Only Slide 27 is admitted into the evidentiary record as stated in the February 21, 2017 Ruling Letter

Questions regarding intakes and tunnels as presented

Nicole S. Suard, Esq. for Snug Harbor Resorts, LLC

Will the construction and/or operation of the proposed intakes and tunnels injure or impact water rights holders…
****In the construction area?***
****Downstream of intakes drinking water resources?***
****Area-wide drinking water aquifer?***
****Downstream agricultural water resources?***

Primary issue: If new intakes became operable, how MUCH water does DWR/USBR propose to divert from the Sacramento River, and how MUCH water will be left to flow through the North Delta waterways of Sacramento River, Sutter Slough, Steamboat Slough, Miner's Slough and Georgiana Slough?

Primary Issue: HOW that water is diverted…intakes, tunnels, forebays and really huge local impacts

Qualifications and work with MWD

Summary of Professional Qualifications of
John V. Bednarski

Education

B.A. Chemistry, Claremont McKenna College, Claremont, California (1979), M.S. in Environmental Engineering (1981), and Masters of Public Administration (1997) from University of Southern California, Los Angeles, California.

Professional Affiliations

Registered California Civil Engineer, Number C48799

Current Experience (2013 to Present) Metropolitan Water District of Southern California

Section Manager – Water Supply Initiatives
From 2013 to present: Responsible for leading Metropolitan's engineering support to DWR for the California Water Fix. Lead engineering staff on the development of the Conceptual Engineering Report dated July 1, 2015 as a supporting document to the EIR/EIS for the program. Work included reconfiguring river intakes, tunnels and pumping systems to achieve budget, schedule and environmental commitments for the program. Since 2012, I have participated as a member of the Design and Construction Enterprise, formerly the Chief Program Management Team charged with planning and implementing the planning efforts of the CWF facilities.

Responsible for planning and directing all engineering activities related to Metropolitan's potential 150MGD regional recycled water program which will eventually include design and construction of advanced water treatment facilities and approximately 60 miles of distribution pipelines in a complex urban environment.

Previous Experience (1991 to 2013) Metropolitan Water District of Southern California

Section Manager- Infrastructure Reliability:
From 2010 to 2013: Plan and manage through five direct reports the work of approximately 100 staff for all construction management activities for Metropolitan Capital Investment Program which includes approximately $100 million in annual construction work. Served as Metropolitan's project sponsor on numerous high-profile construction projects which included regular participation in meetings, discussions and negotiations with construction contractor counterparts in the areas of project "partnering", dispute resolution, and project/program close-out.

In your opinion, Does the conveyance plan TAKE surplus water from the Delta or LEAVE "Surplus Water" in the Delta?

Previous Page Next Page 12 / 63 1960Bulletin_No._76_Delta_Water_Facilities-Color.pdf

The Delta — its role in California's water development

In 1959, the State Legislature enacted the California Water Resources Development Bond Act to finance construction of the State Water Resources Development System. The bond act was approved by the California electorate in November 1960. The State Water Facilities, the initial features of this system, will complement continuing local and federal water development programs and include the very necessary works in the Delta.

One of the principal objectives of the State Water Resources Development System is to conserve water in areas of surplus in the north and to transport water to areas of deficiency to the south and west. The Delta is important in achieving this objective, since it receives all of the surplus flows of Central Valley rivers draining to the ocean during winter and spring months and is the last location where water not needed in the Delta or upstream therefrom can conveniently be controlled and diverted to beneficial use. Surplus water from the northern portion of the Central Valley and north coastal rivers will be conveyed by the natural river system to the Delta, where it must be transferred through Delta channels to export pumping plants without undue loss or deterioration in quality. Aqueducts will convey the water from the Delta to off-stream storage and use in areas of deficiency to the south and west.

In addition to being an important link in the interbasin transfer of water, the Delta is a significant segment of California's economy, and its agricultural, municipal, and industrial water supply problems, and flood control and related problems, must be remedied. A multipurpose system of Delta water facilities, which will comprise one portion of the State Water Resources Development System, is the most economical means of transferring water and solving Delta problems.

If conveyance project were built, is it your understanding that the design of the project is based on a plan To leave no more than 4500 cfs Delta outflow on the combined rivers of Sacramento and San Joaquin?

www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/petitioners_exhibit/dwr/dwr_5_errata.pdf

DELTA OUTFLOW ASSUMPTIONS

NAA and H3 (D-1641 and BiOps)

	W	AN	BN	D	C
Oct	4000/Fall X2	4000/Fall X2	4000	4000	3000
Nov	4500/Fall X2	4500/Fall X2	4500	4500	3500
Dec	4500	4500	4500	4500	3500
Jan	4500	4500	4500	4500	4500
Feb	4000	4000	4000	4000	4000
Mar	4000	4000	4000	4000	4000
Apr	4000	4000	4000	4000	4000
May	4000	4000	4000	4000	4000
Jun	4000	4000	4000	4000	4000
Jul	8000	8000	6500	5000	4000
Aug	4000	4000	4000	3500	3000
Sep	3000/Fall X2	3000/Fall X2	3000	3000	3000

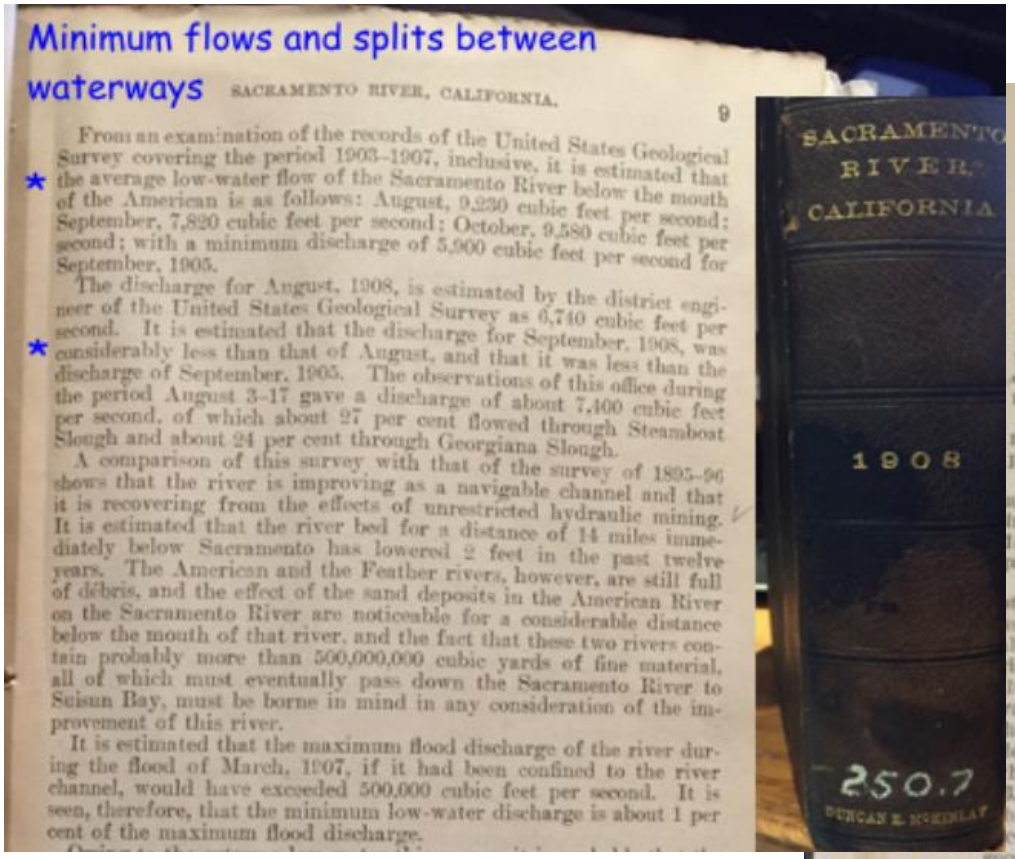
- D-1641 Feb – Jun X2
- USFWS BiOp Fall X2 in W (74 km), AN (81 km) years

Boundary 2

	W	AN	BN	D	C
Oct	11400	11400	7100	7100	7100
Nov	11400	11400	7100	7100	7100
Dec	11400	11400	11400	11400	11400
Jan	35000	35000	35000	35000	35000
Feb	35000	35000	35000	35000	35000
Mar	44500	44500	44500	25000	25000
Apr	44500	44500	44500	25000	25000
May	44500	44500	44500	25000	25000
Jun	11400	11400	7100	7100	7100
Jul	7100	7100	7100	7100	7100
Aug	7100	7100	7100	7100	7100
Sep	11400	11400	7100	7100	7100

- Greater of D-1641/BiOps, or above
- Delta outflow goals above current regulatory requirements achieved through Delta export curtailments
- Upstream releases allowed in Jul – Sep months in all water year types, except Critical.

Minimum flows and splits between waterways



SACRAMENTO RIVER, CALIFORNIA. 9

From an examination of the records of the United States Geological Survey covering the period 1903–1907, inclusive, it is estimated that the average low-water flow of the Sacramento River below the mouth of the American is as follows: August, 9,230 cubic feet per second; September, 7,820 cubic feet per second; October, 9,580 cubic feet per second; with a minimum discharge of 5,900 cubic feet per second for September, 1905.

The discharge for August, 1908, is estimated by the district engineer of the United States Geological Survey as 6,740 cubic feet per second. It is estimated that the discharge for September, 1908, was considerably less than that of August, and that it was less than the discharge of September, 1905. The observations of this office during the period August 3–17 gave a discharge of about 7,400 cubic feet per second, of which about 27 per cent flowed through Steamboat Slough and about 24 per cent through Georgiana Slough.

A comparison of this survey with that of the survey of 1895–96 shows that the river is improving as a navigable channel and that it is recovering from the effects of unrestricted hydraulic mining. It is estimated that the river bed for a distance of 14 miles immediately below Sacramento has lowered 2 feet in the past twelve years. The American and the Feather rivers, however, are still full of débris, and the effect of the sand deposits in the American River on the Sacramento River are noticeable for a considerable distance below the mouth of that river, and the fact that these two rivers contain probably more than 500,000,000 cubic yards of fine material, all of which must eventually pass down the Sacramento River to Suisun Bay, must be borne in mind in any consideration of the improvement of this river.

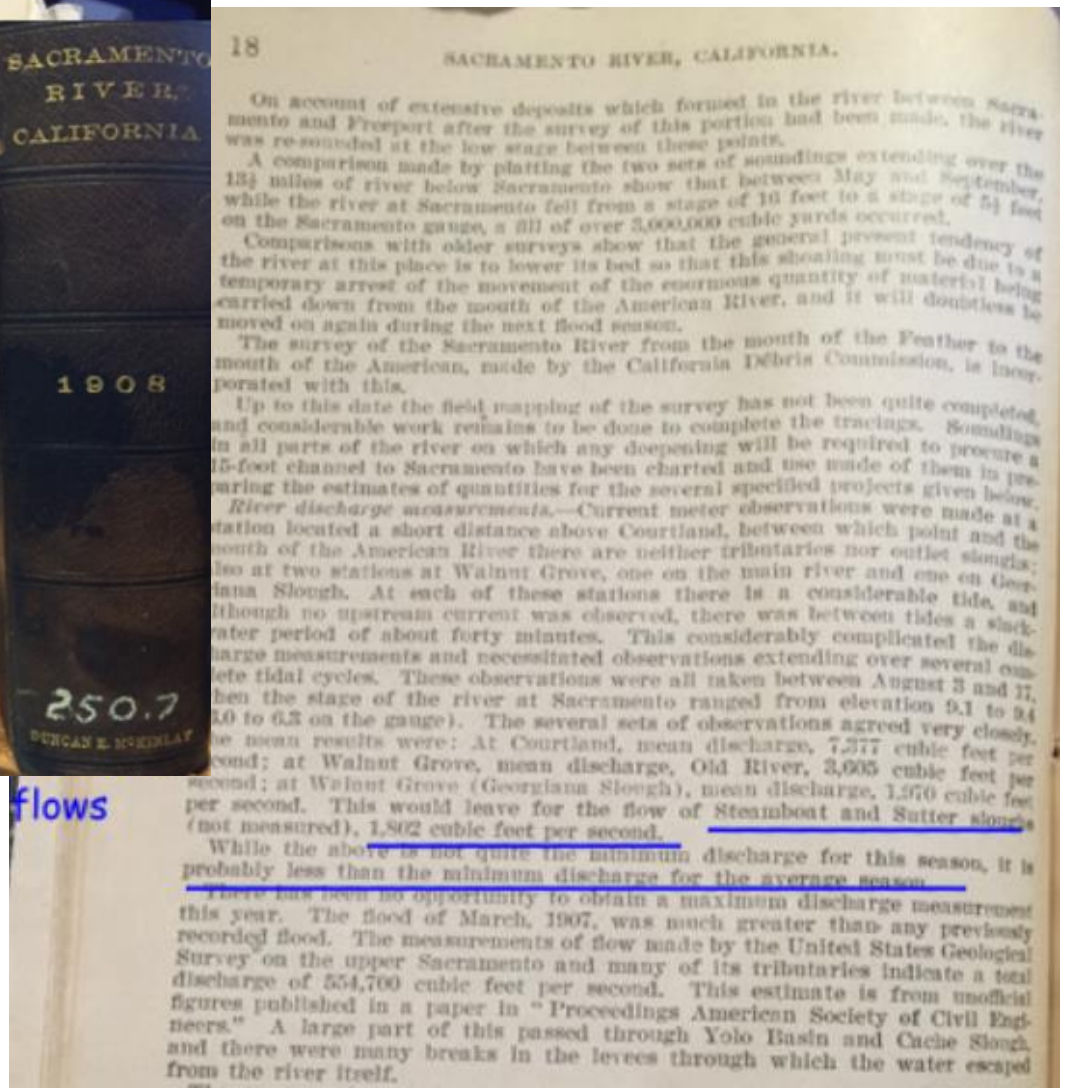
It is estimated that the maximum flood discharge of the river during the flood of March, 1907, if it had been confined to the river channel, would have exceeded 500,000 cubic feet per second. It is seen, therefore, that the minimum low-water discharge is about 1 per cent of the maximum flood discharge.

SACRAMENTO RIVER, CALIFORNIA

1908

250.7

DUNCAN E. McKINLAY



18 SACRAMENTO RIVER, CALIFORNIA.

On account of extensive deposits which formed in the river between Sacramento and Freeport after the survey of this portion had been made, the river was resounded at the low stage between these points.

A comparison made by plotting the two sets of soundings extending over the 13½ miles of river below Sacramento show that between May and September, while the river at Sacramento fell from a stage of 16 feet to a stage of 5½ feet on the Sacramento gauge, a fill of over 3,000,000 cubic yards occurred.

Comparisons with older surveys show that the general present tendency of the river at this place is to lower its bed so that this shoaling must be due to a temporary arrest of the movement of the enormous quantity of material being carried down from the mouth of the American River, and it will doubtless be moved on again during the next flood season.

The survey of the Sacramento River from the mouth of the Feather to the mouth of the American, made by the California Débris Commission, is incorporated with this.

Up to this date the field mapping of the survey has not been quite completed, and considerable work remains to be done to complete the tracings. Soundings in all parts of the river on which any deepening will be required to procure a 15-foot channel to Sacramento have been charted and use made of them in preparing the estimates of quantities for the several specified projects given below.

River discharge measurements.—Current meter observations were made at a station located a short distance above Courtland, between which point and the mouth of the American River there are neither tributaries nor outlet sloughs; also at two stations at Walnut Grove, one on the main river and one on Georgiana Slough. At each of these stations there is a considerable tide, and although no upstream current was observed, there was between tides a slack-water period of about forty minutes. This considerably complicated the discharge measurements and necessitated observations extending over several complete tidal cycles. These observations were all taken between August 3 and 17, when the stage of the river at Sacramento ranged from elevation 9.1 to 9.4 (6.0 to 6.3 on the gauge). The several sets of observations agreed very closely. The mean results were: At Courtland, mean discharge, 7,377 cubic feet per second; at Walnut Grove, mean discharge, Old River, 3,905 cubic feet per second; at Walnut Grove (Georgiana Slough), mean discharge, 1,570 cubic feet per second. This would leave for the flow of Steamboat and Sutter sloughs (not measured), 1,802 cubic feet per second.

While the above is not quite the minimum discharge for this season, it is probably less than the minimum discharge for the average season.

There has been no opportunity to obtain a maximum discharge measurement this year. The flood of March, 1907, was much greater than any previously recorded flood. The measurements of flow made by the United States Geological Survey on the upper Sacramento and many of its tributaries indicate a total discharge of 554,700 cubic feet per second. This estimate is from unofficial figures published in a paper in "Proceedings American Society of Civil Engineers." A large part of this passed through Yolo Basin and Cache Slough, and there were many breaks in the levees through which the water escaped from the river itself.

flows

At the driest time of year of a dry year, the Minimum Sacramento River flow is more than 7,400 cfs, with 27% flow into Steamboat Slough (1,998) and 24% through Georgiana Slough. Or…
7,377 cfs at Courtland, with 1,802 cfs split Between Steamboat and Sutter Sloughs.

North Delta Diversion Bypass Flows

These parameters are for modeling purposes. Actual operations will be based on real-time monitoring of hydrologic conditions and fish presence/movement

Low-Level Pumping (Dec-Jun)

Diversions of up to 6% of total Sacramento River flow such that bypass flow never falls below 5,000 cfs. No more than 300 cfs can be diverted at any one intake.

Initial Pulse Protection

Low level pumping will be maintained through the initial pulse period. For modeling, the initiation of the pulse is defined by the following criteria: (1) Sacramento River flow at Wilkins Slough increasing by more than 45% within a five-day period and (2) flow on the fifth day greater than 12,000 cfs.

The pulse (and low-level pumping) continues until either (1) Sacramento River flow at Wilkins Slough returns to pre-pulse flow level (flow on first day of pulse period), or (2) Sacramento River flow at Wilkins Slough decreases for 5 consecutive days, or (3) Sacramento River flow at Wilkins Slough is greater than 20,000 cfs for 10 consecutive days.

After pulse period has ended, operations will return to the bypass flow table (Sub-Table A).

If the initial pulse period begins and ends before Dec 1st in the modeling, then any second pulse that may occur before the end of June will receive the same protection, i.e., low level pumping.

Post-Pulse Operations

After initial pulse(s), allowable diversion will go to Level I Post-Pulse Operations (see Sub-Table A) until 15 total days of bypass flows above 20,000 cfs occur. Then allowable diversion will go to the Level II Post-Pulse Operations until 30 total days of bypass flows above 20,000 cfs occur. Then allowable diversion will go to the Level III Post-Pulse Operations.

Sub-Table A. Post-Pulse Operations for North Delta Diversion Bypass Flows

Implement following bypass flow requirements sufficient to minimize any increase in the upstream tidal transport at two points of control: (1) Sacramento River upstream of Sutter Slough and (2) Sacramento River downstream of Georgiana Slough. These points are used to minimize any increase in upstream transport toward the proposed intakes or into Georgiana Slough. Allowable diversion will be greater of the low-level pumping or the diversion allowed by the following bypass flow rules.

Level I Post-Pulse Operations			Level II Post-Pulse Operations			Level III Post Pulse Operations		
If Sacramento River flow is over...	**But not over...**	**The bypass is...**	**If Sacramento River flow is over...**	**But not over...**	**The bypass is...**	**If Sacramento River flow is over...**	**But not over...**	**The bypass is...**
Dec–Apr								
0 cfs	5,000 cfs	100% of the amount over 0 cfs	0 cfs	5,000 cfs	100% of the amount over 0 cfs	0 cfs	5,000 cfs	100% of the amount over 0 cfs
5,000 cfs	15,000 cfs	Flows remaining after constant low level pumping	5,000 cfs	11,000 cfs	Flows remaining after constant low level pumping	5,000 cfs	9,000 cfs	Flows remaining after constant low level pumping
15,000 cfs	17,000 cfs	15,000 cfs plus 80% of the amount over 15,000 cfs	11,000 cfs	15,000 cfs	11,000 cfs plus 60% of the amount over 11,000 cfs	9,000 cfs	15,000 cfs	9,000 cfs plus 50% of the amount over 9,000 cfs

Background on the California WaterFix Project

The planning process related to the WaterFix Project began in 2006. The initial proposed project, or BDCP, was envisioned as a water conveyance and habitat conservation project. The project's goals were to obtain long-term federal ESA and CESA permits by improving conditions for various species beyond the mitigation measures required for the water conveyance facility. In December 2013, DWR, Reclamation, the U.S. Fish and Wildlife Service (USFWS), and the National Marine Fisheries Service (NMFS) released a Draft Environmental Impact Report/Draft Environmental Impact Statement for the BDCP pursuant to CEQA and NEPA.

In April of 2015, DWR and Reclamation announced plans to split the project into two separate efforts; one for water conveyance facilities and the other for habitat restoration. The water conveyance effort is now called the California WaterFix Project, which consists of the new water conveyance facilities, operational elements, and habitat restoration and other environmental commitments to mitigate the construction and operation-related impacts of the new conveyance. DWR continues to be the CEQA lead agency and Reclamation is now the sole NEPA lead agency for the WaterFix Project. The habitat restoration effort that goes beyond the mitigation measures identified for the WaterFix Project is referred to as California EcoRestore. California EcoRestore is a separate effort and is not part of the current change petition or application for certification. In July 2015, DWR and Reclamation released a Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS) that analyzes the WaterFix Project. A more detailed description of the WaterFix Project can be found in the Environmental Document as Alternative 4A (http://baydeltaconservationplan.com/RDEIRS/4_New_Alternatives.pdf).

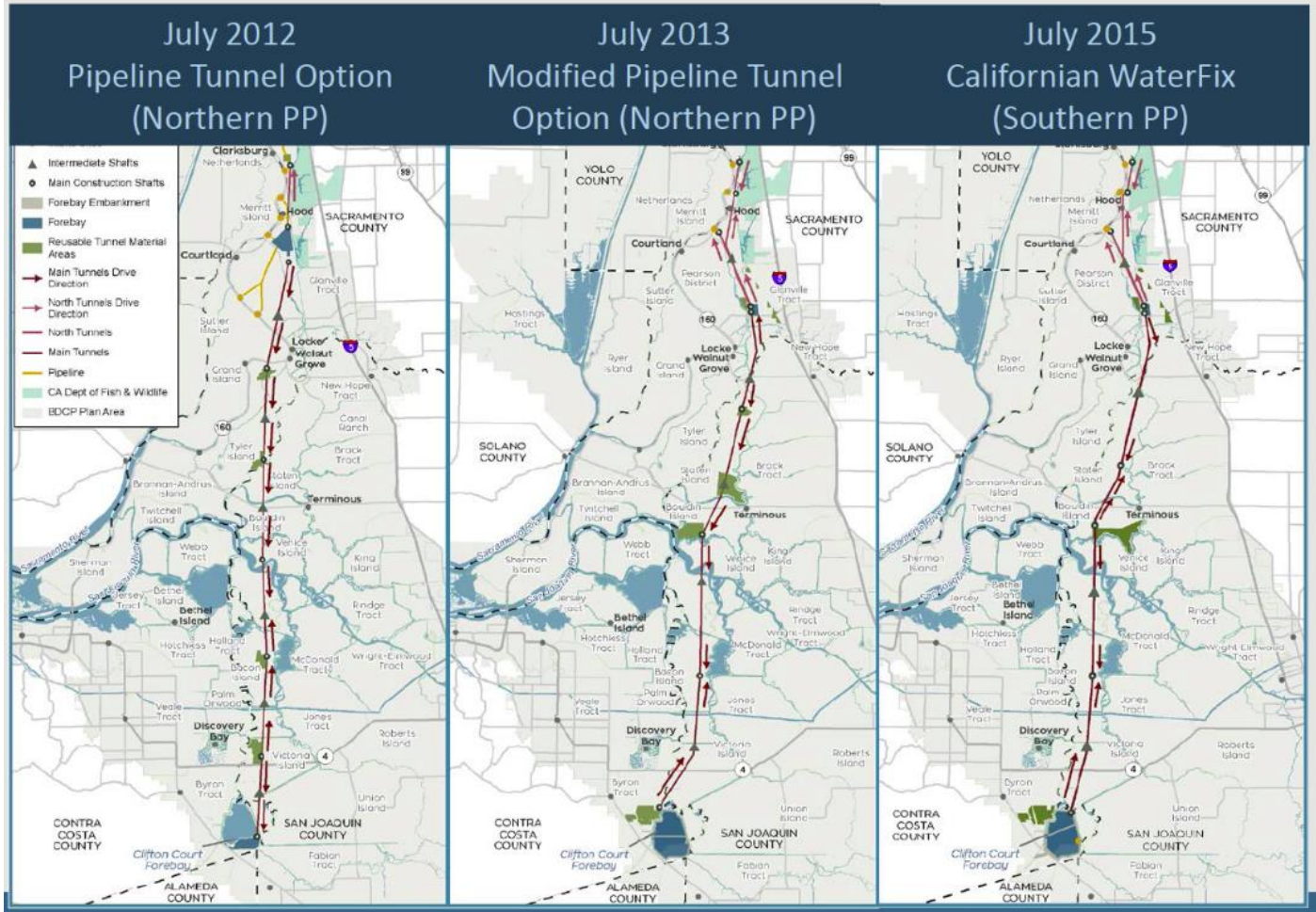
Processing of the Change Petition

In order for the State Water Board to approve a change petition, the petitioner must: 1) demonstrate that the change will not initiate a new water right or injure any legal users of water; and 2) provide information on how fish and wildlife would be affected by the change and identify proposed measures to protect them from any unreasonable impacts of the change. The petitioner must also comply with any applicable requirements of the Fish and Game Code (including CESA), ESA, and CEQA.

https://www.californiawaterfix.com/docs/dwr_2.pdf

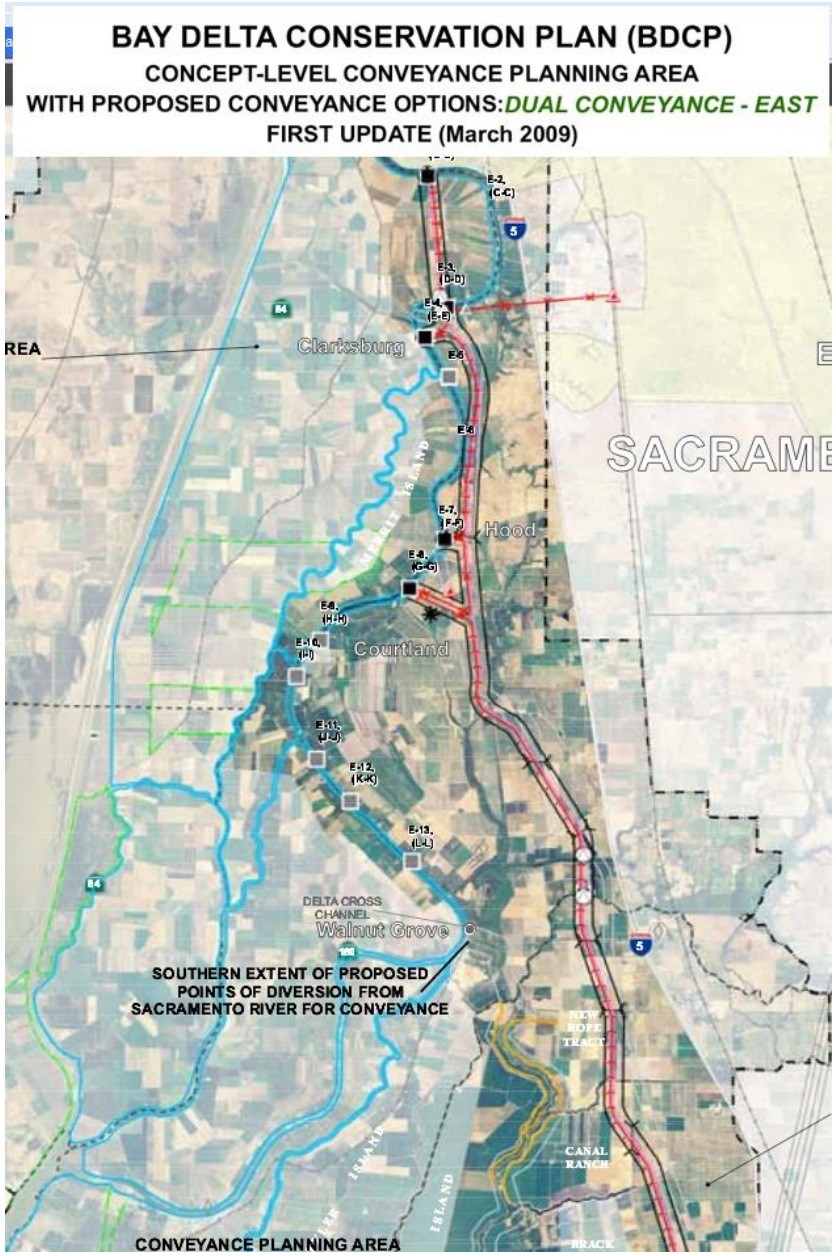
ENGINEERING REFINEMENTS

DWR-2



Page 4

The name game: CalFed to DRMS to BDCP to WaterFix



relevant constraints including land use, infrastructure, biological resources and other factors.

http://baydeltaconservationplan.com/Libraries/News/Final_FFTT_Tech_Memo_07_15_2011_2.sflb.ashx

67 / 97

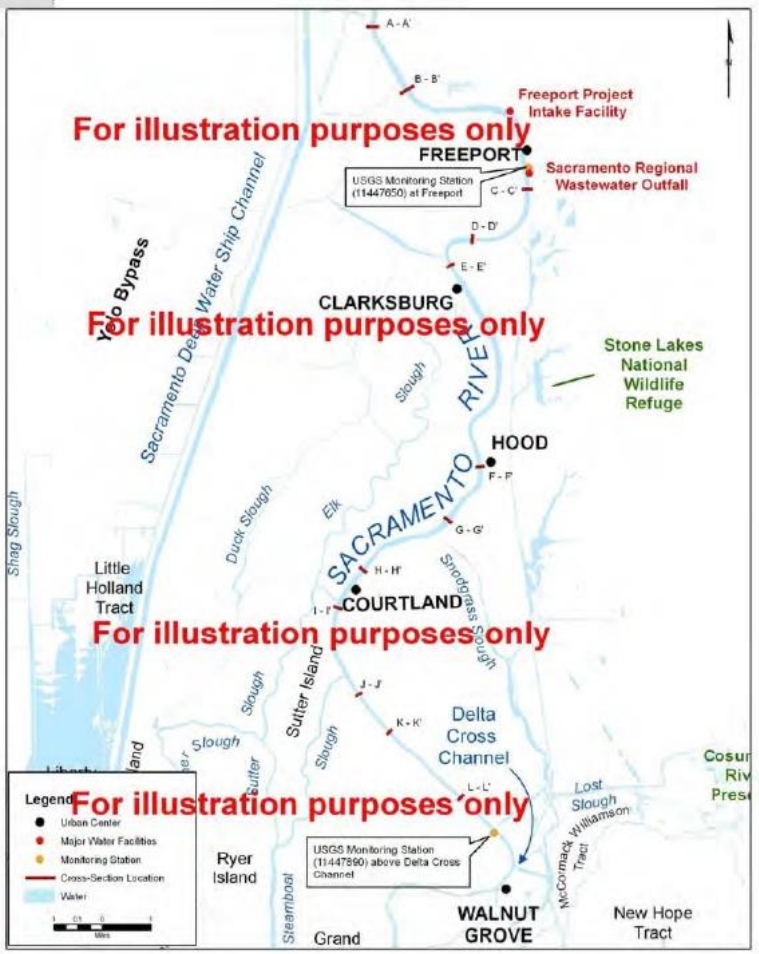
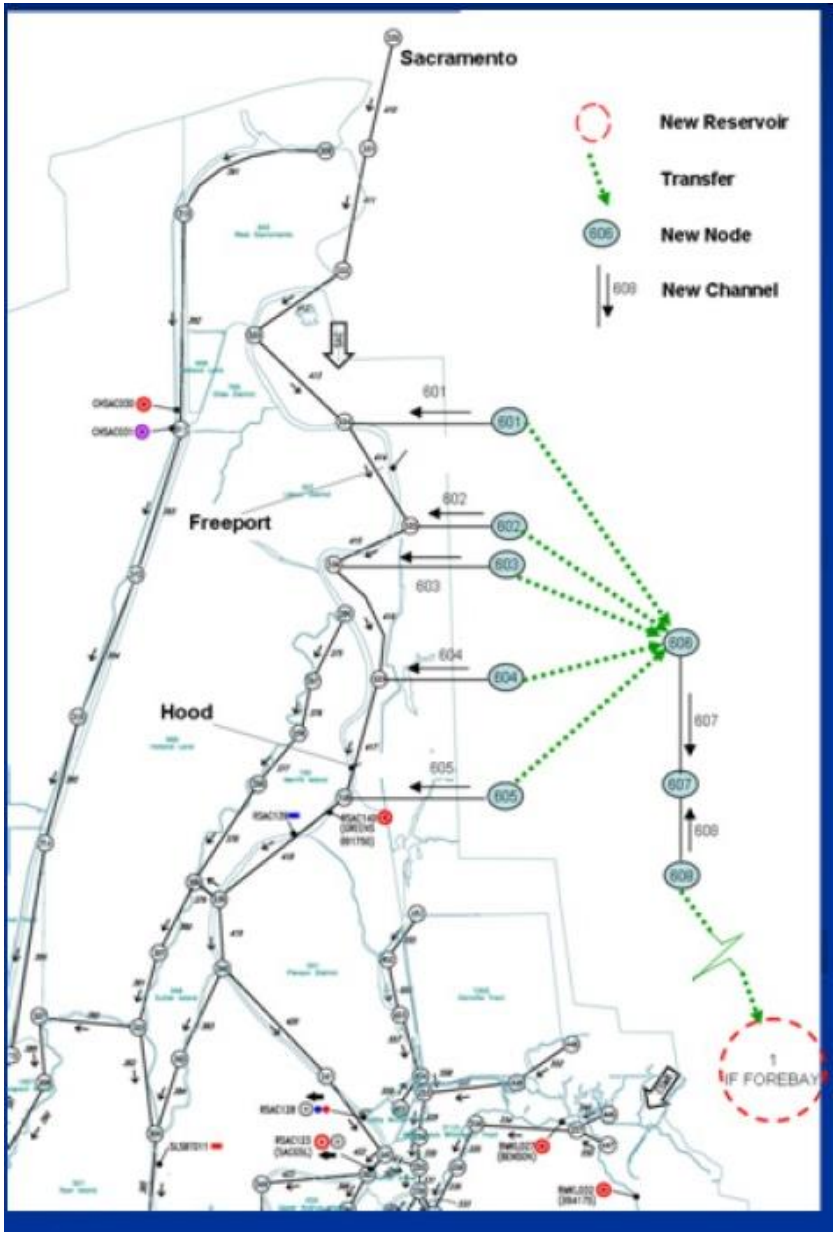


FIGURE 1

PRELIMINARY DRAFT


deltarevision.com/maps/conveyance-canals/ATO_JUNE2010-Poster-Delta-Boundary.pdf
Delta Habitat Conservation & Conveyance Program
Advancing the Bay Delta Conservation Plan
Banks Pumping Plant
Isolated Conveyance Facility
Pipeline/Tunnel Option
Clarksburg
NETHERLANDS
Elk Slough
MERRITT ISLAND
Hood
Courtland
PIERSON DISTRICT
SUTTER ISLAND
160
5
Lost
Walnut


Sacramento
New Reservoir
Transfer
New Node
New Channel
Freeport
Hood
F FOREBAY

SWP POINTS OF DIVERSION

- **Existing Authorized Points of Diversion/Rediversion**
  - Oroville/Thermalito
  - North Bay Aqueduct
  - Delta Water Facilities (location near Hood)
  - Clifton Court Forebay (SWP Banks Pumping Plant)
  - CVP Tracy (Jones) Pumping Plant
- **Proposed New Points of Diversion**
  - 3 new intake locations in north Delta near Hood
- **Combined rate of maximum diversion/rediversion from Delta limited to 10,350 cfs under all four permits**

Page 5

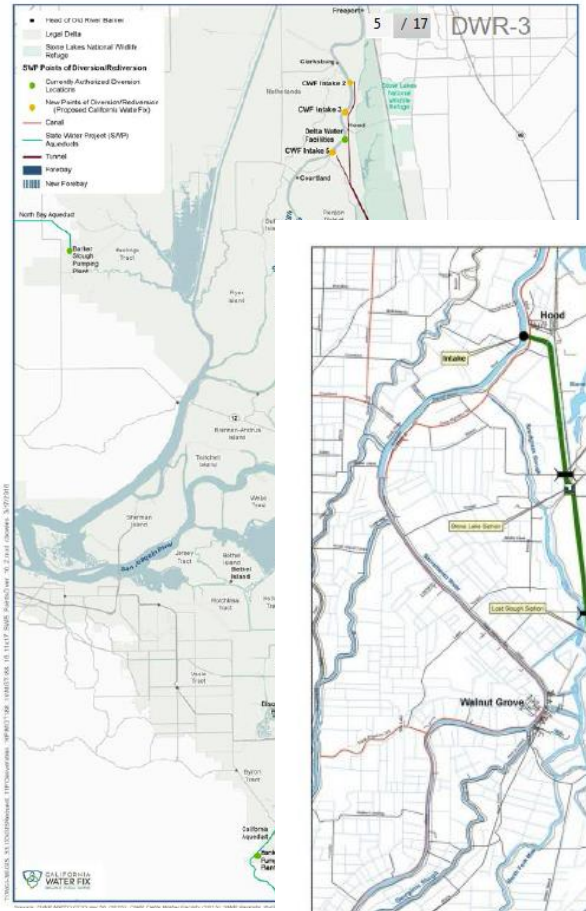


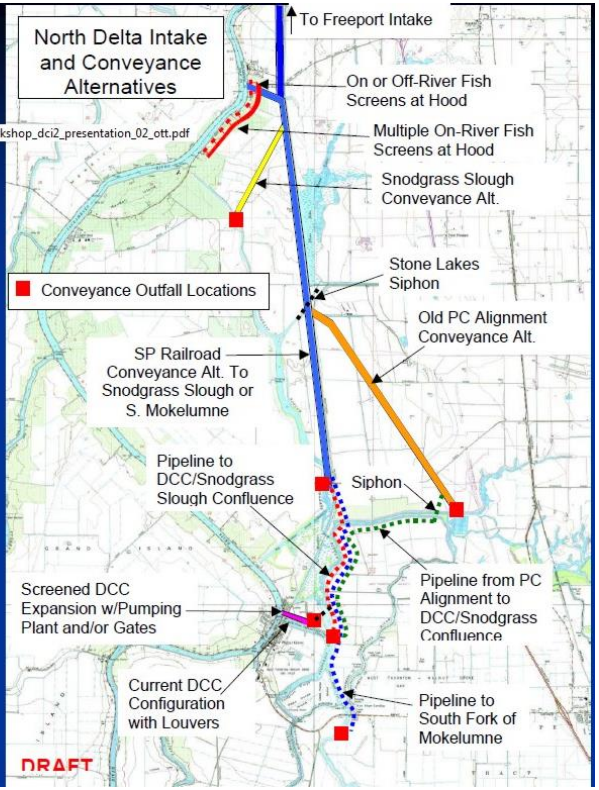
Figure 1: TDF Project Location

DWR
2007

TDF Pre-Feasibility Study Draft Report
March, 2007

1. Existing authorized point of diversion is shown on the map as between intakes 2 and 3. Is that a 1,350 cfs capacity intake? Is it anticipated that when there is sufficient flow on the Sacramento River the full 10,350 cfs under all four permits would be taken from the Sacramento River?

TDF Options



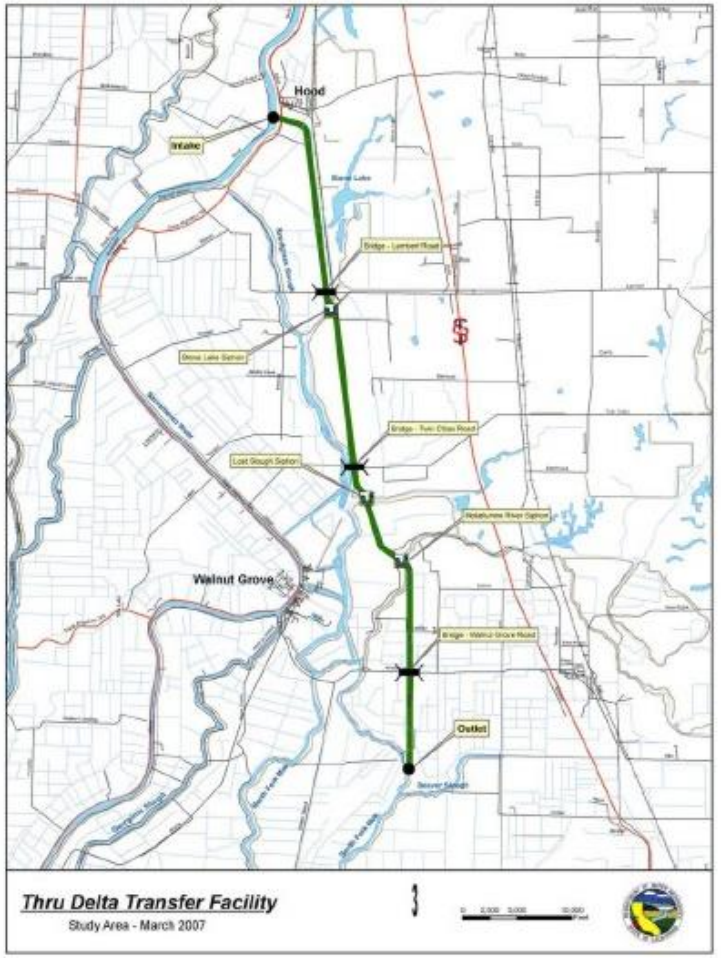


Figure 1: TDF Project Location

DWR
2007

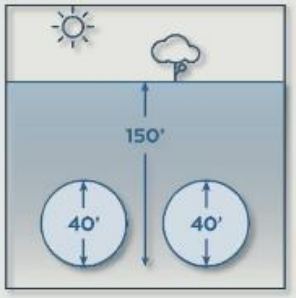
TDF Pre-Feasibility Study Draft Report
March, 2007

www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/petitioners_

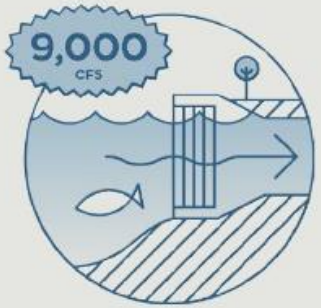
DWR-1

PHYSICAL COMPONENTS OF THE PROJECT

- 2 tunnels up to 150' below ground designed to protect California's water supplies



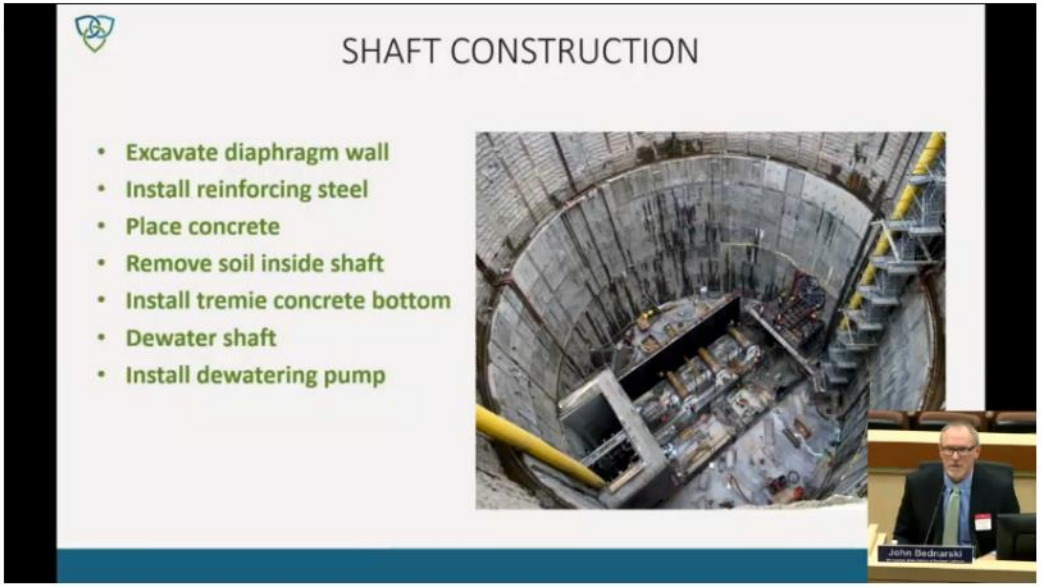
- 3 new intakes, each with 3,000 cubic-feet per second (cfs) capacity. **Average annual yield of 4.9 million acre-feet**

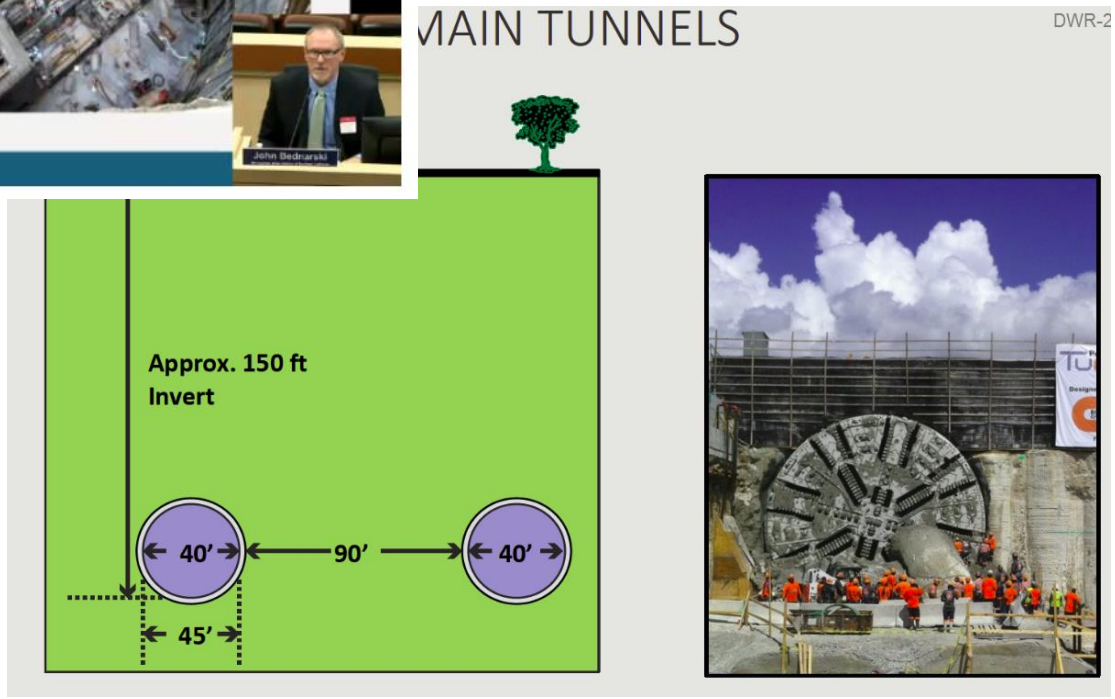


1. 1 cfs = 1.98 acre feet per day estimated. 9000 cfs x 1.98 = 17,820 af per day, which equals 6,504,300 acre feet per year, so why the average yield of 4.9 million acre-feet? Does it take diversion of 6.5 maf to deliver 4.9 maf?
2. Will there be overflow or pressure relief valves and if so where does that water go? Is MAXIMUM capacity for each intake 3000 cfs or is each designed to be adaptable to accept extra capacity? What is the diameter of each smaller tunnel or pipes, and the total number of tunnels or pipes, from each intake structure to the 40 foot tunnels?
3. Will those smaller tunnels or pipes be located at the bottom of the river, mid-river or near the surface?
4. What is the capacity of each 40 foot tunnel? In cfs and in acre feet?

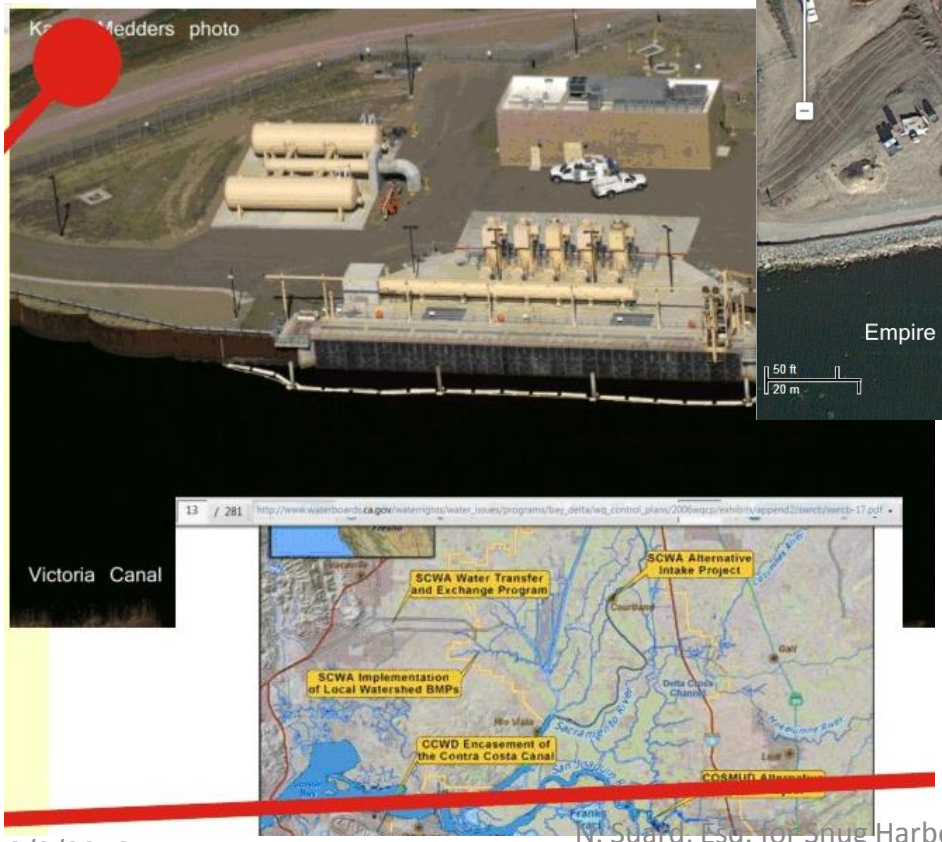
https://video.calepa.ca.gov/#player/byron/LiveVideo/463664

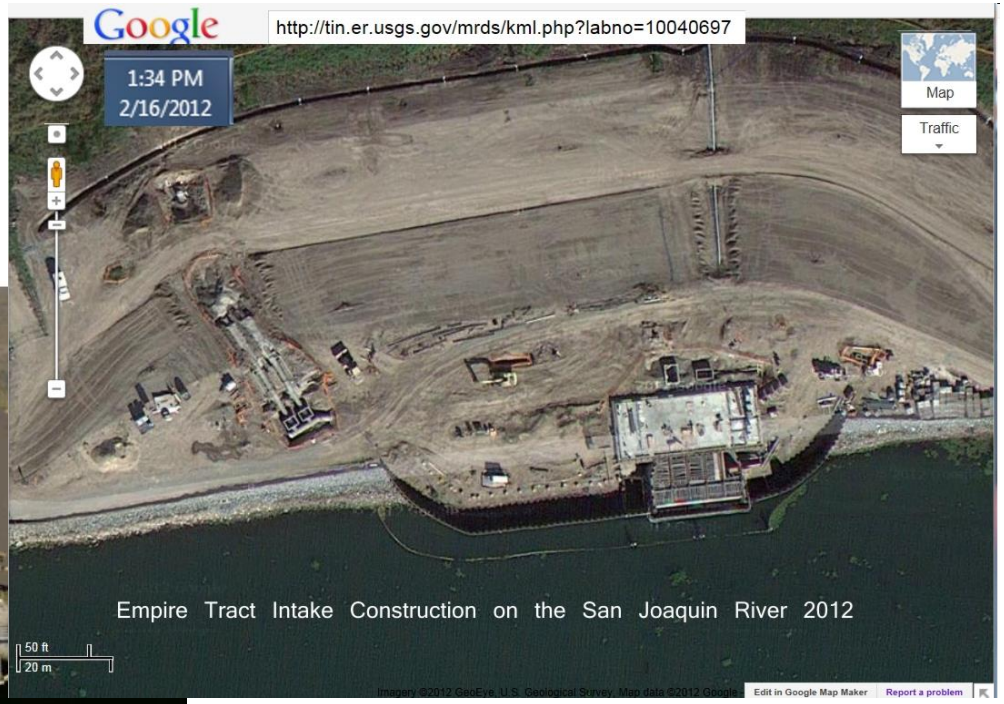
California WaterFix Water Right Petition Hearing





Tunnels and shafts have already been constructed in the Delta region. Were these projects reviewed to give the engineering team an idea of what they might expect to happen?





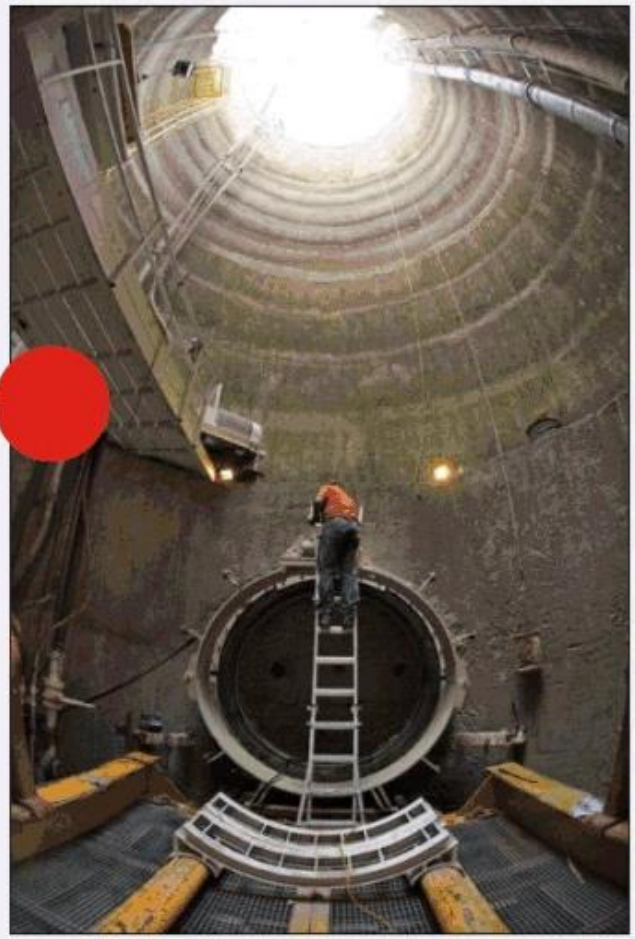
http://deltarevision.com/Issues/conveyance/intakes/intakesupdate2013..jpg

deltarevision.com/Issues/conveyance/intakes/intakesupdate2013..jpg

CCWD Senior Engineer Rachel Martin stands in front of the boring machine as it completed its journey under Old River.

deltarevision.com/Issues/conveyance/intakes/intakesupdate2013..jpg

CCWD's Daryl Hensler and Ryan Freeborn examine the AIP's fish screens prior to the removal of the coffer dam in Victoria Island.



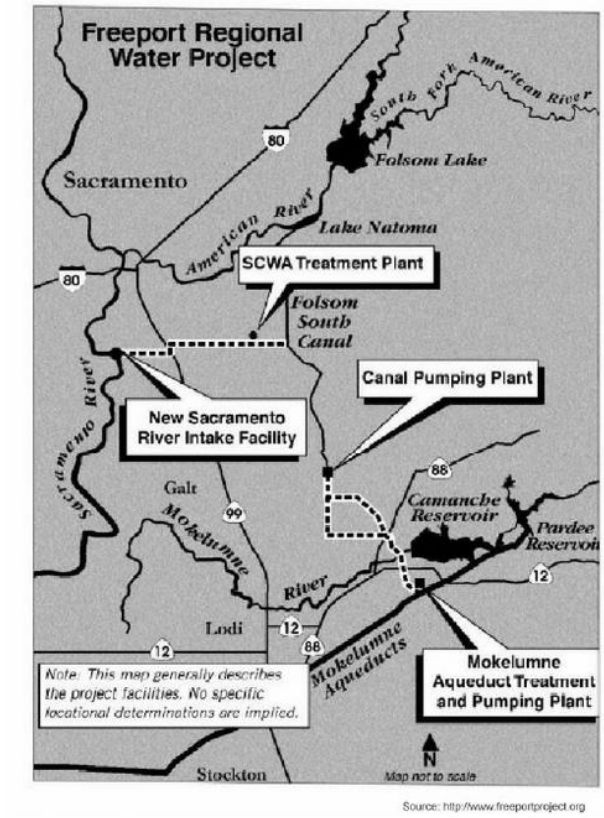
The pit for the tunnel under the river is readied for the boring machine.

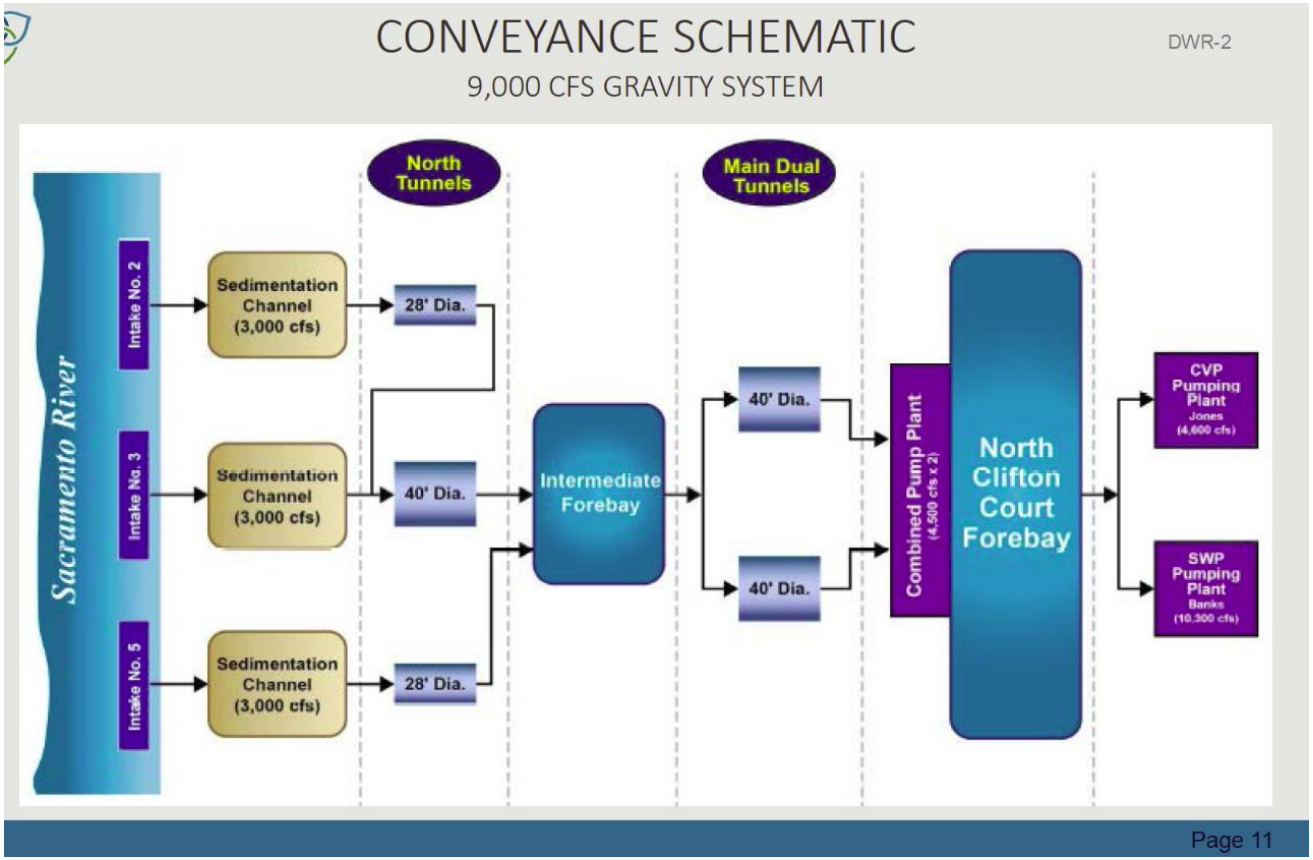
There have been many new intakes built north of the Delta ***and in the Delta*** in the last 5 to 8 years.

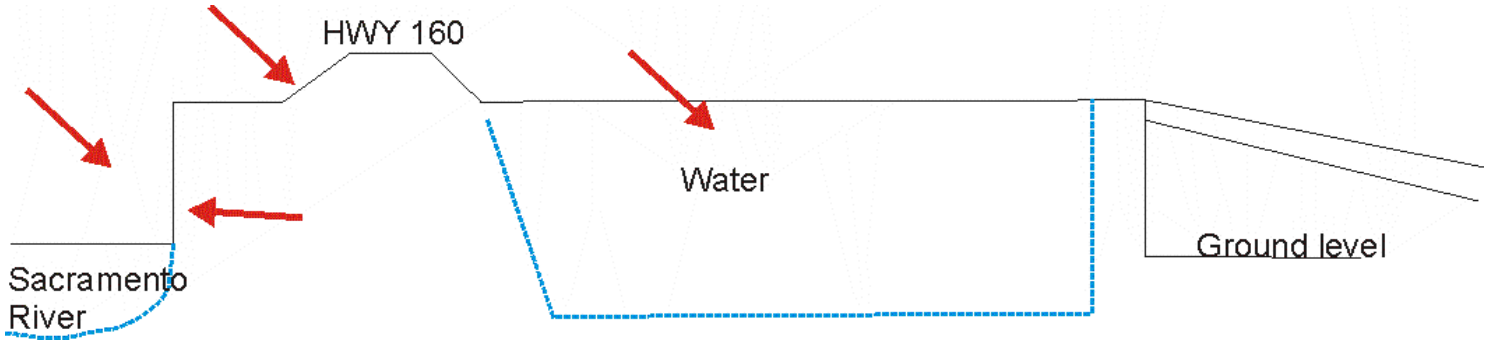
Was the actual impacts to the surrounding area reviewed as a way of assuring the assumed WaterFix impacts are correct? If not, why not?

If so, which intake facility or facility impacts was reviewed?

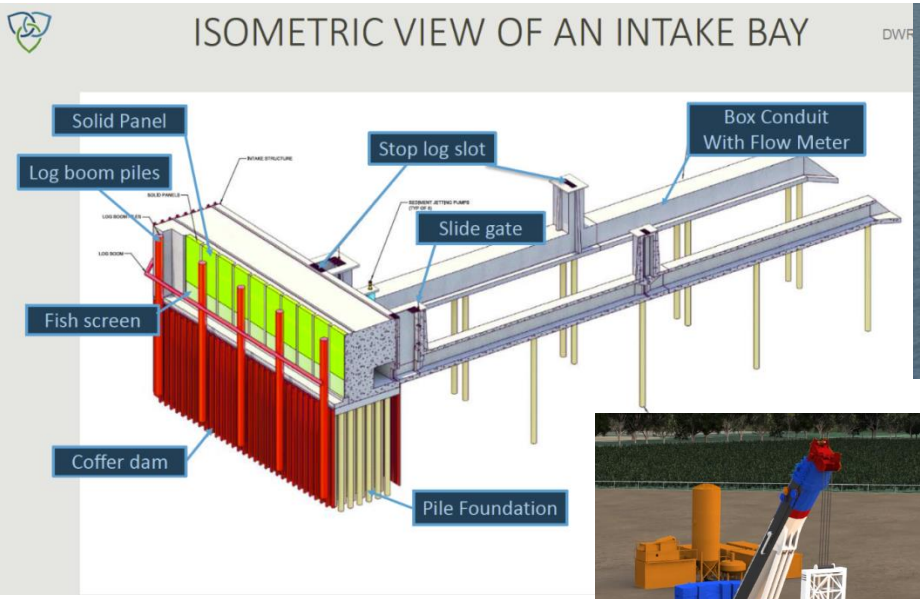
http://www.sjqov.org/pubworks/Docs/American_River_Availability.pdf

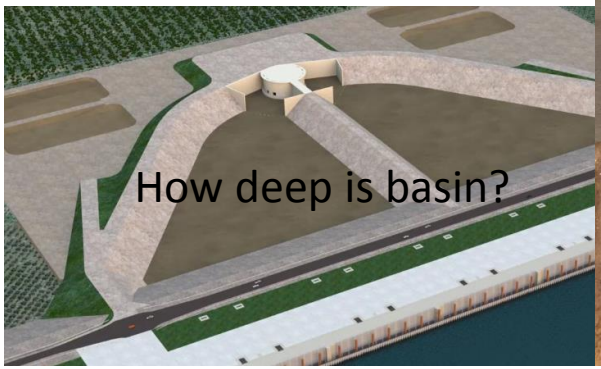



CONVEYANCE SCHEMATIC
DWR-2
9,000 CFS GRAVITY SYSTEM
North Tunnels
Main Dual Tunnels
Sacramento River
Intake No. 2
Intake No. 3
Intake No. 5
Sedimentation Channel (3,000 cfs)
Sedimentation Channel (3,000 cfs)
Sedimentation Channel (3,000 cfs)
28' Dia.
40' Dia.
28' Dia.
Intermediate Forebay
40' Dia.
40' Dia.
Combined Pump Plant (4,500 cfs x 2)
North Clifton Court Forebay
CVP Pumping Plant Jones (4,600 cfs)
SWP Pumping Plant Banks (10,300 cfs)
Page 11


HWY 160
Water
Ground level
Sacramento River

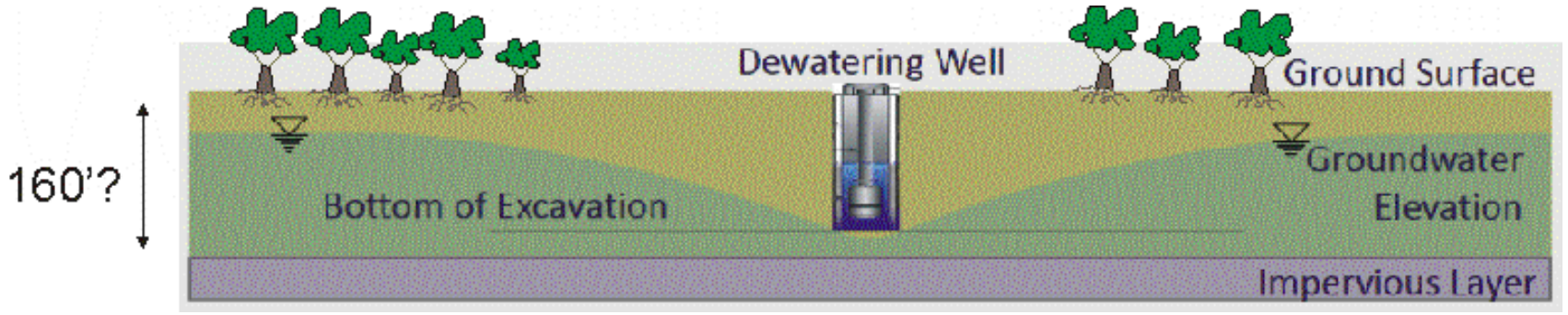
Where is a detailed side profile for the intakes and tunnels?



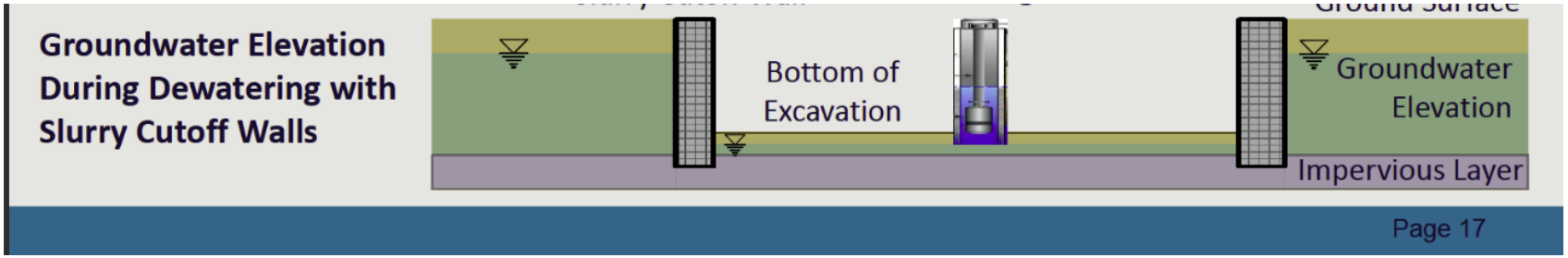


Compared to the existing HWY 160,
How much higher, in feet, will the
Profile of the intake structure be and
How much higher will be the new levee
And HWY 160?

Does water drop 150 feet into tunnels, get pumped up to forebay then dropped again 150 feet or is the tunnel shallow at the intakes and gradually slopes downward to create gravity feed?



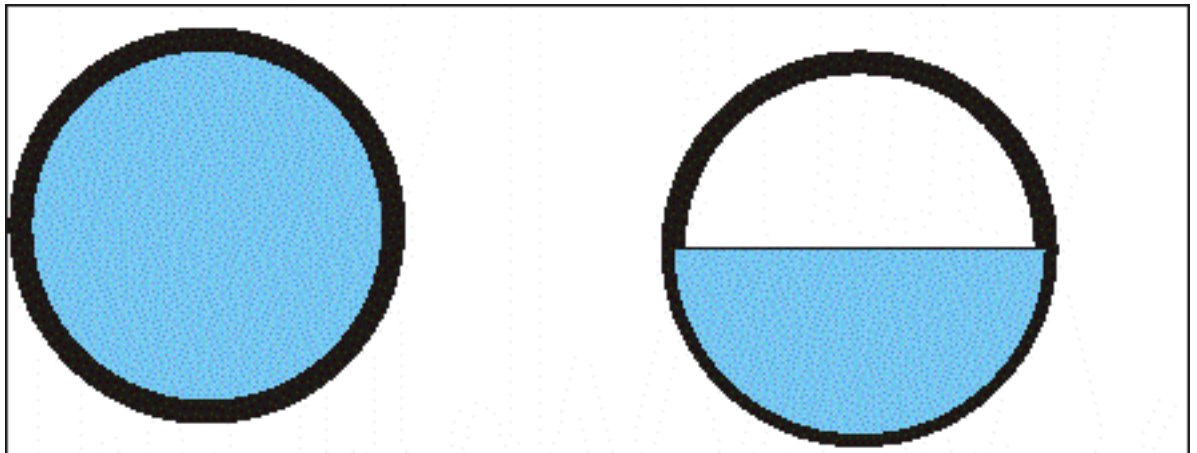
Dewatering will potentially eliminate the water source for area trees which have relied on groundwater during dry periods for their entire existence. How long will the trees in the area survive without root access to groundwater? Or is there a plan to water the trees during the time period of dewatering the ground?



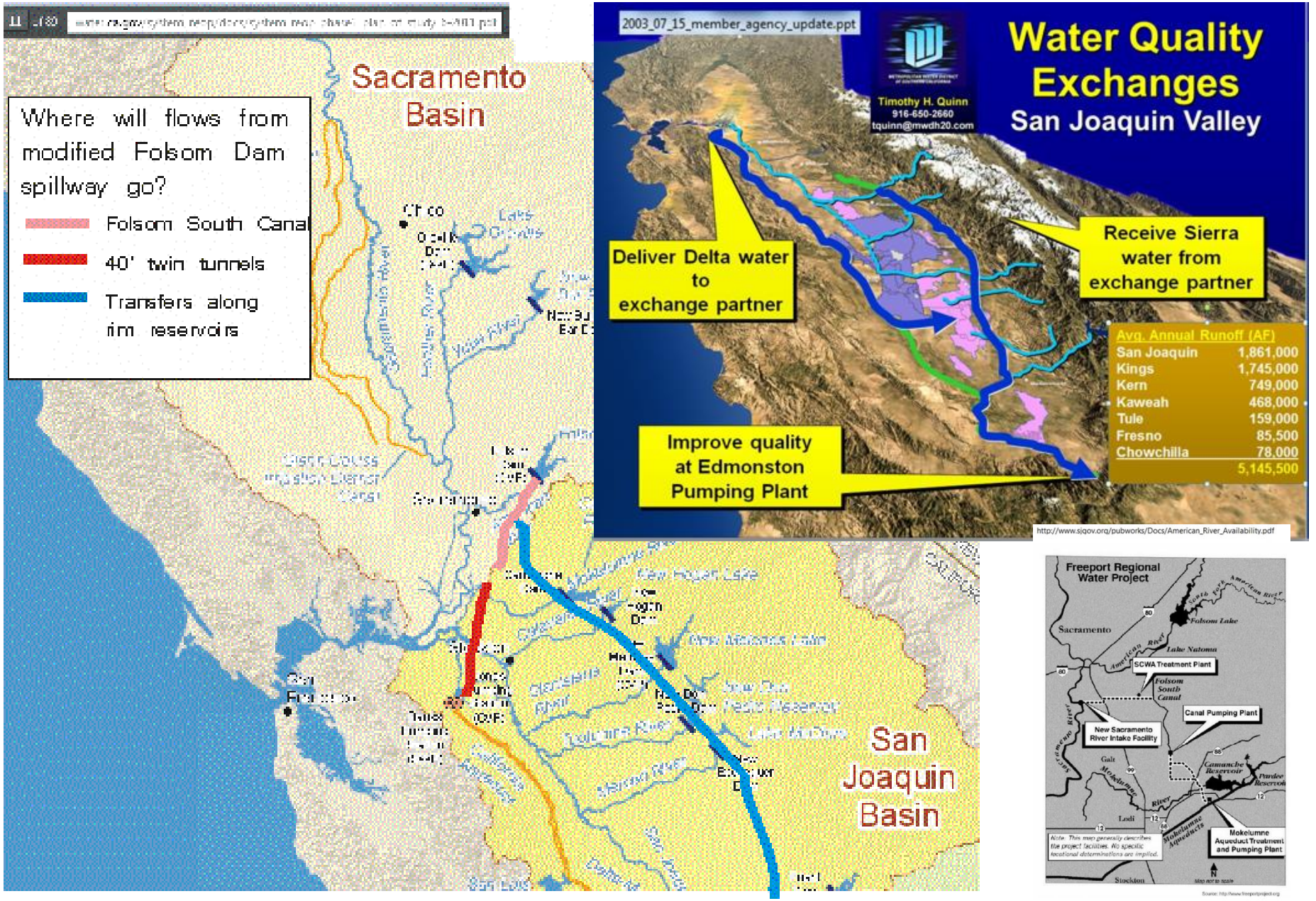
Questions regarding impacts to water rights holders from impacts to water quality due to flood flow backwash:

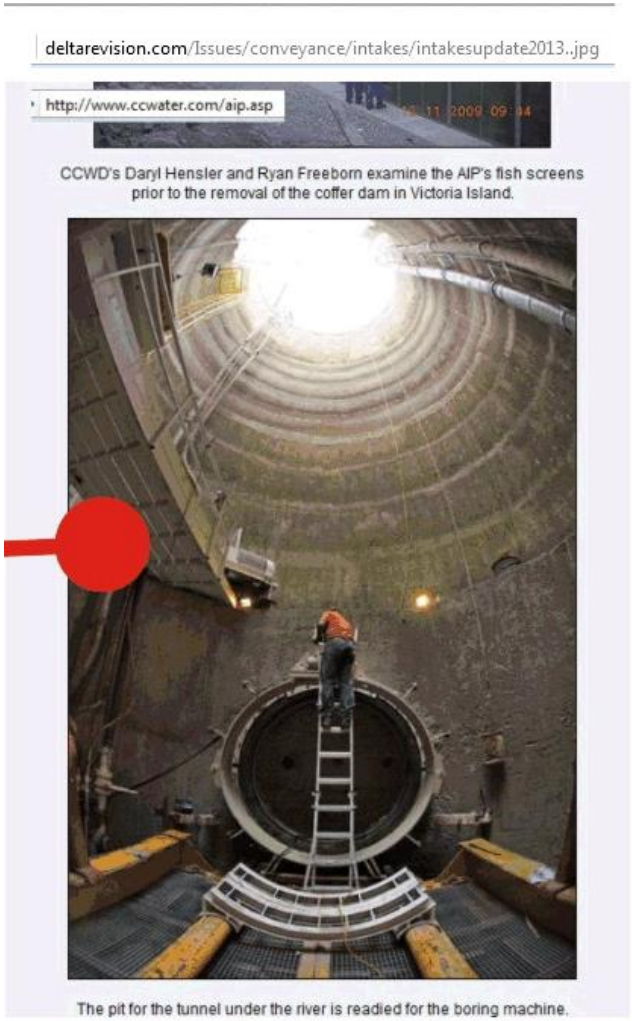
California WaterFix Water Right Petition Hearing

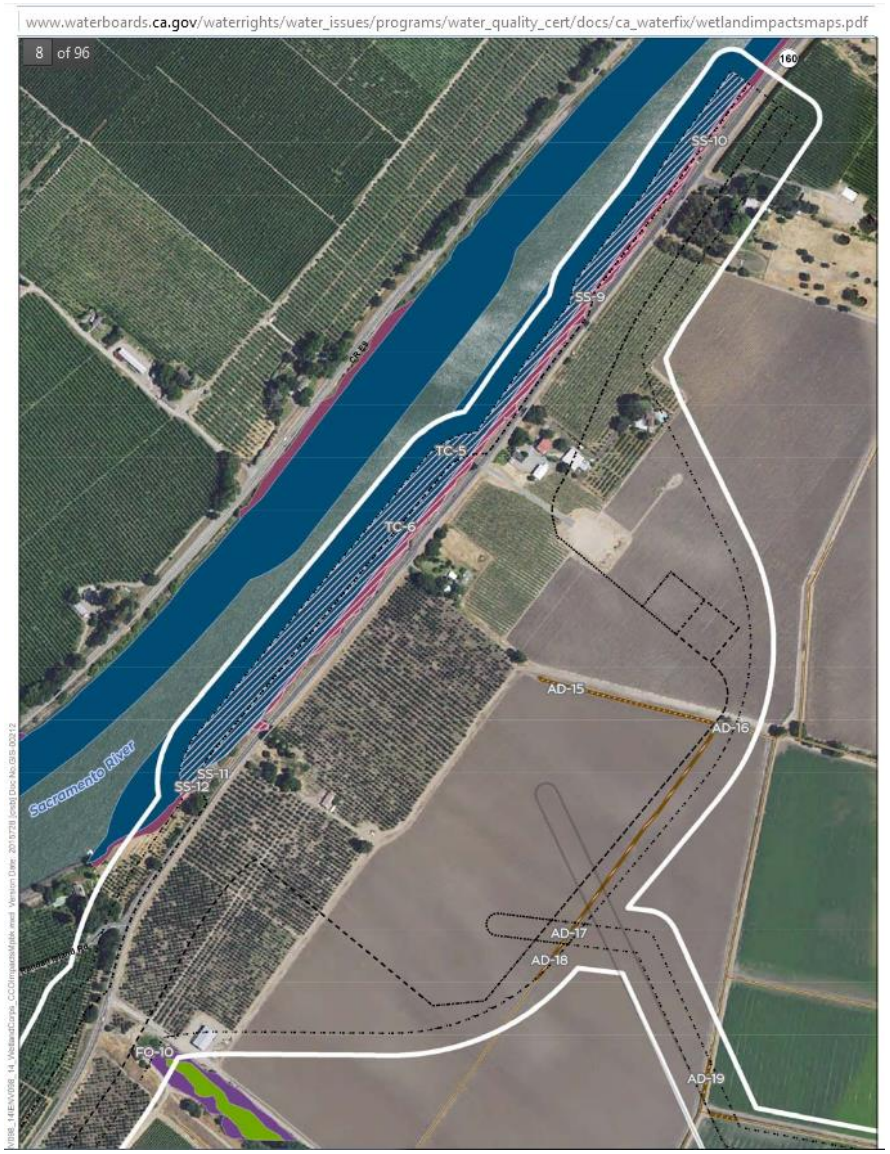
What are the assumed flood effects from pilings during the “temporary” 10 years of construction?
What do you do with the silt from the sediment drying bays? If you dump it back into the Sacramento River, that affects everyone’s water quality downriver!
What is the expected noise factor during construction?
Will there be backflow prevention valves and/or pressure relief valves?



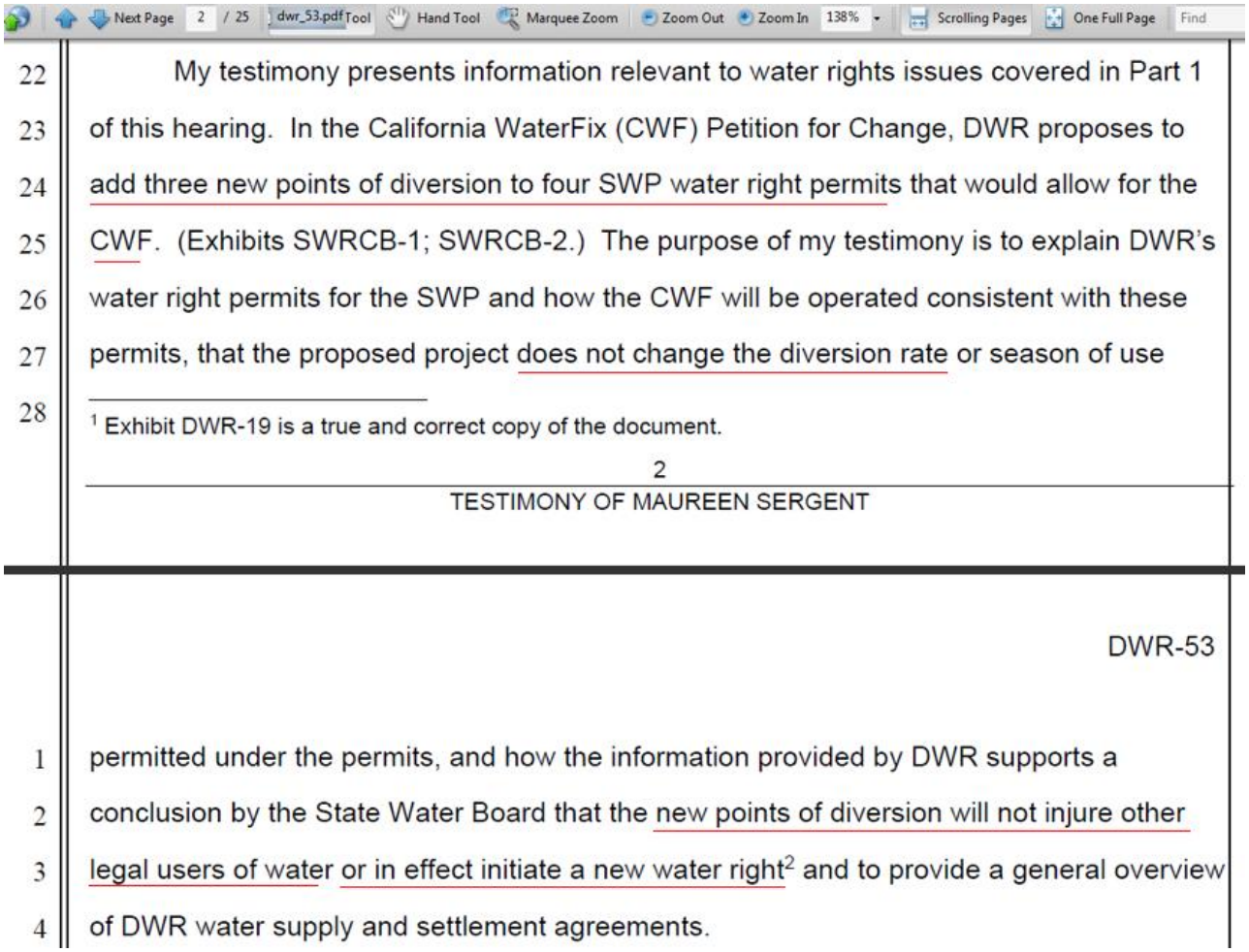
*What is the flow and volume capacity of each tunnel in cfs and af?
*Will the tunnels run parallel the entire length or could they be split, such as east side and west side?
*Have any tunnel shafts been constructed yet?
Or any tunnel sections?


Sacramento Basin
Where will flows from modified Folsom Dam spillway go?
Folsom South Canal
40' twin tunnels
Transfers along rim reservoirs
San Joaquin Basin
2003_07_15_member_agency_update.ppt
Timothy H. Quinn
916-650-2660
tquinn@mwdh20.com
Water Quality Exchanges
San Joaquin Valley
Deliver Delta water to exchange partner
Receive Sierra water from exchange partner
Improve quality at Edmonston Pumping Plant
Avg. Annual Runoff (AF)
San Joaquin 1,861,000
Kings 1,745,000
Kern 749,000
Kaweah 468,000
Tule 159,000
Fresno 85,500
Chowchilla 78,000
5,145,500
http://www.sjqov.org/pubworks/Docs/American_River_Availability.pdf
Freeport Regional Water Project
Sacramento
Folsom Lake
Lake Natoma
SCWA Treatment Plant
Folsom South Canal
Canal Pumping Plant
New Sacramento River Intake Facility
Galt
Lodi
Camanche Reservoir
Pardee Reservoir
Mokelumne Aqueduct Treatment and Pumping Plant
Stockton





Example: CCWD new intake on Victoria Island is a 250 cfs pump station with five 5,000 hp vertical turbine pumps, setback levee, Concrete intake structure with fish screen, a building for electrical and control equipment, electrical substation, SURGE CONTROL TANKS, and 12,000 linear feet of 72" pipeline.



My testimony presents information relevant to water rights issues covered in Part 1 of this hearing. In the California WaterFix (CWF) Petition for Change, DWR proposes to add three new points of diversion to four SWP water right permits that would allow for the CWF. (Exhibits SWRCB-1; SWRCB-2.) The purpose of my testimony is to explain DWR's water right permits for the SWP and how the CWF will be operated consistent with these permits, that the proposed project does not change the diversion rate or season of use

[1] Exhibit DWR-19 is a true and correct copy of the document.

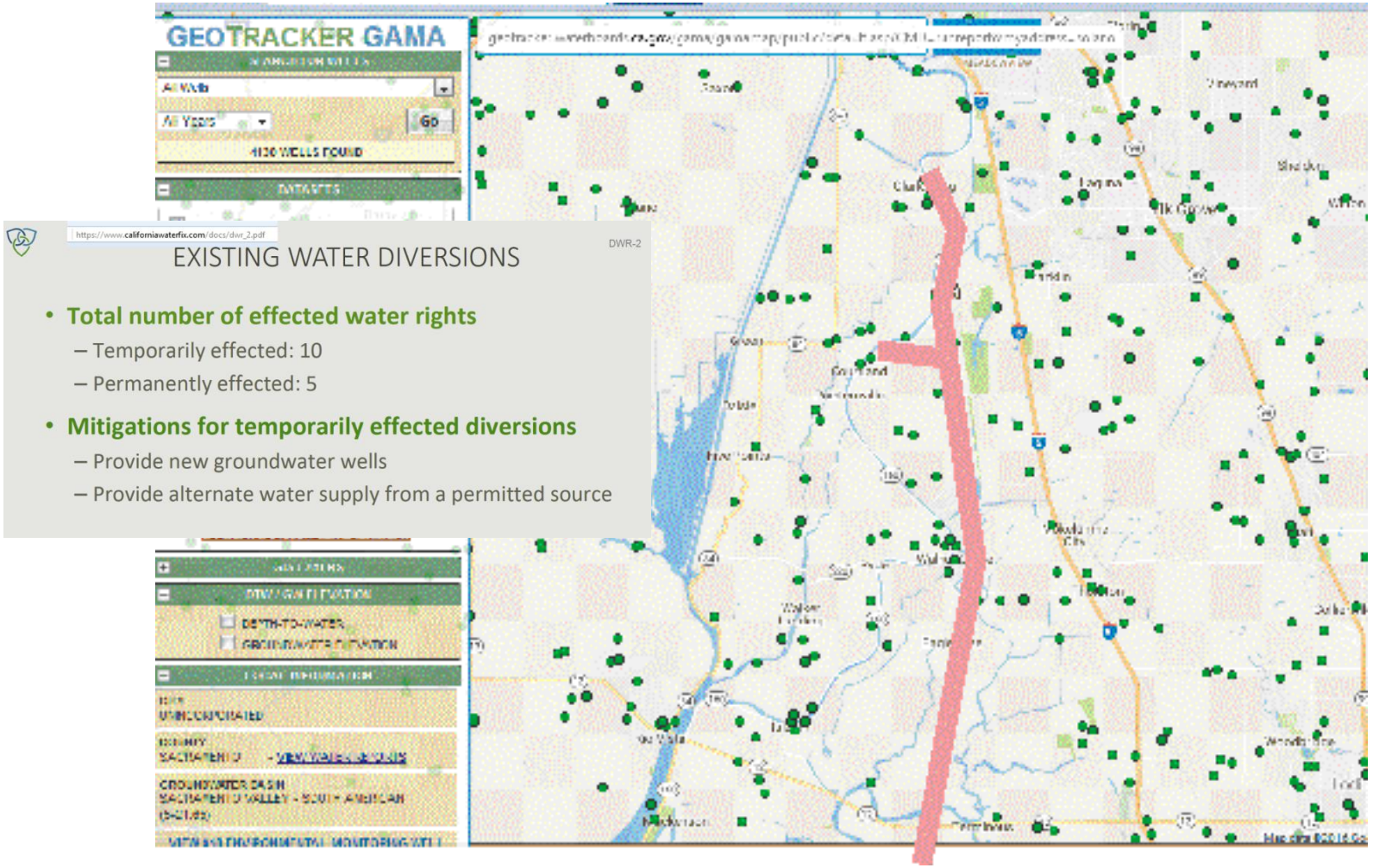
2

TESTIMONY OF MAUREEN SERGENT

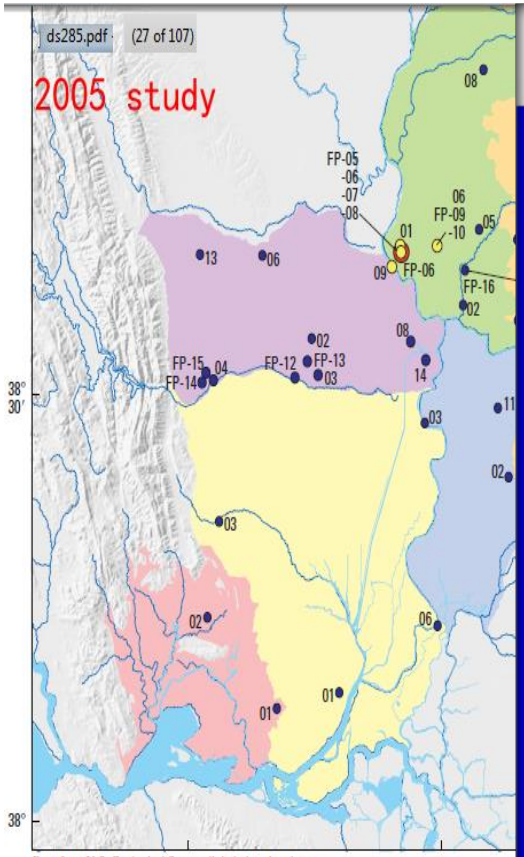
DWR-53

permitted under the permits, and how the information provided by DWR supports a conclusion by the State Water Board that the new points of diversion will not injure other legal users of water or in effect initiate a new water right[2] and to provide a general overview of DWR water supply and settlement agreements.

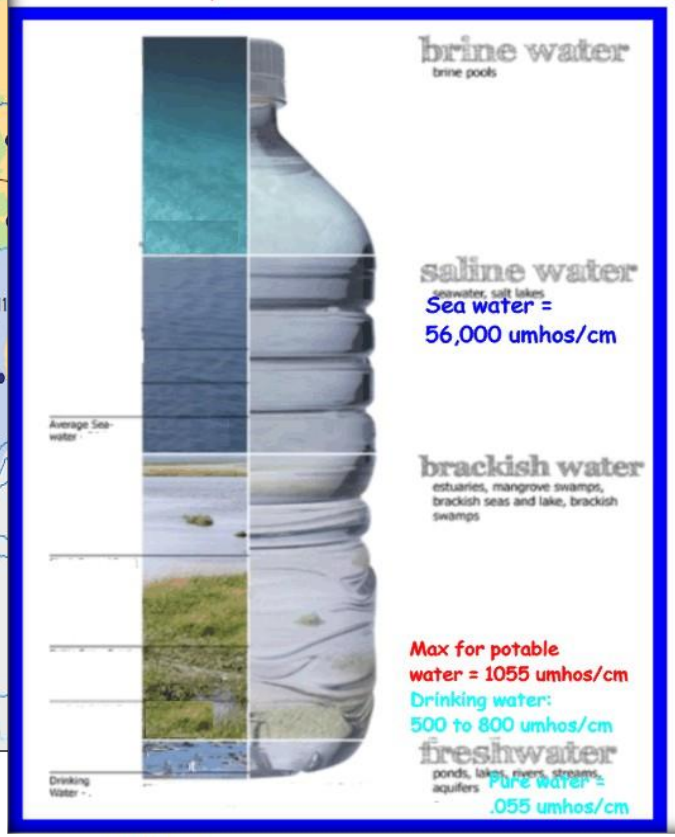
1. It appears from DWR-1 and DWR-53 that petitioners claim to be diverting 6,504,300 acre feet per year of Sacramento River water *already,* so what year did you start taking Sacramento River water at that volume? For the water flow modeling, was the baseline diversion rate 6,504,3000 acre feet from the Sacramento River, and if not, how many acre feet? For example, as a comparison, how much Sacramento River water was diverted in 2000, 2005, 2010 and 2014?
2. How much water was exported from the whole Delta, in acre feet in 2015?



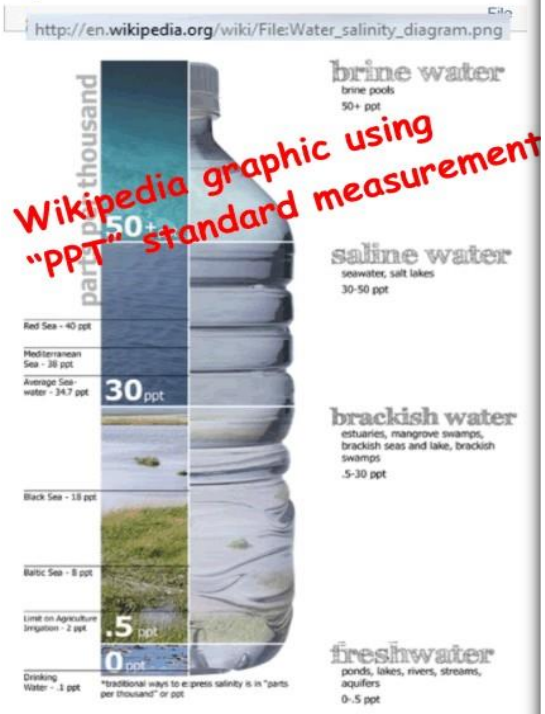
2. Water QUALITY: Do you and/or the WaterFix drafters recognize and account for impacts to legal water rights holders in the Delta area, including the public drinking water wells and private drinking water wells? If so, please describe drinking water quality impacts and show on the map the area that is expected to be impacted: salinity, minerals, availability, cost.
3. Well locations in the Delta….do you know where we are?
4. Do you realize many of the older wells of the Delta may be shallow wells that can be impacted by ground vibration?
5. Do you realize that many of the older wells may be injured or damaged or cracked due to the construction activities
6. And what mitigations have been proposed for that likely situation?



What happens to Delta drinking water wells when there is lower fresh water flow, higher water temperatures and more salinity encroachment?



Delta salinity encroachment maximum historically was 1 ppt, which is double the drinking water standard, but half of the upper limit for irrigation water use. In conductivity terms, maximum "potable" water is reported to be 1055 umhos/cm.



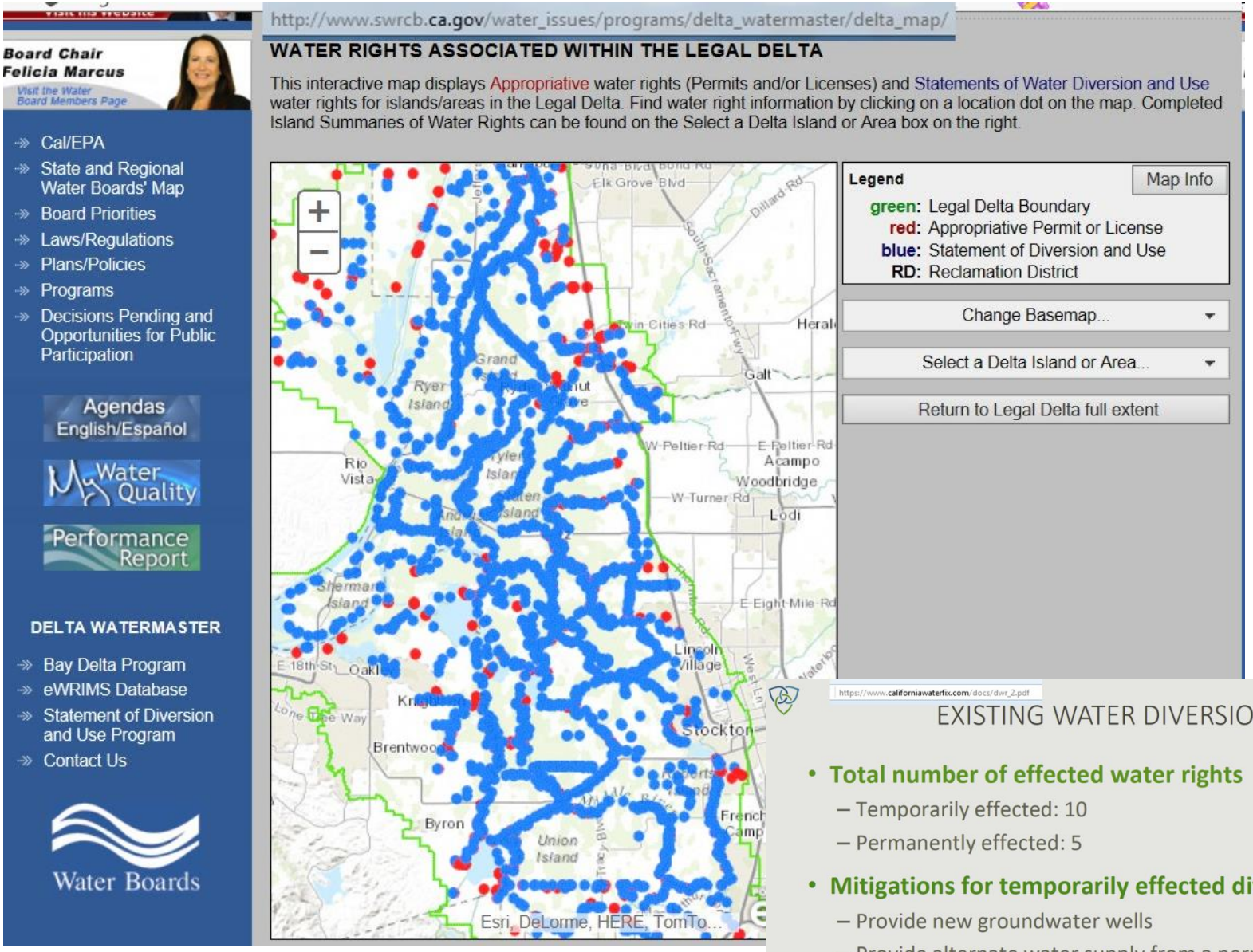
Wikipedia graphic using "PPT" standard measurement

EXPLANATION

Study areas
- North American (NAM)
- Solano (SOL)
- South American (SAM)
- Suisun–Fairfield (SUI)
- Uplands (QPC)
- Yolo (YOL)

Wells sampled, well number, and arsenic concentrations, in micrograms per liter
- 01 < 10
- 01 > 10 – < 50
- 01 > 50

Flowpath (FP)
Depth dependent (DD)


http://www.swrcb.ca.gov/water_issues/programs/delta_watermaster/delta_map/
WATER RIGHTS ASSOCIATED WITHIN THE LEGAL DELTA
This interactive map displays Appropriative water rights (Permits and/or Licenses) and Statements of Water Diversion and Use water rights for islands/areas in the Legal Delta. Find water right information by clicking on a location dot on the map. Completed Island Summaries of Water Rights can be found on the Select a Delta Island or Area box on the right.
Board Chair
Felicia Marcus
Visit the Water Board Members Page
Cal/EPA
State and Regional Water Boards' Map
Board Priorities
Laws/Regulations
Plans/Policies
Programs
Decisions Pending and Opportunities for Public Participation
Agendas English/Español
Water Quality
Performance Report
DELTA WATERMASTER
Bay Delta Program
eWRIMS Database
Statement of Diversion and Use Program
Contact Us
Water Boards
Legend
Map Info
green: Legal Delta Boundary
red: Appropriative Permit or License
blue: Statement of Diversion and Use
RD: Reclamation District
Change Basemap...
Select a Delta Island or Area...
Return to Legal Delta full extent
Elk Grove Blvd
Dillard Rd
South Sacramento Fwy
Twin Cities Rd
Galt
Ryer Island
W Peltier Rd
E Peltier Rd
Acampo
Woodbridge
W Turner Rd
Lodi
Rio Vista
Sherman Island
E Eight Mile Rd
Lincoln Village
E 18th St
Oakley
Stockton
Brentwood
Byron
Union Island
French Camp
Esri, DeLorme, HERE, TomTo...
https://www.californiawaterfix.com/docs/dwr_2.pdf
DWR-2
EXISTING WATER DIVERSIONS
Total number of effected water rights
– Temporarily effected: 10
– Permanently effected: 5
Mitigations for temporarily effected diversions
– Provide new groundwater wells
– Provide alternate water supply from a permitted source

https://www.californiawaterfix.com/docs/dwr_2.pdf

DWR-2

EXISTING WATER DIVERSIONS

- **Total number of effected water rights**
  - Temporarily effected: 10
  - Permanently effected: 5
- **Mitigations for temporarily effected diversions**
  - Provide new groundwater wells
  - Provide alternate water supply from a permitted source

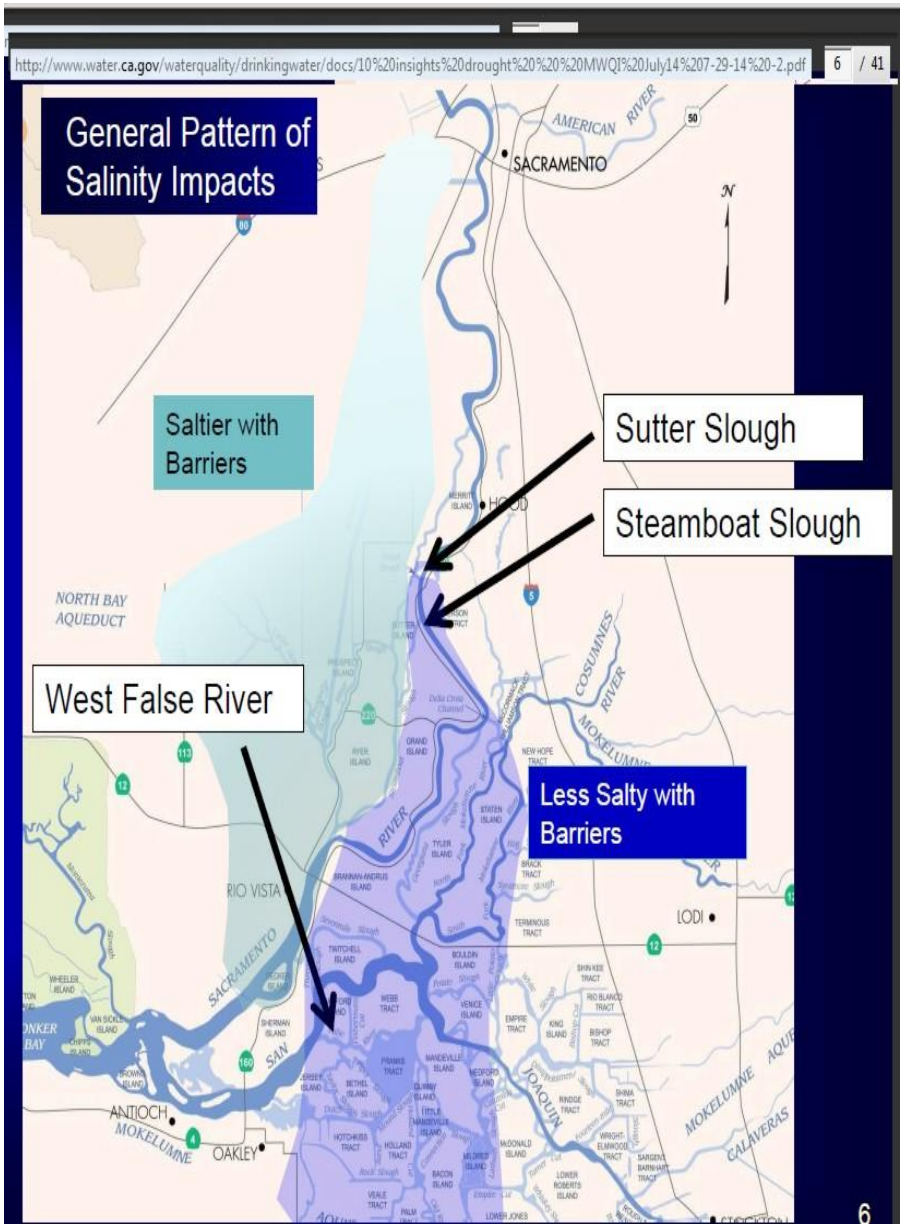


Table 1. Salinity classes of irrigation waters (Environment Protection Authority 1991).

Class	TDS* ($mg \cdot L^{-1}$)	EC* ($\mu S \cdot cm^{-1}$)	Comments
1	0–175	0–270	Can be used for most crops on most soils by all methods or water application with little likelihood that a salinity problem will develop. Some leaching is required, but this will occur under normal irrigation practices, except in soils of extremely low soil permeabilities.
2	175–500	270–780	Can be used if a moderate amount of leaching occurs. Plants with moderate salt tolerance can be grown, usually without special salinity management practices. Sprinkler irrigation with the more saline waters in this class may cause leaf scorch on salt-sensitive crops.
*3	500–1500	780–2340	Do not use the more saline waters in this class on soils with restricted drainage. Even with adequate drainage, best practice management controls for salinity may be required, and the salt tolerance of the plants to be irrigated must be considered.
4	1500–3500	2340–5470	For use, soils must be permeable with adequate drainage. Water must be applied in excess to provide considerable leaching, and salt-tolerant crops should be grown.
5	>3500	>5470	Not suitable for irrigation except on well drained soils under good management, especially leaching. Restrict to salt-tolerant crops, or for occasional emergency use.

* See conversions at end of this chapter.

2007 DRMS map showing both drinking water wells and surface water intakes

Delta_EOP_Concept_Paper-March_2007.pdf 4 of 181

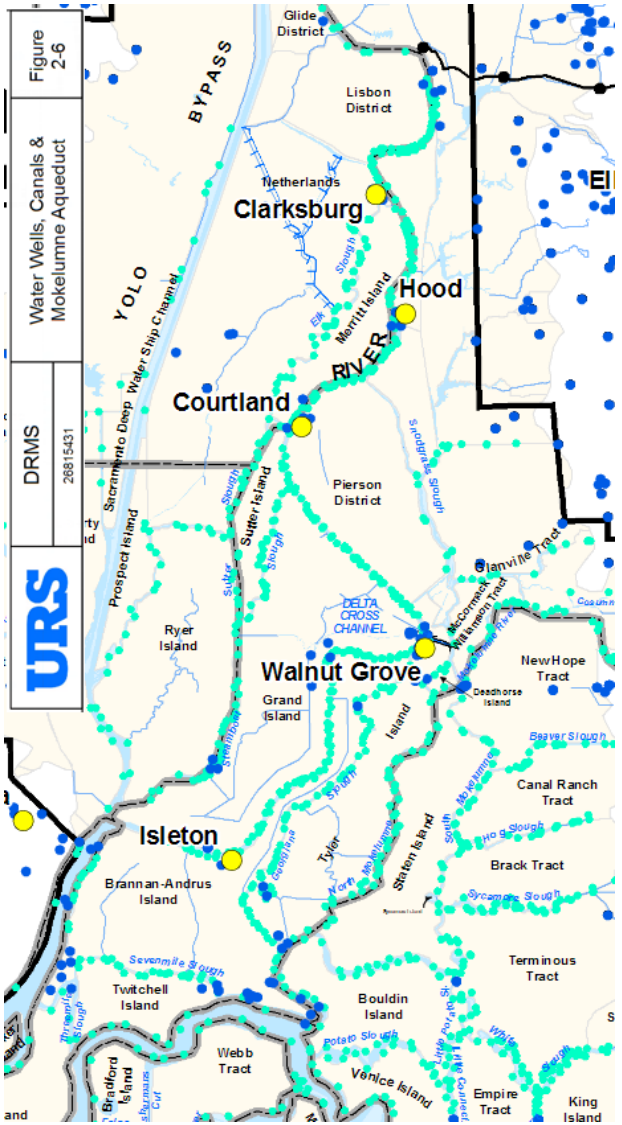
ACKNOWLEDGEMENTS

This Delta Emergency Operation Plan – Concept Paper was prepared by the California Department of Water Resources, Division of Flood Management under the direction of:

Art Hinojosa, Project Manager	DWR, Division of Flood Management
Sonny Fong	DWR, Division of Flood Management
John Leahigh	DWR, Division of Flood Management
Michael Mierzwa	DWR, Division of Flood Management
Dave Paulson	DWR, Division of Flood Management
Ralph Svetich	DWR, Division of Flood Management

In coordination with the Department of Water Resources consultant team:

Chris Barkley, Project Manager	URS Corporation
Jennifer Marr	URS Corporation
Kimberley Walsh	URS Corporation
Bill Betchart	JR Benjamin
Curtis Loeb	Moffat and Nichol
Rick Roads	Moffat and Nichol
Loren Bortorff	Independent Consultant



S Corporation P:\GIS\GIS_Project_Files\MXD\Current Working Documents\Infrastructure\tech_memo_R1_010507\2-6 Water, Wells, Canals & Mokelumne Aqueduct.mxd Date: 1/5/2007 9:56:44 AM Name: smlewis0

http://snugharbor.net/images-2015/barriers/docs/Delta_EOP_Concept_Paper-March_2007.pdf

Since the FUNCTION of the conveyance plan
Is to convey fresh water from the Sacramento River
Within the North Delta to other areas of the state,
In your opinion would that conveyance result in
Downstream Non-compliance of the Water Quality
Control Plan For the Sacramento River and San
Joaquin River Basins Drinking water policy for
surface waters of the Delta?

www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2013/rs2013_0038.pdf

CERTIFICATION

The undersigned Clerk to the Board does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on December 3, 2013.

AYE:	Chair Felicia Marcus Vice Chair Frances Spivy-Weber Board Member Tam M. Doduc Board Member Steven Moore Board Member Dorene D'Adamo
NAY:	None
ABSENT:	None
ABSTAIN:	None

Jeanine Townsend
Clerk to the Board

www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/resolutions/r5-2013-0098_res.pdf

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

RESOLUTION NO. R5-2013-0098

AMENDMENT TO THE WATER QUALITY CONTROL PLAN
FOR
THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS

TO
ESTABLISH A DRINKING WATER POLICY FOR SURFACE WATERS OF THE DELTA AND ITS UPSTREAM TRIBUTARIES

WHEREAS, the California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) finds that:

1. The Sacramento-San Joaquin Delta (Delta) provides drinking water to more than 25 million people or about 60 percent of the population of California.

2. The Central Valley Water Board recognizes that specific treatment requirements are imposed by state and federal drinking water regulations on the consumption of surface waters, including the Delta.

3. In August 2000, CALFED issued the Record of Decision (ROD) for the Programmatic Environmental Impact Statement/Environmental Impact Report requiring the California Bay-Delta Authority (CBDA), with the assistance of the DPH to coordinate a comprehensive source water protection program. One element of this source water protection program is to "establish a comprehensive State drinking water policy for the Delta and upstream tributaries by the end of 2004."

4. The water boards have the authority to formulate and adopt water quality control plans, establish water quality objectives, and develop implementation plans under Water Code sections 13240, 13241, and 13242. Water quality objectives are defined under State law as "the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area." (Wat. Code, §13050, subd. (h).)

www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/resolutions/r5-2013-0098_res.pdf

Since the FUNCTION of the conveyance plan is to divert almost all of the fresh water from the Sacramento River in the North Delta area, common sense and some computer modeling estimates indicate salinity will increase substantially in some areas of the Delta downriver from the proposed intakes.

Did design criteria consider how often the intakes would have to be shut down until such time as the surface waters of the Delta return into compliance with the proposed water quality standards for Selenium for the SF Bay and Delta?

EPA-HQ-OW-2015-0392-0214.pdf

EPA United States Environmental Protection Agency | Office of Water 4304T | EPA 822-R-16-006 June 2016

Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater 2016

2016 EPA proposed rule comment period started 7-15-16

https://www.federalregister.gov/articles/2016/07/15/2016-16266/water-quality-standards-establishment-of-revised-numeric-criteria-for-selenium-for-the-san-francisco
https://www.federalregister.gov/articles/2016/07/15/2016-16266/water-quality-standards-establishment-of-revised-numeric-criteria-for-selenium-for-the-san-francisco#t-3

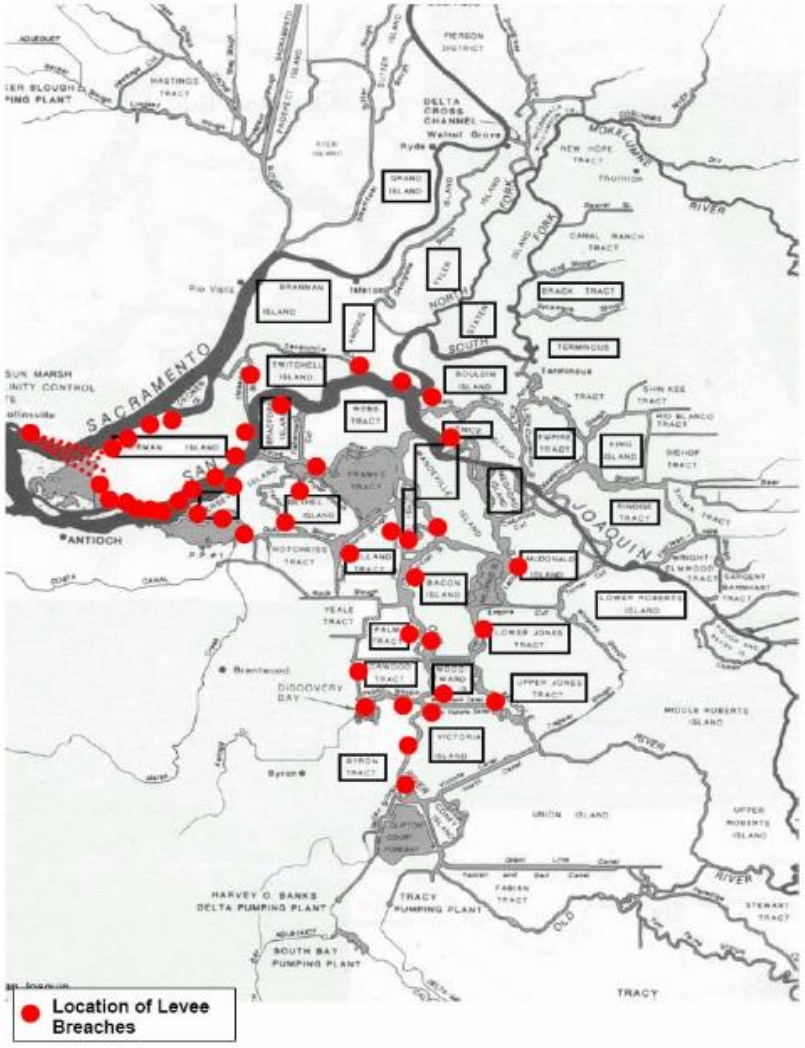
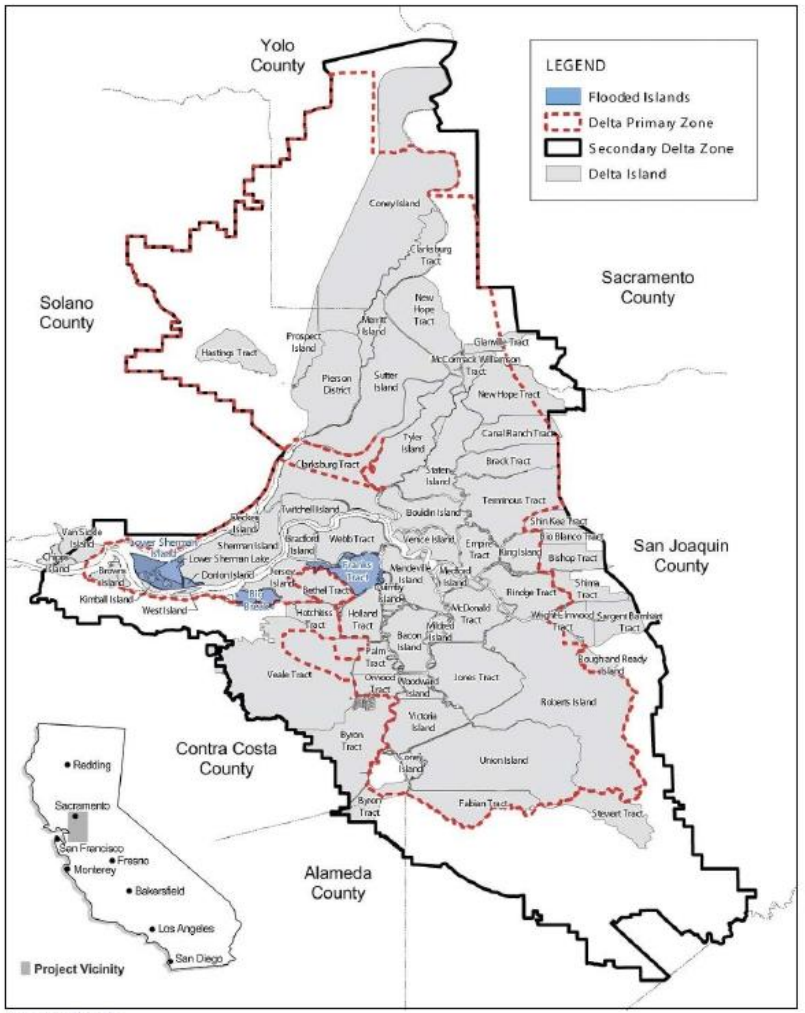


Figure 3-1 Multi-Island Failure Scenario – Levee Breach Locations

Source: Jack Benjamin & Associates, 2007.

http://baydeltaoffice.water.ca.gov/ndelta/summaryreport/documents/FloodedIslandFeasibilitySt



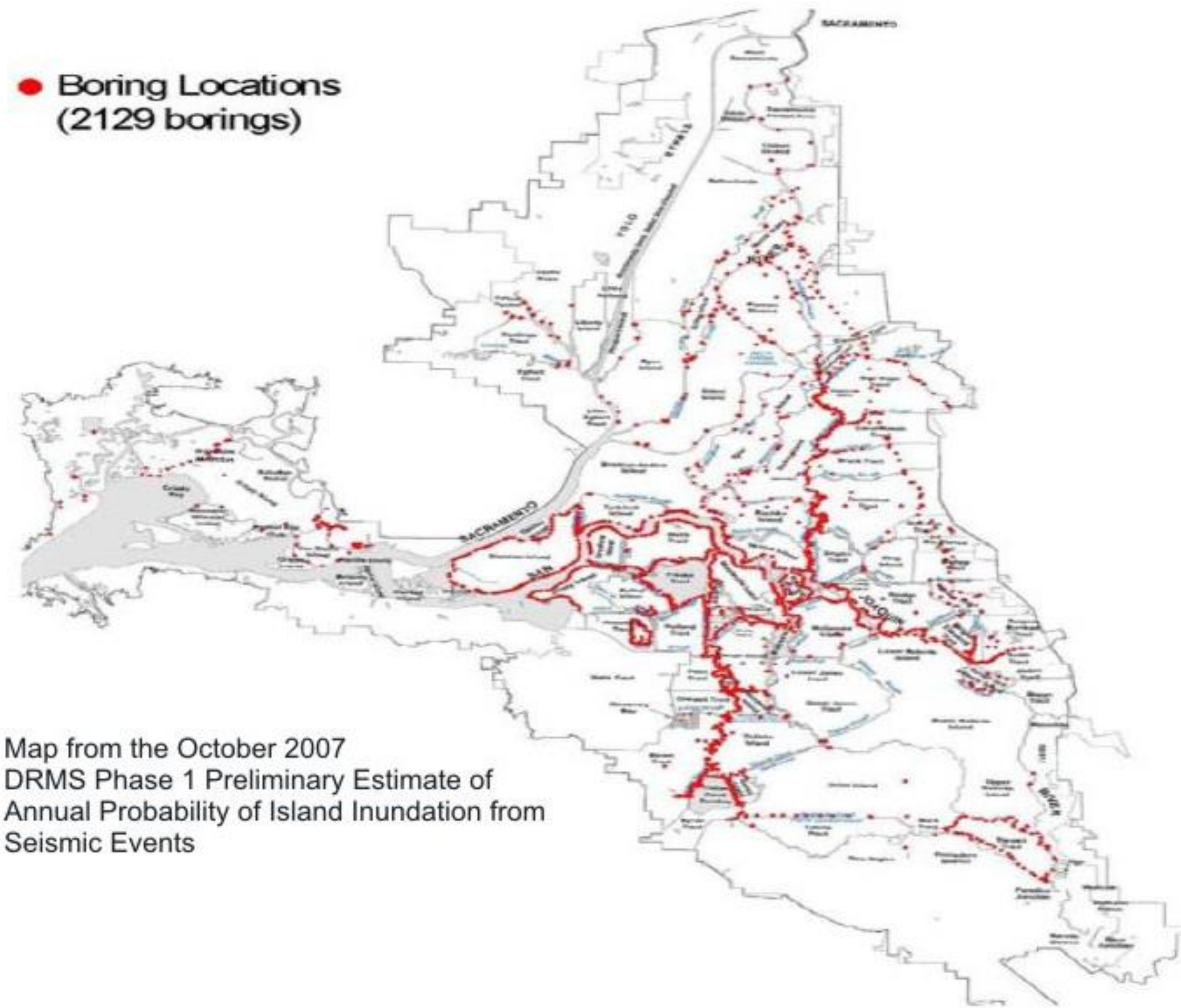
Source: DWR 2003

Regional Map

EXHIBIT 2-1

Flooded Islands Feasibility Study Baseline Report

EDAW



Map from the October 2007
DRMS Phase 1 Preliminary Estimate of
Annual Probability of Island Inundation from
Seismic Events

www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/petitioners_exhibit/dwr/dwr_207.pdf

Table 3-3. Analytical Results Summary for Baseline and Conditioned Soil Samples

Group Analyte	Screening-Level Surrogate	Human Health, Unrestricted-Use Soil (mg/kg)				Sample Results (mg/kg)									
		USEPA RSL[a]		CA-modified Screening Level[b]		Baseline		Condat-Conditioned		BASF-Conditioned		Normet-Conditioned		Nomet-Conditioned (with 3% Lime)	
		Carcinogenic	Non-carcinogenic	Carcinogenic	Non-carcinogenic	Maximum Detected	Maximum MDL	Maximum Detected	Maximum MDL	Maximum Detected	Maximum MDL	Maximum Detected	Maximum MDL	Maximum Detected	Maximum MDL
Inorganic Constituents															
Ammonia	Nitrite	**	7,800	**	**	16	--	0.738	--	0.831	--	--	0.689	2.31	--
Antimony		**	31	**	**	--	1.16	--	1.1	0.229	--	0.27	--	0.262	--
Arsenic		0.61	34	0.062	**	4.37[c]	--	4.03[c]	--	4.51[c]	--	4.23[c]	--	4.03[c]	--
Barium		**	15,000	**	**	207	--	200	--	172	--	197	--	188	--
Beryllium		1400	160	1400	16	0.591	--	0.642	--	--	0.541	0.538	--	0.519	--
Cadmium		1800	70	788	4	0.579	--	0.548	--	0.342	--	0.439	--	0.466	--
Chromium	Chromium(III)	**	120,000	**	**	62.3	--	60.3	--	50.1	--	56.6	--	54.3	--
Chromium (VI)		0.29	230	**	**	--	0.594	--	0.547	--	0.552	--	0.568	--	0.645

arsenic

Sample Results (mg/kg)							
Baseline		Condat-Conditioned		BASF-Conditioned		Normet-Conditioned	
Maximum Detected	Maximum MDL	Maximum Detected	Maximum MDL	Maximum Detected	Maximum MDL	Maximum Detected	Maximum MDL
16	--	0.738	--	0.831	--	--	0.689
--	1.16	--	1.1	0.229	--	0.27	--
4.37[c]	--	4.03[c]	--	4.51[c]	--	4.23[c]	--
207	--	200	--	172	--	197	--
0.591	--	0.642	--	--	0.541	0.538	--
				0.342	--	0.439	--
				50.1	--	56.6	--
			0.547	--	0.552	--	0.568

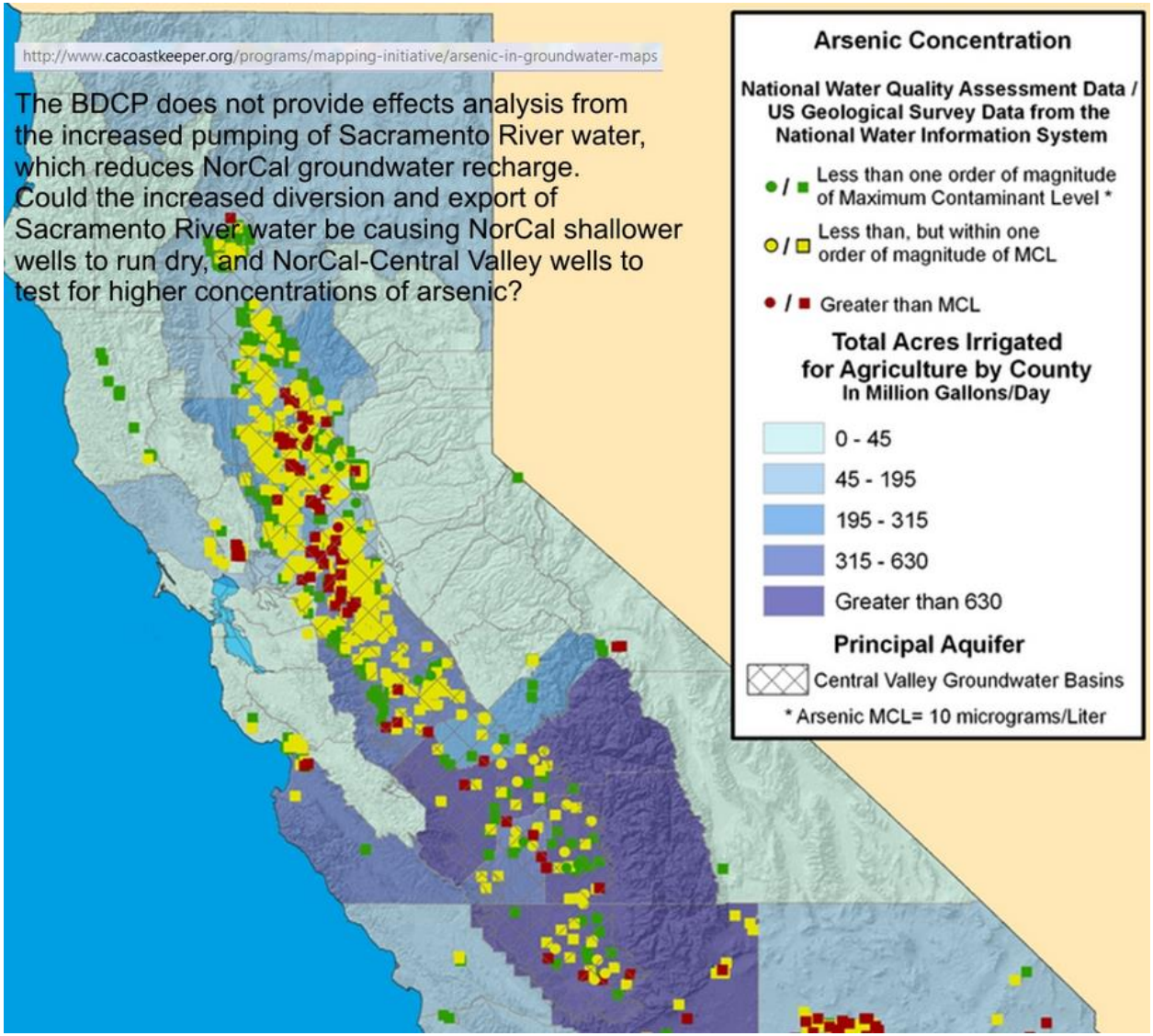
Table 3-3. Analytical Results Summary for Baseline and Co

Notes:

[a] USEPA. 2013. Regional Screening Levels (RSL) for Chemical Contaminants at Su
[b] DTSC. 2013. *DTSC recommended methodology for use of U.S. EPA Regional Scre* (HHRA) Note Number 3. California Department of Toxic Substances Control (DTSC)
[c] Value is less than estimated Delta soil background concentration of 9.36 mg/kg (CV
shaded values = indicate exceedance of the minimum soil-screening concentration
** = no published screening value

BDCP did not disclose possible impacts to groundwater from soil disturbance which may increase arsenic levels in drinking water.

WaterFix also continues to ignore this issue, despite the recognition that tunnel soil samples show concentrations of arsenic at levels that are “flagged” as of concern



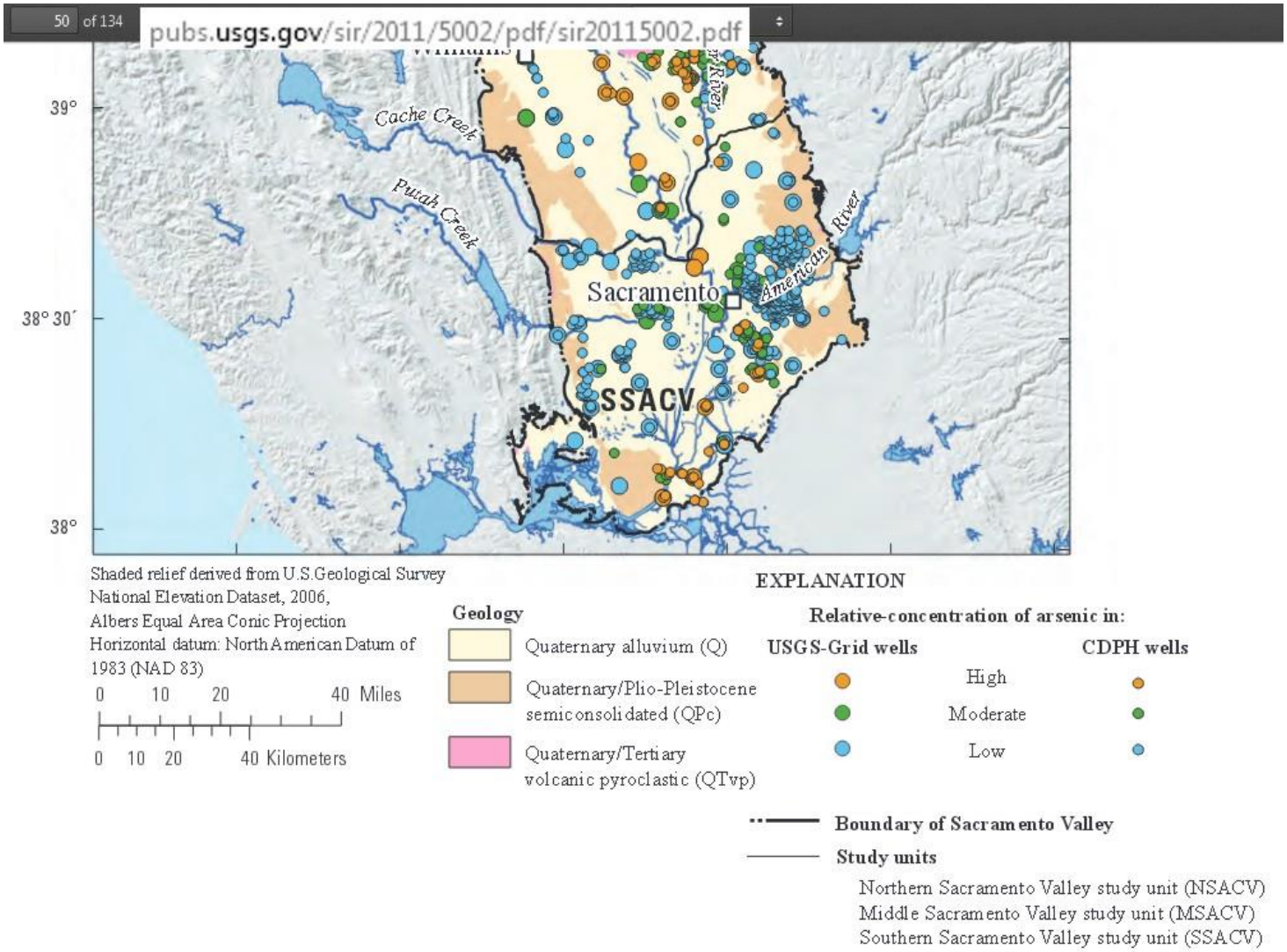
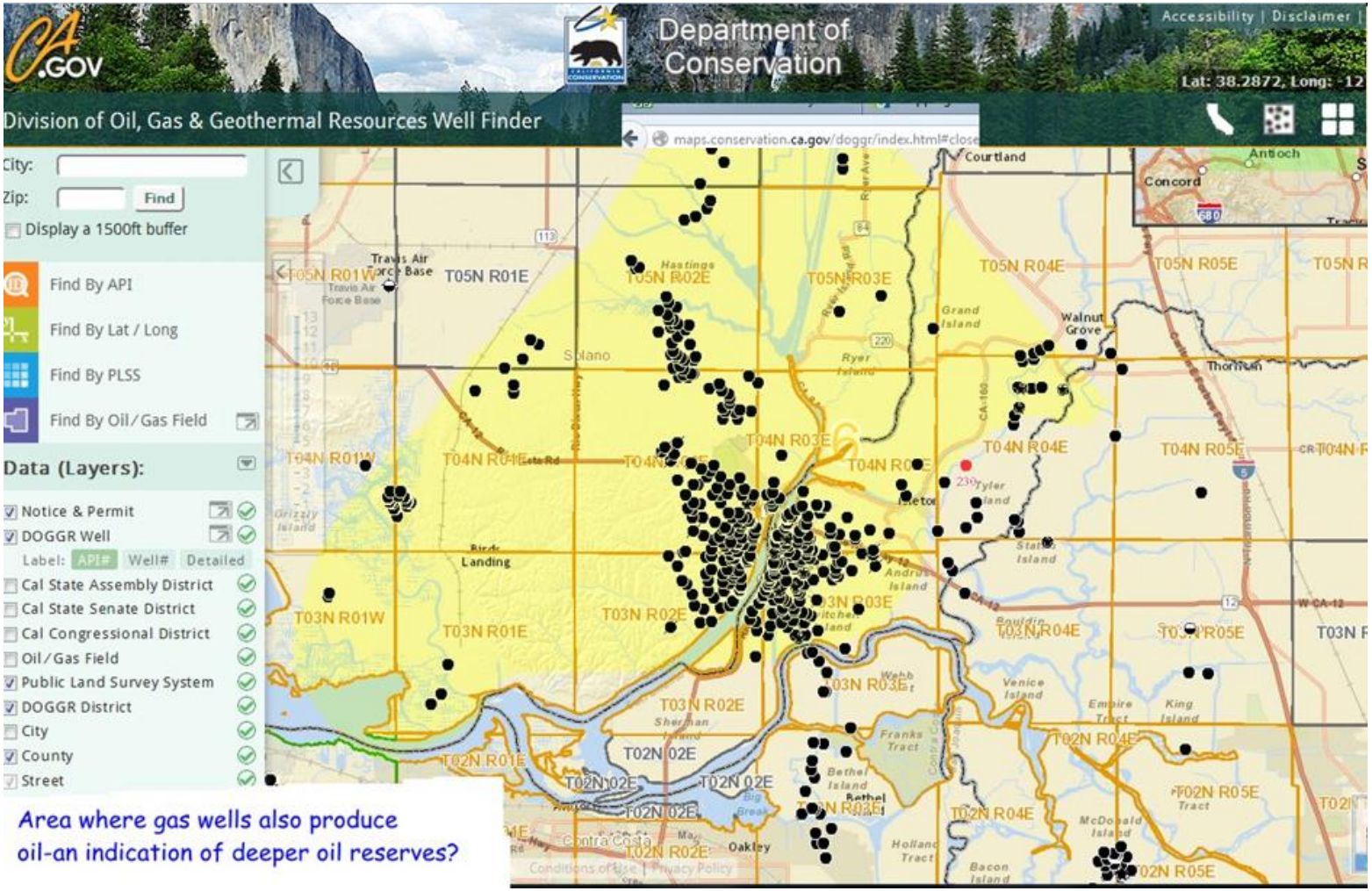


Figure 9. Relative-concentrations of arsenic in USGS-grid wells and CDPH wells, Southern, Middle, and Northern Sacramento Valley Groundwater Ambient Monitoring and Assessment (GAMA) study units, California.

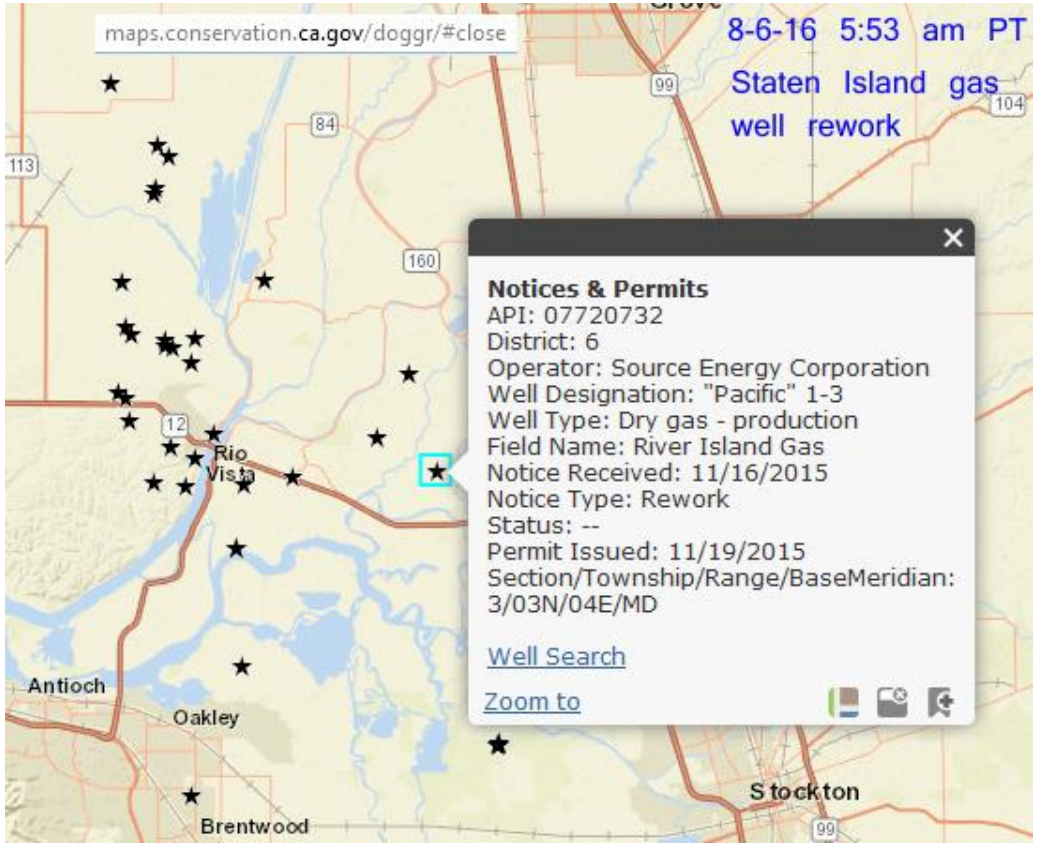
It is a known fact that disturbing soils can affect drinking water wells nearby. How will DWR/USBR mitigate further impacts to drinking water wells, and specifically those around and downriver from the intake construction areas?

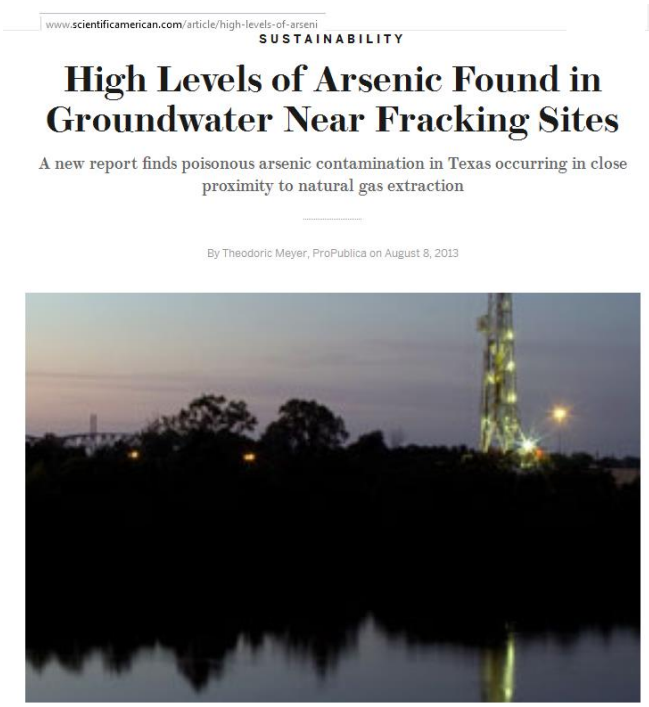
CA Dept of Conservation provides the online records of all gas and oil wells drilled, and includes the well logs, all of which is public records available online. Did WaterFix planning locate all of the natural gas wells along the footprint of the construction site, and plan for closure of those wells and plan for a method that assures there will be no drinking water aquifer contamination from those construction activities? Maps.conservation.ca.gov/doggr/index.html



"A recently published study by researchers at the University of Texas at Arlington found elevated levels of arsenic and other heavy metals in groundwater near natural gas fracking sites in Texas' Barnett Shale.
While the findings are far from conclusive, the study provides further evidence tying fracking to arsenic contamination." Since arsenic is a natural element found in the ground, it is logical to assume the process of fracking disturbs the soil which results in infiltrating the drinking water aquifer and therefore the drinking water wells.

The equipment used to build the intakes and tunnels, and the disturbance to soils in the area, could impact local drinking water wells. Why isn't this addressed in the WaterFix effects documents since it was brought up at BDCP hearings?
http://www.scientificamerican.com/article/high-levels-of-arsenic-found-in-ground-water-near-fracking-sites/





http://opi.consrv.ca.gov/opi/opi.dll/WellFrame?UsrP_ID=100100100&PWT__ID=100256257&PWT__WellTypeCode=DG&StartRow=1&SortFields=WMtr_APINumber&NewSortFields=WLst_Range&FormStack=&PriorState=WMtr_APINumber%3D06720441&SelectedTab=2&SumMode=0&UsrP_RecentYearFirst=1

More oil than gas being produced in this well on the edge of Twitchel island along the levee proposed restoration area: http://opi.consrv.ca.gov/opi/opi.dll/WellFrame?UsrP_ID=100100100&PWT__ID=100271715&PWT__WellTypeCode=DG&StartRow=1&SortFields=WMtr_APINumber&NewSortFields=WLst_Range&FormStack=&PriorState=WMtr_APINumber%3D06720505&SelectedTab=2&SumMode=0&UsrP_RecentYearFirst=1 Note that in the graphs showing production for each year, Oil is in GREEN and Gas is in RED:

www.fractracker.org/2014/03/ca_injection_earthquakes/

Oil & Gas Topics Projects

areas of San Francisco built on landfills, will typically shake more than areas comprised of bedrock at the surface. The type of shaking, whether it is low frequency or high frequency will also present varying hazards for different types of structures. Low frequency shaking is more hazardous to larger buildings and infrastructure, whereas high frequency events can be more damaging to smaller structure such as single family houses. Various assessments have been conducted throughout the state, the majority by the California Geological Survey and the United States Geological Survey.

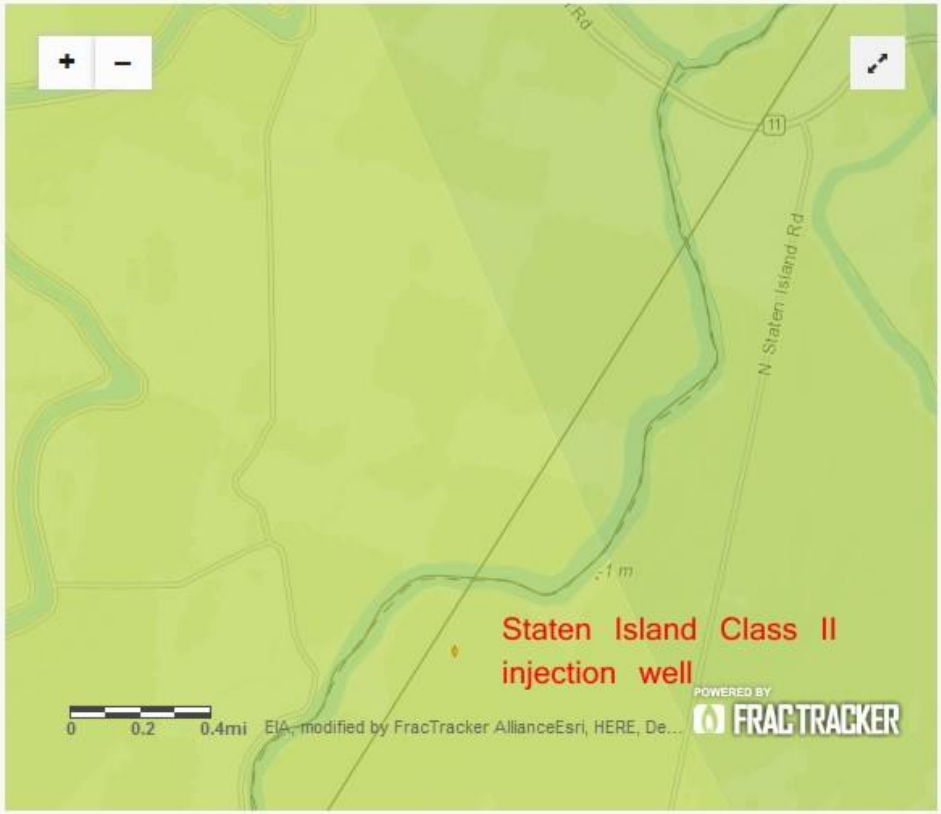
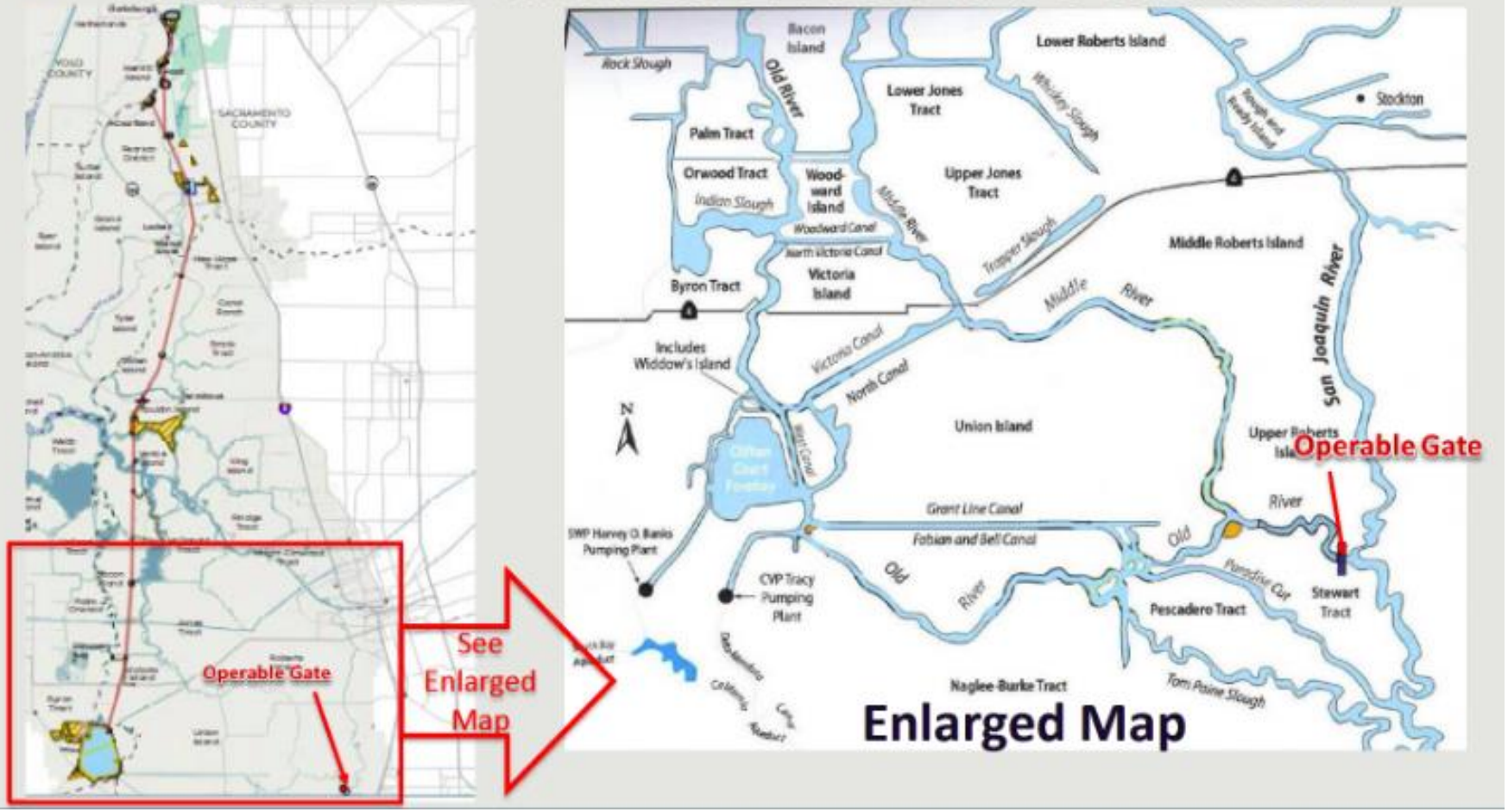


Figure 2. California Earthquake Shaking Amplification and Class II Injection Wells

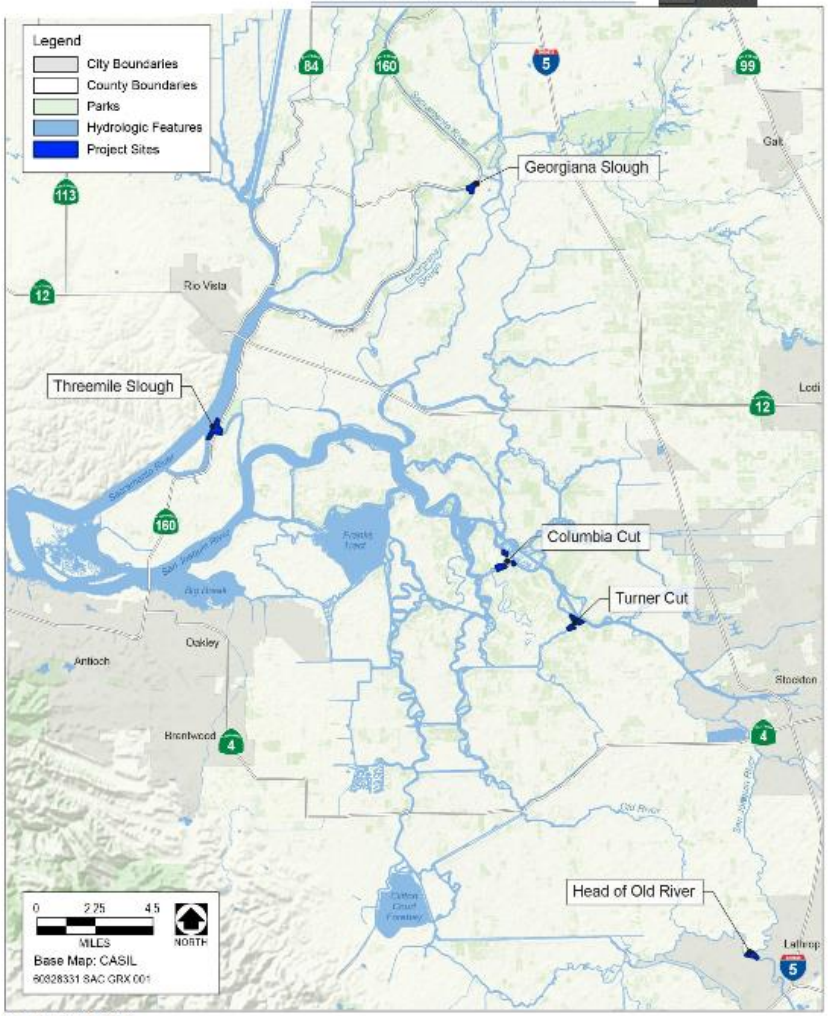
www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/petitioners_exhibit/dwr/dwr_2.pdf 33 of 36

HEAD OF OLD RIVER OPERABLE GATE LOCATION

DWR-2



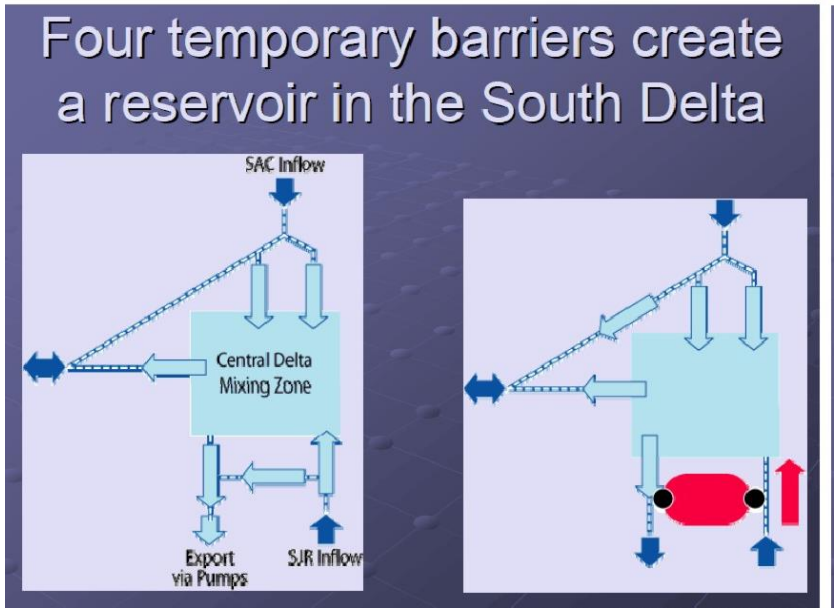
ESS-03 Management Draft_02132015.pdf 24 of 646



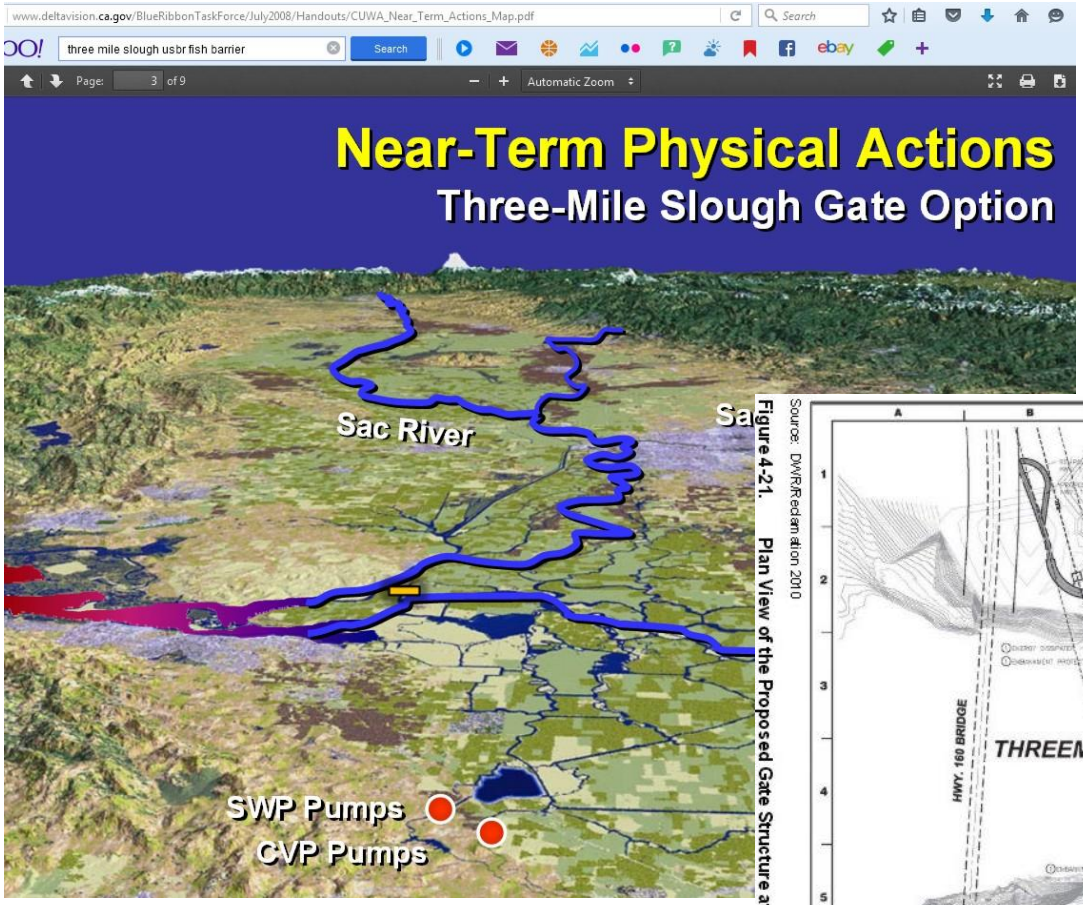
Source: AECOM 2014

Figure 1-1. Map of Delta Study Locations

http://www.water.ca.gov/iep/docs/prstns/ws1_Monsen_52709.pdf 2009 DWR slideshow

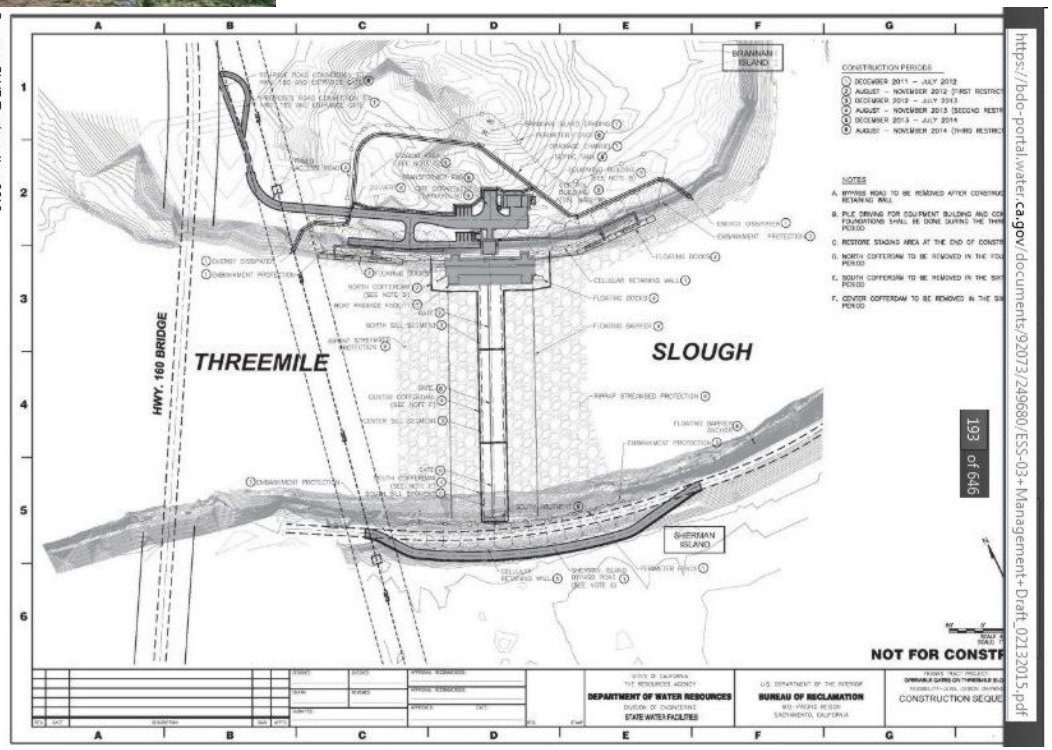


USBR (2015) already went through the process to install flow and fish barrier on 3-Mile Slough. Was this considered in the design and location of the tunnels? (2008 Blue Ribbon Task Force presentation & 2016 USBR



Source: DWR,Reclamation 2010

Figure 4-21. Plan View of the Proposed Gate Structure at Threemile Slough

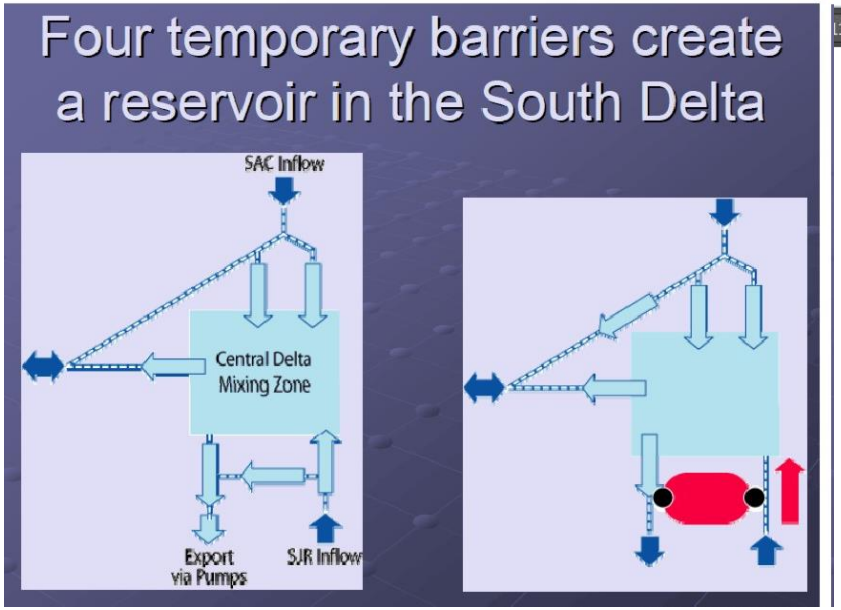


https://bdo-portal.water.ca.gov/documents/92073/249680/ESS-03+Management+Draft_02132015.pdf not there anymore

More engineering questions on the physical construction projects and DWR 510:

http://www.water.ca.gov/iep/docs/prstns/ws1_Monsen_52709.pdf

2009 DWR slideshow



boards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/petitioners_exhibit/dwr/dwr_510.pdf

11 of 61

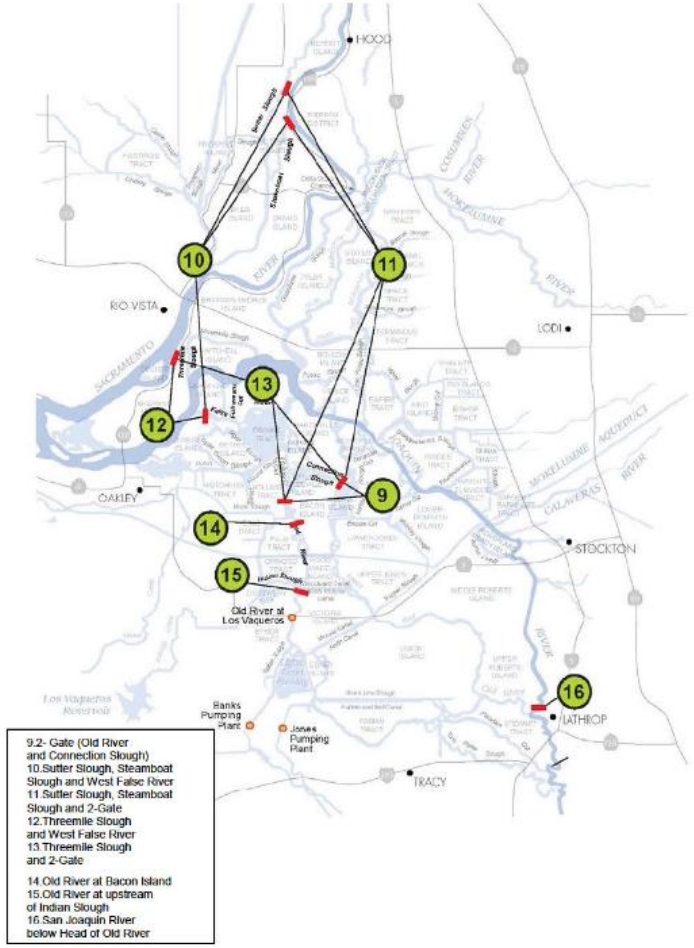


Figure 4-1b Location of Phase 1 Alternatives 9 through 16

Bay-Delta Office
April 2009

Page 6

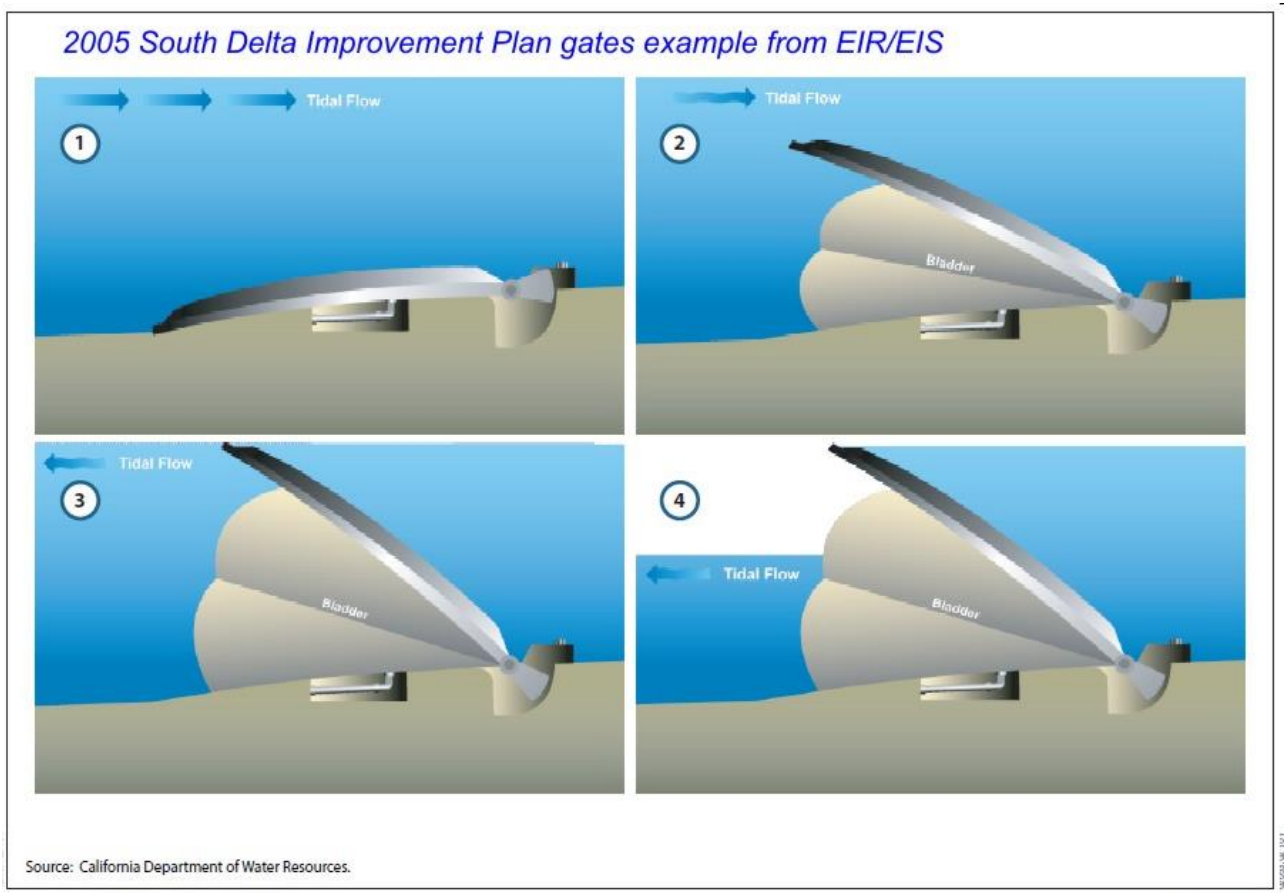
Do you anticipate the need for other barriers in the Delta during construction of the tunnels?

If construction causes levee failures, what is the contingency plan to halt flooding of affected islands? (flooding impacts quality of drinking water wells)

If construction causes flooding of areas upriver of the intakes, due to the coffer dams, what is the contingency plan?

If construction causes flooding of areas downriver of the intakes, due to the coffer dams, what is the contingency plan?

2005

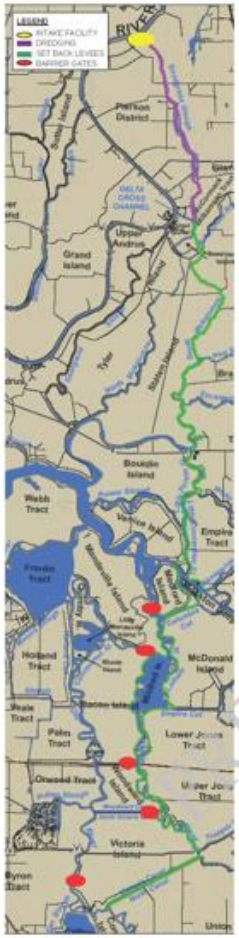


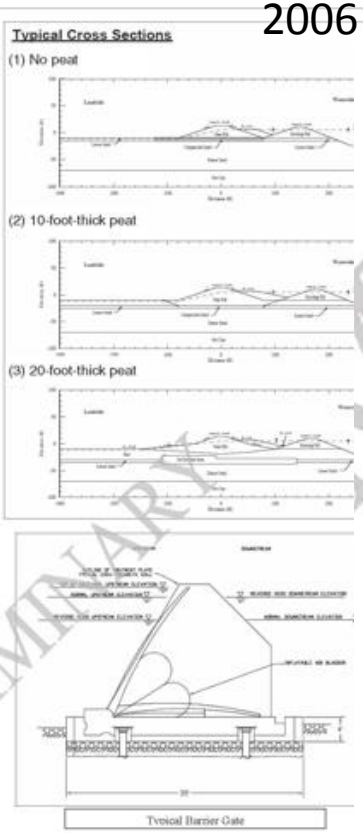
Jones & Stokes

Figure 2-2
Illustration of Bottom-Hinged Gate Operation

Have these types of barriers been installed anywhere in the Delta? If not, why not try it instead of permanent barrier at Head of Old River?

2006





PROJECT INFORMATION
- Capacity = 15,000 cfs
- Corridor Length = 48 miles
- Set Back Levees = 115 miles
- Barrier Gates = 5

PROJECT BENEFITS
- Keeps Salinity Levels Low
- Maintains Water Quality
- Maintains Water Supply Reliability
- Protects Agricultural Areas Adjacent to Improved Levees
- Fish Screens Protect Fish
- Increases Habitat Area in Riparian Zones
- Seismic Resistant Levees

AVOIDED ECONOMIC COSTS DUE TO LOSS OF WATER EXPORTS
- Delta Agriculture Losses Due to Water Quality Degradation $40M
- Losses Due to Water Supply Disruption to Agriculture = $139M
- Losses Due to Water Supply Disruption to Urban Water Users = $16.4B

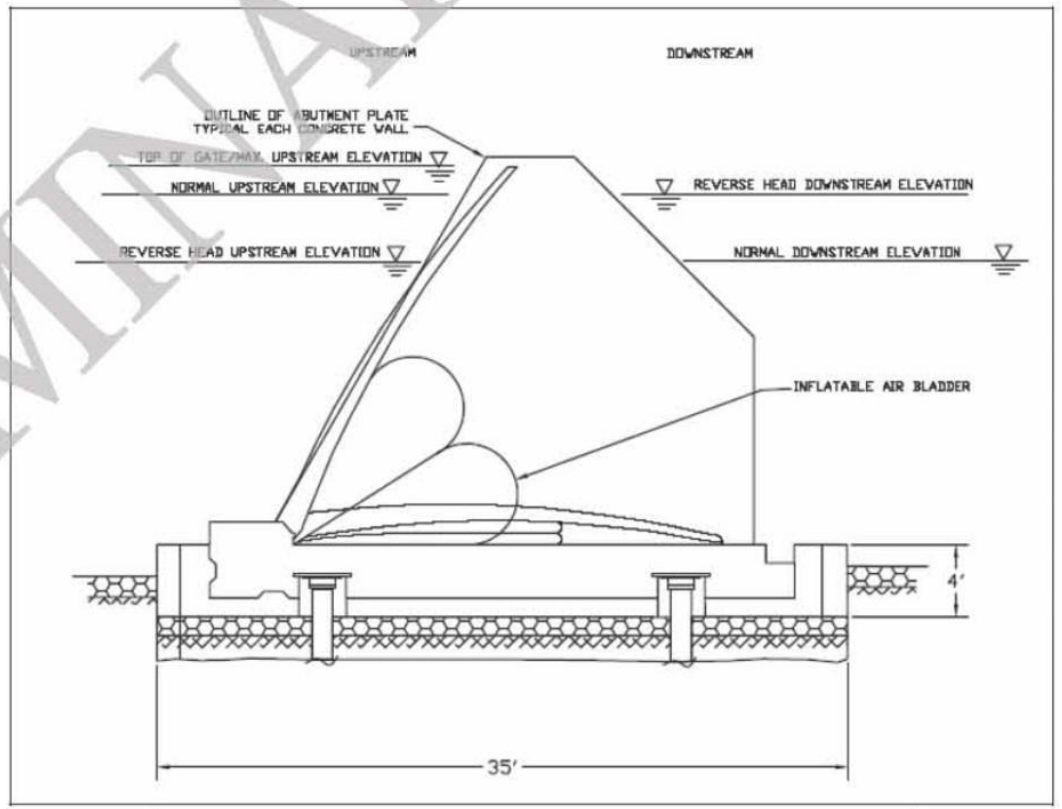
AVOIDED ECONOMIC IMPACTS DUE TO REDUCED WATER SUPPLIES
- Agricultural Water Users Impact = $10.3B
- Urban Water users Impact = $277B

PROJECT COST
(15,000 CFS) = $9.8B

URS

Delta Risk Management Strategy (DRMS) Phase 2

BUILDING BLOCK 1.6: ARMORED PATHWAY THROUGH DELTA CONVEYANCE



Typical Barrier Gate

Emergency Preparedness Plan www.mwdh2o.com/mwdh2o/pages/about/AR/AR11/Chapter-2.pdf

Working in a lead role with the contractors for the State Water Project and Central Valley Project, Metropolitan continued to facilitate and expedite plans for stockpiling material in the Delta region. In the event of a major earthquake in the Delta, these stockpiles would be used to create an emergency freshwater pathway in order to export water supplies.

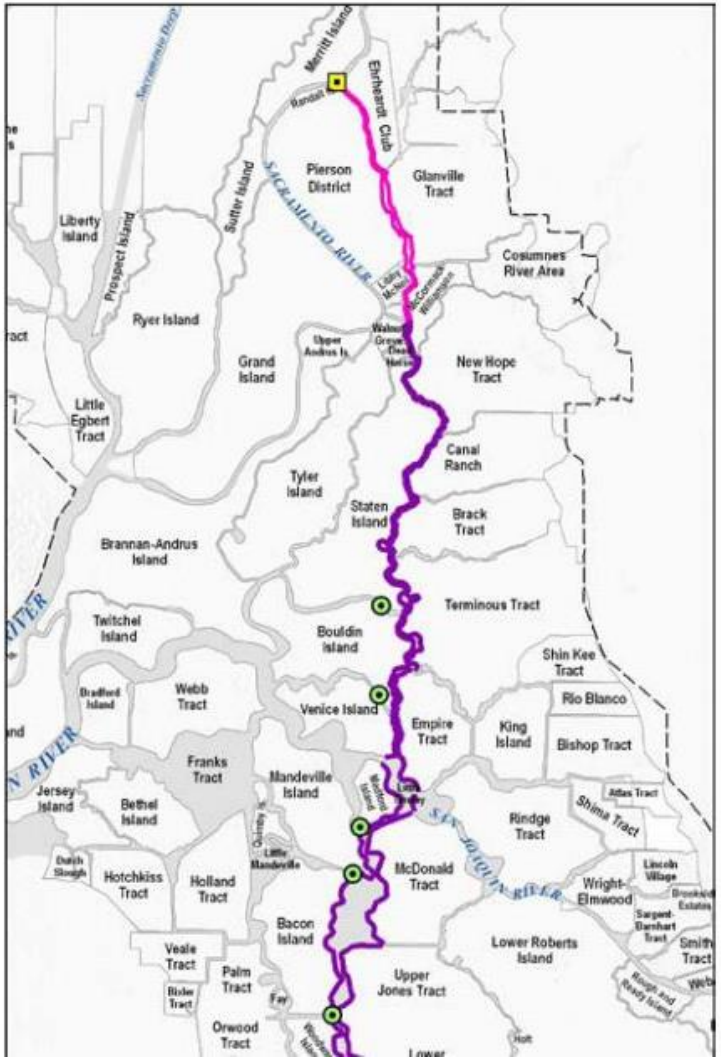
and the luxury of allowing learning from mistakes without undesirable consequences.

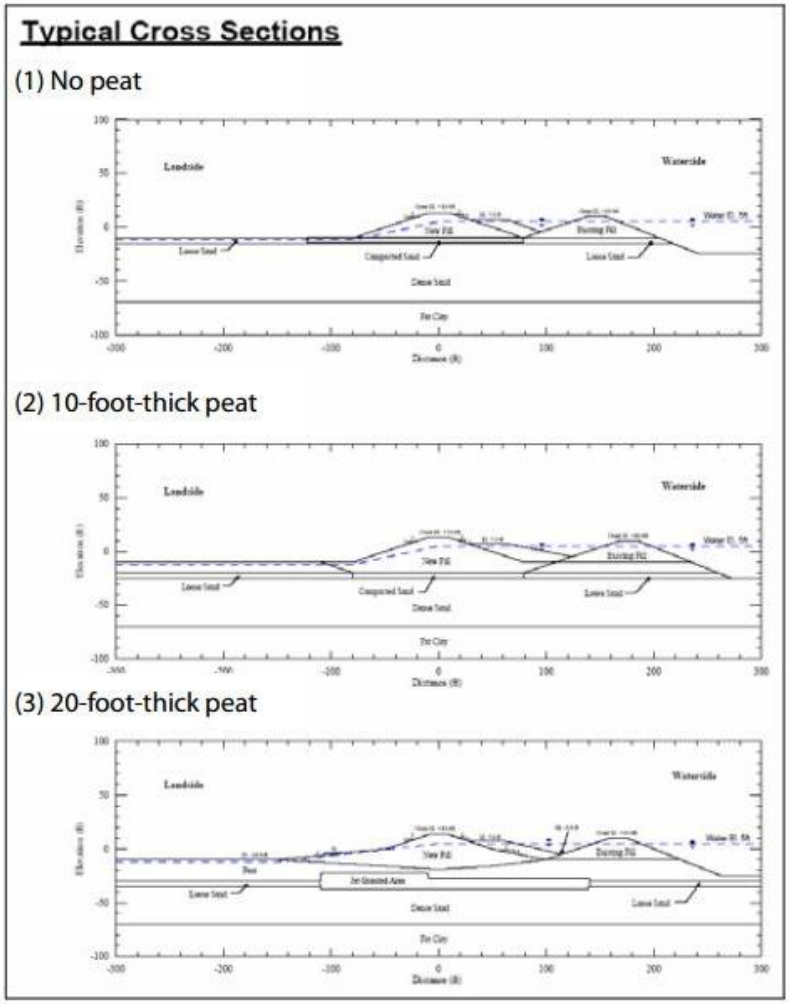
www.water.ca.gov/floodmgmt/docs/Delta_EOP_Concept_Paper-March_2007.pdf

- **Temporary Barriers for New Locations Need Preliminary Designs** – Temporary barriers are indicated as available response actions in DWR's 1986 Emergency Plan and are now being discussed by others (e.g., Ref. 3). At the present time, moveable and/or sinkable structures, such as some of those being discussed, are not available. Mention is made of possibly using sinkable and refloatable rock barges to form temporary barriers. Existing rock barges that might be dedicated to that purpose are scarce. Also, the process of sinking a barge is not as simple as it may sound. It is unlikely to achieve flow diversion because of barge dimensions and the existing geometric properties of the Delta channels. They would also be needed for levee repairs in a major Delta incident. Thus, for the present, it is assumed that any temporary barrier will consist mainly of rock berms in the water, transported and placed by marine equipment. The rock berm may be supplemented by imbedded pipes with flap gates to enable tidal pumping, similar to those now installed in the south Delta. For example, DWR's 1986 Emergency Plan suggests temporary barriers in Steamboat Slough and in the Sacramento River immediately downstream of Georgiana Slough to facilitate greater diversions

http://snugharbor.net/images-2015/barriers/comments/OpposeBarriersMarch172015.pdf

www.water.ca.gov/floodsafe/fessro/levees/drms/docs/DRMS_Phase2_Report_Section8.pdf





2007 MWD plan

197 ftp://ftp.water.ca.gov/users/jpaasch/DEFRP_Technical_Report/DEFRP_Technical%20Report_All%20Sections_App_ABCEF.pdf

respectively. The Earthquake Basic and the Flood basic strategies are designed to meet DWR's recovery strategy objectives a and b in Table 3-3. The water quality strategies for floods and earthquakes are designed to restore water exports as the primary objective. These strategies are referred to as the Flood-Salinity Focused and the Earthquake-Middle River strategies. As described below, each of these strategies addresses other state interests and objectives as well.

These strategies provide DWR with the option of allocating resources in a manner that reduces the water quality impact in the Delta and allows exports to be re-started sooner. These options may be needed in the case where the state is dealing with extensive water shortages for example. For flood initiated failures it is unlikely there will be salinity concerns (DRMS, 2008a). Nonetheless, a Salinity Focused strategy has been developed to respond to levee breaches initiated by a flood event where unforeseen circumstances might raise a concern about water quality. A salinity or water quality focused strategy has been developed to recover from earthquake initiated failures. This is referred to as the Middle River strategy. This strategy schedules levee repairs that are designed to create a fresh water corridor on the east side of the Delta that allows the re-start of exports sooner than would occur in the Earthquake Basic strategy. Figure 3-2 shows the Middle River corridor. There are two elements to the corridor implementation; the first is the closure of levee breaches along the corridor, and the second is the

Computer modeling for emergency barriers was based on an assumption of excess waterflow causing flooding, or in case of earthquake causing levee damage. No modeling was done for drought "emergency" which is an entirely different set of hydraulic flow data and impacts to the Delta would be entirely different too.

3.10

installation of rock barriers to in channels to prevent the intrusion of salinity into the Middle River.

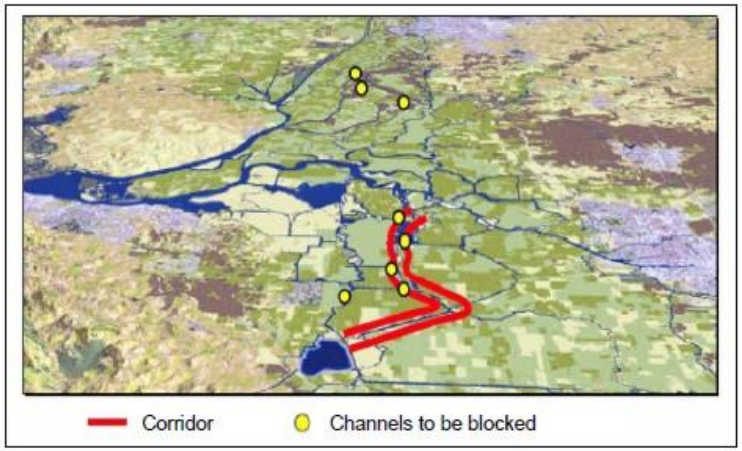


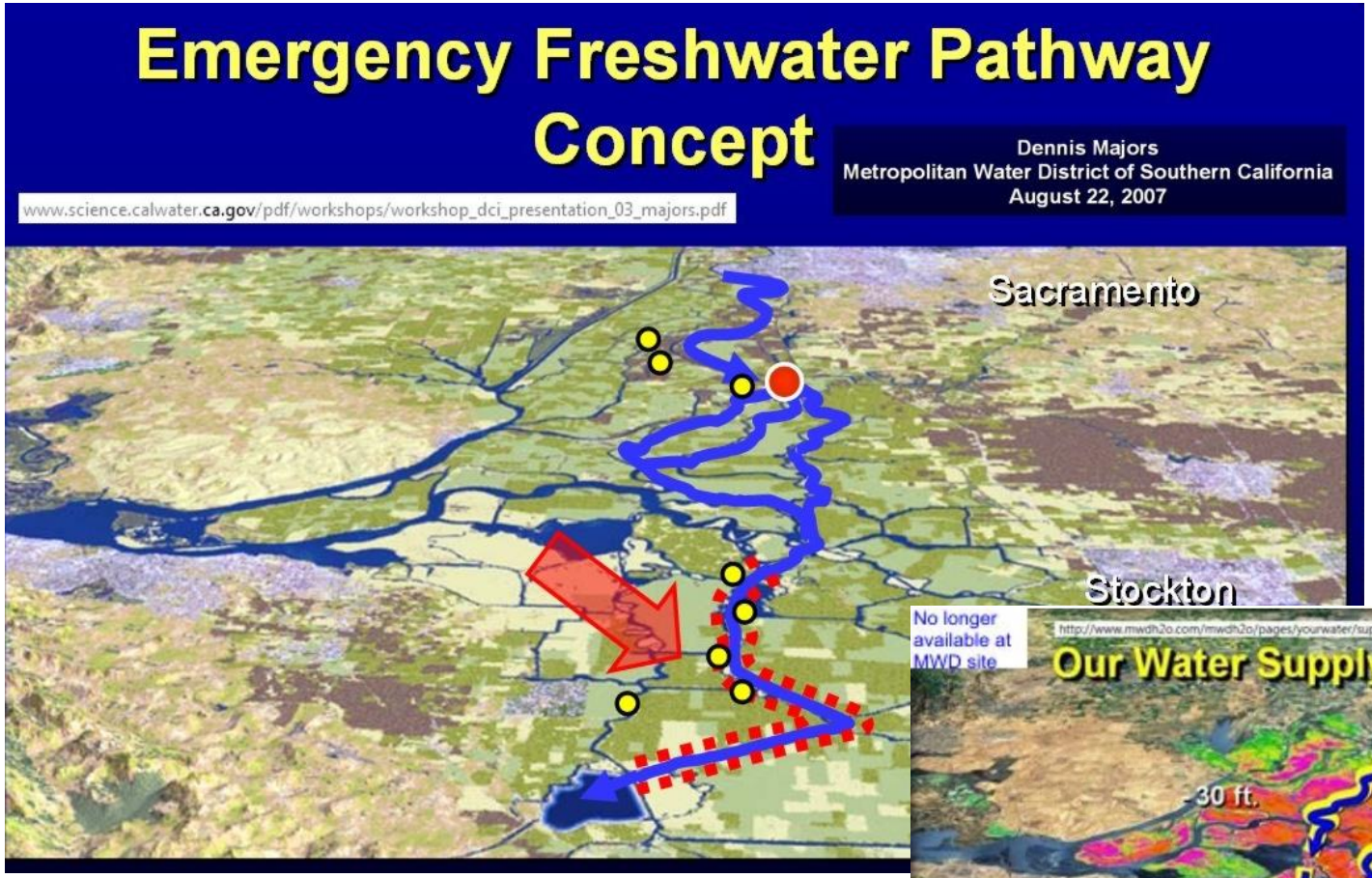
Figure 3-2 Map showing the location of the Middle River corridor.

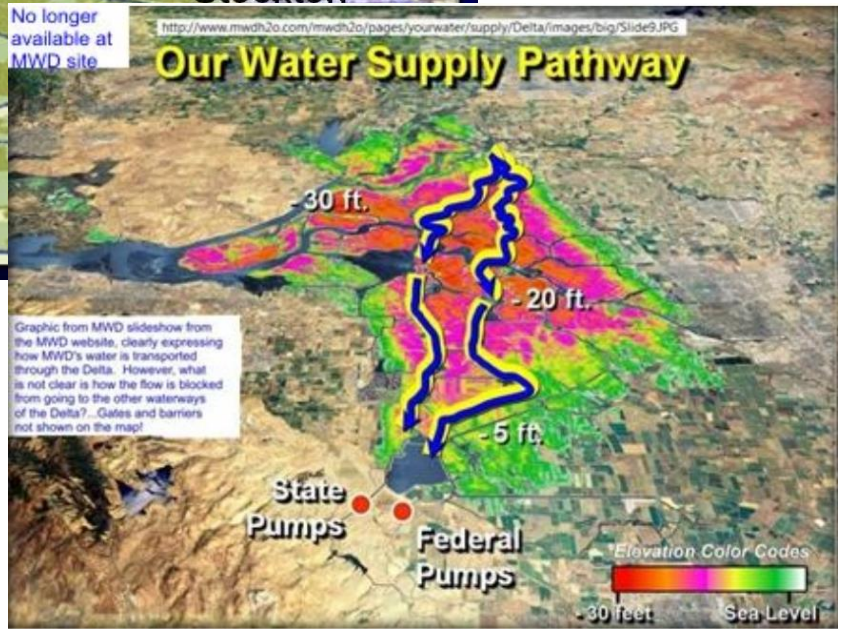
ınd gates at Old River and

ıill force more Sacramento
ɔen, then more Sacramento
d the Central Delta. The Old
d and Middle Rivers from the
n the Sherman Island area
d Columbia Cuts and Middle
ın Joaquin River past where
ver. At this point San
rs channels through Turner

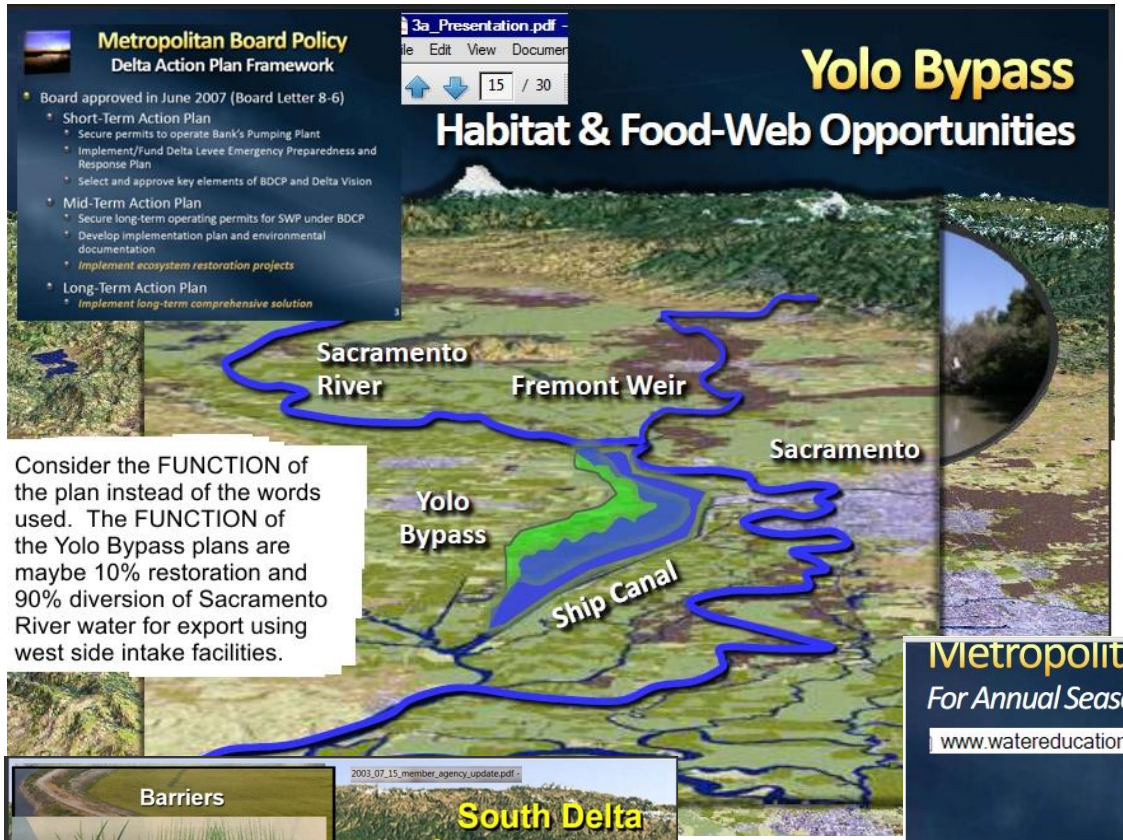
ttle Potato Slough between
tion will help define
Delta as well as the split of
ɔuldin Island. This station
turbid water into the central
r Cut station and the Middle
nd should be upgraded to
y route turbid Sacramento
act delta smelt. The Turner
ygen and chlorophyll *a*. The
lentified with low DO levels
th the closure of the two
licator of algae biomass in
pH, dissolved oxygen,
ain conditions, some species

Page 3

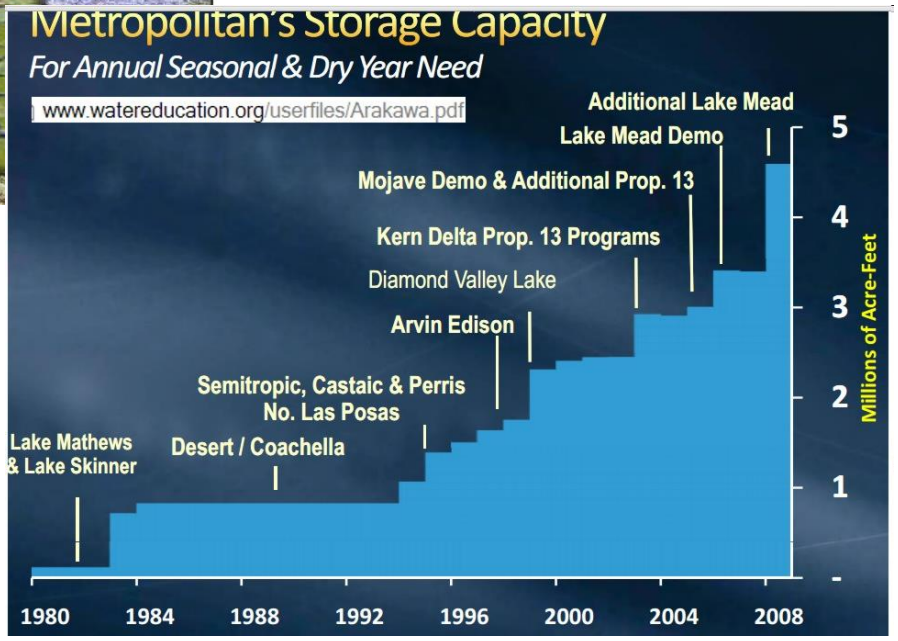




2004-2007 MWD


Metropolitan Board Policy
Delta Action Plan Framework
Board approved in June 2007 (Board Letter 8-6)
Short-Term Action Plan
Secure permits to operate Bank's Pumping Plant
Implement/Fund Delta Levee Emergency Preparedness and Response Plan
Select and approve key elements of BDCP and Delta Vision
Mid-Term Action Plan
Secure long-term operating permits for SWP under BDCP
Develop implementation plan and environmental documentation
Implement ecosystem restoration projects
Long-Term Action Plan
Implement long-term comprehensive solution
3a_Presentation.pdf
File Edit View Documen
15 / 30
Yolo Bypass
Habitat & Food-Web Opportunities
Sacramento River
Fremont Weir
Sacramento
Yolo Bypass
Ship Canal
Consider the FUNCTION of the plan instead of the words used. The FUNCTION of the Yolo Bypass plans are maybe 10% restoration and 90% diversion of Sacramento River water for export using west side intake facilities.


Barriers
Ag Drain
2003_07_15_member_agency_update.pdf
South Delta Improvement Program
Agricultural Drains
Banks Pumping Plant
Tracy Pumping Plant
Barriers


Metropolitan's Storage Capacity
For Annual Seasonal & Dry Year Need
www.watereducation.org/userfiles/Arakawa.pdf
Additional Lake Mead
Lake Mead Demo
Mojave Demo & Additional Prop. 13
Kern Delta Prop. 13 Programs
Diamond Valley Lake
Arvin Edison
Semitropic, Castaic & Perris
No. Las Posas
Desert / Coachella
Lake Mathews & Lake Skinner
Millions of Acre-Feet
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1980
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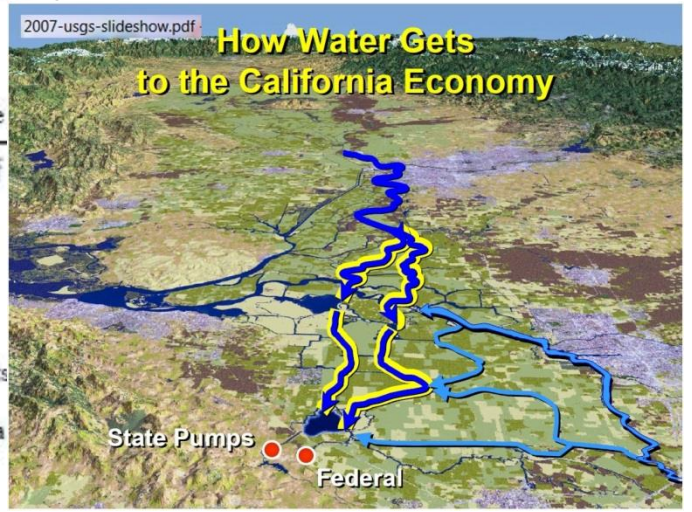
2004
2008

- **Temporary & Reversible Eco-Crescent/Middle River Corridor.** In addition to the real-time operations and monitoring, additional near-term, stop-gap efforts are being further analyzed to turn a portion of the estuary from a habitat area with conflict for smelt into a safe haven, away from the north-to-south movement of water supplies to the Bay Area, Central Valley and Southern California. This effort would include a series of temporary and removable rock barriers with tidal-gates, located strategically on four waterways in the



southern Delta, to create a physical separation between the flows for water supply and the nearby rearing habitat for smelt. These temporary structures would only be in place and operated from February through June when Delta smelt enter the Delta to spawn and rear. This project would include funding for real-time monitoring and operation of these gates, and assessments would be made to ascertain whether a more permanent structure should be constructed later as part of a more comprehensive Delta Vision.

Long-Term Delta Vision Alternatives. In addition to the ongoing effort to resolve near-term issues, two efforts are in progress to develop long-term solutions to resource management conflicts within the Sacramento-San Joaquin Bay Delta system: the Bay-Delta Conservation Plan (BDCP) and the Governor's Delta Vision process. The BDCP is a voluntary effort initiated by water user representatives and state/federal fishery regulatory agencies to develop a conservation plan that will serve as the basis for long-term federal and state endangered species act operational permits for the SWP and CVP. The Governor's Delta Vision process is an effort to develop a specific long-term alternative for addressing Delta resource conflicts and a strategic plan for implementation.

As initially reported to the Board at its workshop in July 2007, four alternatives are under discussion by the Governor's Delta Vision Stakeholder Coordination Group, which advises the Blue Ribbon Task Force. These alternatives include:

1. Existing Delta (with fortified levees)
2. Eco-Crescent/Middle River Corridor Conveyance
3. Dual-Intake Facility (Eco-Crescent + Isolated Conveyance Facility)
4. Fully Isolated Facility

On August 4, 2007, the Delta Vision Stakeholder Coordination Group submitted a report to the Blue Ribbon Committee that narrowed the list of recommended alternatives for further analysis to the Eco-Crescent/Middle River Corridor Conveyance and the Dual-Intake Facility. In addition to these alternatives, the Governor's Blue Ribbon Task Force has received a number of other alternatives from various groups and individuals. The Task

Miller, Robin L. 2007. Personal communication from Robin L. Miller to Jeannie Stamberger, URS.

Miller, Robin L., Lauren Hastings, and Roger Fujii. N.d. *Hydrologic treatments affect gaseous carbon loss from organic soils, Twitchell Island, California, October 1995–December 1997*. U.S. Geological Survey Water Resources Investigations Report 00-4042.

Mitsch, W.J., and J.G. Gosselink. 1993. *Wetlands*. (2nd ed.). New York: Van Nostrand Reinhold.

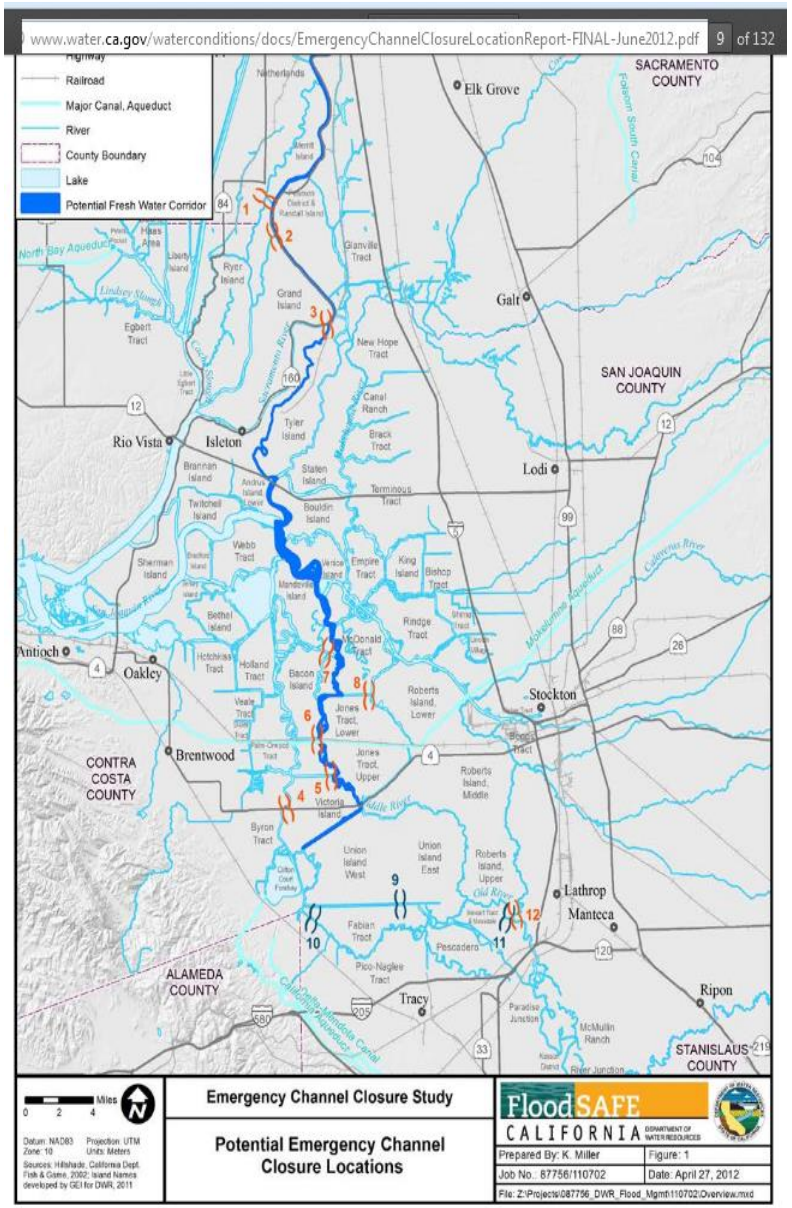
Moffatt & Nichol. 2007. *Levee repair, channel barriers, and transfer facilities concept analyses*. Moffatt & Nichol Memorandum Report. Prepared for the Metropolitan Water District of Southern California. Task Order 4 to Support Emergency Preparation Planning. Draft. August 3.

Moyle, P.B. 2002. *Inland fishes of California*. (revised and expanded). Berkeley: University of California Press. 502 pp.

MWD (Metropolitan Water District of Southern California). 2007. *Delta emergency preparedness: A feasibility plan for protecting the State's water supplies during a large earthquake causing the catastrophic collapse of multiple Delta islands*. Prepared by a team including Hultgren-Tillis Engineers, Washington Group International, Resource Management Associates, and Moffat & Nichol. February 2007.

NOAA (National Oceanic and Atmospheric Administration). 1998. Endangered and threatened species: Threatened status for two ESUs of steelhead in Washington, Oregon, and California. *Federal Register* 63(53):13347–13371 (March 19).

Nobriga, M. 2002. Larval delta smelt diet composition and feeding incidence: Environmental and ontogenetic influences. *California Fish and Game* 88:149–164.



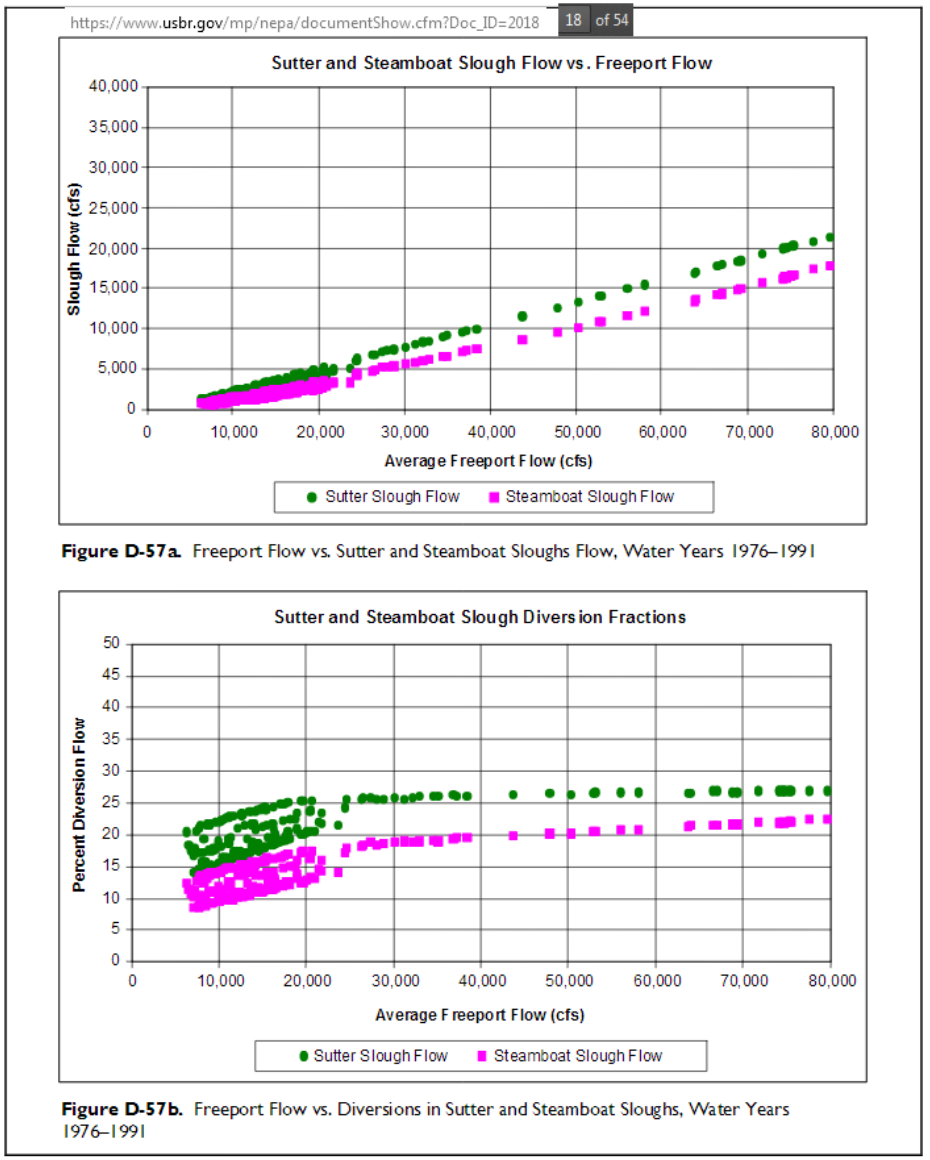


Figure D-57a. Freeport Flow vs. Sutter and Steamboat Sloughs Flow, Water Years 1976–1991

Figure D-57b. Freeport Flow vs. Diversions in Sutter and Steamboat Sloughs, Water Years 1976–1991

Delta_EOP_Concept_Paper-March_2007.pdf

WIDEN THE DELTA CROSS CHANNEL GATE STRUCTURE **TBD**

SOURCE: No reference; new idea for analysis and consideration

RESPONSIBLE PARTY: USBR-CVO

REGIONS AFFECTED: North, Central, South

RESPONSE ACTION DESCRIPTION:

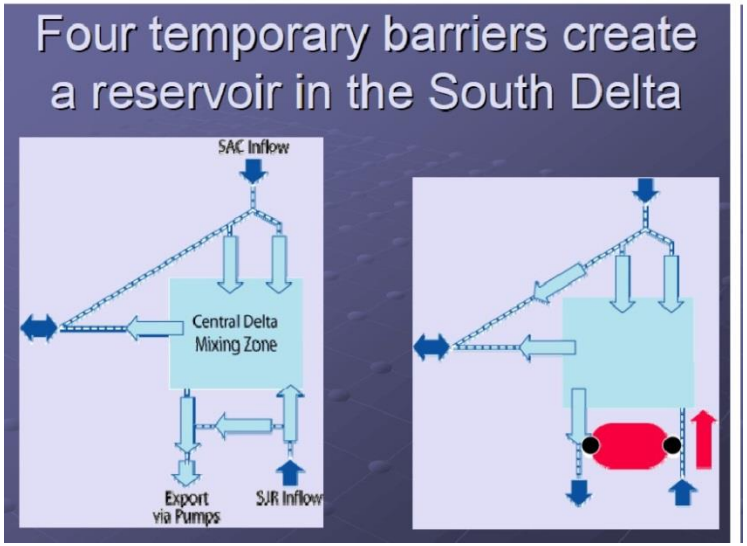
The Cross Channel gate structure would be widened by constructing supplemental gates to one side of the existing gates. The project might include channel modifications in the Sacramento River such as a permanently submerged berm to better direct a portion of the river flow through the gates, modified gate design to allow partial opening when Sacramento flows are higher than 25,000 cfs, and Cross Channel improvements immediately downstream of the gates to prevent erosion. After the new gates were installed, the existing gates could be improved or replaced.

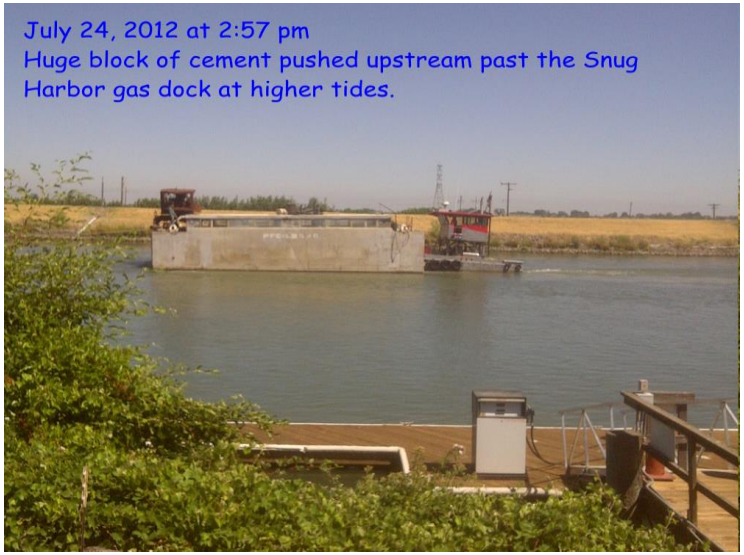
ACTION CHARACTERISTICS
Objective: Potential Future
Timeframe: TBD
Type: Physical

IMPACT:

Increasing the width of the Delta Cross Channel gates would provide the flexibility to increase the portion of Sacramento River flow diverted to the Central Delta to repulse or flush salinity in Delta emergencies. Designing the gates to allow partial opening for controlled diversions during high Sacramento River flow would provide a capability that does not now exist and would markedly improve water operators' ability to flush the Delta when salinity has intruded.

http://www.water.ca.gov/iep/docs/prstns/ws1_Monsen_52709.pdf 2009 DWR slideshow





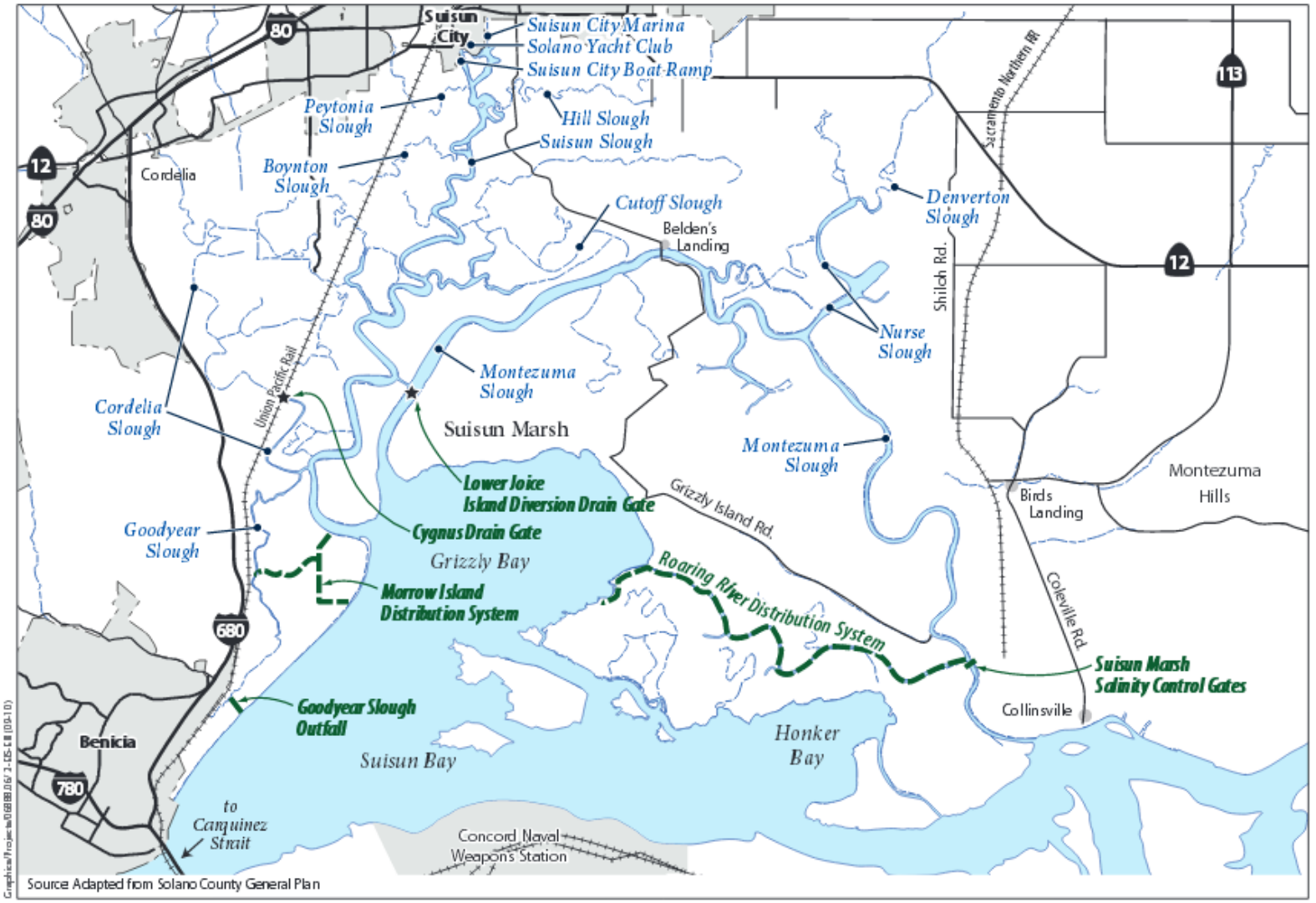
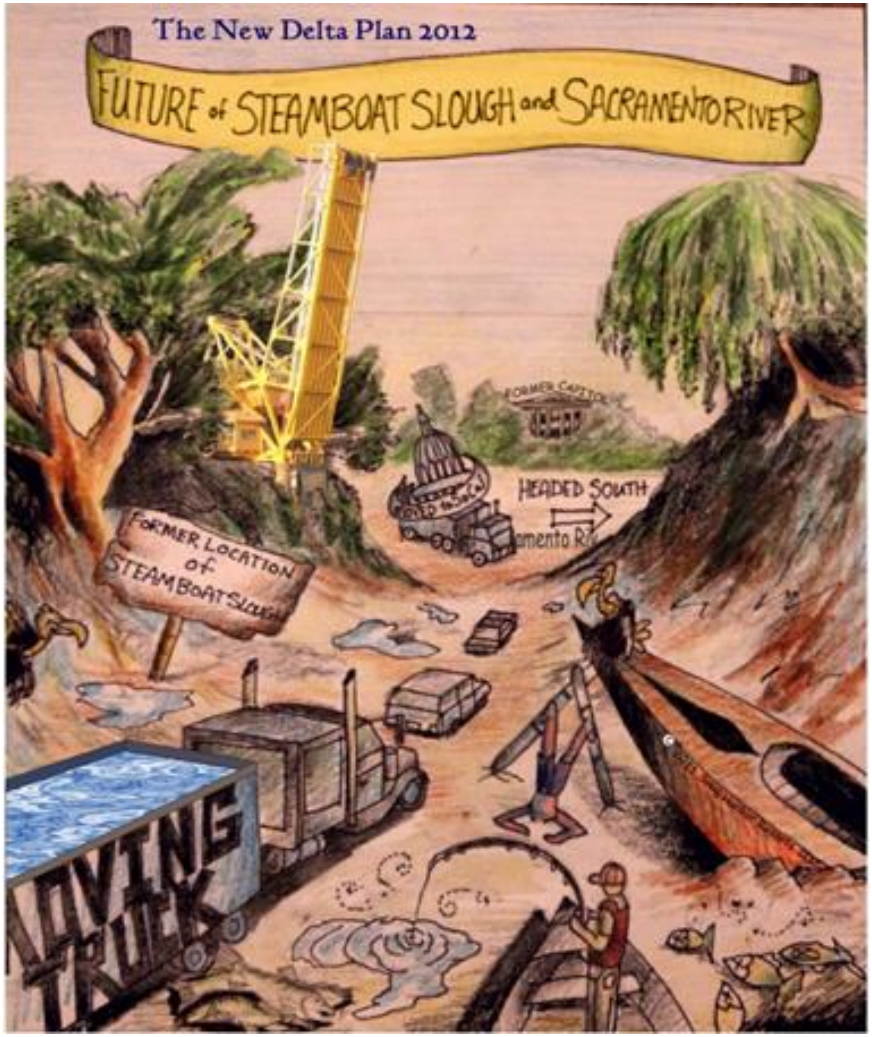


Figure 1-6
DWR and Reclamation Salinity Control Facilities In Suisun Marsh



California WaterFix literally drains the North Delta of its fresh water, and suspends the North Delta in a permanent "Drought flows" status… At BEST!

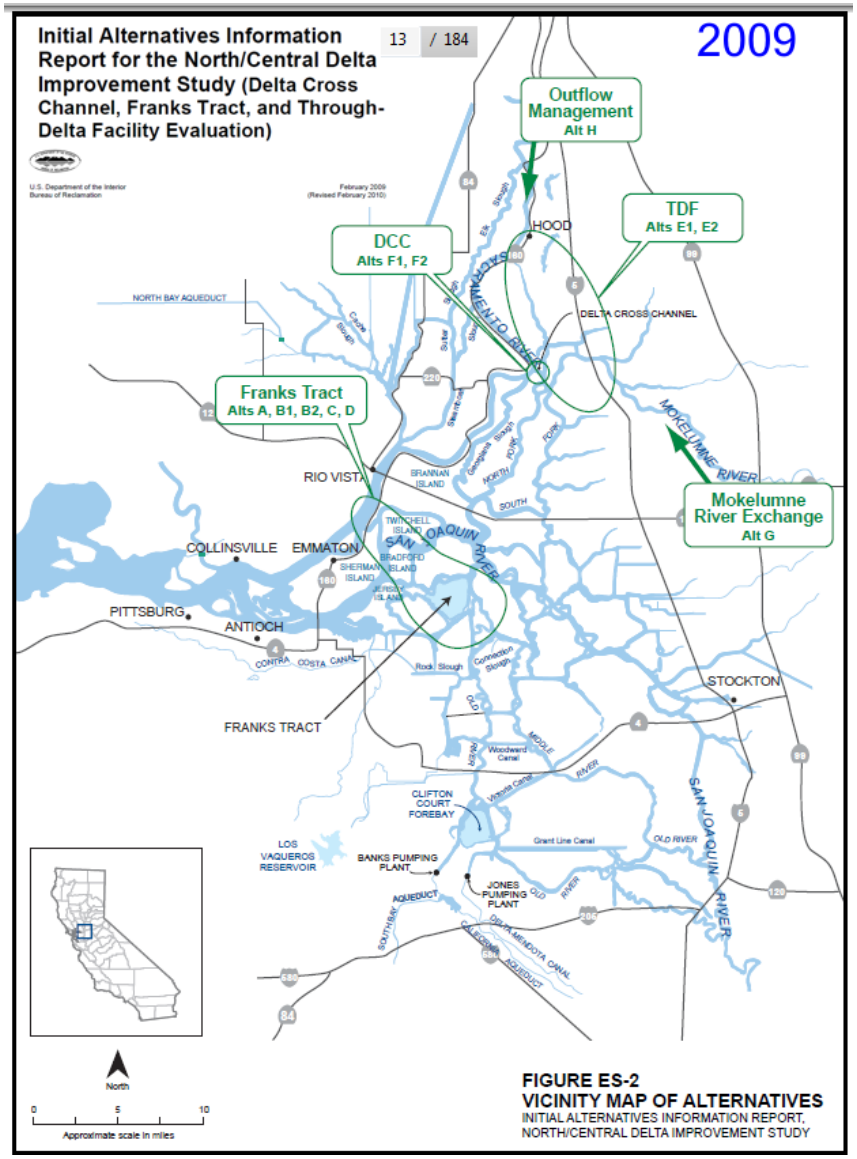
HIgley_1860.pdf FRONTAGE OF SWAMP LANDS ON BAYS AND RIVERS. 21 / 111

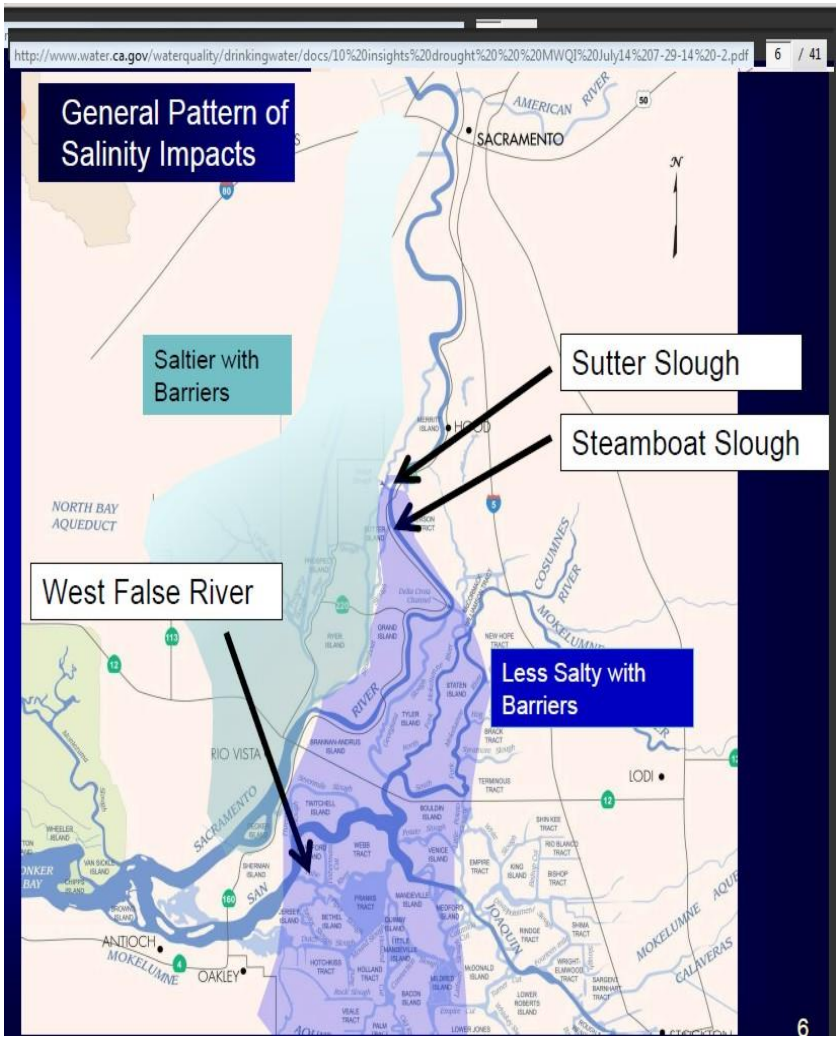
The restriction to a frontage of one-half mile on bays and navigable streams, has caused much complaint among applicants for purchase of swamp lands. I now recommend what I had the honor to submit in my report of last year, which is a follows:

"The Swamp Land Act, passed April twenty-first, eighteen hundred and fifty-eight, authorized the purchase of three hundred and twenty acres of land by one person, but restricted the purchaser to a frontage of one-half mile, by legal subdivision, on any bay, lake, or navigable stream.

The act of eighteen hundred and fifty-nine authorizes the sale of six hundred and forty acres to one individual, but makes no provision for a greater frontage. The object of the restriction was to prevent the monopoly of the narrow strip of land along the margin of water-courses, which is generally higher and more valuable than that back of it, and probably, also, to prevent the settler on the margin of the water courses from shutting out those purchasing in the rear, from communication with the water. The law, so far as it applies to such cases, should not, in my opinion, be changed. In many of the large tracts of swamp land, especially those near the junction of the Sacramento and San Joaquin rivers, there are innumerable sloughs, many of which are navigable. In consequence of their sinuosity, it often occurs that when a person desires to purchase six hundred and forty acres, in the locality in which he wishes to select the same, it is impossible for him to get one hundred and sixty acres, even, without having a greater frontage of two miles. The cost, per acre, of reclaiming swamp lands, by levees or ditches, depends upon the amount reclaimed. It is very evident that, the smaller the tract, the greater will be the cost of reclamation, per acre; consequently, the purchaser who is compelled to take up his three hundred and twenty, or six hundred and forty acres, in separate tracts, labors under a great disadvantage. To avoid this difficulty, I would suggest that the law be so amended as to allow the purchaser, in such cases, to take six hundred and forty acres, with the additional frontage requisite to secure that amount; *provided*, that the Surveyor-General is satisfied that the interests of the State do not suffer thereby, and that the rights of individuals are not interfered with."

It will be seen, by reference to the report of Mr. Beaumont, Surveyor of San Joaquin County, for this year, the importance of having the law amended so as to do away with this difficulty.


Initial Alternatives Information Report for the North/Central Delta Improvement Study (Delta Cross Channel, Franks Tract, and Through-Delta Facility Evaluation)
13 / 184
2009
Outflow Management Alt H
TDF Alts E1, E2
DCC Alts F1, F2
Franks Tract Alts A, B1, B2, C, D
Mokelumne River Exchange Alt G
HOOD
DELTA CROSS CHANNEL
SACRAMENTO RIVER
MOKELUMNE RIVER
RIO VISTA
COLLINSVILLE
EMMATON
PITTSBURG
ANTIOCH
FRANKS TRACT
STOCKTON
CLIFTON COURT FOREBAY
BANKS PUMPING PLANT
JONES PUMPING PLANT
LOS VAQUEROS RESERVOIR
NORTH BAY AQUEDUCT
SAN JOAQUIN RIVER
OLD RIVER
North
0 5 10
Approximate scale in miles
FIGURE ES-2
VICINITY MAP OF ALTERNATIVES
INITIAL ALTERNATIVES INFORMATION REPORT, NORTH/CENTRAL DELTA IMPROVEMENT STUDY


http://www.water.ca.gov/waterquality/drinkingwater/docs/10%20insights%20drought%20%20%20MWQI%20July14%207-29-14%20-2.pdf
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General Pattern of Salinity Impacts
Saltier with Barriers
Sutter Slough
Steamboat Slough
West False River
Less Salty with Barriers
SACRAMENTO
AMERICAN RIVER
HOOD
NORTH BAY AQUEDUCT
RIO VISTA
LODI
ANTIOCH
OAKLEY
6

USGS science for a changing world

water.usgs.gov/nawqa/trace/arsenic/

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Trace Elements National Synthesis Project

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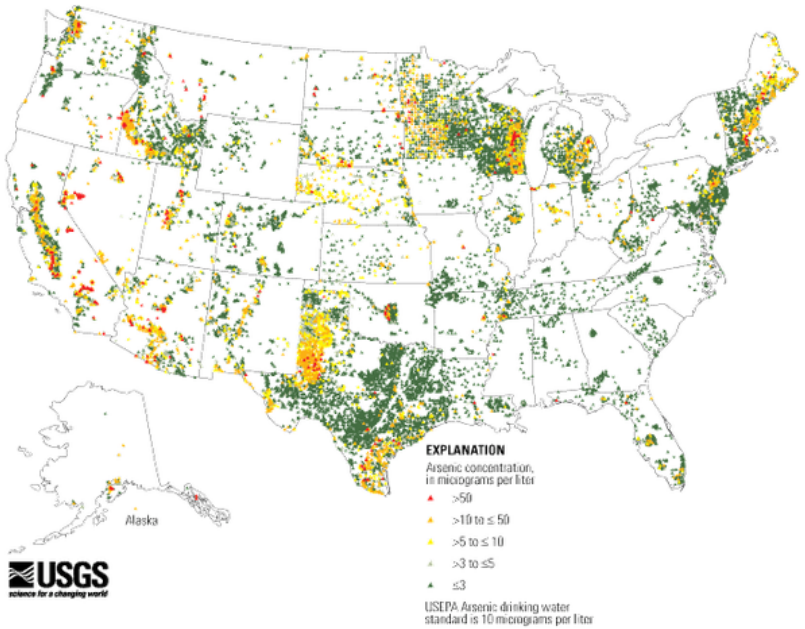
Arsenic in groundwater of the United States



Arsenic in groundwater is largely the result of minerals dissolving from weathered rocks and soils. Several types of cancer have been linked to arsenic in water. In 2001 the US Environmental Protection Agency lowered the maximum level of arsenic permitted in drinking water from 50 micrograms per liter (ug/L) to 10 ug/L.

The USGS has developed maps that show where and to what extent arsenic occurs in groundwater across the country. The current maps are based on samples from 31,350 wells. Widespread high concentrations were found in the West, the Midwest, parts of Texas, and the Northeast. See Ryker (2001) for more information. See Focazio and others (2000) for the use of available data for characterizing arsenic concentrations in public-water supply systems. See Gronberg (2011) for updated arsenic map.

http://findarticles.com/p/articles/mi_pwwi/is_200507/ai_n14822133

Delta Oil and Gas to Commence Drilling of Cache Slough Prospect in California

Market Wire, July, 2005

E-MAIL PRINT LINK

Delta Oil and Gas, Inc. (OTC BB: DOIG) is pleased to announce that the drilling of its first well on its Cache Slough property is expected to commence within the next 45 days. The Cache Slough prospect is a prolific natural gas area northeast of Sacramento, California. The property is located next to and partially on one of the largest gas fields in the State of California, the 3.5 trillion cubic feet ("Tcf") Rio Vista gas field. Pipelines located near and within the project area make it easy to transport and sell any production encountered.

The Cache Slough property covers approximately 825 acres of land. Analysis of 3-D seismic survey, in combination with all available well data, has resulted in the recognition of several natural gas prospects on the property. The initial drilling focus is expected to be on the high side of the Midland Fault, a major structural feature in the Rio Vista area that has historically produced significant amounts of natural gas.

Delta Oil and Gas has agreed to pay 18.75% of all costs of drilling, testing and completion of the first test well to earn a 12.5% economic interest. Thereafter, Delta Oil & Gas will pay 12.5% of all costs of future wells to earn a 12.5% economic interest.

About Delta Oil and Gas

Delta Oil and Gas is a growing exploration company focused on developing North American oil and natural gas reserves. The Company's current focus is on the exploration of its land portfolio comprised of working interests in highly prospective acreage in the Southern Alberta Foothills area and its newest interest in the Cache Slough Project in California. Delta Oil & Gas is looking to expand its portfolio to include additional interests in Canada and the USA.

On behalf of the Board of Directors,

DOUGLAS N. ROLEN, B.A., LL.B., President

Example: CCWD new intake on Victoria Island is a 250 cfs pump station with five 5,000 hp vertical turbine pumps, setback levee, Concrete intake structure with fish screen, abuilding for electrical and control equipment, electrical substation, SURGE CONTROL TANKS, and 12,000 linear feet of 72" pipeline.