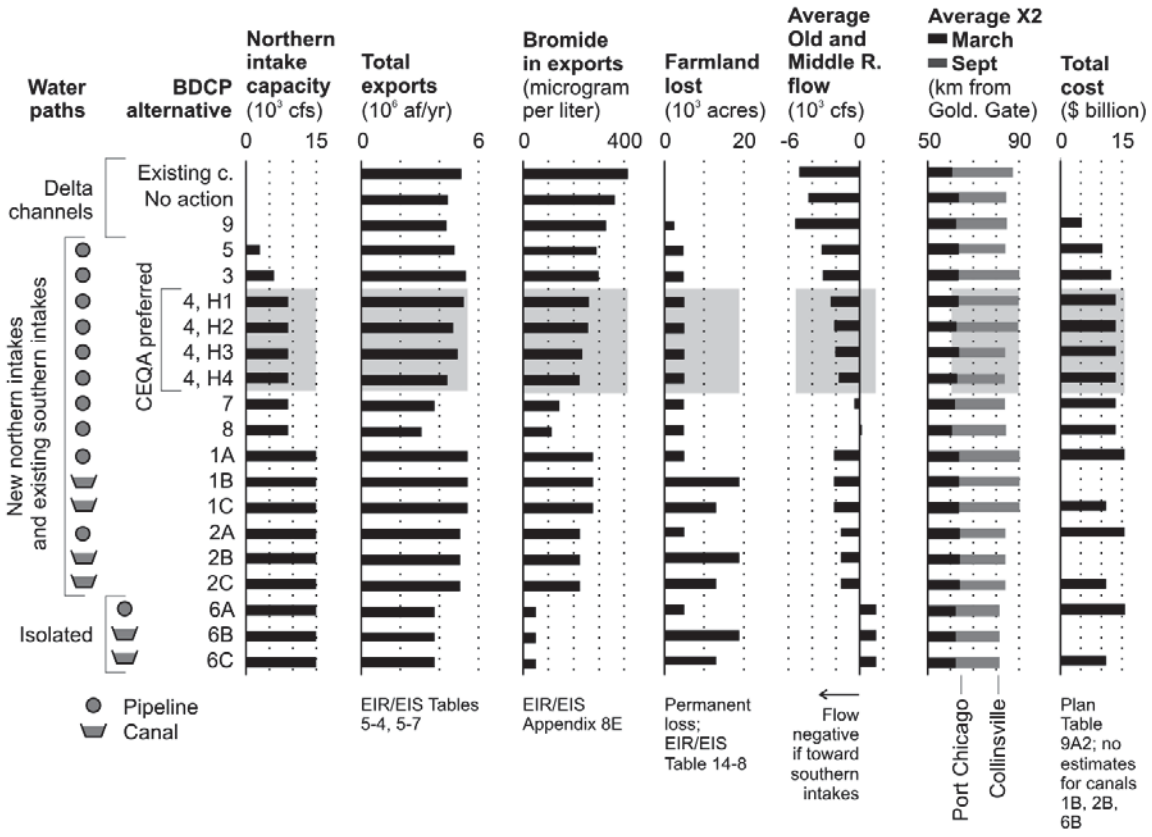
Reducing and managing risk

Our 2014 review advised using risk assessment and decision theory in evaluating the proposed BDCP actions and in preparing contingency plans. We noticed little improvement on this issue, just a mention that it might be considered later. This is not how the process should be used.

Comparing BDCP alternatives

The Previous Draft contained few examples of concise text and supporting graphics that compare alternatives and evaluate critical underlying assumptions. Rudimentary comparisons of alternatives were almost entirely absent. The Current Draft retains this fundamental inadequacy (p. 9).

Our 2014 review urged development and integration of graphics that offer informative summaries at a glance. We offered the example reproduced below. If the Current Draft contains such graphics, they would need to be ferreted out from long lists of individual pdf files. Because they are not integrated into the text where they are referenced in the Current Draft, the figures cannot readily illustrate key points.



COMMENTS ON INDIVIDUAL SECTIONS AND CHAPTERS

This final section of the review contains minimally edited comments on specific points or concerns. These comments are organized by Section or Chapter in the Current Draft. Many are indexed to pages in the section or chapter named in the heading.

Alternatives 4A, 2D, and 5A (Section 4)

It is good that the proposed alternatives are seen as flexible proposals, as it is difficult to imagine that any proposal for such a complex and evolving system could be implemented precisely as proposed. Some initial and ongoing modifications seem desirable, and unavoidable.

The operating guidance for the new alternatives seems isolated from the many other water management and environmental activities in and upstream of the Delta likely to be important for managing environmental and water supply resources related to Delta diversions. While it is difficult to specify detailed operations for such a complex system, more details on the governance of operations (such as the Real Time Operations process) would be useful. The operational details offered seem to have unrealistic and inflexible specificity. Presentations of delivery-reliability for different alternatives remain absent. Environmental regulations on Delta diversions have tended to change significantly and abruptly in recent decades, and seem likely to change in the future. How sensitive are project water supply and environmental performance to changes in operating criteria?

The collaborative science ideas seem philosophically attractive, but are not given much substance. Monitoring is mentioned, but details of organization, intent, and resources seem

lacking. Adequate funding to support monitoring, collaborative science, and adaptive management is a chronic problem. Section ES.4.2 states that "Proponents of the collaborative science and monitoring program will agree to provide or seek additional funding when existing resources are insufficient." This suggests that these activities are lower in priority than they should be.

The three new alternatives, 4A, 2D, and 5A, seem to have modest changes over some previous alternatives, with the exception of not being accompanied by a more comprehensive environmental program. In terms of diversion capacities, they cover a wide range, 3,000 cfs (5A), 9,000 cfs (4A), and 15,000 cfs (2D). The tables comparing descriptions of the new alternatives to previous Alternative 4 are useful, but should be supplemented by a direct comparison of the three new alternatives.

The new Sustainable Groundwater Management Act (SGMA) seems likely to increase demands for water diversions from the Delta to the south to partially compensate for the roughly 1.5-2 maf/year that is currently supplied by groundwater overdraft.

The State seems embarked on a long-term reduction in urban water use, particularly outdoor irrigation. Such a reduction in urban water use is likely to have some modest effects on many of the water-demand and scarcity impacts discussed.

The climate change analysis of changes in Delta inflows and outflows is useful, but isolating the graphs in a separate document disembodies the discussion. The fragmentation of the document by removing each Section 4 figure into a separate file is inconvenient for all, and makes integrated reading practically impossible for many.

The details of the alternative analyses seem mostly relevant and potentially useful. Much can be learned about the system and the general magnitude of likely future outcomes from patient and prolonged reading of this text. An important idea that emerges from a reading of the No Action Alternative is that the Delta, and California water management, is likely to change in many ways with or without the proposed project. The No Action and other alternatives also illustrate the significant inter-connectedness of California's water system. The range of impacts considered is impressive, but poorly organized and summarized.

The discussion of disinfection by-product precursor effects in Delta waters is improved significantly, but could be made more quantitative in terms of economic and public-health impacts.

The discussion on electromagnetic fields is suitably brief, while the tsunami discussion could be condensed.

The effects of the likely listing of additional native fish species as threatened or endangered seems likely to have major effects on project and alternative performance. These seem prudent to discuss, and perhaps analyze.

Is Alternative 2D, with 15,000 cfs capacity, a serious alternative? Does it deserve any space at all?

Table 4.1-8 implies that tidal brackish/*Schoenoplectus* marsh. Should some of this be considered tidal freshwater marsh?

The dynamics of the Delta are largely determined by water flows. The Current Draft acknowledges that water flows and salinity will change in complex ways. There are statements about how inflows, outflows, and exports will change in Alternative 4A in relation to baseline (No-Action) conditions (p. 4.3.8-13). What is the scientific basis on which these changes will be managed? Will models be used? What confidence should we have in current projections? Have the effects of droughts or deluges been considered?

4.3.7-10, line 13: Text on disturbing sediments and releasing contaminants needs to add nitrogen and phosphorus to the concerns.

Water quality (Chapter 8)

8-3, line 13: *Microcystis* is singled out as a cyanobacterium that can (but doesn't always) produce the toxin, myrocystin; however, there are other cyanobacteria that sometimes produce other toxins. Different genera can differ in the nutrient that limits their blooms (see 2014 letter by Hans Paerl in Science 346(6406): 175-176). For example, *Microcystis* blooms can be triggered by N additions because this species lacks heterocysts, while toxin-producing *Anabaena* blooms can be triggered by P additions, because *Anabaena* has heterocysts and can fix N. The frequently repeated discussion of cyanobacteria blooms needs to be updated. Also cite Paerl on page 8-45 line 8. Ditto on page 8-103 and 8-106 line 34.

8-8. In our earlier comments, we recommended that carbon be separated into its dissolved and particulate forms for consideration of water quality impacts because dissolved organic carbon (DOC) is the form most likely to react with chloride and bromide and result in formation of disinfection by-products. The section on bromide focuses on interactions with total organic carbon (TOC), rather than DOC. Carbon is primarily considered with respect to formation of disinfection by-products but carbon plays a central role in the dynamics of the Delta, affecting processes such as metabolism, acidity, nutrient uptake, and bioavailability of toxic compounds. Carbon cycling determines ecosystem structure and function in aquatic systems. It also modifies the influence and consequences of other chemicals and processes in aquatic systems. Dissolved organic carbon (DOC), for example, influences light and temperature regimes by absorbing solar radiation, affects transport and bioavailability of metals, and controls pH in some freshwater systems. Respiration of organic carbon influences dissolved oxygen concentrations and pH.

8-18, line 12 says that salt disposal sites were to be added in 2014; were they?

8-19 and 8-20: "CECs" is not defined and seems to be used incorrectly. Change "CECs" to "EDCs" on page 8-19 and to "PPCPs" on page 8-20.

8-21, line 18-19: Such a statement should be qualified. The conclusion that marine waters are N-limited and inland waters are P-limited is outdated. Recent papers, including the above, find more complex patterns.

8-22, lines 18 and 30: Choose either "cyanobacteria" or "blue-green algae;" using both will confuse readers who may perceive them as different.

8-23, lines 15-16: Say how the N:P ratio changed composition, not just that it did change composition.

8-23 through 8-25: Uncertainties (e.g., standard deviation or standard error of the mean) associated with the mean concentrations of DOC should be presented. It is impossible to interpret differences between the values that are presented without knowledge of the variation around the mean values (e.g., without knowledge of variation around the mean, it is difficult to evaluate whether DOC concentrations at south vs. north-of-Delta stations and Banks headworks differ from one another; 3.9 to 4.2 mg/L vs. 4.3 mg/L).

8-65, line 12: Specify if DO is for daytime or night, and for surface, bottom or mid-water column.

8-75, line 6: The failure to consider dissolved P (DP) should be addressed; there is much greater uncertainty. The adherence of some P to sediment does not prevent considerable

discharge of P as DP. Also on page 8-95 line 40, qualify predictions due to lack of consideration of DP.

8-82, line 4-5: It seems unlikely that current levels of *Microcystis* growth in the Delta are dependent on the exclusive uptake of ammonia. Temperature is one of the primary factors driving *Microcystis* blooms and global warming could promote bloom occurrence. Consider revising this section to, "Because it seems unlikely that current levels of *Microcystis* growth in the Delta are dependent on the exclusive uptake of ammonia, the frequency, magnitude and geographic extent of *Microcystis* under future scenarios is difficult to predict."

8-105, line 8: Would total nitrogen be dominated by nitrate just by increasing ammonia removal? Depending on redox and microbiota, why wouldn't nitrate be converted to ammonium?

A lot of attention is given to factors controlling *Microcystis* blooms in this chapter but little attention is given to its toxicity. Just as factors controlling blooms are not fully understood, the regulating factors of cellular toxin contents remain poorly understood. As a result, the impact of blooms on the environment can vary (e.g., large blooms of non-toxic or low toxin organisms may have impacts on environmental variables such as nutrient uptake and dissolved oxygen consumption while small blooms of highly toxic organisms could impact food webs) [see: Ma et al. (2015) Toxic and non-toxic strains of *Microcystis aeruginosa* induce temperature dependent allelopathy toward growth and photosynthesis of *Chlorella vulgaris*. Harmful Algae 48: 21–29].

Fish and aquatic resources (Chapter 11)

We found individual conclusions or new analyses difficult to identify in this key chapter because changes to it were not tracked in the public version of the Current Draft and there was no table of contents that could have assisted in side-by-side comparison with the Previous Draft.

Effects of temperature

We noticed more emphasis on temperature concerning the fish 'downstream' impacts (but without tracked changes this becomes difficult to document).

The main temperature variable used expresses the percentage of time when monthly mean temperatures exceed a certain rate or fall within a certain boundary. The biological impact, however, is difficult to assess with these numbers. If all of the change occurred just during operations or just during one day, the biological impact could be much different than a small change every day (provided by using means). Graphs of changes and listing of extreme highs and lows during a model run would have more biological meaning. Also, comparisons were made using current baseline conditions and did not consider climate change effects on temperatures.

Fish screens

It is unclear how (and how well) the fish screens would work. The description of fish screens indicates that fish >20 mm are excluded, but what about fish and larvae that are <20 mm, as well as eggs? Table 11-21 seems out of date, because some fish screens appear to have been installed, but data on their effects are not given. Despite the lack of specific data on how well screens function, the conclusion that there will be no significant impact is stated as certain (e.g., page 1-100 line 38).

Here, as in many other places, measures are assumed to function as planned, with no evidence to support the assumptions. The level of certainty seems optimistic, and it is unclear whether there are any contingency plans in case things don't work out as planned. This problem persists from the Previous Draft.

Invasive plants

Cleaning equipment is mentioned, but it is not specifically stated that large machinery must be cleaned before entering the Delta. Section 4.3.8-358 says equipment would be cleaned if being moved within the Delta. Cleaning is essential to reduce transfer of invasive species; a mitigating measure is to wash equipment, but it must also be enforced.

Weed control (fire, grazing) is suggested, but over what time frame? It may be needed in perpetuity. That has been our experience at what is considered the world's oldest restored prairie (the 80-yr-old Curtis Prairie, in Madison, WI).

Weed invasions can occur after construction is completed; how long will the project be responsible for weed control? 3-5 years won't suffice.

4.3.8-347. Herbicides are prescribed to keep shorebird nesting habitat free of vegetation, but toxic effects of herbicides on amphibians etc. are not considered.

4.3.8-354. Impacts of invasive plants seem underestimated. Impact analysis implies that the project disturbance area is the only concern, when dispersal into all areas will also be exacerbated. At the Arboretum, a 1200-ac area dedicated to restoration of pre-settlement vegetation, invasive plants are the main constraint. A judgment of no significant impact over just the disturbance area is overly optimistic.

4.3.8-356. Does not mention need to clean equipment to minimize import of seeds on construction equipment.

Cryptic acronym and missing unit

Figure 2: SLR x year: y axis lacks units; reader has to continue on to table 11-20 to find that it is cm.

Terrestrial biological resources (Chapter 12)

Effects on wetlands and waters of the United States (WOTUS)

Page 12-1, line 18-19 says: "Under Alternatives 2D, 4 , 4A , and 5A, larger areas of non-wetland waters of the United States would be filled due to work in Clifton Court Forebay; however, the Forebay would ultimately expand by 450 acres and thus largely offset any losses there." Is the assumption that, acre for acre, all jurisdictional waters are interchangeable, whether of different type or existing vs. created? The literature does not support this assumption.

The text argues that the wetlands would be at risk with levee deterioration, sea-level rise, seismic activity, etc. But the solution is for "other programs" to increase wetlands and riparian communities. What if this project causes the problem, e.g. via vibration?

CM1 alternative 4A would fill 775 acres of WOTUS (491 wetland acres); Alt 2D would fill 827 (527 wetland) + 1,931 ac temporary fill at Clifton Court Forebay; Alt 5A would fill 750 (470 wetland). That's a lot of area. The timing and details of mitigation measures are not provided. References to the larger Delta Plan suggest that compensations would come at unknown times. Piecemeal losses such as indicated here: "Only 1% of the habitat in the study area would be filled or converted" (Chapter 12, line 29, page 12-22) is how the US has lost its historical wetlands. What are the overall cumulative impacts of wetland losses in the Delta? What is the tipping point beyond which further wetland losses must be avoided? The proposed project is one part of the broader array of management actions in the Delta and should be considered in that broader context.

Habitat descriptions

How will mudflats be sustained for shorebirds? Exposed mud above half-tide can become vegetated rapidly. In the Delta, the bulrush *Schoenoplectus californicus* tolerates nearly continuous tidal submergence.

Are soils clayey enough for the proposed restoration of up to 34 acres of vernal pool and alkali seasonal wetland near Byron? These areas will need to pond water, not just provide depressions.

12-243, line 18: How would adding lighting to electrical wires eliminate any potential impact to black rails? This mitigation is overstated.

Several of the species accounts (e.g., bank swallow) indicate that there is uncertainty about how construction or operations will impact the species. In most cases, monitoring is proposed to assess what is happening. But to be effective, the monitoring results need to be evaluated and fed into decision-making, as visualized in the adaptive-management process. There is little explicit indication of how this will be done or funded.

Land use (Chapter 13)

Alternative 4A would allow water diversion from the northern Delta, with fish screens, multiple intakes, and diversions limited to flows that exceed certain minima, e.g., 7000 cfs. This would reduce flood-pulse amplitudes and, presumably, downstream flooding. How does this alter opportunities for riparian restoration? Which downstream river reaches are leveed and not planned to support riparian restoration? Where would riparian floodplains still be restorable?

Over what surface area does the pipeline transition to the tunnel? At some point along the pipeline-tunnel transition, wouldn't groundwater flow be affected?

Up to 14 years of construction activities were predicted for some areas (e.g., San Joaquin Co.); this would have cumulative impacts (e.g., dewatering would affect soil compaction, soil carbon, microbial functions, wildlife populations, and invasive species). What about impacts of noise on birds; e.g., how large an area would still be usable by greater sandhill cranes?

State how jurisdictional wetlands have been mapped and how the overall project net gain or net loss of wetland area has been estimated. If mitigation consists only of restoration actions in areas that are currently jurisdictional wetlands, then there would be an overall net loss of wetland area due to the project. A mitigation ratio >1:1 would be warranted to compensate for reduced wetland area. This was also a concern for Chapter 12.

Up to 277 ac of tidal wetlands are indicated as restorable; text should indicate if these are tidal freshwater or tidal brackish wetlands (or saline, as is the typical use of "tidal wetlands").

13-19. On the need to store removed aquatic vegetation until it can be disposed: there are digesters for this purpose, and they might be efficient means of mitigation if management of harvested aquatic plants will be long-term. A waste product could be turned into a resource (methane fuel).

13-19, line 12: Text says that "predator hiding spots" will be removed. What are these?

13-19, line 20: What are the E16 nonphysical fish barriers? An electrical barrier?

13-20, line 19: Boat-washing stations are mentioned; would these discharge pollutants (soap, organic debris?)

Testimony by City of Antioch

For SWRCB Delta Flow Criteria
Informational Proceeding
Submitted February 16, 2010
For hearings beginning March 22, 2010

Overview

- Antioch has taken fresh drinking water from the Delta since the 1860s
- Infrastructure and flow diversions have changed distribution and timing of freshwater flows
- Historic conditions were far fresher than current conditions
- Quality of water at Antioch has declined markedly

Why Is This Important ?

- Characterizations of the Delta as "historically saline" are false
- Native species are adapted to historical conditions, so historic salinity and flow patterns must be considered in establishing appropriate flow and salinity standards

What Should Happen ?

- SWRCB should review and incorporate historic salinity data into its analyses
- SWRCB should use historic data to establish an historic baseline of water quality and flows for both fisheries and drinking water quality standards

What Should Happen ?

- SWRCB should ensure that flows are not reduced, nor salinity increased, beyond levels assured by D-1641 and current X2 requirements
- In fact, the City of Antioch asks the SWRCB to establish flow and salinity standards in line with the Delta's historic fresh condition
- SWRCB should state that characterizations of the Delta as "historically saline" are false
- SWRCB should consider using Antioch's gauging station as a 'point of interest' to gauge flow and salinity conditions

Systemic Changes Have Influenced Flows and Salinity

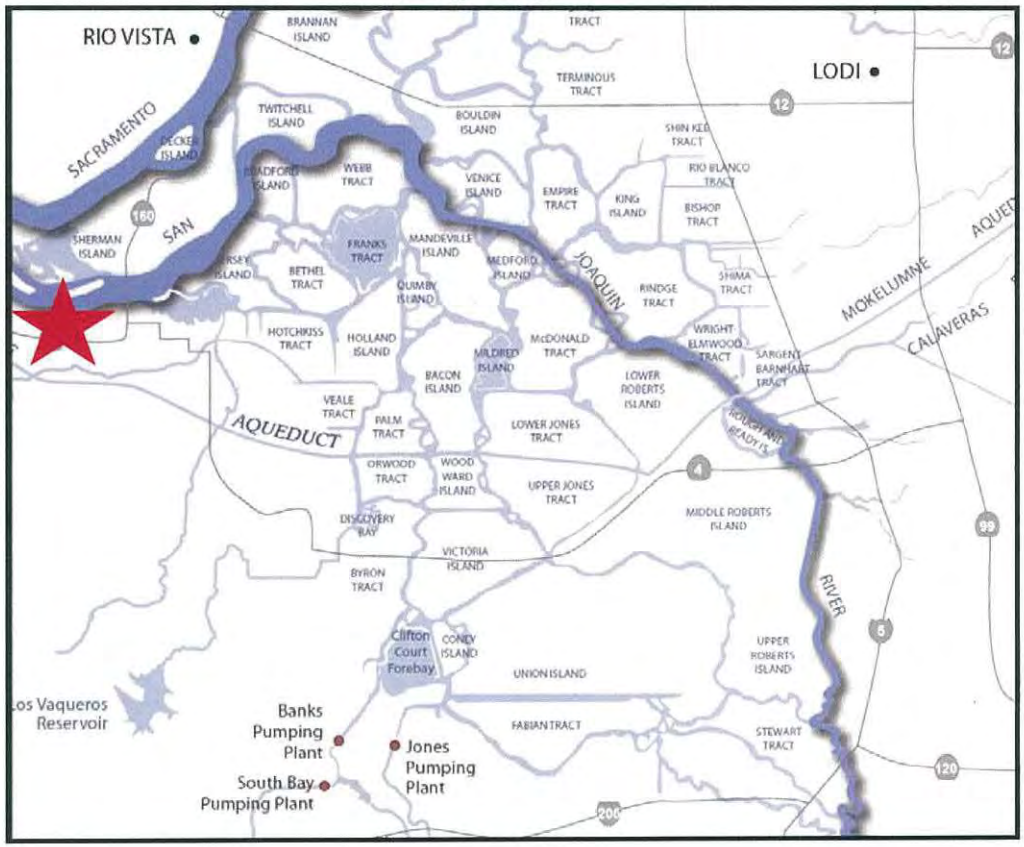
Factors Influencing Salinity

- Hydrology
- Changes to the Delta landscape
- Water Management
  - Exports
  - Diversions
  - Reservoir Storage

The Delta Landscape is Dramatically Different

1873

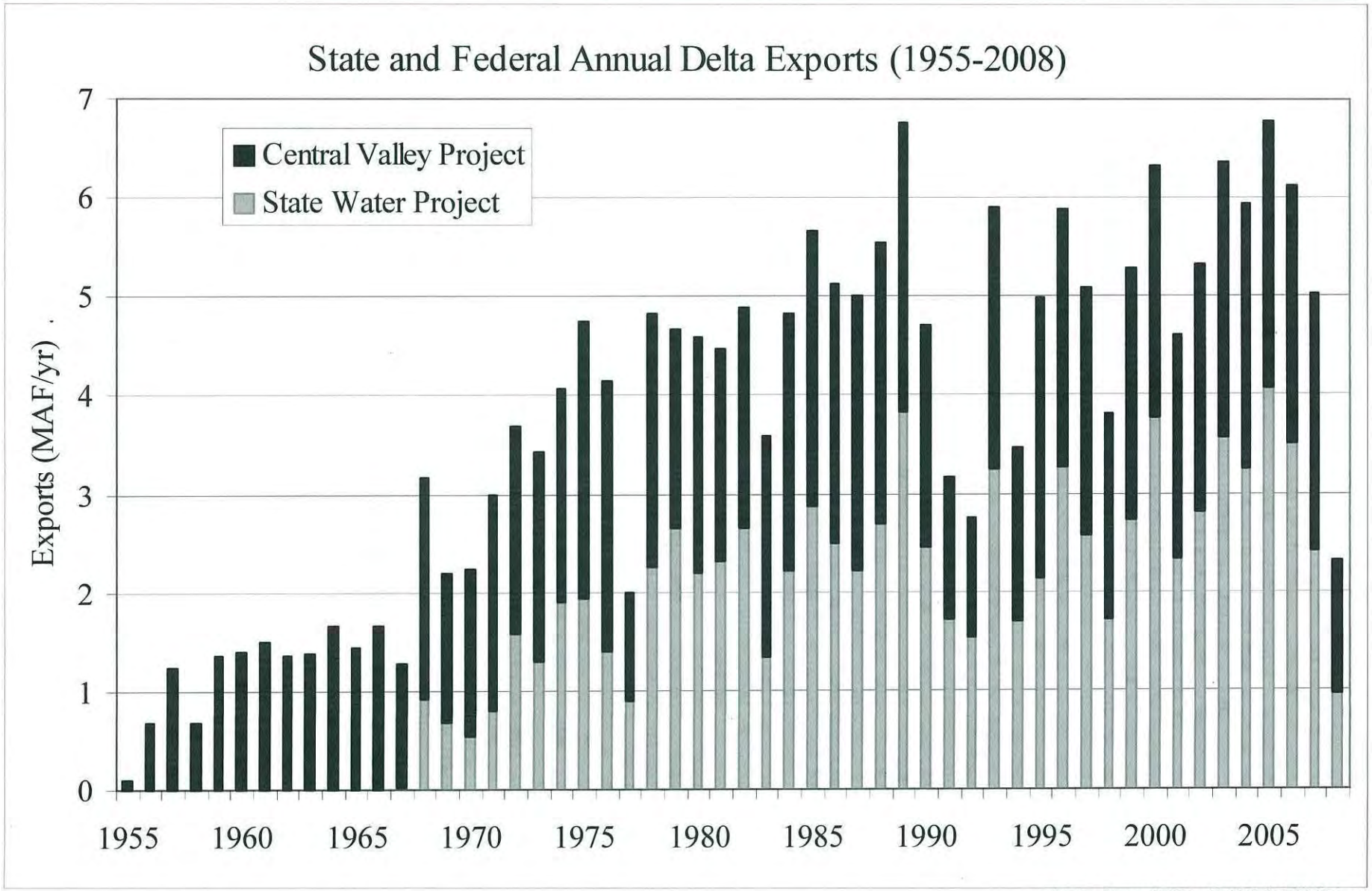
2010



Approximate location of City of Antioch's water intake

Source: left panel: DWR archives presented to Delta Vision (2008) final report; right panel: Delta Vision (2008)

Water Exports Have Increased and Remove Fresh Water from Delta



Data from IEP's DAYFLOW Program

Pre-1918, Fresh Water was Available in Western Delta Nearly Year-round

Antioch-218

Location	Quotation
Antioch, CA	"*From early days, Antioch has obtained all or most of its domestic and municipal water supply from the San Joaquin River immediately offshore from the city… However, conditions were fairly satisfactory in this respect until 1917, when the increased degree and duration of saline invasion began to result in the water becoming too brackish for domestic use during considerable periods in the summer and fall.*" (DPW, 1931, pg. 60)
Western Delta	"*The dry years of 1917 to 1919, combined with increased upstream irrigation diversions, especially for rice culture in the Sacramento Valley, had already given rise to invasions of salinity into the upper bay and lower delta channels of greater extent and magnitude than had ever been known before.*" (DPW, 1931, pg. 22) "*It is particularly important to note that the period 1917-1929 has been one of unusual dryness and subnormal stream flow and that this condition has been a most important contributing factor to the abnormal extent of saline invasion which has occurred during this same time.*" (DPW, 1931, pg. 66)
Carquinez Strait (Western Delta)	"*Under natural conditions, Carquinez Straits marked, approximately, the boundary between salt and fresh water in the upper San Francisco Bay and delta region…*" (Means, 1928, pg. 9) "*For short intervals in late summer of years of minimum flow, salt water penetrated at lower river and delta region, and in wet seasons the upper bay was fresh, part of the time, to the Golden Gate.*" (Means, 1928, pg. 9 & pg. 57)

DPW (1931). Bulletin No. 27. State of California, Department of Public Works, See http://www.archive.org/details/variationcontrol27calirich
Means, T. (1928). Salt Water Problem: San Francisco Bay and Delta of Sacramento and San Joaquin Rivers, San Francisco, California, April 1928. A report prepared for the Association of Industrial Water Users of Contra Costa and Solano Counties.

Pre-1918, Fresh Water was Available in Western Delta Nearly Year-round

Location	Quotation
Benicia, CA (Suisun Bay)	"*In 1889, an artificial lake was constructed. This reservoir, filled with fresh water from Suisun Bay during the spring runoff of the Sierra snow melt water …*" (Dillon, 1980, pg. 131) "*…in 1889, construction began on an artificial lake for the* [Benicia] *arsenal which would serve throughout its remaining history as a reservoir, being filled with fresh water pumped from Suisun Bay during spring runoffs of the Sacramento and San Joaquin Rivers which emptied into the bay a short distance north of the installation.*" (Cowell, 1963, pg. 31)
Pittsburg, CA	"*From 1880 to 1920, Pittsburg (formerly Black Diamond) obtained all or most of its domestic and municipal water supply from New York Slough [near Pittsburg at the confluence of the Sacramento and San Joaquin Rivers] offshore.*" (DPW, 1931, pg. 60) "*There was an inexhaustible supply of river water available in the New York Slough* [near Pittsburg at the confluence of the Sacramento and San Joaquin Rivers], *but in the summer of 1924 this river water showed a startling rise in salinity to 1,400 ppm of chlorine, the first time in many years that it had grown very brackish during the dry summer months.*" (Tolman and Poland, 1935, pg. 27)

Cowell, J. W. 1963. History of Benicia Arsenal: Benicia, California: January 1851 – December 1962. Berkeley, Howell-North Books
Dillon, R. 1980. Great Expectations: The Story of Benicia, California, Fresno, California. 241 pp.
Tolman, C. F. and J. F. Poland. 1935. *Investigation of the Ground-Water Supply of the Columbia Steel Company Pittsburg, California.* Stanford University, California, May 30, 1935

Testimony from Antioch Lawsuit: Pre-1918, Fresh Water was Available at Antioch Year-round

- Antioch lawsuit in 1920: Town of Antioch [plaintiff] v. Williams Irrigation District et al. [defendants] (1922, 188 Cal. 451)

- Plaintiff alleged that the upstream diversions were causing increased salinity intrusion at Antioch

- Testimony from defendants in the Antioch lawsuit (from the supporting Supreme Court record on file at the State Archives) (CCWD, 2010)
  - In the late 1800s, water at Antioch was known to be brackish at high tide during certain time periods.
  - Antioch was able to pump fresh water at low tide throughout the year, with the possible exception of the fall season during one or two dry years.
  - Water at Antioch was apparently fresh at low tide at least until around 1915 (when the pumping plants started pumping continuously, regardless of tidal stage).

Testimony from Antioch Lawsuit: Pre-1918, Fresh Water was Available at Antioch in Fall

Antioch-218

Testimony from plaintiff in the Antioch lawsuit (from the supporting Supreme Court record on file at the State Archives)

- Antioch's freshwater supply was obtained directly from the western Delta from about 1866 to 1918 (pg. 47-48).

- Prior to 1918, freshwater was available at Antioch even during dry years and in the fall (pg. 23-24).

Date	Location	Salinity (ppm)
1913 (Sept; a dry year)	Antioch	66
1916 (Aug. 5th; wet year)	Antioch	22.3
1916 (Aug. 9th; wet year)	Antioch	12.3
1916 (Sept. 19th; wet year)	Antioch	101.3
1917 (Sept. 14th; wet year)	Antioch	141.6

Testimony from Antioch Lawsuit: Post-1918, Upstream Diversions Drastically Increased Salinity Intrusion

Testimony from plaintiff in the Antioch lawsuit (continued)

•After 1918, salinity abruptly increased during irrigation (rice cultivation) season, and returned to a potable level after irrigation ceased (pg. 18-20)

Date	Location	Salinity (ppm)
1918 (Sept. 25th; dry year)	Antioch	1360
1920 (mid-July; critical year)	Pittsburg, CA	4500
1920 (end-July; critical year)	Pittsburg, CA	6000
1920 (mid-Aug.; critical year)	Pittsburg, CA	9500
1920 (end-Sept.; critical year)	Pittsburg, CA	2500
1920 (during rice irrigation; critical year)	Antioch	12,500
1920 (end-Oct, after irrigation; critical year)	Pittsburg, CA	fresh

Measurements at Pittsburg, CA, are from the Great Western Electro Chemical Co.

•Information on the effect of upstream diversions is also confirmed by records in the plaintiff's testimony from C&H Sugar (see CCWD 2010).

Testimony from Antioch Lawsuit: Water at Antioch is from Sacramento River

- Testimony from plaintiff in the Antioch lawsuit (continued)

  - Plaintiff testimony asserted that in 1920 "the amount of water which the San Joaquin carried was dependent entirely upon the amount of water in the Sacramento," and that "the San Joaquin itself carried practically no water at all. In other words, it was demonstrated that the amount of fresh water which came into the San Joaquin and down as far as the Town of Antioch was practically all Sacramento River water." (pg. 15)

  - Water was delivered to the San Joaquin River from the Sacramento River via two main conduits: Georgiana Slough and Three Mile Slough. 1920 flow rates in these sloughs were the basis of the assertion quoted above.

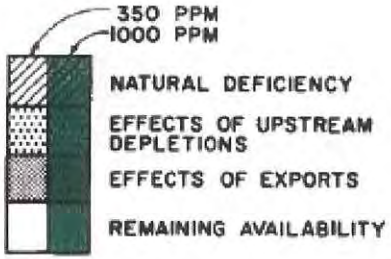
Testimony from Antioch Lawsuit: Water at Antioch is from Sacramento River

- "It is necessary here to state some additional facts to explain how this pollution comes about and why diversions from the Sacramento River may or do affect the volume and quality of the water flowing down the San Joaquin River . . . From the Sacramento River at two points, one about eight [Three Mile] and the other about twenty - three miles [Georgiana] above its mouth, sloughs diverge, into which parts of its waters escape and flow through the said sloughs and into the San Joaquin River at points several miles above the place of the diversion by the city of Antioch." Town of Antioch v. Williams Irrigation District et al. (1922) 188 Cal. 451, 455

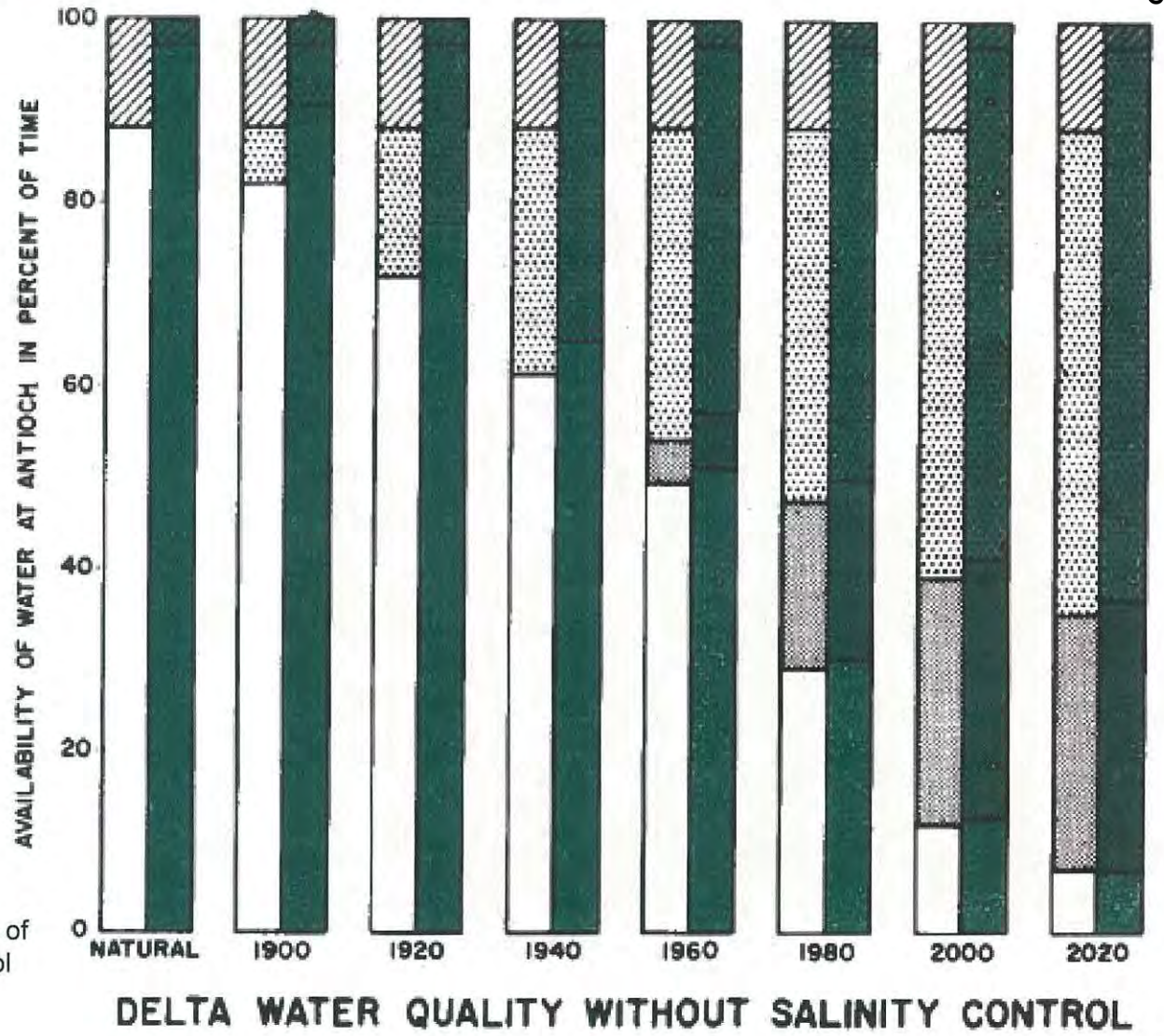
Freshwater Availability has Declined

DWR (1960, pg. 13) found that freshwater was available at San Joaquin River at Antioch:

- 85% of the time under "natural" conditions
- 80% of the time in 1900
- 60% of the time by 1940
- 50% of the time by 1960



NOTE: QUALITY LIMITS IN PARTS OF CHLORIDES PER MILLION PARTS OF WATER

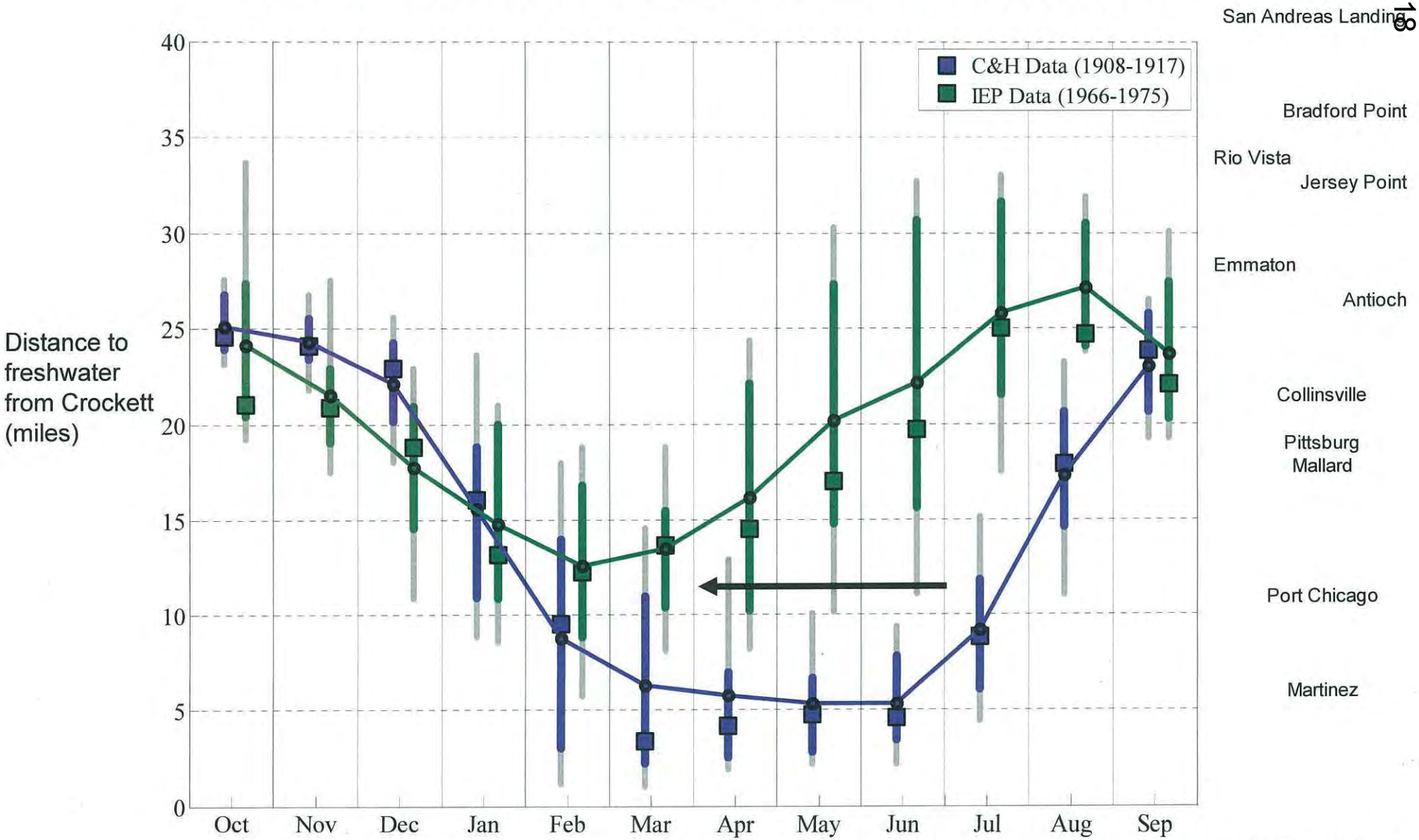


Note:- report did not include effects of reservoir releases for salinity control

DWR (1960). Bulletin No. 76. State of California. See http://www.deltacorridors.com/uploads/Bulletin_No._76_Delta_Water_Facilities-Color.pdf

Salinity Intrusion Occurred Earlier by 1975

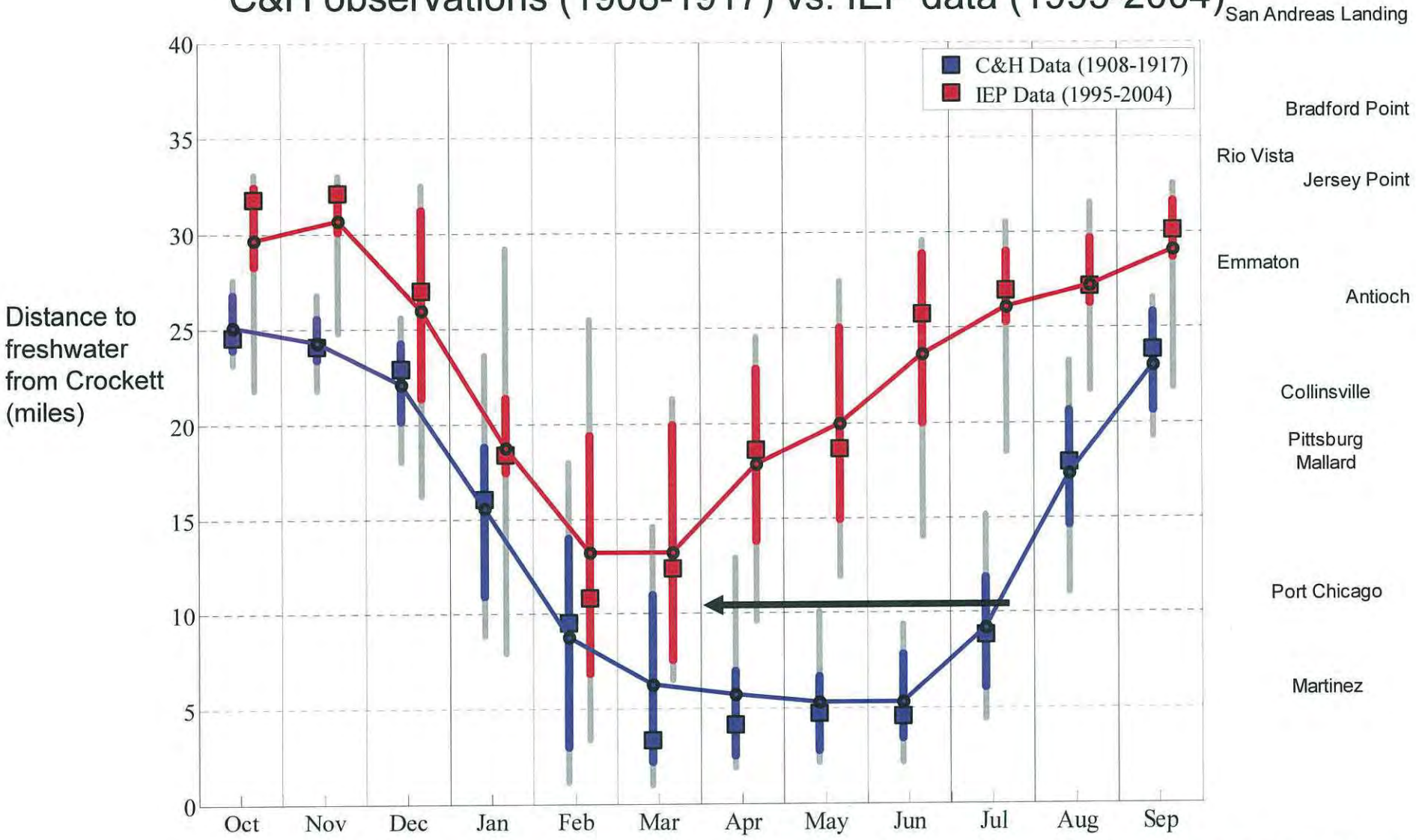
Distance to freshwater from Crockett (~25 miles west of Antioch)
C&H observations (1908-1917) vs. IEP data (1966-1975)



Source: CCWD Salinity Report (2010)

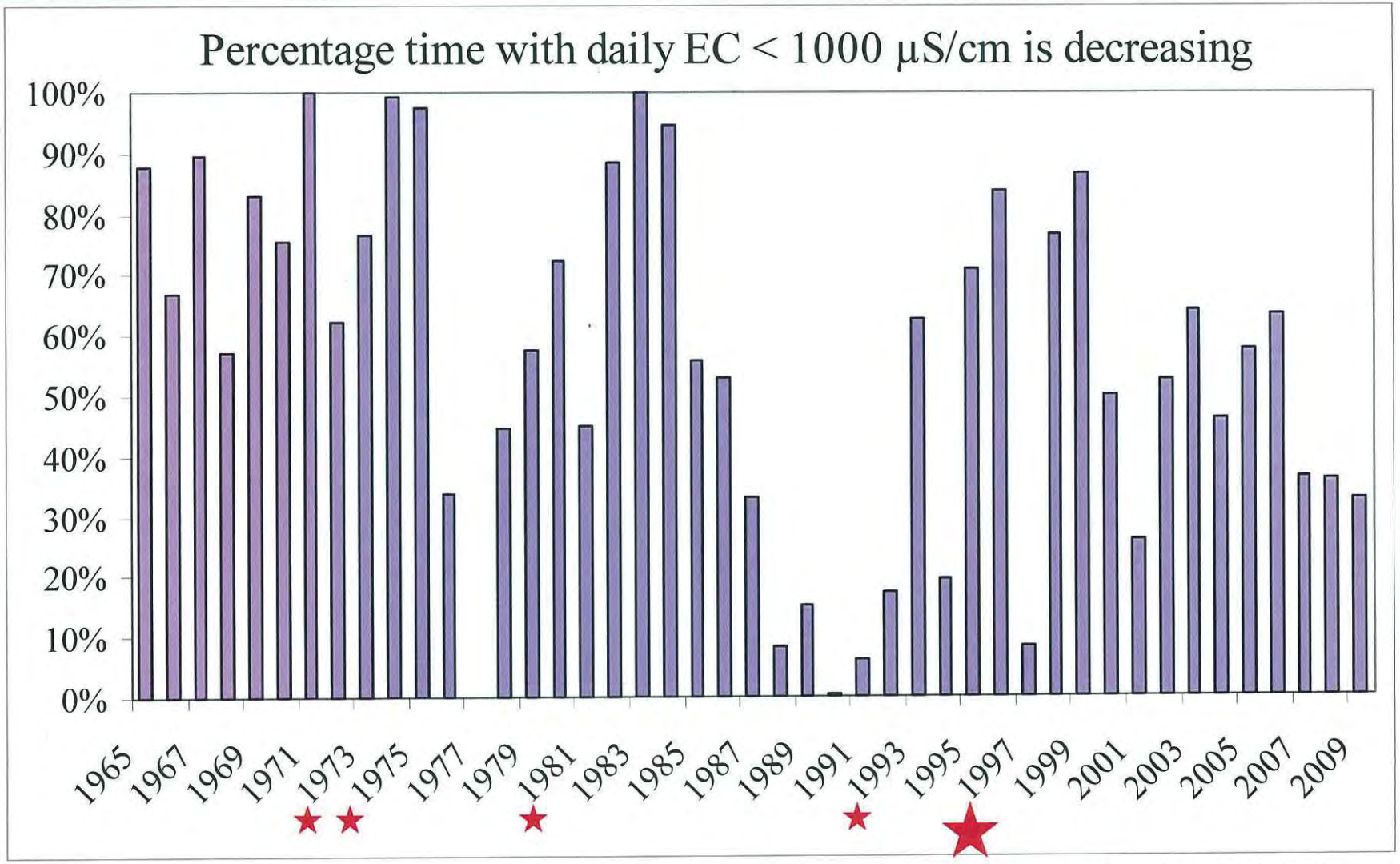
Salinity Intrusion Occurred Even Earlier and Extended Farther by 2004

Distance to freshwater from Crockett (~25 miles west of Antioch) C&H observations (1908-1917) vs. IEP data (1995-2004)

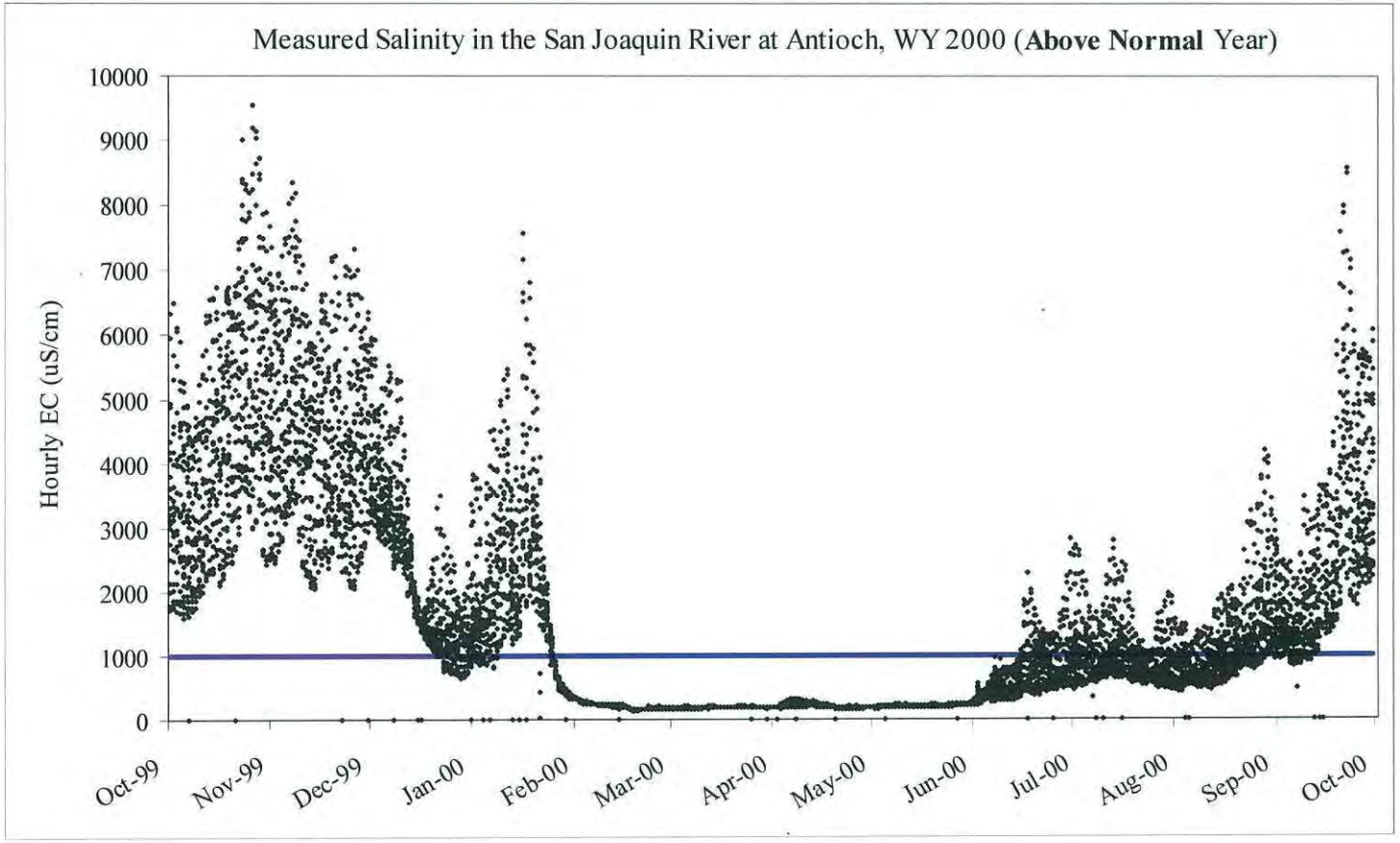


Source: CCWD Salinity Report (2010)

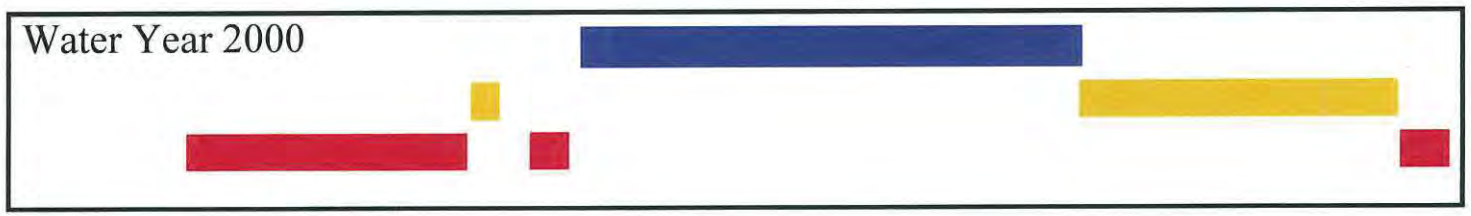
Freshwater Availability at Antioch Continues to Decline



Even in Above Normal Years, Freshwater is Now Unavailable in Summer/Fall



Freshwater Criterion
< 1000 EC

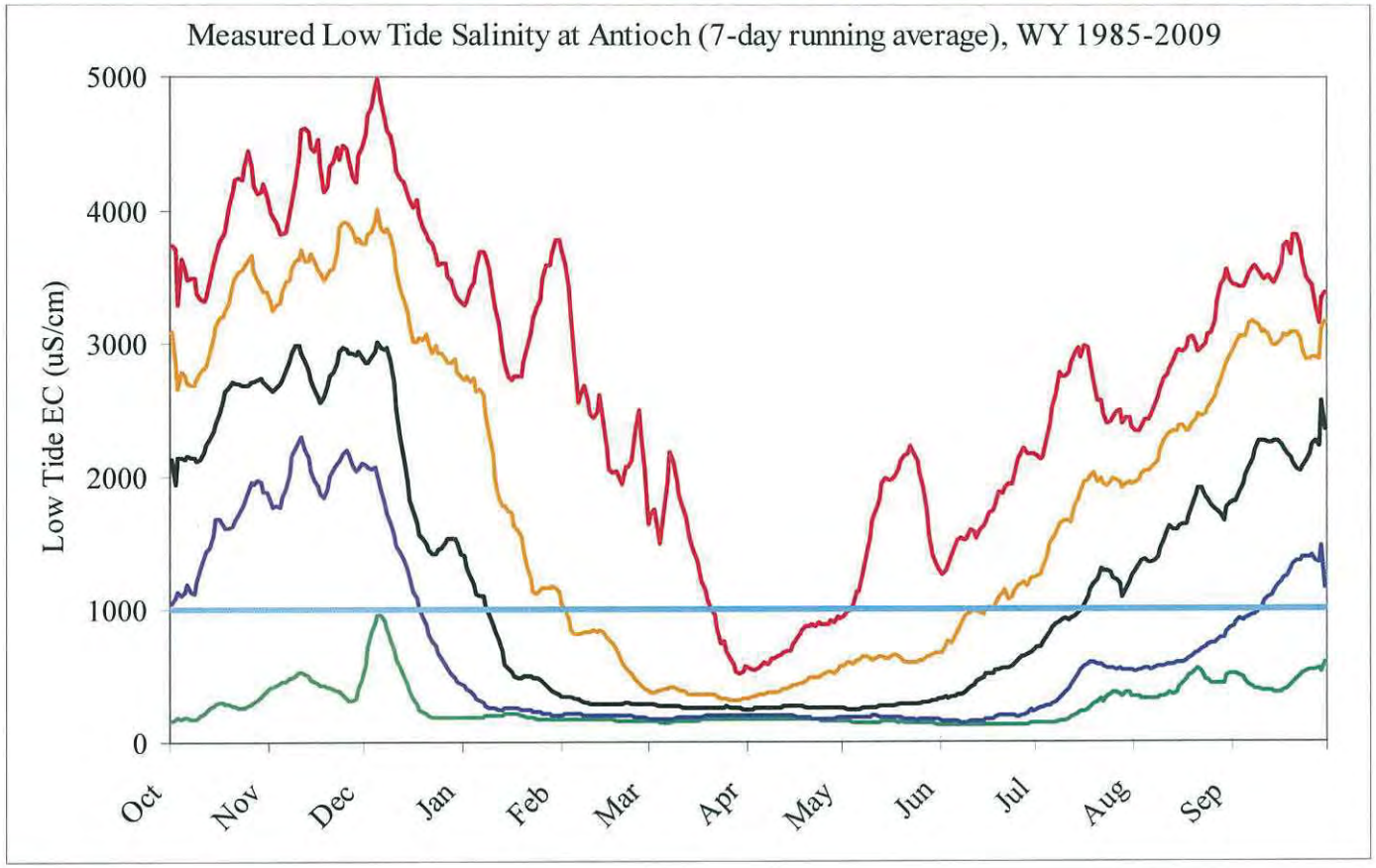


< 1000 EC all day
< 1000 EC low tide only
> 1000 EC all day

Pre-1918,
freshwater was
available year-round

Data from CDEC

Freshwater is Now Available at Antioch Far Less Often



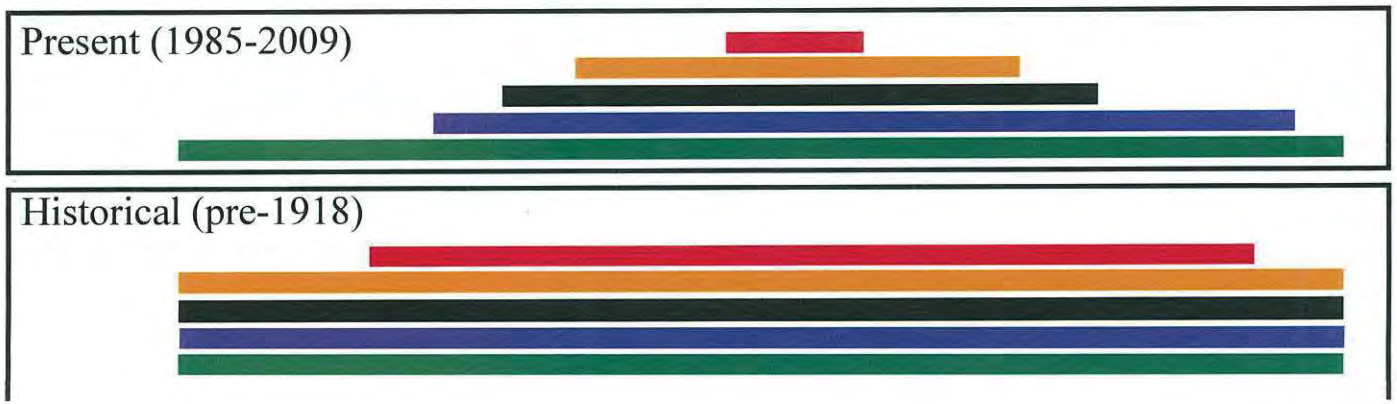
Driest 10%

Driest 25%

Median

Wettest 25%

Wettest 10%



Pre-1918, freshwater was available year-round at low tide in all but driest years

Data from CDEC

Summary: The Western Delta was Historically Fresher

- Pre-1918, freshwater was almost always available at least at low tide.
- Between 1918 and the late 1930s, drought conditions, upstream water diversions, and channelization increased the salinity of water at Antioch.
- By 1940 the drought receded, but salinity at Antioch remained elevated.
- Salinity continues to increase in recent years at Antioch.
- The fraction of time that water at Antioch is suitable for use (when salinity is < 250 mg/L chlorides or 1000 µS/cm EC) has declined significantly.
- "Historic" Delta was significantly fresher than the current Delta.

Conclusions

Consider historic fresh conditions to:

Establish Delta outflows and inflows to protect species adapted to these conditions.

Establish the criteria (volume, timing, quality) required by SB 7X 1.

Establish drinking water quality standards for the Delta.