Timeline of Significant NGO Engagement
Sites Reservoir Project
February 2023

This is a brief review of the more significant engagements that the Sites team has had with Non-Governmental Organizations (NGOs) over the past 5 years related to project development. This review is not intended to be exhaustive. There were several other interactions with NGO's on more specific issues that are not listed.

August 4, 2016 – Working draft of modeling assumptions for Sites Reservoir Intakes (Oct-Jun) developed by CDFW, presumably as advice for the preparation of the 2017 Draft EIR/EIS. Sets bypass flows at Wilkins Slough of 15,000 cfs and other criteria "for a modeling exercise." **(Attachment A)**

June 13, 2017 – Working draft – Preliminary Assessment of CDFW's Proposed Bypass Flow Criteria for the Sites Reservoir Project. This was a test run of the 2016 criteria and shows significant decrease in available diversions and not enough water to meet demands. **(Attachment B)**

August 2017 – Draft EIR/EIS issued for public review.

- Document available here: https://sitesproject.org/resources/environmental-review/draft-environmental-impact-report-environmental-impact-statement/
- Bypass flow and diversion criteria are described in Chapter 12.

Winter 2017 – Friends of the River calling for public comments letters in opposition to the 2017 Draft EIR.

- https://www.friendsoftheriver.org/take-action/help-stop-the-sites-reservoir-project/

January 2018 – Comment letter summary from NGO groups on the Sites 2017 Draft EIR. **(Attachment C)**

February 2018 – Sites Project team report to the Board on the comments received from the public on the 2017 Draft EIR/EIS. **(Attachment C)**

- https://yubanet.com/california/sites-reservoir-project-draws-criticism-from-fishermen-tribes-and-conservation-groups/
- https://mavensnotebook.com/2019/03/20/news-worth-noting-sites-reservoir-project-draws-criticism-from-fishermen-tribes-and-conservation-groups-groups-warn-feinstein-a-dark-ethical-cloud-hangs-over-bernhardt/

May 3, 2018 – CWC decision to set an MCED award to the Sites Reservoir Project of $816M as a Rank 3 project which is approximately 20% below the Staff recommended level of benefits.

There was no specific determination of ecosystem benefits to be provided by the Project and CDFW specifically disallows approximately $300M of benefits for anadromous fish benefits (additions to cold water pool).

March 17, 2019 – Public comment letter signed by 27 NGO's in opposition to the 2017 Draft EIR. **(Attachment D**)

- https://activenorcal.com/sites-reservoir-plan-publicly-criticized-by-conservation-groups/

May 2019 to December 2019 – Sites has over 25 discussions and/or working sessions with CDFW technical staff and/or management to explore modifications to Project operations that would meet the requirements of the California Environmental Quality Act, the California Endangered Species Act (CESA; Fish and Game Code Section 2081) and results in an affordable project. **(Attachment E)**

August 13, 2019 – Sites Environmental Planning and Permitting Manager and key consultants meet with the following NGO's to discuss the revisions made to the Project since 2017, review their collective comments on the 2017 DEIR/EIS and solicit additional input on the Project:

- Natural Resources Defense Counsel
- Defenders of Wildlife
- Western Water Strategies
- The Bay Institute
- Baykeeper
- California Sportfishing Association

September 23, 2019 – CDFW 60-day Consultation **(Attachment F)**

September 23, 2019 – Sites Board initiates a value planning process to arrive at an affordable and permittable project configuration including diversion criteria. **(Attachment G)**

April 22, 2020 – Sites Board approves moving forward with VP7 as the preferred project for feasibility and environmental review. Scenario B is the diversion criteria used to develop the Project economics and permittability assessment. While not "agreed to" by CDFW, the discussions occurring through the end of 2019 resulted in these conditions forming the basis for adequate protection of species and result in an affordable Project, subject to additional detailed analysis. **(Attachment H & I)**

May-July 2020 – Sites Executive Director and Environmental Planning and Permitting Manager provide updates to NGO's on the "rightsizing" of the Project including reviewing the Scenario B diversions criteria used in the value planning analysis.

August 26, 2020 – The Sites team took a summary of the public comments received on the 2017 Draft EIR/EIS to the Board along with how these comments were being addressed in the Revised Draft EIR/Supplemental Draft EIS. **(Attachment J)**

December 2020 – The Sites Board receives an update on the operations modeling results which includes a description of the adjustments that had to be made to make Scenario B criteria (from VP7) operable. Preliminary results of effects analysis show the approach is protective of species and can result in an affordable Project.

The Sites Project team conducted two workshops to update NGOs that had submitted comments on the 2017 Draft EIR/EIS, providing an overview of the new alternatives and the EIR/EIS process moving forward. As a follow up to these workshops, a survey was sent out to solicit input on future meetings. **(Attachment K)**

September 2020 through July 2021 – Reached out and held over 30 meetings with groups such as Friends of the River, Water 4 Wetlands, CWIN, SOS, River Partners, SF Bay Keepers, Trout Unlimited, The Nature Conservancy, etc. **(Attachment L)**

January 26, 2021 – Held Town Hall meeting that included panel discussions. File is here: https://sitesreservoirproject.sharepoint.com/EnvPlanning/Meetings/Forms/AllItems.aspx?id=%2FEnvPlanning%2FMeetings%2FNGO%20meetings&viewid=fe648db5%2D9e1a%2D4351%2Dba81%2D7278a142a378

February 23, 2021 – Held meeting with various NGOs to give an overview of the approach to the Sites water right approach.

Throughout 2021 and 2022 – NGO Small Group Meetings. Summary below. Files are located here: https://sitesreservoirproject.sharepoint.com/:f:/r/EnvPlanning/Meetings/NGO%20meetings/NGO%20Small%20Groups?csf=1&web=1&e=wE4KAZ

Topic Area	Meeting Date(s)
Fisheries	April 29, 2021 July 26, 2021 October 29, 2021 September 1, 2022
Proposition 1 Benefits	March 11, 2021 March 24,2021
Terrestrial Species	March 26, 2021
Trinity River	March 22, 2021 April 30, 2021
Water Quality	March 7, 2021May 13, 2021 July 19, 2021
Water Rights	February 23, 2021

	March 23, 2021 March 4, 2022

May 6, 2021 – Held meeting with Friends of the River and Sites engineering team to discuss flood control design components.

May 28, 2021 – Held meeting with various NGOs to discuss estimate of 1 MAF storage in Sites Reservoir in 2021. Files here: https://sitesreservoirproject.sharepoint.com/:f:/r/EnvPlanning/Meetings/NGO%20meetings/Sites%20in%202021?csf=1&web=1&e=A2HhIm

January 11, 2022 – Meeting with American River Water Forum Executive Director and staff on RDEIR/SDEIS modeling and effects to American River resources. Also discussed water right application. Files here: https://sitesreservoirproject.sharepoint.com/:f:/r/OpsModeling/Shared%20Documents/American%20River?csf=1&web=1&e=A88WVJ

March 4, 2022 – Held meeting with various NGOs for a continued discussion on Water Rights.

Communications call organized by Mike Wade with Jay Vanrein, Constance Anderson, Anjaetta Shadley, Jeff Sutton, Rebecca Quist, Chris Scheuring, Alicia Rockwell, Anja Raudabaugh, Michael Boccadoro, Karen Kapler, Daren Williams, Cory Lunde, Aubrey Bettencourt, Justin Fredrickson, Alssa Houtby, Tom vander List, Rick Kushman, Jonny Amaral, Dan Keppen, Dan Vink, Robert Schettler, Alexis Silveira, Cynthia Davis, Joan Webster, Shelley Cartwright, Joshua Rahm, dana Ferreira, Rylin Lindahl, Jason Phillips, Jeanne Varga, Brandon Souza, Todd Manley, William Bourdeau, Austin Ewell, Bill Diedrich, Brent Walthall, Melissa Williams, Erin Huston, Sara Katz, Cannon Michael, Tina Shields, Rayne Thompson, Jeffifer Giambroni, Lorraine Garcia, Mike Jensen, Heather Engel, Dennis Nuxoll, Melissa Williams, Kathryn Borep, Ian LeMay, Brandon Harder, Jane Townsend, Tricia Geringer, Jason Peltier, Adam Borchard, Casey Cremer, Peter Hecht, Jacob DeBoer, jenny Holtermann, Nadine Bailey, J. Scott Peterson, Elizabeth Jonasson, Daniel Merkley, William Bourdeau, Jeana Hultquist, Mark Looker, Maddie Munson, Priscilla Rodriguez, Dayna Ghirardelli, Emily Rooney, Roger Isom, Josh Weimer, Debbie Murdock, Cristel Tufenkjian, Casey Anderson and Scott Seus:

March 3, 2022, May 18, 2022, June 15, 2022 and August 2022.

Environmental Water Manager
The meetings were with the Steering Committee and the Advisory team on:

April 6, 2022, May 10, 2022, August 3, 2022, August 16, 2022, Augusts 17, 2022, October 5, 2022, October 21, 2022, October 28, 2022 and January 31, 2023.

September 20, 2022 – Held meeting with various NGOs to give an overview of the approach to the Sites water right application, sharing where we were in the process and getting your feedback and any concerns.

Met with PPIC:

June 8, 2022 - Env Water Manager Concepts.
September 21, 2022 - PPIC Report to the Prop 1 Roundtable.
October 5, 2022 – PPIC Report w/EWM Working Group.

Met with David Guy, Norcal Water:

July 29, 2022 – Conversation on building Blocks with Sacramento River Basin Managers.
September 8, 2022 – Discussion on Surface/Groundwater interaction in the Sac Valley.
October 17, 2022 – VA Update and Coordination, Sac River Basin.
October 24, 2022 – Discussion on DCP, Sac River Basin.
November 14, 2022 – VA, Bay-Delta Updates, Sac River Basin Working Group.
November 30, 2022 – Coordination discussion, major projects in Delta and Sac Valley.
December 9, 2022 – follow up discussion on major projects.
December 21, 2022 – Connect meeting with David, Nina and Carolyn Buckman/DWR.
January 11, 2023 & 1/27/2023– DCP Comment Letters.

November 22, 2022 – Met with Doug Obegi, NRDC, to update on the water rights process and related matters.

November 3, 2022 – Met with Jay Ziegler, TNC, to discuss the proposal letter.

January 25, 2023 – Jerry met with Ducks Unlimited, Marc Engstrom, Director of Public Policy, Zach Hartman and Grant McKenzie.

January 31, 2023 – Held meeting with various NGOs to review supplemental materials submitted to SWRCB in regard to water rights application.

Working Draft - Preliminary Assessment of

Working Draft - Preliminary Assessment of

CDFW's Proposed Bypass Flow Criteria for the Sites Reservoir Project

June 13, 2017

This preliminary assessment provides average annual Sites Project diversion results for a range of CDFW suggested bypass flow criteria. Results are preliminary and subject to change.

These criteria specify the amount of storm event flow that must be present at a given location in the system before Sites diversions can occur upstream. These criteria are **not** minimum flow criteria that that must be met or supplemented by the Sites Project.

The analysis included evaluation of eight sensitivity runs under current conditions using the DWR Delivery Capability Report (DCR 2015) CalSim II model with the WSIP implementation of the Sites Project (Alternative D) as the base case. The sensitivity runs include interpretations of three flow criteria proposed by CDFW:

- Diversion restrictions to maintain Tisdale Weir spills up to 5,000 cfs
- Increasing Wilkins Slough bypass flows requirements from 8,000 cfs to 14,000 cfs in November through May
- Delta Outflow criteria of 44,500 cfs in March, April, and May.

In addition, a sensitivity run with no monthly pulse bypass flow requirement was conducted to assess the impact the current monthly pulse bypass flow criteria has on average annual diversions to Sites Reservoir.

Results of the analyses are summarized and presented in the table and figures below.

Summary

The base case DCR2015 current conditions model run with Alternative D shows an average annual diversion to sites Reservoir of 514 TAF/year as show in the table below. Alternative D includes a bypass flow criteria of 5,000 cfs at Wilkins Slough consistent with the project description in the EIS/R. There is no Tisdale Weir or Delta Outflow criteria above D-1641 specified in Alternative D.

Adding the Tisdale Weir spill criteria reduces the annual average diversion to Sites Reservoir by about 12 TAF/year, the smallest impact on Sites fills of all of the sensitivity runs.

Increasing the Wilkins Slough bypass flow criteria from 5,000 cfs to 8,000 cfs reduces average annual diversions by 65.2 TAF/year, a reduction of about 9%. Increasing the Wilkins Slough bypass flow criteria in 2,000 cfs increments from 8,000 cfs to 14,000 cfs reduces average annual Sites fills by additional increments of approximately 9%.

The addition of the Delta Outflow criteria of 44,500 cfs in March through May reduces average annual diversions by 72.6 TAF/year.

The combination of the Tisdale, Wilkins Slough (8,000 cfs), and Delta Outflow criteria reduce annual average Sites diversions by 24% or 124 TAF/year.

The elimination of the monthly pulse bypass flow requirement included in Alternative D resulted in an increase in average annual diversions to Sites Reservoir of about 10 TAF/Year.

Sensitivity Analysis

The runs are defined as follows:

1. **DCR2015** = Base Case (DCR2015 With Alternative D Project)
2. **No Pulse Bypass Flow** = "DCR2015" + No Monthly Pulse Bypass Flow Criteria
3. **Tisdale** = "DCR2015" + Tisdale Weir Spill Criteria
4. **Wilkins8k** = "DCR2015" + Wilkins Slough winter Bypass Flow of 8,000 cfs
5. **Wilkins10k** = "DCR2015" + Wilkins Slough winter Bypass Flow of 10,000 cfs
6. **Wilkins12k** = "DCR2015" + Wilkins Slough winter Bypass Flow of 12,000 cfs
7. **Wilkins14k** = "DCR2015" + Wilkins Slough winter Bypass Flow of 14,000 cfs
8. **DO Criteria** = "DCR2015" + Delta Outflow flow of 44,500 cfs in March, April, and May
9. **DO+T+W8k** = Combination of Delta Outflow 44,500 cfs + Tisdale + "Wilkins Slough 8,000 cfs

The summary table, bar chart, and exceedance figures below present the preliminary results of the analysis.

October-September

Total Average Annual Diversion to Sites Reservoir

Volume (TAF)		Difference from Previous	Difference DCR2015 Alternativ
DCR2015 with Alternative D	514.0		
Eliminate Monthly Bypass Pulse Flow	523.4	9.5	9
Tisdale Weir	502.0	-21.4	-11
Wilkins8k	468.3	-33.7	-45
Wilkins10k	426.4	-41.9	-87
Wilkins12k	388.5	-37.9	-125
Wilkins14k	355.3	-33.2	-158
Delta Outflow Criteria 44,500 cfs March – May	441.3	86.1	-72
Delta Outflow +Tisdale +Wilkins Slough 8,000 cfs	390.0	-51.3	-123

Modeling Assumptions for Sites Reservoir Intakes (Oct-Jun)

Modeling Assumptions for Sites Reservoir Intakes (Oct-Jun)

The following assumptions were developed by CDFW for a modeling exercise to evaluate the ability of Sites Reservoir to operate while ensuring species specific habitat needs and protection are met in the Sacramento River and Delta. It is assumed that these Sacramento River and Net Delta Outflow Index criteria will be met during the specified timeframes prior to and during Sites Reservoir operations. Results from this modeling exercise are intended to support the evaluation of project alternatives and their ability to contribute to ecosystem benefits.

Sacramento River Assumptions

- No pumping at TCCA facility until January
- No pumping until after first initial pulse flow greater than or equal to 15,000 cfs at Wilkins Slough for five consecutive days
- Wilkins Slough bypass flow requirement of 15,000 cfs
- Colusa bypass flow requirement of 29,500 cfs

Habitat and Species Protection

- No pumping at TCCA facility until January
  - The majority of winter-run pass this facility as very small fry.
  - 99% of downstream juvenile winter-run passage is typically completed by the end of December each year (Poytress et al. 2014).

- No pumping until after first initial pulse flow greater than or equal to 15,000 cfs at Wilkins Slough for five consecutive days.
  - The first major pulse flow past Wilkins Slough has been correlated with peak winter-run passage at the Knights Landing rotary screw traps.
  - Substantial increases in cumulative catch of winter-run at Knights Landing have been observed and correspond to a flow threshold of approximately 14,000 cfs at Wilkins Slough (del Rosario et al. 2013).

- 15,000 cfs Wilkins Slough bypass flow requirement.
  - Based on flow survival relationships of juvenile salmonids in the Sacramento River.
  - Increased emigration has also been observed at Knights Landing when flows increase.

- 29,500 cfs Colusa bypass flow requirement.
  - There is substantial benefit to providing floodplain rearing habitat in the Sutter Bypass.
    - This flow rate should provide at 5,000 cfs spill at Tisdale Weir (CDEC data and linear regression analysis of COL and TIS) to provide floodplain rearing habitat in the Sutter Bypass.
  - Based on flow survival relationships of juvenile salmonids in the Sacramento River.

Net Delta Outflow Index Assumptions

Month	W	AN	BN	D	C
Oct	12,400 (74km)	7,100 (81km)	D-1641	D-1641	D-1641
Nov	12,400 (74km)	7,100 (81km)	D-1641	D-1641	D-1641
Dec	11,400	5,000	D-1641	D-1641	D-1641
Jan	25,000				
Feb					
Mar	44,500		25,000	11,400	11,400
Apr					
May					
Jun	D-1641 or 11,400 (74km)[1]	D-1641 or 11,4000 (74km)[1]	D-1641 or 11,400 (74km)[1]	D-1641	D-1641

Habitat and Species Protection	
D-1641	Existing SWRCB D-1641 requirements
BiOp RPA	Existing Fall X2 requirements (Delta Smelt) FWS BiOp
Delta Smelt	Holds LSZ around suitable abiotic habitat for spawning and rearing
Longfin Smelt	Protects flows for LFS abundance
Sturgeon	Protects attraction flows

[1] Whichever flow value is higher

Modeling Assumptions for Sites Reservoir Intakes (Oct-Jun)

The following assumptions were developed by CDFW for a modeling exercise to evaluate the ability of Sites Reservoir to operate while ensuring species specific habitat needs and protection are met in the Sacramento River and Delta. It is assumed that these Sacramento River and Net Delta Outflow Index criteria will be met during the specified timeframes prior to and during Sites Reservoir operations. Results from this modeling exercise are intended to support the evaluation of project alternatives and their ability to contribute to ecosystem benefits.

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Nov	12,400 (74km)	7,100 (81km)	D-1641	D-1641	D-1641
Dec	**11,400**	**5,000**	D-1641	D-1641	D-1641
Jan	**25,000**				
Feb					
Mar	**44,500**		**25,000**	**11,400**	**11,400**
Apr					
May					
Jun	D-1641 or **11,400 (74km)**[1]	D-1641 or **11,4000 (74km)**[1]	D-1641 or **11,400 (74km)**[1]	D-1641	D-1641

Habitat and Species Protection	
D-1641	Existing SWRCB D-1641 requirements
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6. **Wilkins12k** = "DCR2015" + Wilkins Slough winter Bypass Flow of 12,000 cfs
7. **Wilkins14k** = "DCR2015" + Wilkins Slough winter Bypass Flow of 14,000 cfs
8. **DO Criteria** = "DCR2015" + Delta Outflow flow of 44,500 cfs in March, April, and May
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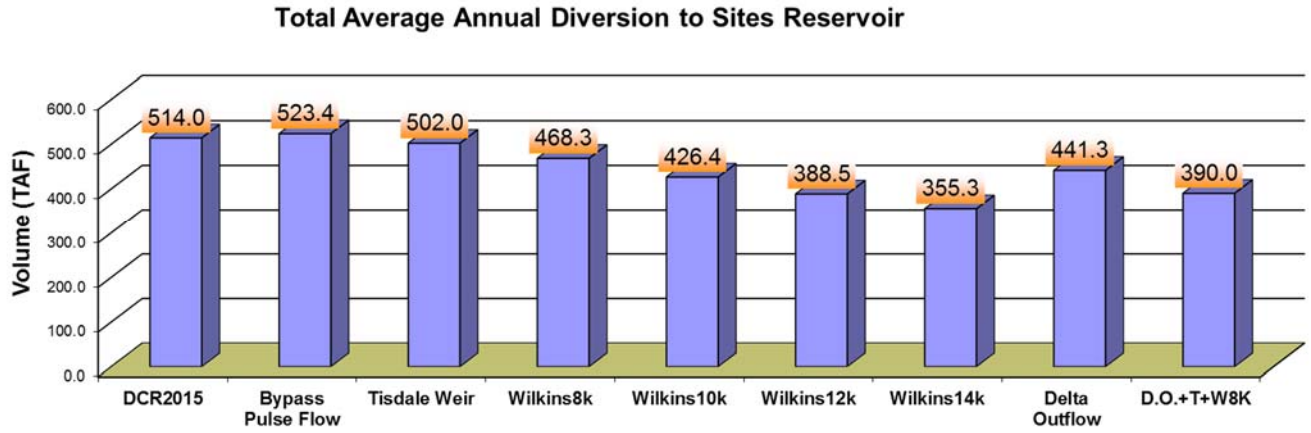
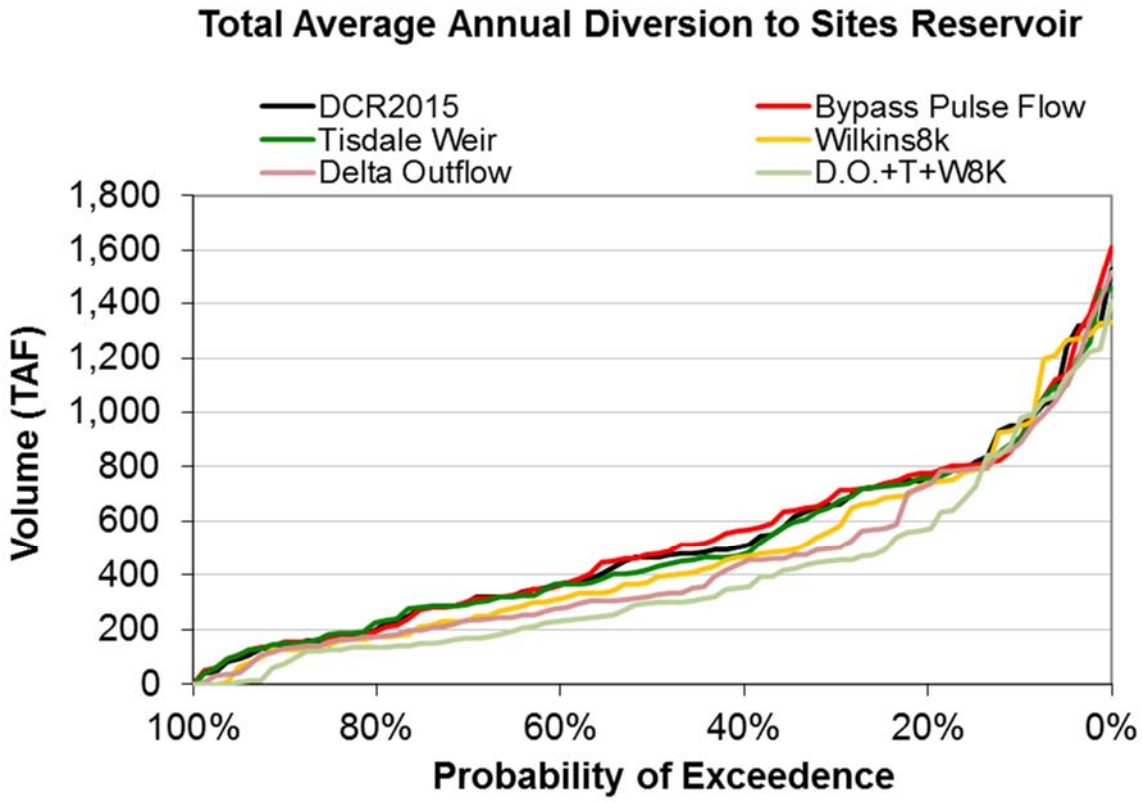
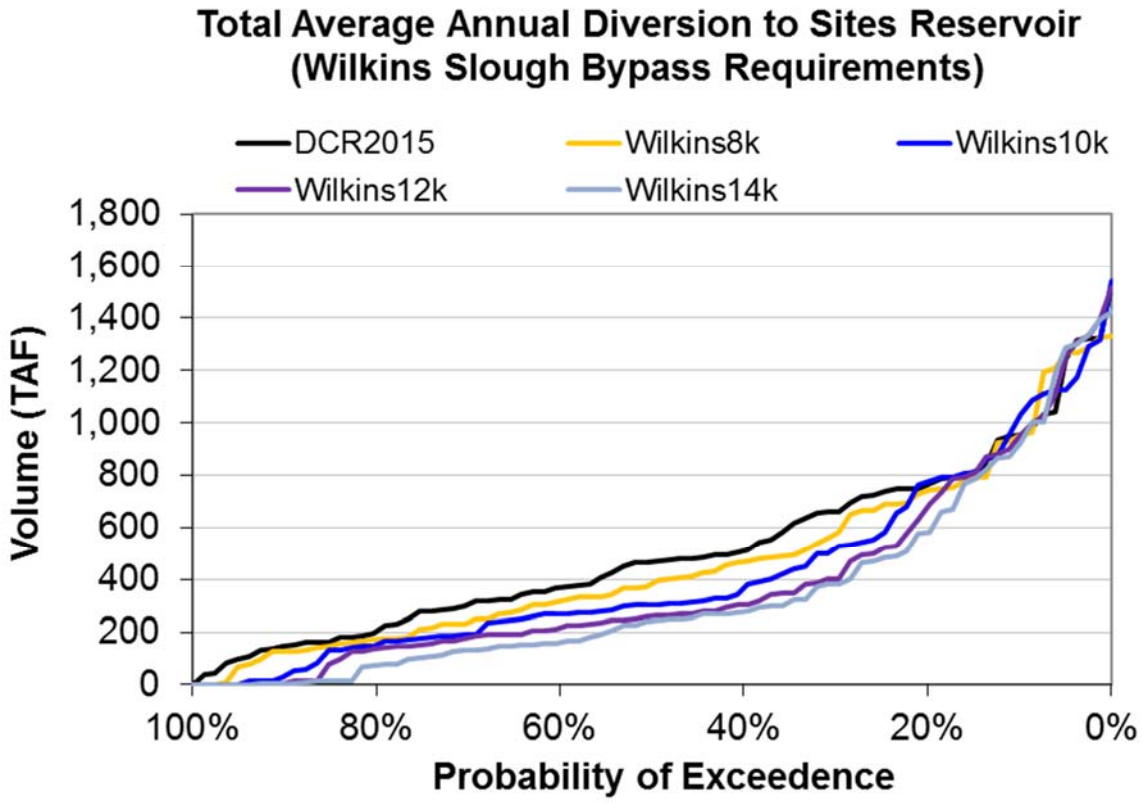

Total Average Annual Diversion to Sites Reservoir
Volume (TAF)
600.0
500.0
400.0
300.0
200.0
100.0
0.0
514.0
523.4
502.0
468.3
426.4
388.5
355.3
441.3
390.0
DCR2015
Bypass Pulse Flow
Tisdale Weir
Wilkins8k
Wilkins10k
Wilkins12k
Wilkins14k
Delta Outflow
D.O.+T+W8K


Total Average Annual Diversion to Sites Reservoir
DCR2015
Bypass Pulse Flow
Tisdale Weir
Wilkins8k
Delta Outflow
D.O.+T+W8K
Volume (TAF)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
100%
80%
60%
40%
20%
0%
Probability of Exceedence


Total Average Annual Diversion to Sites Reservoir
(Wilkins Slough Bypass Requirements)
DCR2015
Wilkins8k
Wilkins10k
Wilkins12k
Wilkins14k
Volume (TAF)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
100%
80%
60%
40%
20%
0%
Probability of Exceedence

Attachment B – General Overview of Key Concerns										
	Project Description and Alternatives, Baseline	Modeling approach	Operational Impacts to fisheries	Impacts to Trinity River resources	Indian Trust Assets and Tribal Cultural Resources	Water Supply/ Rights	Water Quality	Impacts to other species	Geology/ Geomorphology and Seismicity	Cumulative impacts/ GHG
Letter#, NGO										
#12 Natural Resources Defense Council	X	X	X					X		X
#17 AquAlliance	X		X		X		X	X		X
#20 Pacific Coast Federation of Fisheries Associations et al[i]	X	X	X	X	X		X			X
#21 CA Indian Water Commission	X				X			X		
#23 CA Sportfishing Protection Alliance et al[ii]	X	X	X			X	X	X		
#24 Friends of the River	X	X	X			X		X	X	X
#25 Friends of the River et al[iii]	X	X	X			X		X	X	X
#27 Klamath Riverkeeper	X	X	X	X				X		
#30 Save the American River						X	X			
#31 Sierra Club	X		X				X		X	
#122 Sacramento Chapter, CA Native Plant Society								X		
# 140 Save CA Salmon et al[iv]	X	X	X	X	X	X	X	X	X	X
Letter #, Tribal Government										
#4 Colusa Indian Community Council					X	X			X	
#139 Karuk Tribe	X	X	X	X	X					

[i] et al includes: Institute for Fisheries Resources, Save California's Salmon, San Francisco Baykeeper, and the Winnemem Wintu Tribe

[ii] et al includes: AquAlliance, and the California Water Impact Network

[iii] et al includes: Sacramento River Preservation Trust, and Sierra Club

[iv] et al includes: California Sportfishing Protection Alliance, California Water Impact Network, Environmental Water Caucus, Southern California Watershed Alliance, Friends of the River, Pacific Coast Federation of Fishermen's Associations & Institute for Fisheries Resources, Safe Alternatives for our Forest Environment, Butte Environmental Council, Sacramento Valley Chapter of the California Native Plant Society, Protect American River Canyons, Fly Fishers of Davis, Coast Action Group, Friends of the River, Sacramento River Council, Planning and Conservation League, The Environmental Justice Coalition for Water, Golden Gate Salmon Association, Conservation Fly Fishers International Northern California Council, The Bay Institute, Winnemem Wintu Tribe, Water Climate Trust, Chico 350, Women's International League for Peace And Freedom Earth Democracy

NGO Letters

NRDC Letter (1/15/18) Summary #12

- **EIR/EIS fails to consider a reasonable range of alternatives (I)**
  - Alternatives that reduce water diversions from the Sacramento River (particularly during all but wet water year types and during periods of moderate and low flows) would result in reduced adverse effects on native fish and wildlife in Sacramento River and Bay-Delta estuary
    - Claim **"tiering" from CALFED ROD** which was improper
  - Must analyze more than one operational alternative in order to identify alternatives that would minimize or avoid adverse environmental impacts of the project (per their scoping comments).
    - Alternative that would not result in substantial reductions in Delta outflow during winter and spring months
    - One or more alternatives that result in increase in Delta outflow during winter and spring
    - Additional alternative that is consistent with the water operational requirements being proposed for California WaterFix
  - CDFW potential **operational criteria** to protect flows and reduce adverse impacts on salmon, sturgeon, longfin smelt, Delta smelt, and other native fish species need to be evaluated
  - Consider **other storage alternatives such as groundwater storage**, conjunctive use, and/or reoperation of reservoirs to improve water supplies and ecosystem protection
- **Reclamation violated FWCA (II)**
  - Claim FWCA report required to be included in draft EIS
- **Failure to use an accurate environmental baseline (III)**
  - Fails to include several permit conditions imposed prior to the NOP which will be implemented prior to 2030 (primarily the **Revised Shasta RPA and Yolo Bypass restoration including the proposed Fremont Weir notch**)
  - **Fall X2** per 2008 Delta Smelt BO not appropriately addressed
  - Flawed because it is assumed full **contract deliveries** which have never occurred (never more than 75% of contract amounts)
  - **Need to include climate change assumptions in baseline (IV)**
    - Suggests incorporation into baseline rather than separate discussion in Chapter 25
- **2010 CALSIM** model inappropriately used (instead of 2015 version) **(V)**
  - States inconsistency in Appendix 6D related to Delta Alt D outflow
- **Fails to accurately assess impacts to aquatic resources from proposed operations (VI)**
  - **Arbitrary thresholds of significance** - 5-10 % flow reductions will have significant adverse effects
  - **Longfin smelt** impacts greater than 0 are significant (mandatory finding of significance)
  - Operational impacts of greater than 5% are not called significant
  - Impacts to salmon and steelhead inadequate
  - Ignore reduced flows
  - Assume no impact at **fish screens**
  - Fail to assess impacts from **reduced floodplain inundation**

    - **Ineffective mitigation measures**
    - **Fail to use existing life cycle models**
  - Consider feasible mitigation measures, including minimum bypass flows
  - **Delta smelt** impacts
- **Fails to accurately assess impacts to terrestrial biological resources (VII)**
  - Mitigation measures too broad - revise Mitigation Measure Wild-lb – more specificity by species including **ratios/performance standards**
  - Coordination with CDFW not consistently identified
  - **Giant Garter Snake** impacts and mitigation inadequate
  - **Outdated survey information** – inaccurate estimation of impacts
  - Inadequate assessment of impacts to **wildlife refuges – bird strikes associated with powerlines** and overall **impacts to Delevan NWR** as well as surrounding private lands; need to evaluate impacts to **Colusa and Sutter NWRs**
  - No impacts associated with the **TRR**
- **Fails to adequately analyze cumulative impacts and fails to disclose potentially significant adverse impacts to aquatic resources (VIII)**
  - Need to incorporate **WaterFix and Shasta Lake WRI**
  - Cite prior MBK work that identifies significantly reduced Delta outflows and Sac River flows
- **Presentation of Existing Conditions/No Action Alternative is flawed (IX)**
  - Appendix 12F
  - Appendix 6A
  - Examples of misleading and inaccurate descriptions of modeling results

Additional Analysis Requested:

1) Explanation of range of alternatives and reasons for considering single operational alternative;

2) Address environmental baseline flaws such as contract delivery assumptions, failure to include climate change, Shasta RPA, Yolo Bypass

3) Analyze more alternatives such as: alternatives that reduce water diversions from Sac River (especially in wet year types and during moderate and low flows), alternative that would not result in substantial reduction in Delta outflow, alternative that increases Delta outflow in winter and spring, and alternative that is consistent with Waterfix operational requirements;

4) Need to include evaluation of CDFW potential operational criteria to protect flow and reduce impacts on native fish species,

5) Consider other storage alternatives (groundwater storage, conjunctive use etc.);

6) Update CALSIM model to the most recent model

7) 7) Need FWCA report

8) Reanalysis of impacts to Aquatic and Terrestrial resources including updated surveys and mitigation measures for potentially significant adverse impacts

AquAlliance Letter (1/15/18) #17

- **CEQA lead should be DWR** given DSOD oversight and need to coordinate operations with SWP
- **Inadequate project description** – lacks detail/inappropriate impact analysis, improper

segmentation of environmental review (cites tie with SVWMA), seismic activity not addressed, **deferred surveys**, inadequate statement of objectives/P&N

- **Hydrology/water quality (selenium, mercury, hazardous materials, salt)** impacts,
- Additional **wetland survey and mitigation** required, stream flow depletion, concerns related to past CVP/SWP operations and regulatory processes/documents and supposed to tie Sites operations and intentions
- **Cultural resources** evaluations, impacts, and mitigation not completed or appropriately identified (including cumulative impacts)
- **Cumulative impacts** not fully analyzed including recent water transfers – provides many projects/actions suggested to be included

Pacific Coast Federation of Fisheries Associations/Institute for Fisheries Resources/Save California's Salmon/San Francisco Baykeeper/Winnemem Wintu Tribe (1/15/18) #20

- EIR/EIS should be prepared a part of a **FERC license application**; numerous deficiencies
- Use of **Existing Conditions/No Project/Action baseline** biases the analysis and avoids CEQA mitigation requirements
- Document needs to include an **operations plan and diversion schedule**
- Use of old information in the **modeling**; outdated and insufficient model
- **Cumulative impacts** evaluation needs to identify numerous other projects and actions (provides list)
- States on-going **economic impacts** associated with salmon decline
- **Modeling** is problematic – monthly modeling insufficient for addressing fisheries needs
- EIR/EIS does not discuss **flow management impacts** of the project
- Proposed project does not adequately account for importance of flow fluctuations and fishery habitat needs
- Impacts to important **floodplains (including Sutter and Yolo bypasses)** – need to be identify impact to fish production and water quality
- **Water quality** impacts – diversion will further impact **water temperatures** downstream of the proposed diversions
- Reduced flows from Shasta and Keswick – concerns over **metals and reduced dilution**; reduced cold/fresh water to the Delta
- Potential **salinity** issues from Sites Reservoir releases – need a reservoir management plan
- **Climate change** impacts not evaluated
- **Fishery impacts** not properly addressed – no analysis of current state of Delta or Sacramento

fisheries as well as Sacramento River tributaries and Trinity system.

- No **economic analysis** – cite 8% reduction in appendixes in highwater years and 11% increase in normal years

- Impacts to **Klamath and Trinity River salmon** populations not properly analyzed – need to reference recent legal decisions since ROD

- **Sacramento River/Delta fisheries** impacts not properly analyzed – project will exacerbate current problems – **winter and spring flows** need to be maintained; project would result in increased **Delta reverse flows**

- **Water quality** conditions will encourage propagation of **non-native fish species**
- **Tribal beneficial uses** (i.e. water and salmon) impacts not disclosed as well as **public trust** resources – need to reference **reintroduction of salmon and fish passage above Shasta Dam** and potential Project effects

California Indian Water Commission (1/15/18) #21

- **Support the No Project** – project counterintuitive to the laws of nature

- **Ecological effects of the project inadequately analyzed** – suggest consulting with tribes; access from the top of contributing watersheds

- **Recommend use of Mauri-o-meter** to assess impacts to the environment – considers cultural wellbeing (inclusive of metaphysical aspects), social wellbeing, and economic wellbeing using a series of questions that are filtered through a heuristic model

CSPA/AquAlliance/California Water Impact Network (1/13/18) #23

- **Inadequate project description** – need to identify who will operate project, how decisions will be made, and responsibility including prioritizing use of Sites releases

- **Operating rules** too vague – speculative and hypothetical

- Averaging of **model results** masks real impacts

- Potential **thermal impacts** associated with reservoir releases

- **Insufficient range of alternatives**
    - Does not include more restrictive bypass requirement than existing standards
    - Need an alternative that includes operations with WaterFix in place

- Inadequately addresses required **water right** amount, timing, and **relationship with CVP and SWP**

- No discussion as to how **water transfers** would be facilitated

- Does no disclose impacts associated with **decreased floodplain inundation**

Friends of the River (1/15/18) #24

- Inadequate **project description** – need to identify how the project will be operated, inconsistencies with Reclamation's feasibility report

- Inadequate **range of alternatives** – speculative and hypothetical

- Lack of meaningful information about **water rights** – how will the project insure only tributary water will be diverted to Sites

- Fails to adequately consider **impacts of Sacramento River diversions:**

    - Models – analysis depends on models with known deficiencies
    - Environmental Standards – existing flow standards inadequate
    - Public Lands and Land Use – analysis barely acknowledges public lands along Sacramento River

- Inadequate description of **impacts on Sacramento River water quality**
    - Models inadequate to accurately assess temperature impacts

- Fails to adequately address **reservoir-triggered seismicity** on local communities and structures – needs to fully examine the role of frequent filing/emptying of reservoir in triggering earthquakes

- Inadequate in addressing **greenhouse gases** - recommends use of World Bank's guidelines on GHG measurement

- Inadequate evaluation of **rare plants** – analysis should include guidelines and sufficient information

- Overstates **project benefits for threatened and endangered salmonids** – not a net benefit of Sites

- Other specific comments on Draft EIR/EIS regarding:

    - Range of alternatives – need to look at smaller reservoirs
    - Surface water resources – needs to address water rights over-allocation issue
    - Fluvial Geomorphology – analysis is adversely affected by Sacramento River between Colusa and Red Bluff considered part of Secondary Study area
    - Terrestrial Biology – disputes findings of the technical analysis, mitigation lacks detail
    - Geology, Minerals, Soils and Paleontology – no mention of mercury

- Request **withdrawal of the Draft EIR/EIS**, revision and recirculation

Friends of the River, Sacramento River Preservation Trust, Sierra Club (1/15/18) #25 (expanded version of comments provided in Letter #24)

- Expanded version of Letter #24 – includes all comments list above and:
    - Appendices 6B and 6C – review of appendices indicates alarming flow impacts to the Sacramento River and Sutter Bypass, particularly drought years

- Request withdrawal of the Draft EIR/EIS, revision and recirculation

Klamath Riverkeeper (1/15/18) #27

- Compliance with **California and Federal Endangered Species Acts** – increased Sacramento River flows and increased outflows from the Delta necessary to support native fish and wildlife; EIR/EIS fails to provide a consistent operational plan

- Compliance with **California Reasonable Use Doctrine** not demonstrated - reasonableness requires evaluation of alternative water supplies to meet given need and evaluation of the impacts of new water uses on existing legal uses and water users

- Compliance with **Public Trust Doctrine and Tribal Trust Obligations** – suggests that reduced flows would occur in Sacramento, Trinity and Klamath rivers and failure to comply with Public Trust doctrine and protect Tribal Trust resources

- Must accommodate **Humboldt County's Trinity River water right** – county may wish to preserve its water right to augment rather than satisfy flows to comply ESA

- Fully analyze the **No Project Alternative** – fails to include operational plans and does not evaluate how No Project Alternative could satisfy consumptive and instream water supply needs

- The Final EIR/EIS must demonstrate that future instream flow requirements will not render Sites Reservoir a 'stranded asset"

Save the American River Association (n/d) #30

- Analysis based on false premise that **current flow and water quality standards** for the river are adequate

- Entire project based on the false premise that there is **excess water in the Sacramento River** not needed for the environment

- Urges **new environmental document** be prepared and released for public review

Sierra Club, Shasta Group Mother Load Chapter (1/14/18) #31

- Sacramento River **water temperature** – reliability of the water temperature model, Sites Reservoir will have extremely poor water quality

- **Recreational opportunities** will be practically nonexistent due to shallow lake levels

- Site-specific **geotechnical data** missing

- The **summary of environmental effects** by resource (Table ES-2) reflects the "opinion" of the writers of the report, should be independent review to confirm if 'opinion" is scientific defensible

- Source of rockfill material for riprap - further field investigation is needed to verify local bedrock is suitable

- Number of saddle dams indicative of poor project feasibility

- Sufficient water for agriculture, more water needs to be used in the Sacramento/San Joaquin Delta to i**mprove health of the aquatic habitat** – no mention of crop usage and future food types likely to be used in California in the future and associated impacts

- Funds for this project could be used and distributed to improving the health of the Sacramento/San Joaquin Delta

- Unclear if **hydropower** will be part of the project

- **No new facilities** should be constructed in the Sacramento River

- **No Project/No Action Alternative** should be selected

Sacramento Valley Chapter, California Native Plant Society (1/11/18) #122

- Project will destroy 15,000 acres of intact California **natural communities** including oak woodlands, chaparral, California prairie, riparian areas, and fresh and alkaline wetlands

- **Biological surveys**, including rare plants, inadequate

Save California Salmon, California Sportfishing Protection Alliance, California Water Impact Network, Environmental Water Caucus, Southern California Watershed Alliance, Friends of the River, Pacific Coast Federation of Fishermen's Associations & Institute for Fisheries Resources, Safe Alternatives for our Forest Environment, Butte Environmental Council, Sacramento Valley Chapter of the California Native Plant Society, Protect American River Canyons, Fly Fishers of Davis, Coast Action Group, Friends of the River, Sacramento River Council, Planning and Conservation League, The Environmental Justice Coalition for Water, Golden Gate Salmon Association, Conservation Fly Fishers International Northern California Council, The Bay Institute, Winnemem Wintu Tribe, Water Climate Trust, Chico 350, Women's International League for Peace And Freedom Earth Democracy (March 17, 2019) #140

- Foreseeable Impacts to Trinity River Water Temperature Objectives Associated with Sites Project Operations Need to be Evaluated with an Accurate Temperature Model.
- Foreseeable Impacts to Trinity River Water Temperature Objectives Associated with Sites Project Operations Need to be Evaluated with an Accurate Temperature Model.
- Inaccurate Existing (Baseline) TRD Water Operations.
- Incomplete Cumulative Impact Assessment Pertaining to TRD Operations.
- Mitigation for Trinity/Lower Klamath Impacts. Effective mitigation measures must be recommended to ensure that fishery/fish habitat management objectives for the Trinity River and lower Klamath River will be met. The Bureau of Reclamation has used the auxiliary outlet on Trinity Dam to release colder water during drier years, but this action results in the loss of power generation and this impact on CVP power generation needs to be evaluated as it relates to revised Trinity operations as proposed for Sites.
- Narrow Scope of Alternatives.
- No Action Alternative and Existing Conditions. Assuming the existing conditions and No Action alternatives are the same is inappropriate, compromises the ability to compare impacts across alternatives, and may minimize the magnitude of some of the impacts. The faulty assumption that State and Federal water contractors would be projected to use their full contracted water volumes (2030 projected conditions) does not reflect the current water management (existing condition) and likely provides inaccurate impact results. Because of this, the no action alternative minimizes potential impacts and greatly reduces the mitigation responsibilities required under CEQA.
- Sites Project Water Rights and Potential Unforeseen/Undisclosed Impacts.
- Cumulative Impacts.
- Sites Reservoir Operating Procedures/Priorities Absent.
- Compliance with California Endangered Species Act (CESA).
- Tribal Consultation and Mitigation Absent.

- Hydropower Licensing.
- Environmental Baseline/Modeling.
- Bypass Flows and Diversion Rates.
- Reduced Delta Outflows and impacts on Delta Smelt and Other Important Bay-Delta Species.
- Delta and Longfin Smelt Impacts due to Old and Middle River Reverse Flows.
- Water Quality and Beneficial Use Impacts.
- Sacramento River Flow and Temperature Modeling.
- Sacramento River Temperature Effects.
- Impacts to Floodplain Habitat.
- Evaluation of Fishery Impacts Lacking.
- Water Quality
    - Toxic Metals.
    - Methylmercury.
    - Noxious Algal Blooms.
    - Salinity.
- Geomorphology.
- Entrainment Losses of Native Fish.
- Fish Screens.
- Impacts on Funks and Stone Corral creeks.
- Reservoir Fishery Impacts from Pumping Plant Operation:
- Recreation.
- Wildlife Mitigation Actions.
- Need for a Natural Community Conservation Plan (NCCP).
- Nesting Birds.
- Giant Garter Snake.
- Botanical Surveys. Information contained in the DEIS/EIR is insufficient to determine the impacts on botanical resources within the Sites Project area. Botanical surveys must be redone, data included in the DEIS/EIR are from the late 1990's and early 2000's, and must include all areas affected by the project. Accepted scientific protocols should be used to conduct these surveys.
    - Botanical Resources Mitigation.

Letters from Tribal Governments

Colusa Indian Community Council (January 4, 2018) #4

- Project will have a direct impact on the **Indian Trust Assets** of the CICC, Tribal Trust Lands and several Fee Simple Lands owned by the Tribe coated downstream

- Need to ensure **water availability** to meet Tribal water demands; Bureau of Reclamation could provide funding to the Tribe to address water supply impacts of the project

- Delevan Intake/Discharge Facility will lead to **increased erosion downstream** which could impact Tribal Water Diversion downstream.

- Impacts to **cultural resources** including burials within the reservoir footprint and the vicinity of the Sacramento River.

- Construction of the Delevan pipeline will require **traffic diversions** that will impact Tribal Fee Land and put Tribal **agricultural land** out of production.

Karuk Tribe (3/6/19) #139

- **Tribal Consultation and Mitigation** absent - no consultation outside of footprint area, need to conduct additional AB 52 consultation

- Need to 'honestly' evaluate **foreseeable impacts to Trinity River water temperature objectives** associated with project operations – revised Trinity River Division (TRD) water operations associated with Sites Projects violates 2000 Trinity Record of Decision (ROD)

- Need to analyze foreseeable impacts to the Trinity River associated with **Trinity Lake carryover storage –** analysis assumes minimum Trinity Reservoir carryover storage, without sufficient carryover storage would not achieve Trinity River temperature objectives

- Inaccurate **baseline associated with TRD** water operations – analysis did not consider use of Humboldt County's 50 TAF water contract included in the Trinity River Division Act

- Effective **mitigation for Trinity River/Lower Klamath impacts** needed

- Incomplete **cumulative impact assessment** pertaining to TRD operations – impact of carryover storage to meet **temperature objectives** during multi-year droughts; impact on **CVP power generation**

- Any adverse impacts on **fishery resources of the Karuk Tribe** need to be thoroughly evaluated and disclose

EIR/EIS Public Comment Update/Summary

February 2018

- Public meetings input
- Written comments
  - Federal/state/local
  - NGOs/environmental interests
  - Individuals
  - Primary issues/concerns
- Comment response approach
  - “Thematic” responses
  - Potential analysis
- Next steps

Public Meetings

Sacramento (12/5) and **Maxwell** (12/7)

- Both well attended
- Sacramento meeting included support statements from labor interests as well as environmental interest concerns
- Maxwell session included individuals and environmental interest concerns

Sites

Written Comments

136 letters/e-mails to date

- Tribes (3)
- Federal (3)
- State (6)
- NGOs (10)
- Individuals (103)
  - Including one petition (1001 signatures)

Sites

Tribal Comments

Letters received from Colusa Indian Community Council, California Indian Water Commission, and Winnemem Wintu

- Colusa ICC
  - Indian Trust Assets (ITA) need to be identified (Reclamation)
  - Potential impacts to Tribal water demands (potentially met by Sites)
  - Geomorphology impacts to ITAs
  - Burial grounds within reservoir footprint and Sacramento River diversion
- California Indian Water Commission
  - Requests extension for review
  - ITA discussion inadequate
  - Ecocultural effects not analyzed – support no action
- Winnemem Wintu
  - Signatory to Pacific Coast Federation of Fisherman's Association

Federal Agencies

Letters received from EPA, NMFS, WAPA

- Additional detail
  - Final operational approach (including bypass flows and weirs) – *NOAA (NMFS), EPA and WAPA*
  - Water quality – *EPA and NMFS*
  - Fish screens – *NMFS*
  - Wetlands - *EPA*
- Power benefits methodology – *WAPA*
- *USFWS comments to be provided through FWCA report*

State Agencies

Letters from CDFW, SWRCB, Delta Stewardship Council, Cal FIRE, Caltrans, Department of Conservation

- Proposed diversions/bypass flows and impacts to fisheries – additional alternatives
- Water quality (including river and reservoir temperatures)
- Terrestrial resources impacts
- Delta species impacts
- Enforceable mitigation measures/detail
- Avoid run-off to state roads/highways
- Fire suppression and access
- First responders and required communications
- Conversion of agricultural lands – conservation easements

Caltrans

CAL FIRE SINCE 1885

CALIFORNIA CONSERVATION

Water Boards

CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

DELTA STEWARDSHIP COUNCIL

Sites

Local Agencies

Letters from:

- Colusa Board of Supervisors
- Maxwell Fire Protection District
- Kanawha Fire Protection District
- County of Humboldt Board of Supervisors
- Northern California Power Agency
- Woodland-Davis Clean Water Agency (WDCWA)
- Sacramento Municipal Utility District (SMUD)
- Metropolitan Water District (MWD)
- Contra Costa Water District (CCWD)

Primary Local Agency Concerns

- Fire potential during construction and access
- Recreational use and implications to county operations
- Land use impacts
- Impacts to CVP power customers
- Electrical transmission interconnections
- Potential Trinity River impacts
- Potential Woodland-Davis effects
- Potential impacts to CCWD water supply quality
- Support project

Non-Governmental Organizations (NGOs)

Letters from:

- NRDC et al (including Defenders of Wildlife, Bay Institute, Center for Biological Diversity, PCFFA)
- PCFFA, Institute for Fisheries Resources, Save California Salmon, Winnemem Wintu Tribe, San Francisco Baykeeper
- AquAlliance
- Friends of the River
- Sierra Club
- Save California Salmon (1001 individuals)

NRDC

AQUALLIANCE
DEFENDING NORTHERN CALIFORNIA WATERS
WWW.AQUALLIANCE.NET

PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS
PCFFA
Est. 1976
STEWARDS OF THE FISHERIES

Friends of the River
Since 1973

DEFENDERS OF WILDLIFE

SIERRA CLUB
FOUNDED 1892

Sites

Primary NGO Concerns

- Range of alternatives – include decreased diversions
- Baseline assumptions – need to include future/very recent actions (e.g. Shasta storage, Yolo Bypass weir)
- Climate change should be part of baseline
- Outdated modeling approach
- Operational impact to fisheries
- Impacts to terrestrial species
- Impacts to cultural resources
- Impacts to Trinity and Delta
- Additional cumulative impacts

NRDC

AquAlliance
Defending Northern California Waters
www.aqualliance.net

Pacific Coast Federation of Fishermen's Associations
PCFFA
Est. 1976
Stewards of the Fisheries

Friends of the River
Since 1973

Defenders of Wildlife

Sierra Club
Founded 1892

Sites

Individuals

103 individual letters/e-mails (including petition signed by 1001+ individuals)

- Property owner concerns including grazing and general access
- Petition focuses on no surplus water available statewide and does not include protections for fish (including Trinity River) and flows
- Water quality impacts
- Range of alternatives
- Aquatic and terrestrial resources impacts
- Location of powerlines
- Impacts to public roads
- Cultural resources impacts
- Delta outflows
- Additional conservation is necessary

Sites

Potential Thematic Responses

Propose development of thematic responses (number of letters/e-mails referencing) including:

- Additional analyses required - primarily fishery related (87)
- Delta flow impacts (68)
- Terrestrial/botanical impacts (54)
- Tribal, ITA, cultural resources (47)
- Climate change and sea level rise (45)
- Economic/financial impacts (45)
- Range of alternatives (16)
- Bypass flows and flow reductions (13)

Sites

Suggested Additional Analyses

- More analysis on fisheries impacts and direct relationship between Project diversions and Delta outflow (most)
- Suggest use of updated (2015) CALSIM model (CDFW, NRDC, PCFFA et. al.)
- Suggest use of daily modeling related to fishery/WQ impacts (CDFW, NRDC et. al., PCFFA et.al.)
- Concern for analytical approach that relies on 2030/existing conditions as well as climate change baseline assumptions (CDFW, PCFFA et. al., NRDC et. al.)
- Additional analysis of water quality impacts (most)
- Suggest including water residence times and accounting for seasonal warming from intakes to Sites (CDFW)

Sites

Next Steps

- Identify proposed response approach for letters/categories of comments
- Complete Reclamation summary comment/response memo
- Support discussions with permitting agencies
  - NMFS
  - USFWS
  - CDFW
- Prepare for Phase 2 work effort

Sites

EIR/EIS Public Comment Update/Summary

February 2018

From: Staff and CH2M/Jacobs (Rob Thomson, Mark Oliver and Lyna Black)

To: Sites Authority Board

Subject: Report to the Reservoir Committee – Comments on the Draft EIR/S

Meeting: Phase 1 Reservoir Committee Meeting - February 15, 2018

1) Received additional agency and public comments from an additional two individuals. A petition has received additional signees totaling 1,001 signees as of February 8, 2018. The table below summarizes commenters by affiliation. USFWS has notified the Authority their input will be provided through their Fish and Wildlife Coordination Act report.

2) Continuing working through categorizing letters and identifying comments to support development of comment/response matrix.

3) Categorizing primary comments across letters to identify potential thematic response categories, as well as response approaches and potential need for additional analyses. Initial themes include:

   a. Range of alternatives

   b. Operational approach and bypass/weir flows

   c. Tribal/cultural resources

   d. Water quality impacts

   e. Delta species/flow effects

   f. Baseline assumptions and climate change

4) Developing summary memo in coordination with Reclamation for federal coordination purposes summarizing comments and proposed response approaches

5) Summary presentation to be provided at next meeting and subsequent Authority board meeting

Commenter Affiliation	***Number of commenters***
Federal	3
State	6
Tribal	3
Local/Regional	12
NGO*	10
Individuals**	103
OTAL COMMENT LETTERS/E-MAILS/PETITION	**136**

*Some NGO letters included comments from multiple NGOs

** Includes individual petition on Change.com containing 1001 signees as of 2/8/18

Save California Salmon

CSPA
California Sportfishing Protection Alliance
Since 1983

PCFFA
Pacific Coast Federation of Fishermen's Associations
Stewards of the Fisheries

Environmental Water Caucus

california water impact network

Planning and Conservation League

Institute for Fisheries Resources

CRAB BOAT OWNERS ASSOCIATION, Inc.
2907 Jones Street
San Francisco, California 94133-1115
415-885-1180

Since 1971
the Northcoast Environmental Center
www.yournec.org

S.A.F.E.
Alternatives for our Forest Environment

Southern California Watershed Alliance

California Native Plant Society
Sacramento Valley Chapter

EJCW
Water Justice for All

PARC
protect american river canyons

Butte Environmental Council
Protecting Butte County's Land, Air & Water Since 1975

Fly Fishers
Davis, California

Friends of the River
Since 1973

Sacramento River Council

California Wilderness Coalition

GoldenGate Salmon Association

Fly Fishers International
Northern California Council

The Bay Institute

Winnemem Wintu Tribe
Middle River People

Coast Action Group

March 17 2019

Mr. Jim Watson
Sites Project Authority
P.O. Box 517
Maxwell, CA

Re: Request For A Recirculated Draft Sites Reservoir EIS/EIR

Dear Mr. Watson:

It is our understanding that the Sites Project Authority (SPA) is planning on release of a final EIS/EIR in March 2020. We are requesting a revision and recirculation of the Draft Sites Reservoir EIS/EIR (DEIS/EIR) prior to release of a final EIS/EIR because the initial DEIS/EIR was inadequate under the law to fully describe the project, reasonable alternatives, impacts and appropriate mitigation measures. The inadequacy of the DEIS/EIR was clearly pointed out in comment letters by numerous organizations and individuals, including many of our organizations and the California Department of Fish and Wildlife (CDFW).[1]

The DEIS/EIR was inadequate to meet the legal requirements of CEQA and NEPA as described in detail below, but more importantly, the project as described to date does not resolve the fundamental issue of what will be the minimum bypass flows for the Sacramento River. This is a key issue that underlies the basic water yield and economic feasibility of this project.

The California Department of Fish and Wildlife has recommended a much higher minimum bypass flow in the Sacramento River than is being proposed by the SPA (13,000 cfs compared to 3,250 cfs at Red Bluff, 4,000 cfs at Hamilton City and 5,000 cfs at Wilkins Slough).[2] The impacts to the Sacramento River fishery have not been adequately described in the DEIS/EIR, nor is there an alternative analyzed in the DEIS/EIR that would provide the flow recommendations by CDFW.

[1] See Friends of the River's website on Sites Reservoir for comment letters on the Sites DEIS/EIR at https://www.friendsoftheriver.org/our-work/rivers-under-threat/sacramento-threat-sites/

[2] See CDFG letter of 1/12/18, page 9 "*CDFW recommends the Project proponents revise the bypass flow requirement to maintain at least 13,000 cfs past all diversion facilities prior to the diversion of water to reduce impacts on out-migrating juvenile salmonids."* Accessed at https://www.friendsoftheriver.org/wp-content/uploads/2018/09/1-12-2018-CDFW-Sites-Project-Letter.pdf

It is impossible for anybody to know if this project is cost effective and promised environmental public benefits can be delivered until the Sacramento River minimum bypass flow issue is resolved. The SPA's recommendation for Sacramento River minimum bypass flows appears to justify a finding of financial feasibility, but how feasible will the project be if CDFW's minimum bypass flows are legally required? We believe this issue must be fully and adequately analyzed in the DEIS/EIR, prior to any water rights hearing or other permitting process that will rely on the information in the DEIS/EIR.

Due to the extensive and significant issues listed above, a recirculated draft document addressing these deficiencies is necessary for the Sites Project to comply with NEPA and CEQA. The existing DEIS/EIR is inadequate and cannot be relied upon for preparation of a Final EIS/EIR.
Therefore, we urge you to prepare a recirculated draft EIS/EIR for the proposed Sites Reservoir to fully disclose impacts, alternatives and mitigation measures. You would do a disservice to your own cause to do otherwise.

Sincerely,

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Attachment: Kamman Hydrology Analysis of Sites DEIS/EIR on Trinity River

cc: California Water Commission Members
Representative Jared Huffman
Karuk Tribe
Hoopa Valley Tribe
Yurok Tribe
Humboldt County Board of Supervisors
Trinity County Board of Supervisors
Eileen Sobeck, Executive Officer SWRCB
Charlton Bonham, Director CDFW

Specific List of Issues That Must Be Addressed in a Recirculated Draft EIS/EIR For The Sites Project

1. **Foreseeable Impacts to Trinity River Water Temperature Objectives Associated with Sites Project Operations Need to be Evaluated with an Accurate Temperature Model.** The revised Trinity River Division water operations associated with the Sites Project (shifting diversions to winter/spring from summer/fall in dry years) violates the 2000 Trinity Record of Decision and will lead to increased water temperatures in Lewiston Reservoir and downstream in the Trinity River. The Draft EIS/EIR does not disclose the impact, even though the proposed operation would clearly increase river temperatures, meaning that the temperature model is not accurate. Any increase in the temperature of water released to the Trinity River would degrade water quality conditions and increase the potential for violations of North Coast Basin Plan water quality (temperature) objectives protective of adult spring and fall Chinook, as well at the water temperature objectives established under the Trinity River Record of Decision to protect outmigrating juvenile salmonids. The water temperature model developed by USGS for the Trinity River should be used to evaluate the impacts to Trinity River water temperatures and attainment of water temperature objectives See detailed comments in attached memo from Kamman Hydrologics.

2. **Foreseeable Impacts to Trinity River Associated with Trinity Lake Carryover Storage.** The Sites Project water operation and temperature analyses assume a minimum Trinity Reservoir carryover storage volume of 600TAF, thereby impacting Trinity River water temperatures. Water temperature modeling for the Trinity River, including studies by the Bureau of Reclamation, indicate that initial October 1 carryover storage volumes of 600- and 750-TAF are not sufficient to satisfy Trinity River temperature objectives for a single dry/critically dry water year-type, let alone multi-year droughts. It is reasonable to foresee that current implementation of the ROD Flows without sufficient carryover storage will not achieve Trinity River temperature objectives during critically dry year-types and possibly not meet objectives of the ROD for the Long-Term Plan to Protect Adult Salmon in the Lower Klamath River. Additionally, Trinity Reservoir storage has no chance of being replenished during multi-year droughts. See detailed comments in attached memo from Kamman Hydrologics.

3. **Inaccurate Existing (Baseline) TRD Water Operations.** The water operations analysis for Sites Project EIR/S did not include an analysis considering use of Humboldt County's 50 TAF water contract included as a provision of the Trinity River Division Act of 1955. The ROD for the Long-Term Plan to Protect Adult Salmon in the Lower Klamath River (Lower Klamath ROD) identifies Humboldt County's 50 TAF water contract as a volume of water available to release into the Trinity River to reduce the probability of a fish kill in the Lower Klamath River. The omission of the Humboldt County 50 TAF contract and the Lower Klamath ROD in the DEIR/S analyses could have significant effects on projected CVP water deliveries and the water quality conditions and potential impacts to both the Trinity and Sacramento Rivers. Therefore, the DEIR/S should be considered incomplete in the analysis of the effects of the Site Project operations on the Trinity River. See detailed comments in attached memo from Kamman Hydrologics.

4. **Incomplete Cumulative Impact Assessment Pertaining to TRD Operations.** Several issues were not evaluated as part of the cumulative impact assessment that will likely have adverse impacts on the Trinity River including (1) the impact of the 600 TAF minimum carryover storage in meeting Trinity River water temperature objectives during multi-year droughts, (2) accounting for Humboldt County's 50 TAF water contract, and (3) the influence of climate change on meteorology and hydrology of northern California rivers. See detailed comments in attached memo from Kamman Hydrologics.

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5. **Mitigation for Trinity/Lower Klamath Impacts.** Effective mitigation measures must be recommended to ensure that fishery/fish habitat management objectives for the Trinity River and lower Klamath River will be met. The Bureau of Reclamation has used the auxiliary outlet on Trinity Dam to release colder water during drier years, but this action results in the loss of power generation and this impact on CVP power generation needs to be evaluated as it relates to revised Trinity operations as proposed for Sites.

6. **Narrow Scope of Alternatives.** The DEIS/EIR should include a wider range of alternatives rather than only alternatives that maximize attaining project benefits of increasing water supply. Alternatives that achieve varying levels of project objectives while minimizing project impacts should be developed and evaluated.

7. **No Action Alternative and Existing Conditions.** Assuming the existing conditions and No Action alternatives are the same is inappropriate, compromises the ability to compare impacts across alternatives, and may minimize the magnitude of some of the impacts. The faulty assumption that State and Federal water contractors would be projected to use their full contracted water volumes (2030 projected conditions) does not reflect the current water management (existing condition) and likely provides inaccurate impact results. Because of this, the no action alternative minimizes potential impacts and greatly reduces the mitigation responsibilities required under CEQA.

8. **Sites Project Water Rights and Potential Unforeseen/Undisclosed Impacts**. The DEIS/EIR does not sufficiently address the acquisition of water rights for the Sites Project nor does it address water over-allocation issue in the Central Valley. Also, potential impacts of acquiring these water rights and the associated water to be stored in Sites Reservoir on other streams/watersheds must be evaluated.

9. **Cumulative Impacts.** The conclusion presented in the DEIS/EIR that there are no cumulative impacts associated with the Sites Project is flawed. An evaluation of cumulative impacts is necessary to comply with the law. With the declining status of the fishery resources in the Sacramento-San Joaquin Basin and the Delta, reduction of flows in the Sacramento River by the proposed Sites Project operations would contribute to the decline of these populations in a cumulative manner. Changes in proposed diversions from the Trinity Basin would also have cumulative impacts on the fishery resources of the Klamath-Trinity Basin. Additionally, many

actions are not identified in the cumulative impacts section and need to be included in the cumulative impacts analysis including: the ROD for the Trinity River Mainstem Fishery Restoration (without modifications to diversions to the Sacramento River as proposed in the DEIS/EIR), the ROD for the Long-Term Plan to Protect Adult Salmon in the Lower Klamath River (as proposed), the lower American River Modified Flow Management Standard, California Water Fix, the Temperance Flat Dam proposal, the proposed enlargement of Shasta Dam, the State Water Project Contract Extension, the Agricultural Drainage Selenium Management Program, the West Sacramento Levee Improvements Program, the Central Valley Flood Protection Plan, FloodSAFE,, the Lower Yolo Restoration Project, the Contra Costa Water District Intake and Pump Station (Alternative Intake Project), 2009 National Marine Fisheries Service Biological Opinion and Conference Opinion for the Coordinated Long-Term Operation of the CVP/SWP, , the new Biological Assessment and NOAA Fisheries consultation regarding the State and Federal Water Projects, the 2008 United States Fish and Wildlife Service Biological Opinion for Delta smelt for the Coordinated Long-Term Operation of the CVP/SWP, the Draft Environmental Impact Statement for Revisions to the Coordinated Long-Term Operation of the Central Valley Project and State Water Project, the Central Valley Flood Management Program, the San Joaquin River Restoration Program, the Recovery Plan for Sacramento-San Joaquin Delta Native Fishes, the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan, Bay Delta Phase 2 plan updates, the California Water Action Plan, California EcoRestore, and the Davis-Woodland Water Supply Project.

10. **Sites Reservoir Operating Procedures/Priorities Absent.** The operating /accountable entity of the Sites Project is not identified, and no operating rules/procedures are provided. The DEIS/EIR identifies four potential uses of stored water (supplemental deliveries to TC Canal, GC Canal and RD108 settlement contractors; increasing deliveries to wildlife refuges; increasing water reliability for CVP and SWP contractors; and releases for delta water quality) but no rule set with priorities and volumes to be used to meet these uses are provided. These procedures must include integration of the Sites Project with CVP, SWP, and other water management projects.

11. **Tribal Consultation and Mitigation Absent.** There is no Tribal consultation outside the footprint area and there are cultural resources within the foot print area with no mitigation measures discussed for their protection. AB-52 tribal consultation is now required and federal Tribal consultation has always applied.

12. **Compliance with California Endangered Species Act (CESA).** As identified in the DEIS/EIR, CESA protected species may be affected (take) by the Sites Project and any take must be authorized by CDFW by a CESA permit which is also subject to CEQA. Impacts, mitigation actions with an associated monitoring and reporting program much be included in the CEQA document supporting the CESA permit. In addition, Klamath River spring Chinook are now a candidate species under CESA and must be considered.

13. **Hydropower Licensing.** Since it is likely that hydropower facilities would be constructed as part of the project, a detailed descriptions and operation protocols of the proposed facilities and analyses of potential impacts should be presented in the DEIS/EIR. A description of the steps, including timelines, that will be taken to obtain FERC approval for the project should also be provided.

14. **Environmental Baseline/Modeling**. The source of much of the information used in the modeling and impact assessment appears to be outdated (it is difficult to discern the source of some of the data) and likely does not reflect the current understanding of the system using the best available data. Without the use of updated, contemporary models the information presented in the document on potential impacts are highly questionable.

15. **Bypass Flows and Diversion Rates.** The DEIS/EIR indicates diversions to the Sites Project would reduce flows in the Sacramento River and Delta outflows, especially in the winter in spring. Potentially significant flow reductions in the Sacramento River, especially during dry and critically dry water years, will likely have significant biological impacts on fish species in the river at those times. The proposed bypass flows of 3,250 cfs at Red Bluff, 4,000 cfs at Hamilton City and 5,000 cfs at Wilkins Slough are less than those needed to restore native fish and wildlife identified in the State Water Resources Control Board report "*Scientific Basis Report in Support of New and Modified Requirements for Inflows from the Sacramento River and its Tributaries and Eastside Tributaries to the Delta, Delta outflows, Cold Water Habitat, and Interior Delta Flows*" (https://www.waterboards.ca.gov/water_issues/programs/peer_review/docs/scientific_basis_phase_ii/201710_bdphaseII_sciencereport.pdf). Justification for these flow magnitudes should be presented and impacts of these flows that are insufficient for restoration of native fish species should be thoroughly evaluated. The timing of the Sites Project diversions during winter and spring will eliminate or greatly diminish the effectiveness of higher releases of water from Shasta Dam to meet environmental needs if it remained in the river. Additionally, potential mitigation measures to address these decreased flow impacts such changing diversion timing and magnitude, a variety of pulse flows to improve outmigration conditions for fishes, and other physical/biological/ecological processes should be proposed and evaluated. An alternative using Sacramento minimum bypass flows of no less than 13,000 cfs recommended by CDFW should be fully analyzed.

16. **Reduced Delta Outflows and impacts on Delta Smelt and Other Important Bay-Delta Species.** The draft EIS/EIR erroneously states there is no relationship between winter/spring Delta outflows and Delta smelt abundance. Information presented in the Interagency Ecological Delta Smelt Management Analysis and Synthesis Team report (2015) shows a positive relationship between larval Delta smelt abundance and winter-spring Delta Outflows. The impacts on larval Delta smelt abundance resulting from reduced winter-spring Delta outflows due to Sites Project operations needs to be evaluated and necessary mitigation actions identified. Additionally, the impacts of reduced Delta outflows on the zooplankton community should be evaluated because of their critical importance as food for larval fishes.

17. **Delta and Longfin Smelt Impacts due to Old and Middle River Reverse Flows.** The DEIS/EIR acknowledges the potential increase of Old and Middle River reverse flows during some summer, fall, and winter months due to increased pumping at the CVP and SWP facilities but does not adequately assess the impact on Delta smelt and Longfin smelt. In addition to the estimated losses due to entrainment in the CVP/SWP facilities, losses in Old and Middle River (and other affected waterways) occurring before the diversion facilities, the areas where the majority of mortality occurs, must be evaluated.

18. **Water Quality and Beneficial Use Impacts.** Diverting higher-quality water from the Sacramento River will likely lead to water quality degradation at downstream sites and these potential impacts are not evaluated. The Sacramento River and Delta already suffer from water quality impairments (temperature, heavy metals, nutrients, pesticides) and decreasing flows will only exacerbate these problems. This not only impacts the aquatic resources but also potentially agricultural and domestic uses of these waters.

19. **Sacramento River Flow and Temperature Modeling.** The use of an outdated version of the CALSIM II model not calibrated to current data is inappropriate. This model is based on a monthly timestep which is not appropriate for modeling impacts on habitat availability and water temperature. Water temperature analyses should be based on daily time steps because of the potential sub-lethal and lethal effects of temperatures on aquatic organisms due to daily or weekly changes. The water quality analyses that use the weekly time-step information from CALSIM II would not capture this shorter timeframe impacts. The shorter timestep for habitat modeling such as weekly would be more appropriate.

20. **Sacramento River Temperature Effects.** The assumption that a multi-level outlet structure to manage releases water temperatures to match those of the Sacramento River needs to be evaluated and appropriate information presented. The Sites Reservoir will be a relatively shallow and large surface area impoundment that may not provide the stratification and resulting cold water pool necessary to effectively manage water temperature releases to preserve cold water fishes. Modeling of reservoir water volume and thermal dynamics, using information from similar reservoirs, should be conducted, and potential impacts on attaining the objective of releasing the same water temperature as the Sacramento River disclosed. Incorporation of operations procedures using the multi-level outlet should be presented and an evaluation of how these procedures, using anticipated volumes of cold-water storage and release patterns, is needed to evaluate the effectiveness of this component of the proposed action. Additionally, an explanation and modeling data of how Sites Project operations will be incorporated CVP and SWP operations in meeting temperature objectives should be presented.

21. **Impacts to Floodplain Habitat.** Sites Project operations will reduce flows in the Sacramento River and may impact the timing and duration that fish have to high quality habitat in the Yolo

and Sutter bypasses. An annual time-series analyses of flow impacts on access to, duration of connectivity and extent of habitat availability of these floodplain habitats is needed.

22. **Evaluation of Fishery Impacts Lacking.** Fishery resources in the Sacramento-San Joaquin and Klamath-Trinity Basins contribute to significant tribal, commercial, and recreational fisheries within these river systems and along the coasts of California and Oregon. An evaluation of the cultural, social and economic impacts on these fisheries must be included in the document to fully disclose potential impacts. The is no supporting documentation on how the fishery impact information presented in the DEIS/EIR were derived and many statements pertaining to fishery impacts are unsupported. There is no information concerning the potential impacts on spring and fall Chinook salmon, Coho salmon, and steelhead populations in the Klamath-Trinity. The DEIR/EIS should evaluate how alternatives would impact different runs and species as well as the fisheries that depend on these resources, including impacts on port facilities, marinas, bait shops, motels, and restaurants that benefit from these fisheries.

23. **Water Quality – Toxic Metals.** Potential significant water quality issues pertaining to toxic metals are not evaluated in the DEIS/EIR. Although data are limited, the source water for the Sites Reservoir (Sacramento River, Funks and Stone Corral creeks) indicate high levels of many metals that exceed water quality standards. In addition to the high concentrations of metals present in streams inundated by the project, additional leaching from soils under the reservoir, known for high concentrations of mercury, will occur when these soils are inundated. The impacts of toxic metals on water quality in the reservoir and impacts to the Sacramento River water quality from Sites Project release needs to be analyzed. Additionally, the potential impacts to the reservoir fishery due to chronic toxicity/mortality and public health/fish consumption concerns needs to be evaluated.

24. **Methylmercury.** Many impoundments near the proposed Sites Project (Black Butte, Colusa Drain, Indian Valley Stony Gorge) have fish advisories due to elevated mercury levels. There is a potential for methylmercury creation and subsequent bioaccumulation in fish resulting from the implementation of the Sites and this should be modeled, evaluated and any potential mitigation measures proposed.

25. **Noxious Algal Blooms**. Blue-green algal are common in shallow reservoirs in California near the proposed Sites Project as well as downstream in the Delta. The potential for noxious algal blooms should be evaluated under the proposed operation plan and potential mitigation measures to minimize algal blooms and minimize public health issues should be proposed.

26. **Water Quality – Salinity**. Sites Reservoir will inundate areas where known saline springs exist. The impact of these salt springs on the water quality of the reservoir and the releases into the Sacramento needs to be evaluated.

27. **Geomorphology.** The problematic geomorphic analyses (errors/inconsistencies in data presented on geomorphic impacts, inappropriate citations, apparent analyses of alternatives that are different than the proposed alternatives) requires reanalysis of the potential geomorphic impacts. Increases in sediment entrainment of 55% in the Tehama-Colusa Canal and 46% in the Glenn-Colusa Canal suggest that there are significant undisclosed geomorphic impacts which could affect riverine and riparian habitats adjacent to these canal intakes.

28. **Entrainment Losses of Native Fish**. The amount of water available to be pumped through the Federal and State pumping facilities will be increased with the Sites Project. The potential impacts to larval and juvenile fishes (salmonids, Delta smelt, white and green sturgeon, Pacific Lamprey, and other native species) should be evaluated. This evaluation should not just estimate losses of entrainment as was done in the draft EIS/EIR but also estimated losses in southern delta channel prior to fish reaching the screening facilities. The mitigation actions to address the potentially significant impacts of impingement, entrainment and stranding are not sufficiently defined to ensure that impacts are minimized. These mitigation actions need to be developed with appropriate performance criterial so the effectiveness of these actions can be assessed.

29. **Fish Screens**. Effectiveness of fish screens and fish mortality associated with entrainment into the Sites Project or impinged on screens should be evaluated. With the majority of the diversions occurring during the winter and spring, impacts to larval and small juvenile fishes migrating past the Sites Project can be significant.

30. **Impacts on Funks and Stone Corral creeks**. Impacts to the instream habitats and dependent fish populations in Funks and Stone Corral creeks are not evaluated. No justification for the instream flows of "up to 10 cfs" in these creeks is provided. The method for establishing this flow level should be provided. An evaluation of how these flow levels will impact physical processes necessary to maintain stream habitats and impacts to aquatic habitats and fish populations should be included.

31. **Reservoir Fishery Impacts from Pumping Plant Operation:** Since a recreational fishery is an anticipated benefit of the Project, the potential impacts of the pumping/power generation between the reservoirs should be evaluated in the context of the sustainability of a recreational fishery. Stating that a fishery impact analysis was not conducted because no reservoir exists is not sufficient. Mitigation measures to minimize pumping/power generation impacts to recreational fisheries such as screening or timing of operations should be proposed.

32. **Recreation.** The presentation of potential recreation benefits of the Sites Project presented in the DEIS/EIR is insufficient. Only boat ramp accessibility is evaluated, presumably to inform fishing/boating use, but no information on other recreational activities (swimming, bird watching, camping, hunting, etc.) are provided. Additionally, the potential for the development of a reservoir fishery should include a fish management plan. While the development of a

warm-water reservoir fishery may be a recreational benefit, the potential impact of increased non-native predators on native fish populations needs to be evaluated.

33. **Wildlife Mitigation Actions**. Future agreements with other public or private entities for mitigation actions to address significant wildlife and terrestrial habitat impacts are not acceptable because there is no guarantee these actions will be implemented. Mitigation actions should be feasible and the agency needs to commit to ensuring these actions are fully implemented to reduce project impacts to less than significant prior to project approval.

34. **Need for a Natural Community Conservation Plan (NCCP).** A plan for the development and implementation of a NCCP must be included because the Sites Project affect several species that may occur in the Sites Project area.

35. **Nesting Birds.** Sites Project activities must be implemented in a manner that eliminates disturbance to the nests/nesting birds protected under the Migratory Bird Treaty and Fish and Game Code. Depending on the species, the disturbance distance of activities may be variable and, if established buffer distances are found to be ineffective at minimizing disturbance through monitoring of nests, the buffer must be increased to eliminate the disturbance.

36. **Giant Garter Snake.** The Giant Garter Snake, a CESA protected species, may occur in the areas within the Sites Project and the Project would negatively alter giant garter snake habitats resulting in significant impacts to this species. Implementable and enforceable actions must be included to address these significant impacts and appropriate CESA permits obtained.

37. Botanical Surveys. Information contained in the DEIS/EIR is insufficient to determine the impacts on botanical resources within the Sites Project area. Botanical surveys must be redone, data included in the DEIS/EIR are from the late 1990's and early 2000's, and must include all areas affected by the project. Accepted scientific protocols should be used to conduct these surveys.

38. **Botanical Resources Mitigation.** Using information from updated botanical surveys, implementable actions, with the commitment to fully implement them until they effectively mitigate for project impacts, need to be include in the document. These actions must include sufficient detail to allow for determination of their feasibility and likelihood for success.

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January 21, 2019

Mr. Noah Oppenheim, Pacific Coast Federation of Fishermen's Association (PCFFA)
Mr. Thomas Stokely, Save California Salmon

Subject: Review of Draft Environmental Impact Report/Statement
Sites Reservoir Project

Dear Mr. Oppenheim and Mr. Stokely:

I have reviewed the Draft Environmental Impact Report/Draft Environmental Impact Statement (DEIR/S) for the Sites Reservoir (Sites) Project located in Glenn and Colusa Counties, California. The focus of my review was to evaluate if the Sites Project and associated Trinity River Division (TRD) of the Central Valley Project (CVP) operations would potentially impact the hydrology and water quality of the Trinity River. I am familiar with how TRD operations affect water temperatures as I have completed numerous water temperature modeling studies related to alternative operations of Trinity and Lewiston reservoirs with a focus on effects on downstream temperatures in the Trinity River. These studies were completed from 1997 through 2004. A copy of my resume is attached.

The DEIR/S indicates that the project poses less than significant impacts on the water quality to the Trinity River downstream of Trinity and Lewiston reservoirs. However, based on my review and analysis of the DEIR/S and other available information, I have identified a number of notable deficiencies in the water quality assessment that fail to identify and correctly analyze revised water operation impacts on Trinity River water quality (temperature) and, in turn, biological resources. Therefore, it is my opinion that the information presented in the DEIR/S is inadequate in evaluating potential adverse impacts to the water quality of the Trinity River. Nor does it propose mitigation measures for reasonably foreseeable adverse impacts to water quality and aquatic resources of the Trinity River. A discussion of the identified deficiencies is provided below.

1. Foreseeable Impacts to Trinity River Associated with Sites Project Operations

Based on my knowledge and experience in analyzing water temperature conditions of the TRD of the CVP, it is my opinion that the revised TRD water operations associated with the Sites Project will lead to increased water temperatures in Lewiston Reservoir and releases to the Trinity River. Any increase in the temperature of water released to the Trinity River would degrade water quality conditions and increase the potential for violations of North Coast Basin Plan[1] water quality (temperature) objectives as well at the water temperature objectives

[1] "Water Quality Control Plan for the North Coast Region" Footnote 5, Table 3-1, page 3-8.00: Accessed at http://www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan/083105-bp/04_water_quality_objectives.pdf

established under the Trinity River Record of Decision (USDOI 2000) to protect outmigrating juvenile salmonids[2].

I reached this conclusion through analysis of water resources system modeling results provided in Appendix 6B of the DEIR/S. Tables 1 through 3 are taken from Appendix 6B and present Trinity Reservoir storage, Trinity River flow and Clear Creek Tunnel diversion modeling results for both the Sites Project No Action Alternative and Alternative D under a variety of water year types. Table 1 presents a comparison of end of month (EOM) storage in Trinity Reservoir. The DEIR/S suggests incorrectly that the small differences between the No Action Alternative and Alternative D are not significant per the following statement (page 6-36).

> *The CALSIM II model monthly simulation of real-time daily (or even hourly) operation of the CVP and SWP results in several limitations in use of the CALSIM II model results. The model results must be used in a comparative manner to reduce the effects of use of monthly assumptions and other assumptions that are indicative of real-time operations, but do not specifically match real-time observations. Given the CALSIM II model uses a monthly time step, incremental flow and storage changes of 5 percent or less are generally considered within the standard range of uncertainty associated with model processing, and as such flow changes of 5 percent or less were considered to be similar to Existing Conditions/No Project/No Action flow levels in the comparative analyses using CALSIM II conducted in this EIR/EIS.*

Table 2 presents the monthly average releases to the Trinity River from Lewiston Reservoir. Apart from the 8.9% decline during December of Wet years, 8.6% to 31.2% decline in flows during February and March of Above Average water year-types, and the 24.2% drop during February of the Below Average water year-type, there are no reductions in flow under Alternative D that are considered significant in the DEIR/S.

Table 3 presents the changes in flow through the Clear Creek Tunnel, which represent diversions from Lewiston Reservoir (via the Carr power plant) to the Sacramento River and potentially Sites Reservoir. A general pattern seen in the these data is a shift in operations under the Project Alternative that increase the rate of diversions through the winter months (December-March) and reduce diversion rates through the summer/fall months (July-November) during dry and critically dry year types. I assume this change in operations is intended to provide more water to the Sacramento River during the winter to enhance

Daily Average Not to Exceed	Period	River Reach
60°F	July 1- Sept 15	Lewiston to Douglas City Bridge
56°F	Sept 15-Oct 1	Lewiston to Douglas City Bridge
56°F	Oct 1- Dec 31	Lewiston to North Fork Confluence

[2] Trinity River Outmigrant Juvenile Salmonid objectives at Weitchpec (Trinity River Flow Evaluation (USFWS and HVT 1999) accessed at http://www.trrp.net/library/document/?id=226

Normal, Wet and Extremely Wet	April 1-May 22	<13.0 C (<55.4 F)
	May 23-June 4	<15.0 C (<59.0 F)
	June 5-July 9	<17.0 C (<62.6 F)
Dry and Critically Dry	April 1-May 22	<15.0 C (<59.0 F)
	May 23-June 4	<17.0 C (<62.6 F)
	June 5-July 9	<20.0 C (<68.0 F)

the opportunity for diversion to Sites Reservoir. However, this change in operations would have a significant negative effect on the water temperatures in Lewiston Reservoir as well as the temperature of releases to the Trinity River.

Table 4 was developed in order to compare the total average flow through Lewiston Reservoir under the Sites Project No Action Alternative and Alternative D operations. The total flow through Lewiston Reservoir was computed by summing the average monthly flow values of releases to the Trinity River (Table 1) and flow through Clear Creek Tunnel (Table 3).

Due to its geometry and operations of the TRD, water temperatures in Lewiston Reservoir are highly variable. During the summer when there are relatively low and constant releases to the Trinity River and Carr power plant diversions are at capacity, the rate of flow through Lewiston Reservoir is sufficient to displace its entire volume in about 2.5 days and water temperatures remain relatively cool (Brown et al., 1992)[3]. On the other hand, when the Carr power plant is not operating, flow through Lewiston Reservoir stagnates and thermal stratification develops within days, typically leading to the warming of summer surface waters to between 60 and 70 F (15.6 and 21.1 C) (Ibid).

Modeling that I have completed suggests that total flow rates through Lewiston Reservoir (i.e. the sum of Carr power plant diversions and river releases) should be between approximately 800 cubic feet per second (cfs) during the late summer/early fall months of normal year-types and up to 1900 cfs during the summer/fall months of critically dry year-types in order to comply with downstream temperature objectives (Kamman, 1999a)[4]. The maximum late summer/early fall daily releases for releases to the Trinity River under the Trinity ROD range from 300 to 450 cfs. Thus, Carr power plan diversions (i.e., flow through Clear Creek Tunnel) would need to be maintained between 1450 and 1600 cfs to meet summer/early fall temperature needs during normal and critically dry years, respectively.

Based on this this information, it can be inferred that any decrease on total flow through Lewiston Reservoir during the summer/fall period would lead to increased temperatures in water released to the Trinity River as well as that diverted via the Carr power plant and Clear Creek Tunnel. Comparison of total flow rates through Lewiston Reservoir for Alternative D (Table 4) indicates significant reductions during most summer/fall months of the representative dry and critically dry year-types. Most notable are the reductions in flow and likely reservoir heating during the month of October, where flow through Lewiston Reservoir is reduced by 165% and 56% during dry and critically dry year-types, respectively, a time when meeting downstream temperature objectives is already compromised (Kamman, 1999b)[5].

Evaluation of average monthly temperature results for releases to the Trinity River presented in Appendix 7E (River Temperature Modeling) of the DEIR/S do not corroborate the anticipated increase in Lewiston Reservoir temperatures. Table 5 presents the DEIR/S temperature modeling results and

[3] Brown, R., Yates, G., and Field, J. (1992) "Temperature Modeling of Lewiston Lake with the BETTER two-dimensional reservoir flow mixing and heat exchange model." *Rep*., Department of Transportation and Planning, Trinity County, Weaverville, CA.

[4] Kamman, G.R., 1999a, Temperature Analysis of Proposed Trinity River Fish and Wildlife Restoration Flow Alternatives using the BETTER Model: Prepared for: Trinity County Planning Department, June, 80p.

[5] Kamman, G.R., 1999b, Addendum to Temperature Analysis of Proposed Trinity River Fish and Wildlife Restoration Flow Alternatives using the BETTER Model: Cumulative Effects. Prepared for: Trinity County Planning Department, September, 7p.

suggests (contrary to the discussion above) that water temperatures in Lewiston Reservoir (i.e., temperature of releases to Trinity River) would decrease as total flow through the reservoir decreases. In fact, the temperature decreases are most pronounced during some dry and critically dry months of greatest reduction in flow rates through Lewiston Reservoir, when water temperatures would be increasing. This leads me to call into question the validity of the temperature model analysis of TRD operations presented in the DEIR/S.

More important is that the proposed change in TRD operations by the Sites Project directly conflicts with and reverses intended operations stipulated in the Secretary of Interior's 2000 Record of Decision (ROD) for the Trinity River Mainstem Fishery Restoration project. As you are aware, the modeling and temperature analysis work I completed for Trinity County back in the late 1990's contributed significantly to development of the instream flow and Carr power plant and Clear Creek Tunnel diversion schedules for the Trinity Preferred Alternative in order to better meet downstream temperature objectives. This work was accomplished through lengthy and focused analyses and meetings with project stakeholders and resulted in final preferred alternative operations with increased late summer CVP diversions to the Sacramento River. Acknowledging that even the river releases and temperatures from Lewiston Reservoir associated with the Preferred Alternative may not satisfy downstream temperature objectives, the Trinity Project ROD stipulates the following (page 20): "*Under the Preferred Alternative, the TRD would be operated to release additional water to the Trinity River, and the timing of exports to the Central Valley would be shifted to later in the summer to help meet Trinity River instream temperature requirements*". By proposing to reduce late summer CVP diversions to the Sacramento River, the Sites Project creates a foreseeable potential impact on Trinity River water quality by reversing the very operations associated with the Trinity River ROD that are intended to satisfy downstream water temperatures objectives and protect instream beneficial uses, particularly for salmon and steelhead.

This potential shift in TRD operations is concerning due to the fact that there are frequent exceedances of water temperature objectives under the current TRD ROD operations and flows. Recent studies completed by the U.S. Fish and Wildlife Service[6] provide data on how the TRD operations and ROD flows comply with downstream Basin Plan and Restoration Project temperature objectives. Appendix A from David and Goodman (2017), presented below, summarizes the exceedances to the Basin Plan (DGC and NFH locations) and Trinity River Restoration Project (TRWEI location) temperature objectives for the period 2001 through 2016.

[6] David, A.T. and Goodman, D.H., 2017, Performance of water temperature management on the Klamath and Trinity Rivers, 2016. U.S. Fish and Wildlife Service, Arcata Fisheries Technical Report TR 2017-29, November, 72p; and
Polos, J. 2016. Adult salmon water temperature targets. Trinity River Restoration Program Performance Measure. Trinity River Restoration Program.

Appendix A. Number of days exceeding numeric water temperature objectives for the three specified locations on the Trinity River, 2001-2016. DGC = Trinity at Douglas City; NFH = Trinity above the North Fork Trinity; TRWE1 = Trinity above the Klamath.

	Objective locations			Forecast water year	Actual water year
Year	DGC	NFH	TRWE1	type	type
2001	--	--	33[a]	Dry	Dry
2002	0	--	54	Normal	Normal
2003	11	--	34	Wet	Wet
2004	0	--	43	Wet	Wet
2005	--	1	21[b]	Normal	Wet
2006	6	0	18	Ex Wet	Ex Wet
2007	3	0	19	Dry	Dry
2008	1	4	0	Normal	Dry
2009	31	2	21	Dry	Dry
2010	6	7	10	Normal	Wet
2011	0	0	7	Wet	Wet
2012	0	1	25	Normal	Normal
2013	0	0	26	Dry	Dry
2014	18	15	53	Crit. Dry	Crit. Dry
2015	--	18	65	Dry	Dry
2016	14	3	52	Wet	Wet

[a] Data unavailable prior to 5/3 for TRWE1 in 2001. We assumed mean daily temperatures did not reach or exceed 15.0 C before this date.
[b] Data unavailable prior to 4/4 for TRWE1 in 2005. We assumed mean daily temperatures did not reach or exceed 13.0 C before this date.

These exceedances occur during all water year types, but with highest frequency during dry and critically dry year types. Of note in this Appendix are the high number of exceedances during the wet water year 2016. As reported by David and Goodman, the exceedances during 2016 are, in part, due to depletion of the cool water pool (carry-over storage) during the preceding 3-year drought period (2013-2015).

2. Foreseeable Impacts to Trinity River Associated with Trinity Lake Carryover Storage

Ordinarily in late summer, water temperatures in Trinity Reservoir are well stratified, displaying a layer of warm water above a deeper pool of much colder water. During this time, releases from Trinity Reservoir to Lewiston Reservoir occur through a submerged powerhouse outlet. If the reservoir is drawn down to a relatively low level, the upper warm layer may intersect the powerhouse outlet, releasing warm water to Lewiston Reservoir. In turn, these warm temperatures are propagated through Lewiston Reservoir to the Trinity River. As presented below, a number of studies have been completed to quantify the minimum October 1st carryover storage volume that is needed to protect against the introduction of warm summer water releases during various water year types and droughts.

In 1998, Trinity County retained KHE to evaluate how an intense multi-year drought would affect carryover storage in Trinity Reservoir (Kamman, 1998)[7]. The study approach included an

[7] Kamman, G.R., 1998, Carryover Storage Analysis – Simulated (1928-1934) period. Prepared for: Trinity County Planning Department, May 22, 3p

interannual accounting of Trinity Reservoir storage during a series of representative water year-types similar to those experienced during the 1928-1934 drought.[8] Water releases from Trinity Lake were based on the water year type for Trinity Division operations[9] under the ROD Flows. A series of interannual Trinity Reservoir water budgets were developed with initial carryover storage volumes ranging from 750- to 2000-TAF.

Study results (Kamman, 1998) indicate that under CVP operations to meet ROD Flows, there is a net annual increase in Trinity Reservoir storage during normal (1928) year-types, but decrease during dry (-17.5 TAF) and critically dry (-341 TAF) year-types. Thus, when starting with 750 TAF of storage, Trinity Reservoir storage would have dropped below 200 TAF after the third year of the drought, primarily driven by storage reductions experienced during critically dry years. Study results also indicate that a starting storage volume of 1250 TAF is required to maintain a minimum carryover storage of 600 TAF through the drought. However, modeling results (Kamman, 1999a and 1999b) indicate that even 600 TAF of carryover storage does not fully achieve compliance with temperature objectives during dry and critically dry year types. This study suggests that a minimum carryover storage volume of between 1250- and 1500-TAF during the first year of drought is likely required in order to provide the necessary water release temperatures to the Trinity River to meet downstream temperature objectives during subsequent years.

In addition to the work cited above, I am aware of other studies focused on identifying the minimum Trinity Reservoir carryover storage to provide the necessary cold water releases to satisfy river temperature objectives. In their 1992 testimony to the State Water Board, Finnerty and Hecht (1992)[10] concluded that Trinity Reservoir carryover storage of 900 TAF or slightly more may be needed to meet downstream temperature objectives during 90% of all years. Their conclusion was based on analysis of hydrology, reservoir operations and temperatures for 1991, a single critically dry year-type. The second study, completed by Deas in 1998[11] on behalf of Trinity County, included water temperature simulations of Trinity Reservoir using the Water Temperature Simulation Model (WTSM). Deas evaluated temperature compliance under 1990 dry year-type conditions assuming initial reservoir storage volumes of 750-, 1250- and 1500-TAF. Model simulation results indicated elevated water temperatures at the powerhouse intake elevation for the 750 TAF carryover storage scenario and minimal to no temperature concerns at initial carryover storage volumes of 1250- and 1500-TAF, respectively. Deas' findings of elevated temperatures associated with 750 TAF of carryover storage are corroborated in the 2012 report by Reclamation[12], which found that a September 30 carryover storage requirement of less than 750 TAF is "problematic" in meeting state and federal Trinity River temperature objectives

[8] The interannual water budget accounting started in 1928, a normal water year type.
[9] It is likely that CVP operations would change during drought periods. However, we did not have the knowledge or expertise to define such changes. Thus, the analysis used operations consistent with the earlier PROSIM simulations.
[10] Hecht, B. and Finnerty, A.A., 1992, Testimony to the State Water Resources Control Board regarding Carryover Storage in Trinity and Lewiston Reservoirs to Protect Public-interest Resources. State Water Resources Control Board Water Right Phase of the Bay-Delta Estuary Proceedings, June 26, 7p.
[11] Deas, M.L., 1998, Trinity Reservoir Carryover Analysis. Prepared for: Trinity County Planning Department, Natural Resources Division, August, 26p.
[12] U.S. Department of Interior, Bureau of Reclamation, 2012, Trinity Reservoir Carryover Storage Cold Water Pool Sensitivity Analysis – Technical Service Center (TSC) Technical Memorandum No. 86-68220-12-06. August 20, 7p.

protective of the fishery.

The Sites Project water operation and temperature analyses assume a minimum Trinity Reservoir carryover storage volume of 600TAF. The study findings presented above indicate that initial October 1 carryover storage volumes of 600- and 750-TAF are not sufficient to satisfy Trinity River temperature objectives for a single dry/critically dry water year-type, let alone multi-year droughts. Thus, it is reasonable to foresee that current implementation of the ROD Flows without sufficient carryover storage will not achieve Trinity River temperature objectives during critically dry year-types. Modeling results indicate that critically dry water year-types deplete reservoir carryover storage volumes at much higher rates than occurs during dry years. Whether dealing with dry or critically dry year-types, reservoir storage has no chance of being replenished during multi-year droughts under the current and proposed Sites Project CVP operations.

As determined by Finnerty and Hecht, a minimum baseline carryover storage volume of 900 TAF is required to meet Basin Plan temperature objectives on the Trinity River during a single dry year. Studies by Deas and Kamman suggest this baseline carryover storage volume is likely higher for critically dry year-types. Significantly higher carryover storage volumes over the baseline value are required to preserve the necessary reservoir cool water pool during multi-year drought periods, in order to achieve temperature objectives. Modeling studies suggest first year drought carryover storage volumes of around 1750 TAF are sufficient to maintain adequate carryover storage to meet temperature objectives during multi-year droughts. Thus, a single minimum carryover storage volume cannot be developed without revising CVP operations that focus on preserving Trinity Reservoir carryover storage, most likely by reducing water that is diverted out of the Trinity River basin.

The Sites Project DEIR/S presents the results of their modeling analyses as monthly average values of flow, storage and water temperature for multiple years within designated water-year type classifications. This presentation masks the impacts from a single extreme dry year as well as repeated impacts associated with a continuous multi-year drought. These are the periods of greatest concern and potential damage to aquatic resources, but they are not identified or described in the DEIR/S. Prior to 2016, the USGS[13] developed a water temperature model that accurately simulates daily mean water temperature along the course of the Trinity River, from Lewiston Dam to the Klamath River confluence. This model would be a more appropriate tool to evaluate how changes in TRD water operations associated with the Sites Project would satisfy water temperature objectives in the Trinity River.

3. Inaccurate Existing (Baseline) TRD Water Operations

The water operations analysis for Sites Project EIR/S did not include an analysis considering use of Humboldt County's 50 thousand acre feet (TAF) water contract included as a provision of the Trinity River Division Act. The following is an excerpt from the Statutory Authority Appendix contained in the DEIS for the Long-Term Plan to Protect Adult Salmon in the Lower Klamath River (Lower Klamath LTP)[14] describing Humboldt County's 50 TAF water contract.

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[13] Jones, E.C., Perry, R.W., Risley, J.C., Som, N.A. and Hetrick, N.J., 2016, Construction, calibration and validcation of the RBM10 water temperature model for the Trinity River, Northern California. U.S. Department of Interior, U.S. Geological Survey, Open-File Report 2016-1056, prepared in cooperation with the U.S. Fish and Wildlife Service and the Bureau of Reclamation, 56p.

[14] U.S. Department of Interior, Bureau of Reclamation, 2016, Long-Term Plan to Protect Adult Salmon in the Lower Klamath River, Humboldt County, California Draft Environmental Impact Statement, October.

Construction of the Trinity River Division (TRD) of the Central Valley Project (CVP) was authorized by the Act of August 12, 1955 (Public Law 84-386) (TRD Act). In section 2 of the 1955 TRD Act, Congress directed that the operation of the TRD should be integrated and coordinated with the operation of the CVP, subject to two conditions set forth as distinct Provisos in section 2 of that Act. The first of these two Provisos states that the Secretary of the Interior is authorized and directed to "adopt appropriate measures to insure the preservation and propagation of fish and wildlife" including certain minimum flows in the Trinity River deemed at the time as necessary to maintain the fishery. The second Proviso directs that not less than 50,000 acre-feet of water shall be released and made available to Humboldt County and other downstream users[15].

The recently released Solicitor's Opinion, M-37030, concludes that each of the two Provisos in section 2 of the TRD Act are "separate and independent limitations on the TRD's integration with, and thus diversion of water to, the CVP" and that the two Provisos may "require separate releases of water as requested by Humboldt County and potentially other downstream users pursuant to Proviso 2 and a 1959 Contract between the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and Humboldt County."[16] *M- Opinion 37030 at 2. Formal 18 opinions of the Solicitor are binding on the Department of the Interior and its bureaus.*

Chapter 6 and Appendix 6A of the Sites Project DEIR/S state that the project water operations modeling analyses adhered to 2000 Trinity River ROD releases to the Trinity River downstream of Lewiston Reservoir to meet instream flow requirements. The DEIR/S states, "The total volume of water released to the Trinity River ranges from approximately 368,600 AF in critically dry years to 815,000 AF in extremely wet years, depending on the annual water-year type (hydrology) determined as of April 1st (DOI, 2000). Table 6-2 shows the annual volumes, peak flows, and peak flow duration by water type." Table 6-2 from the DEIR/S is presented below. However, there is no mention of Humboldt County's 50 TAF annual water contract being integrated into the DEIR/S water resources system modeling and analysis. It is not possible to compare total annual modeled Trinity River releases from the DEIR/S (Table 2, attached) to the annual Trinity River ROD flow volumes (Table 6.2 below) as they represent different water year type classification schemes[17]. The USFWS report by David and Goodman (2017) indicates how the Humboldt County 50 TAF water contract has been especially important for flow augmentation during dry years to meet flow and temperature targets in the lower Klamath River to reduce the probability of an adult fish kill. The omission of the Humboldt County 50 TAF contract in the DEIR/S analyses could have significant effects on the water quality conditions and potential impacts

[15] Reclamation's water permits from the State of California includes the following condition:
"Permittee shall release sufficient water from Trinity and/or Lewiston Reservoirs into the Trinity River so that not less than an annual quantity of 50,000 acre-feet will be available for the beneficial use of Humboldt County and other downstream users." Condition 9

[16] The 1959 water delivery contract between Reclamation and Humboldt County includes the following:
"The United States agrees to release sufficient water from Trinity and/or Lewiston Reservoirs into the Trinity River so that not less than an annual quantity of 50,000 acre-feet will be available for the beneficial use of Humboldt County and other downstream users."
Contract, Article 8.

[17] The water year types included in the Trinity ROD are probability-based and classified by ranges of annual upper Trinity River Basin water year runoff. This classification is different from the water year types presented in all other tables in Appendix 6B of the DEIR/S, which are based on the historical record of WY1922 through WY2003 and defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 2000).

to both the Trinity and Sacramento Rivers. Therefore, the DEIR/S should be considered incomplete in the analysis of the effects of the Site Project operations on the Trinity River.

Table 6-2
Trinity River Record of Decision
Annual Flow Volumes and Peak Flows

Water Year Type	Volume (AF)	Peak Flow (cfs)	Peak Flow Duration (days)
Extremely Wet	815,000	11,000	5
Wet	701,000	8,500	5
Normal	647,000	6,000	5
Dry	453,000	4,500	5
Critically Dry	369,000	1,500	36

Notes:
cfs = cubic feet per second
Source: DOI, 2000.

4. Incomplete Cumulative Impact Assessment

In addition to the omission of the Humboldt County 50 TAF water delivery contract on the Trinity River, the Sites Project DEIR/S fails to consider and incorporate the Lower Klamath LTP operations into the water resources system modeling analyses. Under CEQA, a cumulative impact assessment must consider development projects within the cumulative study area, which includes past projects, projects under construction and approved, and pending projects that are anticipated to be either under construction or operational by the time of the completion of the proposed project. The Sites DEIR/S states the following (pg. 6A-2, Appendix 6A).

> *The Existing Conditions/No Project/No Action Condition simulation was developed assuming Year 2030 level of development and regulatory conditions. The Existing Conditions/No Project/No Action Condition assumptions include existing facilities and ongoing programs that existed as of March 2017 (publication of the Notice of Preparation) that could affect or could be affected by implementation of the alternatives. The Existing Conditions/No Project/No Action Condition assumptions and the models do not include any restoration actions or additional conveyance over the current conditions.*

Although the ROD for the Lower Klamath LTP[18] wasn't signed until April 2017, it was certainly a well-known and defined pending project and should have been incorporated into the baseline condition of the water resource system modeling analysis. Tables 6 through 8 provide average monthly storage and flow values for the TRD under the Lower Klamath LTP. Comparison of the Lower Klamath LTP Alternative 1 conditions presented in Table 6 through 8 to the Sites Project No Action Alternative conditions presented in Tables 1 through 3 indicate significant differences in project operations and hydrologic conditions when including the Lower Klamath LTP in the water resource impact assessment. For example, under the Lower Klamath LTP, diversions to

[18] U.S. Department of the Interior, Bureau of Reclamation, 2017, Record of Decision for the Long Term Plan to Protect Adult Salmon in the Lower Klamath River, April, Accessed at https://www.usbr.gov/mp/nepa/includes/documentShow.php?Doc_ID=28314

the Sacramento River are reduced by an average of 13 TAF per year, while Sites DEIR has diversions increasing, on average, by 4 TAF per year. The main reason for this difference is the August and September Trinity River release rates: as a result of flow augmentations, the Lower Klamath LTP increases average releases to Trinity River by 20% and 42% (presumably using the Humboldt County 50TAF water) above No Action flows, respectively (see Table 7). Alternative D of the Sites Project maintains a constant 450 cfs baseline ROD flow during these months for all water year types. The Lower Klamath LTP introduces significant project operations, not included in the Sites Project DEIR/S analyses, which could have significant effects on the anticipated water supply available to the project as well as impacts to temperature on the Sacramento River. Because of this omission in the impact analysis, the Sites Project DEIR/S should be considered incomplete.

Another cumulative impact that is not evaluated in the Sites Project DEIR/S is the influence of climate change on the meteorology and hydrology of northern California rivers. The water temperature modeling of Alternatives completed as part of DEIR/S analyses uses historic meteorologic and hydrologic data and do not consider the predicted warmer future temperatures in the Trinity and Klamath River basins under climate change (USBR, 2011)[19]. Warmer air temperatures under climate change will result in warmer reservoir and river water temperatures. Anticipated changes to the timing and magnitude of spring snowmelt hydrograph and associated tributary accretion (flow and water temperature) are likely to increase river water temperatures, which will reduce the attainment of water temperature objectives on the Trinity River, especially those established for outmigrant juvenile salmonids. Thus, the DEIR/S fails to evaluate the cumulative impact of climate change conditions.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Gregory R. Kamman

Greg Kamman, PG, CHG
Principal Hydrologist

[19] U.S. Department of the Interior, Policy and Administration, Bureau of Reclamation, 2011, SECURE Water Act Section 9503(c) – Reclamation Climate Change and Water. April, 226p.

TABLE 1: Trinity Lake end of month storage. Source: Table SW-01-9a, Appendix 6B of Sites Project DEIR/S.

Table SW-02-9a
Trinity Lake, End of Month Elevation
Long-term Average and Average by Water Year Type

Analysis Period	End of Month Elevation (FEET)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-term												
Full Simulation Period[1]												
No Action Alternative	2,278	2,280	2,285	2,292	2,302	2,313	2,325	2,324	2,321	2,310	2,297	2,286
Alternative D	2,281	2,283	2,288	2,294	2,304	2,314	2,325	2,325	2,322	2,310	2,298	2,287
Difference	2	3	3	2	2	1	1	1	1	1	1	1
Percent Difference[3]	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Water Year Types[2]												
Wet (32%)												
No Action Alternative	2,322	2,323	2,325	2,324	2,337	2,347	2,357	2,359	2,358	2,350	2,342	2,332
Alternative D	2,322	2,323	2,324	2,325	2,338	2,348	2,358	2,360	2,358	2,350	2,341	2,331
Difference	-1	0	0	1	1	1	0	0	0	0	-1	-1
Percent Difference	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Above Normal (15%)												
No Action Alternative	2,305	2,305	2,307	2,298	2,313	2,329	2,341	2,342	2,340	2,331	2,321	2,309
Alternative D	2,307	2,307	2,309	2,305	2,319	2,334	2,345	2,346	2,344	2,335	2,323	2,311
Difference	2	2	2	7	6	5	4	4	4	4	2	2
Percent Difference	0.1%	0.1%	0.1%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%	0.1%
Below Normal (17%)												
No Action Alternative	2,275	2,278	2,285	2,281	2,289	2,298	2,313	2,313	2,310	2,298	2,287	2,277
Alternative D	2,275	2,278	2,286	2,281	2,289	2,298	2,314	2,313	2,310	2,298	2,286	2,277
Difference	0	1	0	0	0	0	0	0	0	0	0	0
Percent Difference	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Dry (22%)												
No Action Alternative	2,260	2,261	2,270	2,283	2,291	2,304	2,316	2,312	2,307	2,293	2,277	2,266
Alternative D	2,261	2,263	2,273	2,284	2,292	2,304	2,316	2,312	2,306	2,291	2,277	2,266
Difference	2	2	2	1	1	0	0	-1	-1	-1	0	0
Percent Difference	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%
Critical (15%)												
No Action Alternative	2,189	2,190	2,198	2,240	2,246	2,255	2,263	2,260	2,258	2,239	2,218	2,203
Alternative D	2,203	2,206	2,211	2,242	2,248	2,257	2,265	2,262	2,260	2,242	2,224	2,208
Difference	14	16	13	2	2	2	2	2	2	2	6	5
Percent Difference	0.6%	0.7%	0.6%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.3%	0.2%

1 Based on the 82-year simulation period

2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999)

3 Relative difference of the monthly average

TABLE 2: Monthly flow on Trinity River below Lewiston Reservoir. Source: Table SW-04-9a, Appendix 6B of Sites Project DEIR/S.

Table SW-04-9a
Trinity River below Lewiston Reservoir, Monthly Flow
Long-term Average and Average by Water Year Type

Analysis Period	Monthly Flow (CFS)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-term												
Full Simulation Period[1]												
No Action Alternative	368	360	522	655	645	575	554	3,779	2,091	923	450	450
Alternative D	373	360	498	638	621	570	561	3,779	2,091	923	450	450
Difference	5	-1	-24	-17	-24	-5	6	0	0	0	0	0
Percent Difference[3]	1.2%	-0.2%	-4.6%	-2.6%	-3.7%	-0.9%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Water Year Types[2]												
Wet (32%)												
No Action Alternative	373	300	852	1,412	1,026	1,096	627	4,636	3,318	1,289	450	450
Alternative D	373	300	775	1,351	1,052	1,143	647	4,636	3,318	1,289	450	450
Difference	0	0	-76	-61	26	47	20	0	0	0	0	0
Percent Difference	0.0%	0.0%	-8.9%	-4.3%	2.5%	4.3%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Above Normal (15%)												
No Action Alternative	373	713	621	316	831	436	469	4,462	2,488	1,048	450	450
Alternative D	373	709	621	332	760	300	469	4,462	2,488	1,048	450	450
Difference	0	-5	0	16	-72	-136	0	0	0	0	0	0
Percent Difference	0.0%	-0.7%	0.0%	5.1%	-8.6%	-31.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Below Normal (17%)												
No Action Alternative	373	300	300	300	517	319	507	3,774	1,672	869	450	450
Alternative D	373	300	300	300	392	319	507	3,774	1,672	869	450	450
Difference	0	0	0	0	-125	0	0	0	0	0	0	0
Percent Difference	0.0%	0.0%	0.0%	0.0%	-24.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Dry (22%)												
No Action Alternative	373	300	300	300	300	300	529	3,216	1,251	667	450	450
Alternative D	373	300	300	300	300	300	529	3,216	1,251	667	450	450
Difference	0	0	0	0	0	0	0	0	0	0	0	0
Percent Difference	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Critical (15%)												
No Action Alternative	342	300	300	300	300	300	575	2,092	783	450	450	450
Alternative D	373	300	300	300	300	300	575	2,092	783	450	450	450
Difference	31	0	0	0	0	0	0	0	0	0	0	0
Percent Difference	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

1 Based on the 82-year simulation period

2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999)

3 Relative difference of the monthly average

TABLE 3: Monthly flow through Clear Creek Tunnel. Source: Table SW-05-9a, Appendix 6B of Sites Project DEIR/S.

Table SW-05-9a
Clear Creek Tunnel, Monthly Flow
Long-term Average and Average by Water Year Type

Analysis Period	Monthly Flow (CFS)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-term												
Full Simulation Period[1]												
No Action Alternative	1,033	344	257	420	95	269	389	168	551	1,812	1,926	1,666
Alternative D	900	261	269	460	155	341	373	163	576	1,862	1,957	1,675
Difference	-133	-83	12	40	61	71	-16	-5	25	50	30	9
Percent Difference[3]	-12.9%	-24.2%	4.7%	9.4%	64.2%	26.4%	-4.2%	-3.2%	4.6%	2.8%	1.6%	0.5%
Water Year Types[2]												
Wet (32%)												
No Action Alternative	1,593	481	536	430	81	344	483	278	421	1,742	1,678	2,135
Alternative D	1,571	448	585	437	118	355	493	268	439	1,765	1,882	2,142
Difference	-22	-32	49	7	36	12	10	-10	18	23	204	6
Percent Difference	-1.4%	-6.7%	9.1%	1.6%		3.4%	2.0%	-3.5%	4.3%	1.3%	12.1%	0.3%
Above Normal (15%)												
No Action Alternative	964	437	304	269	58	302	588	0	167	1,417	1,875	1,958
Alternative D	1,088	340	237	269	71	468	564	21	166	1,500	2,313	1,875
Difference	124	-98	-67	0	12	166	-24	21	-1	83	438	-83
Percent Difference	12.9%	-22.4%	-22.1%	0.0%		54.9%	-4.1%		-0.5%	5.9%	23.3%	-4.3%
Below Normal (17%)												
No Action Alternative	429	186	65	295	80	384	265	61	660	1,538	1,796	1,361
Alternative D	433	68	96	334	212	406	171	61	660	1,698	1,714	1,342
Difference	4	-118	32	39	132	22	-94	0	0	161	-82	-18
Percent Difference	1.0%	-63.5%	48.6%	13.4%		5.8%	-35.3%	0.0%	0.0%	10.5%	-4.6%	-1.4%
Dry (22%)												
No Action Alternative	884	333	100	408	166	141	222	221	905	2,100	2,322	1,468
Alternative D	676	205	81	551	265	295	252	200	978	2,147	2,119	1,420
Difference	-209	-128	-20	143	99	154	29	-22	73	47	-203	-48
Percent Difference	-23.6%	-38.4%	-19.7%	35.2%	59.9%	109.4%	13.1%	-9.8%	8.1%	2.2%	-8.7%	-3.3%
Critical (15%)												
No Action Alternative	818	156	62	715	70	135	385	147	561	2,245	2,075	1,012
Alternative D	142	84	99	710	90	174	342	143	585	2,200	1,802	1,235
Difference	-676	-72	37	-5	21	39	-43	-4	25	-45	-272	222
Percent Difference	-82.6%	-46.2%		-0.8%		28.5%	-11.2%	-2.5%	4.4%	-2.0%	-13.1%	22.0%

1 Based on the 82-year simulation period

2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999)

3 Relative difference of the monthly average

TABLE 4: Estimated Monthly flow through Lewiston Reservoir.

Flow through Lewiston Lake (cfs)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Full Simulation Period1												
No Action Alternative	1401	704	779	1075	740	844	943	3947	2642	2735	2376	2116
Alternative D	1273	621	767	1098	776	911	934	3942	2667	2785	2407	2125
Difference	(128)	(83)	(12)	23	36	67	(9)	(5)	25	50	31	9
Percent Difference	-9.1%	-11.8%	-1.5%	2.1%	4.9%	7.9%	-1.0%	-0.1%	0.9%	1.8%	1.3%	0.4%
Wet (32%)												
No Action Alternative	1966	781	1388	1842	1107	1440	1110	4914	3739	3031	2128	2585
Alternative D	1944	748	1360	1788	1170	1498	1140	4904	3757	3054	2332	2592
Difference	(22)	(33)	(28)	(54)	63	58	30	(10)	18	23	204	7
Percent Difference	-1.1%	-4.2%	-2.0%	-2.9%	5.7%	4.0%	2.7%	-0.2%	0.5%	0.8%	9.6%	0.3%
Above Normal (15%)												
No Action Alternative	1337	1150	925	585	889	738	1057	4462	2655	2465	2325	2408
Alternative D	1461	1049	858	601	831	768	1033	4483	2654	2548	2763	2325
Difference	124	(101)	(67)	16	(58)	30	(24)	21	(1)	83	438	(83)
Percent Difference	9.3%	-8.8%	-7.2%	2.7%	-6.5%	4.1%	-2.3%	0.5%	0.0%	3.4%	18.8%	-3.4%
Below Normal (17%)												
No Action Alternative	802	486	365	595	597	703	772	3835	2332	2407	2246	1811
Alternative D	806	368	396	634	604	725	678	3835	2332	2567	2164	1792
Difference	4	(118)	31	39	7	22	(94)	0	0	160	(82)	(19)
Percent Difference	0.5%	-24.3%	8.5%	6.6%	1.2%	3.1%	-12.2%	0.0%	0.0%	6.6%	-3.7%	-1.0%
Dry (22%)												
No Action Alternative	1257	633	400	708	466	441	751	3437	2156	2767	2772	1918
Alternative D	1049	505	381	851	565	595	781	3416	2229	2814	2569	1870
Difference	(208)	(128)	(19)	143	99	154	30	(21)	73	47	(203)	(48)
Percent Difference	-16.5%	-20.2%	-4.8%	20.2%	21.2%	34.9%	4.0%	-0.6%	3.4%	1.7%	-7.3%	-2.5%
Critical (15%)												
No Action Alternative	1160	456	362	1015	370	435	960	2239	1344	2695	2525	1462
Alternative D	515	384	399	1010	390	474	917	2235	1368	2650	2252	1685
Difference	(645)	(72)	37	(5)	20	39	(43)	(4)	24	(45)	(273)	223
Percent Difference	-55.6%	-15.8%	10.2%	-0.5%	5.4%	9.0%	-4.5%	-0.2%	1.8%	-1.7%	-10.8%	15.3%

TABLE 5: Monthly temperatures of Trinity River below Lewiston Dam. Source: Table SQ-33-9a, Appendix 7E of Sites Project DEIR/S.

Table SQ-33-9a
Trinity River below Lewiston Dam, Monthly Temperature
Long-term Average and Average by Water Year Type

	Monthly Temperature (DEG-F)											
Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-term												
Full Simulation Period[1]												
No Action Alternative	49.4	44.7	40.0	39.4	42.7	47.0	50.2	46.6	50.9	51.3	51.7	50.7
Alternative D	49.3	44.6	39.9	39.5	42.7	46.9	50.3	46.6	50.8	51.1	51.3	50.7
Difference	-0.1	-0.1	-0.1	0.2	0.0	-0.2	0.1	0.0	-0.1	-0.2	-0.4	0.1
Percent Difference[3]	-0.2%	-0.2%	-0.2%	0.4%	0.0%	-0.4%	0.2%	-0.1%	-0.2%	-0.4%	-0.7%	0.1%
Water Year Types[2]												
Wet (32%)												
No Action Alternative	47.0	44.6	41.5	40.6	43.0	45.9	49.1	45.8	48.3	50.8	51.6	48.6
Alternative D	47.0	44.6	41.3	40.5	43.0	45.8	49.1	45.8	48.3	50.7	50.9	48.8
Difference	0.1	0.0	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	-0.2	-0.7	0.2
Percent Difference	0.1%	0.1%	-0.3%	-0.2%	-0.1%	-0.3%	-0.1%	0.0%	0.0%	-0.3%	-1.4%	0.4%
Above Normal (15%)												
No Action Alternative	48.2	43.3	40.2	38.6	42.6	47.3	49.9	45.9	50.6	51.6	50.9	48.8
Alternative D	47.7	43.2	39.8	38.8	42.6	47.2	50.0	45.9	50.5	51.2	49.6	49.4
Difference	-0.5	-0.1	-0.4	0.1	0.0	-0.1	0.1	-0.1	-0.1	-0.4	-1.3	0.6
Percent Difference	-1.1%	-0.2%	-1.1%	0.3%	0.0%	-0.2%	0.2%	-0.2%	-0.2%	-0.8%	-2.5%	1.3%
Below Normal (17%)												
No Action Alternative	50.2	44.7	39.0	38.7	41.9	46.8	51.1	46.4	51.3	52.0	52.0	51.3
Alternative D	50.2	44.7	39.1	38.8	41.9	46.7	51.6	46.5	51.3	51.6	52.2	51.5
Difference	0.0	0.0	0.2	0.1	0.0	-0.2	0.5	0.0	0.0	-0.3	0.1	0.2
Percent Difference	-0.1%	0.1%	0.4%	0.3%	0.0%	-0.4%	1.0%	0.1%	0.0%	-0.6%	0.3%	0.4%
Dry (22%)												
No Action Alternative	49.5	45.0	39.6	38.4	42.4	47.9	51.4	46.7	51.9	50.7	50.1	50.3
Alternative D	49.7	44.7	39.4	39.0	42.4	47.6	51.1	46.6	51.7	50.5	50.5	50.4
Difference	0.2	-0.2	-0.2	0.6	0.0	-0.4	-0.2	-0.1	-0.2	-0.3	0.4	0.1
Percent Difference	0.4%	-0.5%	-0.4%	1.5%	0.1%	-0.8%	-0.4%	-0.2%	-0.5%	-0.5%	0.8%	0.2%
Critical (15%)												
No Action Alternative	54.5	45.7	38.2	39.4	43.1	48.0	50.2	49.3	55.5	52.5	54.4	56.6
Alternative D	53.8	45.5	38.4	39.7	43.2	47.8	50.4	49.2	55.3	52.6	53.9	55.6
Difference	-0.7	-0.2	0.1	0.2	0.1	-0.2	0.2	-0.1	-0.2	0.1	-0.5	-1.0
Percent Difference	-1.3%	-0.5%	0.3%	0.6%	0.2%	-0.3%	0.4%	-0.2%	-0.3%	0.2%	-0.9%	-1.8%

1 Based on the 82-year simulation period

2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999)

3 Relative difference of the monthly average

TABLE 6: Monthly Trinity Lake Storage. Source: Table 4-1, Lower Klamath LTP DEIS.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
No Action (TAF)												
Extremely Wet	1,197	1,258	1,399	1,618	1,839	1,998	2,208	2,300	2,236	2,105	1,993	1,850
Wet	1,373	1,393	1,507	1,621	1,806	1,952	2,114	2,090	2,018	1,896	1,752	1,606
Normal	1,322	1,324	1,346	1,415	1,529	1,669	1,843	1,773	1,689	1,534	1,386	1,276
Dry	1,096	1,089	1,113	1,127	1,189	1,292	1,403	1,361	1,302	1,159	1,005	901
Critically Dry	1,051	1,016	1,014	988	1,012	1,068	1,087	1,048	985	836	676	598
Average All Years	1,233	1,242	1,306	1,385	1,511	1,637	1,779	1,755	1,686	1,548	1,403	1,283
Alternative 1 (TAF)												
Extremely Wet	1,170	1,236	1,377	1,597	1,821	1,981	2,191	2,285	2,221	2,090	1,979	1,839
Wet	1,362	1,382	1,497	1,613	1,798	1,946	2,107	2,083	2,011	1,890	1,743	1,595
Normal	1,319	1,321	1,343	1,415	1,528	1,669	1,842	1,772	1,689	1,536	1,387	1,266
Dry	1,092	1,085	1,109	1,123	1,184	1,288	1,399	1,357	1,298	1,148	992	881
Critically Dry	1,044	1,007	1,005	979	1,004	1,058	1,078	1,039	976	848	677	576
Average All Years	1,224	1,233	1,298	1,377	1,504	1,631	1,772	1,749	1,680	1,544	1,396	1,269
No Action compared to Alternative 1 (TAF)												
Extremely Wet	-27	-22	-22	-21	-17	-17	-17	-15	-15	-15	-15	-11
Wet	-11	-11	-10	-9	-8	-7	-7	-7	-6	-6	-8	-11
Normal	-3	-2	-3	0	0	0	0	0	0	3	1	-10
Dry	-4	-4	-4	-4	-4	-4	-4	-4	-4	-11	-13	-20
Critically Dry	-7	-9	-9	-9	-8	-9	-9	-9	-9	11	1	-22
Average All Years	-9	-9	-9	-8	-7	-6	-6	-6	-6	-5	-8	-14
No Action compared to Alternative 1 (%)												
Extremely Wet	-2%	-2%	-2%	-1%	-1%	-1%	-1%	-1%	-1%	-1%	-1%	-1%
Wet	-1%	-1%	-1%	-1%	0%	0%	0%	0%	0%	0%	0%	-1%
Normal	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-1%
Dry	0%	0%	0%	0%	0%	0%	0%	0%	0%	-1%	-1%	-2%
Critically Dry	-1%	-1%	-1%	-1%	-1%	-1%	-1%	-1%	-1%	1%	0%	-4%
Average All Years	-1%	-1%	-1%	-1%	0%	0%	0%	0%	0%	0%	-1%	-1%

Key:
TAF = thousand acre-feet

TABLE 7: Monthly flow on Trinity River below Lewiston Reservoir. Source: Table 4-3, Lower Klamath LTP DEIS.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
No Action (cfs)												
Extremely Wet	373	796	930	1,264	1,525	2,458	1,042	4,570	4,626	1,241	450	450
Wet	373	300	1,023	1,175	915	510	481	4,687	2,862	1,102	450	450
Normal	373	300	300	300	385	302	477	4,189	2,120	1,102	450	450
Dry	337	286	300	300	300	300	543	2,848	847	481	450	450
Critically Dry	368	267	300	300	300	300	600	1,498	783	450	450	400
Average All Years	363	359	605	696	668	654	584	3,753	2,210	890	450	445
Alternative 1 (cfs)												
Extremely Wet	373	719	930	1,248	1,455	2,458	1,042	4,570	4,626	1,241	460	477
Wet	373	300	1,024	1,151	910	505	481	4,687	2,862	1,102	503	533
Normal	373	300	300	300	358	302	477	4,189	2,120	1,102	508	632
Dry	337	286	300	300	300	300	543	2,848	847	481	574	725
Critically Dry	332	267	300	300	300	300	600	1,498	783	450	699	861
Average All Years	359	349	605	687	652	652	584	3,753	2,210	890	538	630
No Action compared to Alternative 1 (cfs)												
Extremely Wet	0	-77	0	-16	-69	0	0	0	0	0	10	27
Wet	0	0	1	-24	-5	-5	0	0	0	0	53	83
Normal	0	0	0	0	-27	0	0	0	0	0	58	182
Dry	0	0	0	0	0	0	0	0	0	0	124	275
Critically Dry	-37	0	0	0	0	0	0	0	0	0	249	461
Average All Years	-4	-10	0	-9	-16	-2	0	0	0	0	88	185
No Action compared to Alternative 1 (%)												
Extremely Wet	0%	-10%	0%	-1%	-5%	0%	0%	0%	0%	0%	2%	6%
Wet	0%	0%	0%	-2%	-1%	-1%	0%	0%	0%	0%	12%	18%
Normal	0%	0%	0%	0%	-7%	0%	0%	0%	0%	0%	13%	40%
Dry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	28%	61%
Critically Dry	-10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	55%	115%
Average All Years	-1%	-3%	0%	-1%	-2%	0%	0%	0%	0%	0%	20%	42%

Key:
% = percent
cfs = cubic feet per second

TABLE 8: Monthly flow on Trinity River Diversion to Sacramento River at Lewiston Reservoir. Source: Table 4-3, Lower Klamath LTP DEIS.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
No Action (cfs)												
Extremely Wet	827	233	235	410	7	329	278	498	407	1,836	1,526	2,079
Wet	945	541	376	482	97	322	591	0	290	1,190	1,952	2,065
Normal	792	355	193	418	243	396	228	0	472	1,553	1,991	1,471
Dry	712	418	166	385	134	153	229	247	1,011	1,973	2,098	1,358
Critically Dry	598	609	132	748	168	157	426	378	736	2,028	2,178	949
Average All Years	802	439	241	464	131	276	367	172	575	1,640	1,965	1,648
Alternative 1 (cfs)												
Extremely Wet	766	234	233	410	7	329	278	465	407	1,836	1,513	1,984
Wet	904	551	355	482	100	303	586	0	290	1,181	1,937	2,025
Normal	767	344	196	378	270	396	228	0	469	1,510	1,957	1,471
Dry	636	415	162	387	134	152	229	247	1,008	2,092	2,009	1,196
Critically Dry	521	642	132	753	143	177	426	373	736	1,701	2,092	880
Average All Years	748	443	234	457	134	272	366	167	573	1,623	1,920	1,573
No Action compared to Alternative 1 (cfs)												
Extremely Wet	-61	1	-2	0	0	0	0	-33	0	0	-13	-95
Wet	-42	10	-21	0	3	-20	-5	0	0	-9	-14	-41
Normal	-25	-10	4	-40	27	0	0	0	-3	-43	-34	0
Dry	-75	-3	-4	2	0	-1	0	0	-3	119	-89	-163
Critically Dry	-77	32	0	5	-25	20	0	-4	0	-327	-86	-69
Average All Years	-53	4	-7	-7	3	-4	-2	-5	-2	-16	-45	-74
No Action compared to Alternative 1 (%)												
Extremely Wet	-7%	0%	-1%	0%	0%	0%	0%	-7%	0%	0%	-1%	-5%
Wet	-4%	2%	-6%	0%	3%	-6%	-1%	0%	0%	-1%	-1%	-2%
Normal	-3%	-3%	2%	-10%	11%	0%	0%	0%	-1%	-3%	-2%	0%
Dry	-11%	-1%	-3%	1%	0%	0%	0%	0%	0%	6%	-4%	-12%
Critically Dry	-13%	5%	0%	1%	-15%	13%	0%	-1%	0%	-16%	-4%	-7%
Average All Years	-7%	1%	-3%	-1%	3%	-1%	0%	-3%	0%	-1%	-2%	-5%

Key:
% = percent
cfs = cubic feet per second

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	1985	A.B. Geology Miami University, Oxford, OH
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PROFESSIONAL HISTORY	1997 - Present	Principal Hydrologist/Vice President Kamman Hydrology & Engineering, Inc. San Rafael, CA
	1994 - 1997	Senior Hydrologist/Vice President Balance Hydrologics, Inc., Berkeley, CA
	1991 - 1994	Project Geologist/Hydrogeologist Geomatrix Consultants, Inc., San Francisco, CA
	1989 - 1991	Senior Staff Geologist/Hydrogeologist Environ International Corporation, Princeton, NJ
	1986 - 1989	Instructor and Research/Teaching Assistant Miami University, Oxford, OH

SKILLS AND EXPERIENCE

As a Principal Hydrologist with over 25 of technical and consulting experience in the fields of geology, hydrology, and hydrogeology, Mr. Kamman routinely manages projects in the areas of surface- and ground-water hydrology, stream and wetland habitat restoration, water supply, water quality assessments, water resources management, and geomorphology. Areas of expertise include: stream and wetland habitat restoration; characterizing and modeling basin-scale hydrologic and geologic processes; assessing hydraulic and geomorphic responses to land-use changes in watersheds and causes of stream channel instability; evaluating surface- and ground-water resources and their interaction; and designing and implementing field investigations characterizing surface and subsurface conditions; and stream and wetland habitat restoration feasibility assessments and design. In addition, Mr. Kamman commonly works on projects that revolve around sensitive fishery, wetland, wildlife and/or riparian habitat enhancement. Thus, Mr. Kamman is accustomed to working within a multi-disciplined team and maintains close collaborative relationships with biologists, engineers, planners, architects, lawyers, and resource and regulatory agency staff. Mr. Kamman is a prime or contributing author to over 80 technical publications and reports in the discipline of hydrology – the majority pertaining to ecological restoration. Mr. Kamman routinely teaches courses on stream and wetland restoration through U.C. Berkeley Extension and San Francisco State University's Romberg Tiburon Center.

PROFESSIONAL SOCIETIES & AFFILIATIONS	American Geological Institute Society for Ecological Restoration International California Native Plant Society

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5.0 ACADEMIC APPOINTMENTS

San Francisco State University, 2012 through 2014, Wetland hydrology. SFSU College of Extended Learning, Romberg Tiburon Center, CA, 2-day course, 1.6 CEU.

San Francisco State University, 2011, Introduction to wetland hydrology. Basic Wetland Delineation Training, SFSU College of Extended Learning, Romberg Tiburon Center, CA, March 28-April 1.

University of California, Berkeley Extension, 2001 through 2008, Hydrologic and geomorphic processes in stream restoration. Civil and Environmental Engineering, Certificate Program in California Water Management and Ecosystem Restoration, Berkeley, CA, 2-day course, 1.0 CEU.

San Francisco State University, 2007, Introduction to tidal wetland hydrology. SFSU College of Extended Learning, Romberg Tiburon Center, CA, May 11-12, 1.6 CEU.

City of San Jose, 2005, Hydrologic and geomorphic processes in stream restoration. City of San Jose's Environmental Services Department, Watershed Protection Division, San Jose, CA, January 26.

Miami University Geology Field Station, Dubois, WY, 1989, Instructor, Summer Session, May-July.

Miami University, Oxford, Ohio, 1985-89, Instructor and Research/Teaching Assistant (MS candidate).

Save California Salmon

CSPA
California Sportfishing Protection Alliance
Since 1983

Pacific Coast Federation of Fishermen's Associations
PCFFA
Stewards of the Fisheries

Environmental Water Caucus

california water impact network

Planning and Conservation League

Institute for Fisheries Resources

CRAB BOAT OWNERS ASSOCIATION, Inc.
2907 Jones Street
San Francisco, California 94133-1115
415-885-1180

Since 1971
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S.A.F.E.
Alternatives for our Forest Environment

Southern California Watershed Alliance

California Native Plant Society
Sacramento Valley Chapter

EJCW
Water Justice for All

PARC
protect american river canyons

Butte Environmental Council
Protecting Butte County's Land, Air & Water Since 1975

Fly Fishers
Davis, California

Friends of the River
Since 1973

Sacramento River Council

California Wilderness Coalition

GoldenGate Salmon Association

Fly Fishers International
Northern California Council

The Bay Institute

Winnemem Wintu Tribe
Middle River People

Coast Action Group

California Water Commission
P.O. Box 942836
Sacramento, CA 94236-0001

March 17, 2019

Subject: Need for Recirculated DEIS/EIR for Proposed Sites Reservoir

Dear Mr. Yun and Members of the California Water Commission;

We write to you under your role as a responsible agency under the California Environmental Quality Act[1] regarding the environmental documentation for the proposed Sites Reservoir Project. While the CWC is not the CEQA lead agency for Sites, you will be required to use the EIR prepared by the Sites Project Authority. In order to ensure timely awarding of construction funds, you have a vested interest to ensure that a legally adequate EIR is prepared.

Attached is a letter we sent to the Sites Project Authority documenting the multiple inadequacies in the Draft EIS/EIR for the project. Most importantly, the project as described to date does not resolve the fundamental issue of what will be the minimum bypass flows for the Sacramento River. This is a key issue that underlies the basic water yield and economic feasibility of this project.

The California Department of Fish and Wildlife has recommended a much higher minimum bypass flow in the Sacramento River than is being proposed by the (13,000 cfs compared to 3,250 cfs at Red Bluff, 4,000 cfs at Hamilton City and 5,000 cfs at Wilkins Slough).[2] The impacts to the Sacramento River fishery have not been adequately described in the DEIS/EIR, nor is there an alternative analyzed in the DEIS/EIR that would provide the flow recommendations by CDFW.

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[1] See PowerPoint Presentation on CWC's role under CEQA for the WSIP at https://cwc.ca.gov/-/media/CWC-Website/Files/Documents/2015/06_June/June2015_Agenda_Item_11_Attach_2_Powerpoint_King.pdf It should be noted that slide 12 says that CWC as a responsible agency should provide comments on the public review draft EIR, but according to the Sites Project Authority, the CWC did not provide comments.

[2] See CDFG letter of 1/12/18, page 9 "*CDFW recommends the Project proponents revise the bypass flow requirement to maintain at least 13,000 cfs past all diversion facilities prior to the diversion of water to reduce impacts on out-migrating juvenile salmonids."* Accessed at https://www.friendsoftheriver.org/wp-content/uploads/2018/09/1-12-2018-CDFW-Sites-Project-Letter.pdf

It is impossible for anybody to know if this project is cost effective and promised environmental public benefits can be delivered until the Sacramento River minimum bypass flow issue is resolved. The Sites Project Authority's recommendation for Sacramento River minimum bypass flows appears to justify a finding of financial feasibility, but how feasible will the project be if CDFW's minimum bypass flows are legally required?

We believe this issue must be fully and adequately analyzed in the DEIS/EIR, prior to any water rights hearing or other permitting process that will rely on the information in the DEIS/EIR.

Based on the inadequacies identified in the attached letter, we encourage you to strongly recommend that the Sites Project Authority prepare a recirculated Draft EIS/EIR.

Sincerely,

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Save California Salmon
tstokely@att.net

Bill Jennings, Executive Director
California Sportfishing Protection Alliance
deltakeep@me.com

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Tryg Sletteland
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Caleen Sisk, Chief
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Konrad Fisher, Director
Water Climate Trust
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Mary Kay Benson
Steering Committee Manager
Chico 350
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Jean Hays, ED Leadership Team
Women's International League for Peace
And Freedom Earth Democracy
Skyhorse3593@sbcglobal.net

Attachments: Coalition Letter to Sites Project Authority
Kamman Hydrology Analysis of Sites DEIS/EIR on Trinity River

cc: California Water Commission Members
Representative Jared Huffman
Karuk Tribe
Hoopa Valley Tribe

Yurok Tribe
Humboldt County Board of Supervisors
Trinity County Board of Supervisors
Eileen Sobeck, Executive Officer SWRCB
Charlton Bonham, Director CDFW

Topic: **Authority Board Agenda Item 6-2** **2019 September 23**

Subject: **CDFW 60-day Consultation**

Requested Action:

No action requested. Discussion and possible direction to staff regarding consultation discussion with the California Department of Fish and Wildlife.

Detailed Description/Background:

By September 23, the Sites Project staff will have organized and participated in 22 technical meetings with CDFW technical staff from their Water Branch and Region 2 (16 Aquatic/Operations and 6 Terrestrial, including 1 site visit for Terrestrial). Staff is being supported by key consultants from Service Area D (modeling) and Service Areas E and F (Environmental and Permitting), respectively. The purpose of the meetings is to work through items identified in CDFW's comment letter to the Draft Environmental Impact Report/ Environmental Impact Statement.

The meetings are informational and collaborative in nature. The Sites Technical Team have provided project background information and analysis results covering a wide range of topics including:

- 60-day work plan, key topics.
- General project overview, models used and published results.
- Terrestrial species models and GIS analysis methods.
- Biological metrics.
- Temperature modeling of the Upper Sacramento River.
- Delta outflow analysis.
- Diversion flow options.
- Floodplains and bypass habitat benefits and impact.

The Sites Technical Team will continue working with our CDFW's counterparts to address the items identified in their comment letter. The Sites Technical Team is also working to prepare a revised, biologically based operations scenario along with a science, adaptive management and mitigation framework that would form the basis of upcoming permit applications.

In addition to the Technical Team, 8 management level meetings have occurred with CDFW's counterparts. Representing the Sites Project is Doug Headrick, Reservoir Committee Chair, Thad Bettner, Reservoir Committee Vice-Chair and

key program management staff. These meetings have also been collaborative in nature.

Prior Authority Board Action:

None.

Fiscal Impact/Funding Source:

None.

Staff Contact:

Jim Watson/Ali Forsythe/Rob Thomson/Kevin Spesert

Attachments:

None.

Topic: **Authority Board Agenda Item 06-5.3** **2019 September 23**

Subject: **An updated description for the preferred Project**

Requested Action:

Consider approving an updated executive-level description for the preferred Project and provide direction to staff to advance the level of detail.

Detailed Description/Background:

Documents that defined the preferred project were released in mid-August 2017. Since then:

1. The Authority has received comments from the public, governmental agencies and other stakeholders that have been informative.

2. Pre-application consultations related to key permits are underway and have also informed the Authority.

3. The Water Commission made their conditional determinations in July 2018 and have conditionally approved a funding amount for eligible Prop 1 benefits. This funding amount needs to be translated into a proportionate share of the reservoir for the state's resource managers use to produce ecologic benefits.

4. Work continues to determine a federal interest in participation and potentially obtaining congressional funding for eligible benefits. However, the timing and ability to commit any federal funding commensurate with both the Reservoir Committee members' and the State of California remains uncertain.

5. Other water management actions, some of which have matured since 2017 to allow a better understanding of their potential role to benefit the state's water system and some of which are newer and have the potential to also help to improve the state's water system in a positive manner (i.e. changing landscape).

6. The science related to the aquatic ecology in the Sacramento River and the Delta continues to add to the overall understanding and improving the ability to develop sustainable solutions.

Based on this accumulated information, a revision to the description of the preferred project should be considered.

Approving an updated, executive-level, description for the preferred project will facilitate advancement of the Final EIR/EIS, the Authority's feasibility studies and analysis, and continuing pre-application consultations.

Prior Authority Board Action:

At the August 15 and September 12, 2019 joint Authority and Reservoir Committee workshops, the attendees discussed the results of information gained since the project description for the preferred project was last updated. The discussions also included updated information related to the financing and estimated repayment costs for the Reservoir Committee's proportionate share of costs to build the preferred project.

The Reservoir Committee, at their July 20, 2017 meeting approved the release of the Draft EIR/EIS and draft Feasibility Report for public comment and inclusion into the Authority's application for Chapter 8 of Proposition 1 [2014] and in accordance with the WSIP. These documents identified the preferred project as Alternative D in the draft EIR/EIS.

Fiscal Impact/Funding Source:

None.

Staff Contact:

Jim Watson/Ali Forsythe

Attachments:

None.

Topic: **Authority Board Agenda Item 2-1.a** **2020 April 22**

Subject: **Value Planning**

Requested Action:

Consider acceptance of the following:

1. The final report titled "Sites Project Value Planning Alternatives Appraisal Report, dated April 13, 2020" and the recommendations presented within, and

2. A recommendation to the Sites Project Authority to approve the final report titled "Sites Project Value Planning Alternatives Appraisal Report, April 13, 2020" and the recommendations presented within.

Detailed Description/Background:

The subject report presents the value planning process and the Ad Hoc Value Planning Workgroup's recommended Project. The recommended Project includes substantial changes over Alternative D in the 2017 Draft EIR/EIS in that it:

- Rightsized the Project for the level of participation which reduces construction and repayment costs for local agencies;

- Significantly modifies operational parameters and substantially lessens environmental impacts; and

- Continues to meet the project objectives.

With approval of this final report, the Authority will proceed to the next stage of project development and use the recommendations as the basis of planning work through Phase 2.

Prior Action:

None.

Fiscal Impact/Funding Source:

Direction was given on value planning as a concept in September and the first meetings were held in October of 2019. There was no budget for the value planning in 2019 and the work was executed through scope changes until approval of a new work plan in January 2020. The approved budget was $720k through August 2020 for value planning and was funded at no additional cost to members through 2019 carryover funds and prop 1 reimbursements. Task order amendments including value planning were approved in February of 2020.

Staff Contact:

Lee Frederiksen

Attachments:

Sites Project Value Planning Alternatives Appraisal Report, April 13, 2020.

Sites
Program Management Team

Sites Project Value Planning Alternatives Appraisal Report

April 2020

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Appendix B – Operations
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- Attachment B-1-1: Sites Operations Scenario B
- B-2: Shasta Exchanges with No Reclamation Investment
- B-3: Colusa Basin Drain Value Planning Evaluation

Appendix C – Environmental Permitting and Planning
- C-1: Permitting and Environmental Planning Impacts Assessment
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Appendix D – Repayment
- D-1: Financial Analysis in Support of March 2020 Value Planning
- D-2: Annual Cash Flow Tool (available digitally)

Executive Summary

Ongoing planning efforts to develop the Sites Reservoir Project (Project) continue to inform expectations on diversion permits and water rights, as well as shape investor participation. In October 2019, representatives from the Authority Board and Reservoir Committee began undertaking a "value planning" process: an effort to identify and evaluate additional alternatives that could make the Project more affordable for the Project's participants. This decision was based on ongoing discussions with permitting agencies, expected project cost and cost per acre foot, and existing participation levels. An Ad Hoc Value Planning Workgroup was formed in late 2019 and continued to meet through early 2020. The Workgroup directed the efforts of Authority staff and the consultant team to formulate and evaluate Project alternatives that would be more affordable, and to identify a recommended Project.

For the purpose of this value planning effort, project objectives were limited to the interests of the Authority's participants and the anticipated benefits to be funded through the Water Storage Investment Program (WSIP) by the State of California. The primary and secondary Project objectives are provided in Table E-1.

TABLE E-1. PROJECT OBJECTIVES.

Primary Objectives	Secondary Objectives
Improve Water Supply and Water Supply Reliability	Provide Opportunities for Recreation
Provide Incremental Level 4 Water Supply for Refuges	Provide Opportunities for Flood Damage Reduction
Improve the Survival of Anadromous Fish	
Enhance the Delta Ecosystem	

Overview of Project Components

The Project includes many facilities. Most of the Project costs are associated with four primary functions: diversions for filling, conveyance for releases, storage, and roads and bridges.

- Diversion Facilities for Filling – Diversion facilities include pipelines, canals, and pumping plants required to fill Sites Reservoir. To reduce costs, the value planning alternatives focused on using existing facilities for filling Sites Reservoir rather than constructing new facilities.
- Conveyance for Releases – The value planning alternatives focused on using the existing Tehama-Colusa Canal (T-C Canal) to deliver water to the southern terminus of the canal. Releases could then be conveyed from the southern end of the T-C Canal to either the Colusa Basin Drain (CBD) or the Sacramento River.
- Storage – Smaller reservoir sizes, focusing on reservoir sizes of 1.5, 1.3, and 1.0 million acre-feet (MAF) were evaluated to reduce the number and size of the dams and saddle dams along with related gates, towers, tunnels, and pumping facilities needed to fill Sites Reservoir.
- Roads and Bridges – The value planning effort considered a number of road and bridge combinations, ultimately focusing on lower costs options for a new bridge to maintain emergency and public access from Maxwell to Lodoga along with roads (paved and unpaved) to maintain access for residents and provide for construction traffic.

Value Planning Alternatives

Value planning alternatives that combine different types and sizes of diversion, release, reservoir, and road and bridge facilities were developed. Initial alternatives were developed following the October 2, 2019 kickoff meeting. These initial alternatives were then refined in the following months and additional alternatives were also added. Over this time period, analyses were completed to assess the operational, environmental, and permitting considerations for different alternatives. Staff also performed a repayment analyses for the alternatives. These analyses are summarized below.

Operational Assessment

The value planning alternatives evaluated the ability of several reservoir sizes and conveyance capacities to meet current participant subscriptions of approximately 230,000 acre-feet (AF), comprised of 192,892 AF of public water agency participation and approximately 40,000 AF of participation by the State of California through the Water Storage Investment Program (WSIP). A sensitivity analysis for a range of reservoir sizes and release capacities for Sites Reservoir was conducted to evaluate the quantity of water that could be released under different conveyance capacities assuming diversion criteria based on current discussions with regulatory agencies. Table 5-2 shows the estimated average annual releases under different combinations of potential Sites storage and release capacities.

TABLE E-2. SITES RESERVOIR RELEASES UNDER VARYING STORAGE AND RELEASE CAPACITIES

	Long-term Average		
Storage Capacity (MAF)	**1,500 cfs Release Capacity (TAF)**	**1,000 cfs Release Capacity (TAF)**	**750 cfs Release Capacity (TAF)**
1.5	253	243	236
1.3	243	234	230
1.0	207	195	191

Based on the preliminary analysis performed, the value planning alternatives with reservoir sizes of 1.3 to 1.5 MAF including assumed diversion criteria would be able to provide enough water to meet current participant demands. In addition, the use of the T-C Canal and the CBD as the conveyance systems appears possible based on preliminary analysis. Additional hydraulic analyses will be needed to confirm downstream conveyance conditions in the CBD, and the available capacity of the T-C Canal downstream of Funks Reservoir should be confirmed. Discussions with Reclamation on non-investment exchanges with Shasta Lake are ongoing. Annual Shasta Lake exchanges including assumed diversion criteria are estimated to be about 60 TAF. While field verification and additional analysis are required, the value planning alternatives with reservoir sizes of 1.3 to 1.5 MAF appear feasible from an operations standpoint.

Environmental and Permitting

The analysis of the value planning alternatives determined that obtaining permits from regulatory resource agencies for some of the alternatives would be relatively easier because of the (1) reduced inundation areas (within reservoir footprint), (2) lack of a pipeline easement to the Sacramento River, (3) removal of the northern regulating reservoir facilities, and (4) shorter conveyance off the T-C Canal (to CBD).

Repayment Analyses

A repayment analysis was conducted to estimate the annual repayment costs per AF of release from Sites Reservoir for both with and without a Water Infrastructure Finance and Innovation Act (WIFIA) loan. The analysis was based upon the estimated construction, operation and maintenance costs, and the estimated releases. Key assumptions included using 2019 as the base year, the U.S. Department of Agriculture loan for the Maxwell Intertie at 3.85%, a revenue bond interest rate of 5%, and a 30-year repayment. Including the USDA loan reduces the overall project cost by approximately $20 per acre-foot. The range in repayment costs are summarized in Table E-3.

TABLE E-3. ANNUAL REPAYMENT COSTS PER ACRE-FOOT OF RELEASE

	VP1			VP2			VP3		VP4		VP5	VP6	VP7
Reservoir Size (MAF)	1.0	1.3	1.5	1.0	1.3	1.5	1.3	1.5	1.3	1.5	1.3	1.3	1.5
Release Capacity (cfs)	750			750			1,500		1,000		1,000	1,000	1,000
Project Cost (2019 $, billions)	3.2	3.4	3.6	2.7	2.9	3.1	3.4	3.6	2.9	3.1	2.9	3.0	3.0
Annualized acre-feet/year Release (TAF)	191	230	236	191	230	236	243	253	234	243	234	234	243
PWA Annual Costs During Repayment Without WIFIA[a] Loan (2020 $, $/acre-feet)	862	776	805	730	667	693	738	754	660	678	644	674	661
PWA Annual Costs During Repayment With WIFIA Loan (2020 $, $/acre-feet)	799	724	755	665	614	641	689	708	608	628	592	621	611

[a] Water Infrastructure Finance and Innovation Act

Recommended Project

The recommended Project was developed by the Ad Hoc Value Planning Workgroup through a sequential process that included initial and refined alternatives. Important considerations included total project cost, impacts on landowners, impacts on traffic and public safety, ability to meet participant demands, ability to provide public benefits to the State, relative magnitude of environmental impacts, and the estimated cost per acre-foot of water delivered. The recommended Project and two options for consideration are shown in Table E-4.

TABLE E-4. VALUE PLANNING GROUP RECOMMENDED PROJECTS

	VP5	VP6	VP7
	Option 1	Option 2	Recommended
Reservoir Size	1.3 MAF	1.3 MAF	1.5 MAF
Dunnigan Release Capacity (cfs)	1,000	1,000	1,000
Estimated Cost (2019 dollars)	$2,855,000,000	$2,988,000,000	$3,037,000,000
Estimated Cost per Acre-Foot with WIFIA[a] (2020)	$592	$621	$611
Estimated Deliveries (Long-Term Average in TAF)	234	234	243

[a] Water Infrastructure Finance and Innovation Act

The recommended project (Alternative VP7) includes a 1.5 MAF reservoir to provide additional storage for dry and critical years. All options include a bridge to minimize travel times and provide emergency access for communities on the west side of the reservoir. The bridge for all options was sized based on the maximum water surface elevation for a 1.5 MAF facility to avoid future traffic impacts that could arise if climate change or other factors necessitated expanding a smaller reservoir. All alternatives also include a new unpaved road to maintain access for residents along the southern portion of the reservoir.

All options for consideration, including the recommended alternative, would release water through the T-C Canal. A 1,000 cfs release near the end of the canal would deliver water to either the CBD (Alternatives VP5 and VP7) or to the Sacramento River (Alternative VP6).

The Value Planning Workgroup recommends the Project proceed as Alternative VP7. Although Alternative VP5 had the lowest overall cost and lower cost per acre-foot, the Value Planning Workgroup recommends VP7 based on higher deliveries at a comparable cost and improved operational flexibility with a 1.5 MAF reservoir. The proposed facility locations associated with VP7 are shown in Figure E-1.

The Value Planning Workgroup also recommends the subsequent analyses of the Project include a 1.3 MAF reservoir (per VP5) and a Dunnigan to Sacramento River 1000 cfs release pipeline (per VP6) in order to provide flexibility to respond to any future condition changes that might result in such facilities becoming preferable.

The Recommended Project results in the following significant changes to the Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) Alternative D 1.8 MAF Project:

- Reduced project size and footprint
- Reduced Sacramento River diversions
- Elimination of Delevan Sacramento River diversion and release facility
- Elimination of Delevan Pipeline and associated impacts to landowners and wildlife refuges along that alignment
- Reduced costs and improved affordability to the Project's funding participants

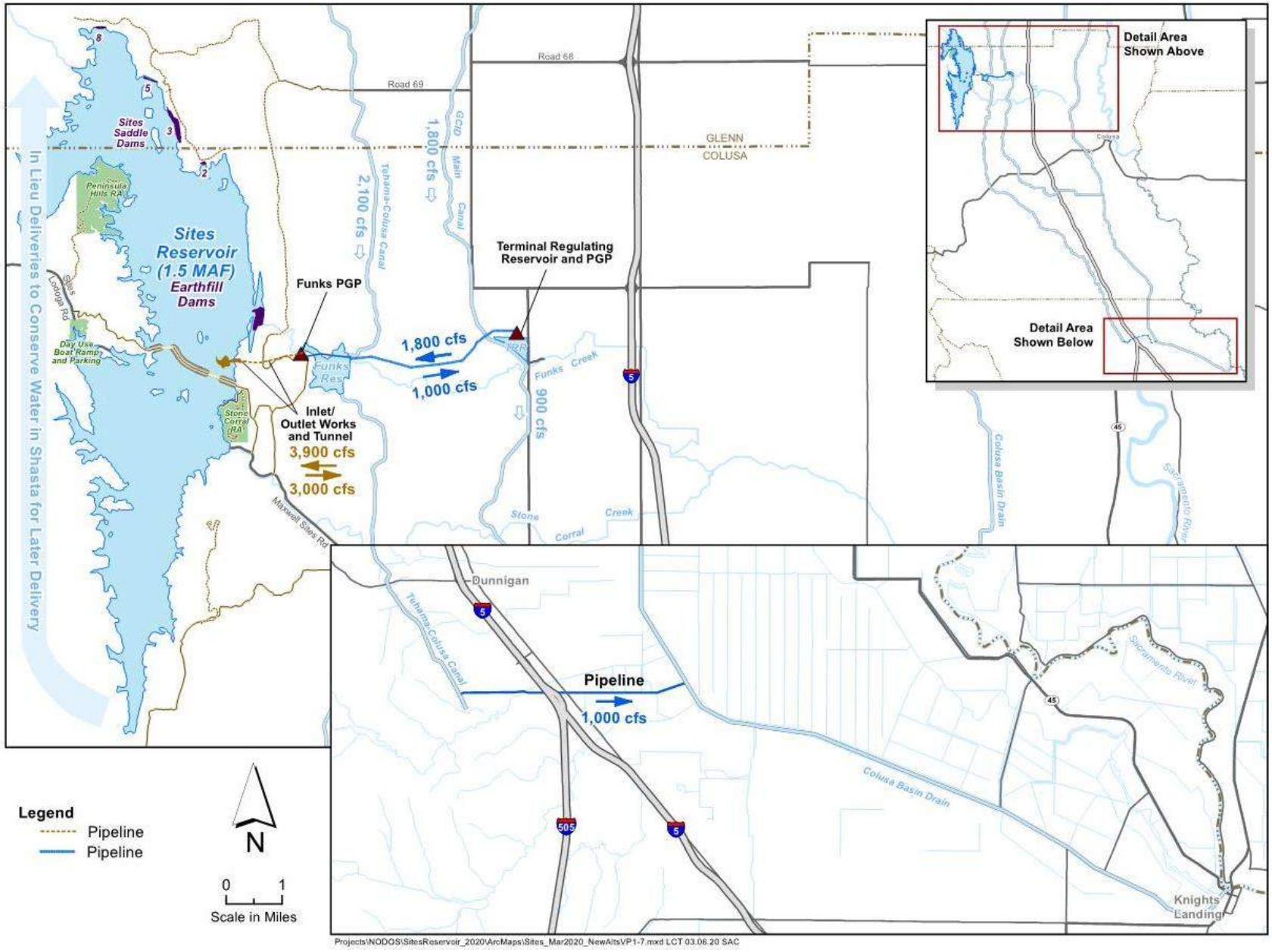

FIGURE E-1. RECOMMENDED VALUE PLANNING ALTERNATIVE (VP7)

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1. Introduction

1.1 Background

Ongoing planning efforts to develop the Sites Reservoir Project (Project) continue to inform expectations on diversion permits and water rights, as well as shape investor participation. In October 2019, representatives from the Authority Board and Reservoir Committee began undertaking a "value planning" process: an effort to identify and evaluate additional alternatives that could make the Project more affordable for the Project's participants. This decision was based on ongoing discussions with permitting agencies, expected project cost and cost per acre foot, and existing participation levels. An Ad Hoc Value Planning Workgroup was formed in late 2019 and continued to meet through early 2020. The Workgroup directed the efforts of Authority staff and the consultant team to formulate and evaluate Project alternatives that would be more affordable, and to identify a recommended Project.

1.2 Purpose

The purpose of this report is to present the methodology and findings of the value planning process and to summarize the overall Project status from a permitting, operations, and repayment perspective. The intent is that the Participants will find this information useful in assessing their level of ongoing Project participation.

2. Project Objectives and Participants

2.1 Objectives

A wide variety of Project objectives have been proposed in previous planning efforts by the Authority, the California Department of Water Resources (DWR), the Bureau of Reclamation (Reclamation), and others. For the purpose of this value planning effort, project objectives were limited to the interests of the Authority's participants and the anticipated benefits to be funded through the Water Storage Investment Program (WSIP) by the State of California.

Prior to the initiation of the value planning effort, the estimated Project cost for participants for a presumed 1.8 million acre-feet (MAF) reservoir exceeded the average annual cost per acre-foot subscription that was acceptable (i.e. affordable for the agricultural participants) for their continued participation. The primary purpose of value planning was to provide enough water for current Project subscription while reducing the overall cost and the cost per acre-foot to an affordable level, which varies by participants. It was also essential that the alternatives selected meet the overall Project objectives:

- **Improve Water Supply and Water Supply Reliability.** The assumed total Project demand is approximately 230 thousand acre-feet per year (TAFY) in releases from Sites Reservoir, including a water agency demand of approximately 193 TAFY (see Table 5.1 for additional details).
- **Provide Incremental Level 4 Water Supply for Refuges.** Through the WSIP, the State committed to invest in Incremental Level 4 water supply for refuges at an undetermined level. The estimated level of commitment is an average delivery of 26 TAFY. Level 4 refuge demand is located primarily south of the Sacramento-San Joaquin Delta (Delta).
- **Improve the Survival of Anadromous Fish.** Participants are supportive of actions that benefit salmon, steelhead, and other anadromous fish species of concern in the Sacramento River watershed. The ability of Sites Reservoir to benefit salmon largely depends on the ability to use Sites Reservoir for in-lieu deliveries to Central Valley Project (CVP) contractors or to meet other CVP requirements. This enables the conservation of the coldwater pool in Shasta and Folsom Lakes. The species benefit from improved coldwater pool management, lower river water temperatures and supplemental flows to prevent the dewatering of redds. Negotiations are ongoing with Reclamation to establish a mutually agreeable operation.
- **Enhance the Delta Ecosystem.** Water released from Sites Reservoir would be conveyed to the Yolo Bypass toe drain to convey biomass to the Delta to help supply food for Delta smelt.

Alternatives include opportunities to achieve the following secondary objectives:

- **Provide Opportunities for Recreation**. This benefit is being funded through WSIP. The WSIP funding will support the construction of new recreation facilities, including Stone Corral Recreation Area on the east side of the reservoir, a boat ramp on the west side of the reservoir, and the Peninsula Hills Recreation Area on the west side of the reservoir.
- **Provide Flood Damage Reduction**. This benefit is being funded through WSIP. The WSIP application focused on flood-damage reduction resulting from the construction of Sites Dam on Stone Corral Creek. Once completed, Sites Dam will reduce the likelihood of flooding in the Stone Corral Creek watershed, and Golden Gate Dam will improve flood damage reduction for extreme events on Funks Creek.

Previously published benefits included hydropower production. The Value Planning Workgroup decided not to require facilities for pumpback generation in the value planning alternatives. Most costs associated with pumpback hydropower are attributable to Fletcher Reservoir. If pumpback generation is not required, then there is no requirement for a forebay/afterbay arrangement and Fletcher Reservoir can be eliminated, resulting in significant cost savings.

Although hydropower is not a Project objective, the cost estimates for the value planning alternatives include turbines in the pumping plants for generation on release. These turbines are not a major cost driver for the Project and are likely to significantly reduce operations, maintenance, and replacement (OM&R) costs by offsetting the costs for power to pump water into Sites. The benefit derived from retaining turbines can be reassessed to optimize the design as the Project progresses and energy markets fluctuate.

2.2 Participants

The Project facilities are to be limited to those that directly benefit the current participants (WSIP and local entity participants). Reclamation and the State of California, through the CVP and the State Water Project (SWP), were assumed to be cooperating partners not investors. The State may contract for WSIP benefits through the California Water Commission, the California Department of Fish and Wildlife, DWR, or the State Water Resources Control Board; nevertheless, the WSIP participation level is currently capped at $816 million (some of which is allocated to recreation and flood control benefits), and deliveries were constrained to correspond to this level. Beyond the State, current financial participants include the following:

- City of American Canyon
- Antelope Valley-East Kern Water Agency
- Carter Mutual Water Company
- Coachella Valley Water District
- Colusa County
- Colusa County Water Agency
- Cortina Water District
- Davis Water District
- Desert Water Agency
- Dunnigan Water District
- Glenn-Colusa Irrigation District (GCID)
- LaGrande Water District
- Metropolitan Water District of Southern California
- Reclamation District 108
- San Bernardino Valley Municipal Water District
- San Gorgonio Pass Water Agency
- Santa Clara Valley Water District
- Santa Clarita Valley Water District
- Westside Water District
- Wheeler Ridge-Maricopa Water Storage District
- Zone 7 Water Agency

3. Overview of Project Components

The Project includes many facilities. Most of the Project costs are associated with four essential Project functions: diversions, conveyance for releases, storage, and roads and bridges. The following sections provide an overview of the overall Project components, with focus on those that were closely evaluated during the value planning process.

3.1 Diversions

At the October 2, 2019 meeting of the Ad Hoc Value Planning Workgroup, it was decided to focus alternatives on the use of existing diversions (Red Bluff and Hamilton City pumping plants) rather than constructing a new pumping plant on the Sacramento River.

Diversion facilities include pipelines, canals, and pumping plants required to fill Sites Reservoir. Alternative D (1.8 MAF reservoir) relied on three diversions, including the existing Tehama-Colusa (T-C) Canal diversion at Red Bluff, the existing GCID Main Canal diversion at Hamilton City, and a new diversion on the Sacramento River for the Delevan pipeline. The lowest cost options use the existing pumping plants and canals. Together, the T-C and GCID Main Canals can deliver approximately 3,900 cubic feet per second (cfs). Eliminating the new Delevan pumping plant provides substantial cost savings (approximately $260 million). Although this reduces the ability to fill Sites Reservoir, the workshop participants believed that two diversions would provide adequate conveyance capacity consistent with the likely permittable diversion capacity.

3.1.1 Diversion Criteria

Sites Reservoir would be filled through the diversion of excess Sacramento River flows that originate primarily from unregulated tributaries to the Sacramento River downstream from Keswick Dam. Diversions would be allowed when operational criteria are met, which would be set by permitting requirements. Based on current permitting discussions, the diversion criteria included in Table 3-1 were assumed for the value planning analysis. These criteria are often referred to as “Scenario B.”

TABLE 3-1. ASSUMED DIVERSION AND OPERATIONS CRITERIA (SCENARIO B)

Location	Criteria
Wilkins Slough Bypass Flow	8,000 cfs April/May 5,000 cfs all other times
Fremont Weir Notch	Prioritize the Fremont Weir Notch, Yolo Bypass preferred alternative, flow over weir within 5%
Flows into the Sutter Bypass System	No restriction due to flow over Moulton, Colusa, and Tisdale Weirs
Freeport Bypass Flow	Modeled WaterFix Criteria (applied on a daily basis) Post-Pulse Protection (applied on a moving 7-day average) Post-Pulse (3 levels) = January–March Level 2 starts January 1 Level 1 is initiated by the pulse trigger
Net Delta Outflow Index (NDOI) Prior to Project Diversions	44,500 cfs between March 1 and May 31

For more information on the assumed diversion and operations criteria, refer to Appendix B.

3.1.2 Pumping Facilities

Once water is diverted from the Sacramento River, it must be pumped into Sites Reservoir. This requires pumping plants with regulating reservoirs at the existing T-C and GCID Main Canals.

Pumping from T-C Canal to Sites Reservoir

The Tehama-Colusa Canal Authority (TCCA) diversion facility is located on the Sacramento River near Red Bluff. The Red Bluff Pumping Plant has an existing pumping capacity of 2,000 cfs, which is used to meet current agricultural water demand. The Project would include installation of one additional pump (250 cfs) and

one backup pump to the existing pump grouping, which would increase the overall pumping capacity to 2,250 cfs to fully use the 2,100 cfs capacity for diversion through the T-C Canal to Sites Reservoir.

For value planning, two regulating reservoir options were considered for the T-C Canal: the existing Funks Reservoir and a new Tehama-Colusa Regulating Reservoir (TCRR). The primary advantages of a new northern regulating reservoir (TCRR) are that it would eliminate almost all impacts on T-C Canal operations, and it would allow for early filling of Sites Reservoir. Two locations were considered, with one near Road 68 and a second to the northwest near Hunters Creek. Preliminary cost estimates indicate that both locations would have comparable cost for implementation. The Hunters Creek location reduces the length of pipeline needed to lift water into Sites Reservoir by approximately 2 miles, but it is less accessible for construction and maintenance and has greater environmental impacts because of streambed impacts. Using the existing Funks Reservoir minimizes the length of pipeline and does not require constructing a new regulating reservoir into Sites Reservoir and, therefore, has the lowest cost.

Pumping from GCID Main Canal to Sites Reservoir

Under proposed Project operations, the GCID Main Canal would convey water pumped from the existing Hamilton City pumping facility to Sites Reservoir. The Hamilton City pumping facility has a 3,000 cfs diversion capacity at the Sacramento River intake, and the capacity of the GCID Main Canal is 1,800 cfs. Table 3-2 shows the flows that are assumed to occupy capacity in the canal during existing winter operations. A dedicated annual 2-week maintenance shutdown period is assumed in the last week of January through the first week of February.

TABLE 3-2. OCCUPIED CAPACITY IN THE GCID MAIN CANAL DURING EXISTING WINTER OPERATIONS

Month	October	November	December	January	February	March
Occupied Capacity (cfs)	513	534	389	235	56	48

Conveying water from the GCID Main Canal requires the construction of the Terminal Regulating Reservoir (TRR) to regulate levels in the canal with the operation of the new pumping plant to convey water to Sites Reservoir. Therefore, construction of the TRR was included in each alternative.

Forebay/Afterbay and Sites Pumping/Generating Plants

Alternative D of the Draft EIR/EIS (1.8 MAF reservoir) included a forebay/afterbay (Fletcher Reservoir) where all diversions collected were then lifted into Sites Reservoir using the Sites Pumping/Generating Plant. This arrangement maximized the potential for pumpback generation (cycling between the upper and lower reservoir to provide dispatchable power). The Value Planning Workshop participants decided to eliminate pumpback generation from the Project at this time. This enables the elimination of Fletcher Reservoir (approximately $190 million). It also allows consideration of eliminating the Sites Pumping/Generating Plant (the most expensive single Project facility, at $800 million), provided some additional investment is made to the other pumping plants to compensate for increased head to pump directly into Sites Reservoir.

3.2 Conveyance for Releases

Shasta Exchange for Project Demands: It is possible to release water from Sites Reservoir to meet CVP Sacramento Valley agricultural water service and Settlement contractor CVP demands. Meeting CVP needs from Sites Reservoir in the T-C Canal and GCID Canal service areas south of Funks Reservoir allows water to be conserved in Shasta Lake for subsequent delivery to meet Project demands. This could include refuge water supply or South of Delta participant needs. The amount of additional conveyance (for example, Delevan conveyance or Dunnigan conveyance) that must be constructed to release water directly from Sites Reservoir to the Sacramento River depends on the amount and timing of water that could be cooperatively exchanged through Shasta for Project demands.

Delevan Pipeline or Canal: Alternative D (1.8 MAF Reservoir) included two pipelines with a combined capacity of 1,500 cfs back to the Sacramento River for releasing water directly to the Sacramento River. The value planning effort considered a reduced capacity of 750 cfs using a canal in place of a pipeline where

possible to reduce costs. Constructing a canal is less costly but increases environmental impacts by introducing potential flooding issues and creating a barrier to terrestrial species migration.

Dunnigan Release: A new option introduced by the Value Planning Workgroup is the use of the existing T-C Canal to deliver water to the southern terminus of the canal. Water could be conveyed from the southern end of the T-C Canal to either the Colusa Basin Drain (CBD) or the Sacramento River. Three conveyance approaches were considered:

- Conveyance through existing drainage channels to the CBD
- Conveyance through a new canal to the CBD
- Conveyance through a pipeline to the CBD or river

Gravity releases through existing drainage channels to the CBD are possible but would result in significant water loss attributable to seepage and evaporation and, therefore, were eliminated. The environmental team has recommended pipeline release versus a canal as the preferred option to minimize environmental impacts. Conveyance through a pipeline to the CBD or river can be done by gravity without a pump station. The ability of the T-C Canal to operate using a gravity pipeline to the CBD or river was evaluated, with results summarized in Section 5.

3.2.1 Release Criteria

Sites Reservoir would be operated in cooperation with CVP and SWP operations to coordinate releases from Shasta Lake, Lake Oroville, and Folsom Lake. Sites releases could allow reduced releases from other reservoirs while maintaining minimum instream flow objectives, Sacramento River temperature requirements, and Delta salinity control requirements assigned to CVP and SWP. Through reduction in releases from CVP and SWP reservoirs, storage could be conserved in Shasta Lake, Lake Oroville, and Folsom Lake to increase operational flexibility.

Releases from Sites Reservoir to the Sacramento River would be operated to achieve multiple benefits associated with the Project's primary objectives in specific water year types and months of the year. Most releases are likely to occur in dry and critical water years when members request releases from storage, and when state water (WSIP) is likely to be released for environmental benefits. Priority operations would include the following:

- Provide water to Project participants north and south of the Delta.
- Provide water to the Cache Slough area via the Yolo Bypass.
- Provide water for Incremental Level 4 refuge deliveries.
- Support Reclamation goals through exchange. Goals could include improved Shasta Lake temperature management and Sacramento River fall flow stabilization to improve spawning and rearing success of anadromous fish.

Sites releases to Sacramento Valley members include deliveries to TCCA members, GCID, Reclamation District 108 (RD 108), Colusa County, and other members. Most of these deliveries are conveyed through the T-C Canal.

TCCA historical monthly diversion data for 1999 through 2013 were reviewed to assess seasonal diversion patterns and variations in water use for a range of hydrologic conditions and CVP allocations. The historical data were used to verify that the total irrigation demands and diversion patterns generally represented actual water operations. TCCA's CVP Agricultural Water Service Contracts are subject to shortage allocations based on CVP storage and annual hydrologic conditions. Sites deliveries to TCCA participants will be used to supplement existing CVP contract supplies.

GCID and RD 108 are CVP Sacramento River Settlement Contractors and are subject to a 25 percent contract reduction in severe drought years under specific shortage criteria in their contracts. Sites water will be used to supplement existing CVP settlement contract supplies.

It is assumed that South of Delta SWP Contractors will take delivery of Sites water to supplement SWP Table A allocations in dry and critical water years. Sites Reservoir releases to SWP contractors are assumed to be initiated when the SWP allocation is less than 85 percent of Table A values. If the SWP allocation is less than

65 percent of Table A values, releases to SWP members are assumed to become more aggressive to supplement decreased supplies.

3.3 Dams and Reservoir

Alternative D of the EIR/EIS proposed a 1.8 MAF reservoir for Sites. The capacity of the reservoir depends on the size of the dams. The height of Golden Gate and Sites Dams is reduced for a 1.5, 1.3, or 1.0 MAF reservoir, and some of the saddle dams are eliminated with the smaller reservoir.

Reducing the capacity of the reservoir would also reduce the height and number of gates required for the inlet/outlet tower. Dam safety regulations also require the ability to rapidly reduce the amount of water stored behind a dam in the event of imminent failure. The reservoir inlet/outlet tunnels are designed to meet this rapid drawdown requirement, instead of normal service levels. Smaller reservoirs require smaller-diameter tunnels, further reducing the cost.

Finally, reducing the reservoir size also reduces the head on the pumping facilities needed to fill Sites Reservoir. The value planning effort focused on 1.5, 1.3, and 1.0 MAF facilities to reduce construction costs.

Three alternative construction methods for dams were considered. The original DWR concept was for a zoned rockfill dam. Reduced cost is likely with an earthfill dam or a hardfill dam; however, the variance in cost based on the dam construction method is much less than the potential savings associated with reducing the size of the reservoir.

3.4 Roads and Bridge

Alternative D (1.8 MAF reservoir) included a new bridge approximately 1.5 miles in length to maintain emergency and public access from Maxwell to Lodoga. Other alternatives considered included a pair of shorter-span bridges along with the use of constructed fill (causeways) between the sections and a combination of a shorter bridge with a tunnel for the smaller reservoir.

A new road around the southern end of Sites Reservoir that would connect over to Lodoga was considered as an alternative to building a bridge.

All alternatives include a road to the southern end of Sites Reservoir to provide access for residents who would otherwise be stranded by the new reservoir.

The road and bridge options are described more fully in Appendix A.

4. Value Planning Alternatives

4.1 Alternative Development

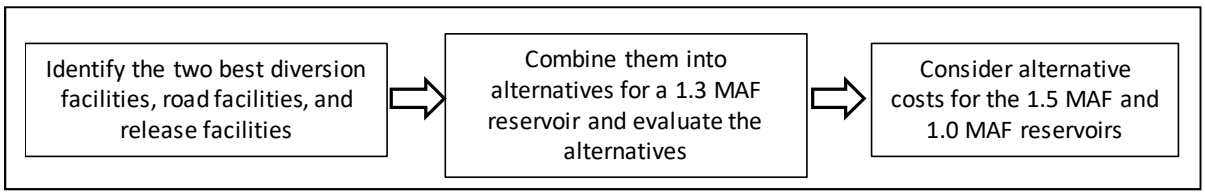
Project alternatives were developed that combine different types and sizes of diversion, release, reservoir, and road and bridge facilities described in Section 3. Initial alternatives were developed following the October 2, 2019 kickoff meeting and then refined in the following months to develop a recommended alternative. Initial alternatives are described in Appendix A. The refined alternatives are described in this section, with the preferred alternative discussed in Section 8. Figures for the refined alternatives are provided in Appendix A.

4.2 Initial Alternatives

Representatives from the Reservoir Committee and Authority Board met on October 2, 2019, to discuss approaches that could potentially lower the Project cost. Several facility modifications were identified, and appraisal-level costs are provided in this analysis to allow a comparison of alternatives. The Value Planning Analysis Technical Memorandum is in Appendix A of this report; however, additional alternatives were identified in subsequent meetings on November 15 and December 16, 2019, and during the value planning alternatives field trip on January 14, 2020. The costs for the refined alternatives are provided in Appendix A.

4.3 Evaluation of Alternatives Selected for Further Study

The following approach was used to develop and evaluate the initial alternatives (VP1 through VP4).



4.3.1 Evaluation of Facilities

Diversion Facilities: Diversion facilities considered are described in Section 3.1 and are evaluated in Table 4-1**.**

TABLE 4-1. INITIAL SCREENING OF DIVERSION FACILITIES (750 cfs)

Option	Initial Cost	Advantages	Disadvantages	Rank
Delevan Pipeline and Pumping Plant	$859M	Direct release to river	Requires new intake Impact on landowners Giant garter snake habitat High cost	Low
TCRR, Pipeline, and Pumping Plant	$634M	Existing Red Bluff pumping Independent regulation for TCCA Early fill (2-3 years earlier)	Impacts additional real estate Cost of new regulating reservoir Pipeline distance	Medium
TRR, Pipeline, and Pumping Plant	$474M	Existing Hamilton City pumping	—	Best
Funks, Channel, and Pumping Plant	$256M	Closest to Sites Reservoir No additional regulating reservoir required	Must avoid T-C Canal impacts	Best

Roads and Bridges: Options for roads and bridges at Sites Reservoir are discussed in Section 3.4 and are evaluated in Table 4-2.

TABLE 4-2. ROADS AND BRIDGES

Option	Initial Cost	Advantages	Disadvantages	Rank
South Road to Residents	$41M	Provide access to stranded property	—	Required
North Construction Bypass – construction traffic only (paved)	$30M	Avoid traffic through Maxwell	—	Required
Bridge	Varies	Shortest travel time Lower maintenance cost Less environmental impact	—	Best
South Road	$224M	Avoids bridge	Higher maintenance More acres affected	Medium

Release Facilities: Options for conveyance for releases from Sites Reservoir are discussed in Section 3.2 and are evaluated in Table 4-3.

TABLE 4-3. INITIAL SCREENING OF RELEASE FACILITIES (750 CFS)

Option	Initial Cost	Advantages	Disadvantages	Rank
Delevan Pipeline	$389M	Direct release to river	Impact on landowners Giant garter snake habitat High cost	Low
Delevan Canal	$360M	Direct release to river	Impact on landowners Giant garter snake habitat Complicates local drainage Additional pump station at CBD High cost	Low
Dunnigan to CBD[a]	$54M	Less acreage affected May avoid a 408 permit	Potential losses in CBD	Best
Dunnigan to River	$173M	Avoid loss in CBD	Impact additional acreage	Medium

[a] CBD – Colusa Basin Drain

An evaluation of conveyance facility sizing was performed, with results provided in Section 5.

4.3.2 Refined Alternatives

Four alternatives were developed for the 1.3 MAF reservoir with combinations of the highest ranked facilities to bookend the value planning options for the March 2, 2020 review meeting. An additional three alternatives were developed during the review meeting:

- Alternative VP 5 – This alternative includes a 1.3 MAF reservoir and uses the Funks Reservoir and the TRR to fill Sites Reservoir with releases (1,000 cfs) from the southern end of the T-C Canal through a pipeline that would go to the CBD.
- Alternative VP 6 – This alternative includes a 1.3 MAF reservoir and uses the Funks Reservoir and the TRR to fill Sites Reservoir with releases (1,000 cfs) from the southern end of the T-C Canal through a pipeline that would extend to the Sacramento River.
- Alternative VP 7 – This alternative This alternative includes a 1.5 MAF reservoir and uses the Funks Reservoir and the TRR to fill Sites Reservoir with releases (1,000 cfs) from the southern end of the T-C Canal through a pipeline that would go to the CBD.

The refined alternatives are shown in Table 4-4.

TABLE 4-4. RECOMMENDED ALTERNATIVE AND ALTERNATES

Major Facilities	VP5	VP6	VP7
	Alternate 1	Alternate 1A	**Recommended**
Reservoir Size	1.3 MAF	1.3 MAF	1.5 MAF
Bridge Size (avoids future traffic Interruption)	1.5 MAF	1.5 MAF	1.5 MAF
South Road to Local Residents	Included	Included	Included
Misc. Local and Project Roads	Included	Included	Included
Diversion Locations	Funks and TRR	Funks and TRR	Funks and TRR
Dunnigan Release	1,000 cfs to CBD	1,000 cfs to River	1,000 cfs to CBD
Direct Cost	$1,787,000,000	$1,870,000,000	$1,902,000,000
Non-Contract Costs	$485.000,000	$508,000,000	$516,000,000
Contingency	$557,000,000	$583,000,000	$592,000,000
Total Estimated Cost (2019 dollars)	$2,855,000,000	$2,988,000,000	$3,037,000,000

Cost estimating details are provided in Appendix A-4.

The availability of site data and design information to support preparing cost estimates varies between the facilities that constitute the Sites Reservoir project. Some facilities (like the main dams) are advanced enough to support a lower-bound Class 3 estimate as defined by the Association for Advancement of Cost Engineering, International. Other facilities, like the Dunnigan conveyance from the T-C Canal to the CBD have no supporting geotechnical evaluation and only a preliminary screening of potential utility conflicts. These estimates are at a Class 5 level.

A contingency of 10% was first applied for design, followed by a 15% contingency for construction. The compounded contingency is approximately 30% of the direct cost for construction. Non-contract costs were estimated at 17% of the total estimated cost.

5. Operational Assessment of Sites Release Capacity for Value Planning

5.1 Participant Subscriptions

The value planning alternatives evaluated the ability of several reservoir sizes and conveyance capacities to meet participant subscriptions. Table 5-1 shows the current member participation for the Sites Reservoir Project by region and delivery type. WSIP deliveries for Refuge Incremental Level 4 and Yolo Bypass are estimated to be about 40 TAFY.

TABLE 5-1. CURRENT SITES RESERVOIR PARTICIPATION

Member	Reservoir Participation (AFY)
Public Water Agencies	
North of Delta	52,142
South of Delta	140,750
Subtotal Public Water Agencies	192,892
State of California (WSIP)	
Refuge Incremental Level 4 and Yolo Bypass	~40,000
Total Requirement	~230,000

5.2 Evaluation of Reservoir Size and Release Capacity

A sensitivity analysis for a range of reservoir sizes and release capacities for Sites Reservoir was conducted to evaluate the quantity of water that could be released under different conveyance capacities. The analysis included a surrogate approximation of the potential to exchange water between Sites Reservoir and Shasta Lake based on the analysis presented in Section 5.3. This exchange would be implemented through the release of Sites water to meet Sacramento Valley CVP contract demands and Delta regulatory obligations. The exchange assumes a corresponding reduction in Shasta Lake releases that preserves storage in the lake and contributes to water temperature management and Sacramento River flow stability benefits. Based on Scenario B diversion criteria (see Table 3-1), it is assumed that approximately 60 TAF could be exchanged on an average annual basis, with most of these exchanges occurring in dry and critical water year types. This also assumes integration with the SWP to facilitate operations and deliveries to South of Delta members.

Three conveyance capacities for Sites Reservoir releases were evaluated: 750, 1,000, and 1,500 cfs. Each conveyance capacity was assessed using three storage capacities for the reservoir: 1.5, 1.3, and 1.0 MAF, with assumed reservoir dead storage of 120 TAF. All nine combinations of these capacities were run under Scenario B. For each scenario, releases from Sites Reservoir were quantified using monthly releases, as reported by CalSim II modeling. Deliveries include releases for TCCA, GCID, RD 108, Colusa County, Sacramento Valley members, South of Delta members, Refuge Level 4, and Yolo Bypass.

Table 5-2 shows average annual releases under different combinations of potential Sites storage and release capacities. -Releases highlighted in green meet current participant demand, while releases highlighted in orange do not meet current participant demands.

TABLE 5-2. SITES RESERVOIR RELEASES UNDER VARYING STORAGE AND RELEASE CAPACITIES

Storage Capacity (MAF)	Long-term Average		
	1,500 cfs Release Capacity (TAF)	1,000 cfs Release Capacity (TAF)	750 cfs Release Capacity (TAF)
1.5	253	243	236
1.3	243	234	230
1.0	207	195	191

Meets participant demand (193+40=233)

Does not meet participant demand

Table 5-3 shows average annual releases for Sacramento Valley Index water year types. Maximum Sites releases generally occur in dry water years, as highlighted yellow, because there is increased water demand and available Delta export capacity. Overall, decreasing Sites' release capacity from 1,000 to 750 cfs reduces average annual releases by 1.6 to 2.7 percent, depending on reservoir size.

Overall, decreasing Sites' release capacity from 1,500 to 1,000 cfs reduces average annual releases by 4.0 to 6.2 percent. Further reducing the release capacity to 750 cfs reduces average annual deliveries by an additional 1.6 to 2.7 percent.

Releases from Sites are greatest during dry years. Consequently, dry years are more critical to the conveyance capacity of Sites releases than any other year type. For example, the average annual delivery of a 1.5 MAF reservoir decreases by 13.5 percent when its release capacity is reduced from 1,500 to 750 cfs.

Based on this sensitivity analysis, the combination of a 1.5 MAF reservoir and a 1,000 cfs release capacity provides about a 243 TAF average annual release for Sites Reservoir, which meets current participation and provides additional operational flexibility.

TABLE 5-3. SITES RESERVOIR RELEASES UNDER VARYING STORAGE AND RELEASE CAPACITIES, BY WATER YEAR TYPE

Year Type	Storage Capacity (MAF)	1,500 cfs Release Capacity (TAF)	1,000 cfs Release Capacity (TAF)	750 cfs Release Capacity (TAF)
Wet	1.5	115	116	112
	1.3	122	115	113
	1.0	118	112	109
Above Normal	1.5	275	286	280
	1.3	287	299	303
	1.0	185	186	194
Below Normal	1.5	285	273	277
	1.3	278	263	266
	1.0	237	217	213
Dry	1.5	422	382	365
	1.3	392	364	345
	1.0	343	309	301
Critically Dry	1.5	243	237	225
	1.3	205	204	204
	1.0	185	184	177

Note: Recommended range to account for uncertainty is simulated values less 30,000 acre-feet.

5.3 Evaluation of Potential for Shasta Lake Exchange

The Ad Hoc Value Planning Workgroup wanted to evaluate the proposed alternatives without Reclamation investing in the Project financially. In this scenario, water stored in Sites Reservoir could be exchanged with Shasta Lake to meet CVP TCCA agricultural water service and Settlement Contractor obligations as well as downstream flow and Delta water quality requirements. Therefore, a portion of the water demand within the CVP service area along the T-C Canal and GCID Main Canal south of Sites Reservoir could be met from releases from Sites Reservoir in the spring and allow an equal amount of water to be retained in Shasta Lake (via exchange) to improve summer cold water pool management.

The exchange could occur when Sacramento River flows at Keswick and temperatures at Clear Creek are within a specific range and not compromised by reduced Shasta Lake releases into the Sacramento River. This exchange would likely occur in April through May (and possibly June) in dry and critically dry years.

Shasta Lake releases of exchange water are proposed to be scheduled to benefit downstream temperatures in the Sacramento River, which would likely occur in September, October, or November. Withdrawals from Shasta would be coordinated with Reclamation. Based on conversations with Reclamation, this analysis assumes that no carryover storage of exchange water would be allowed between years.

The exchange operation would likely be subject to the following constraints provided by Reclamation to protect the interests of the CVP and to comply with State and federal laws and regulations:

- All water stored in Shasta would be subject to spill at any date and would be the first water in Shasta to spill.
- All operations associated with this exchange would be subject to river temperature constraints. This ensures there is no impact by reducing releases to store, and ensures a benefit when water is released later in the year.
- All operations are subject to approval by the State Water Resources Control Board and must comply with any applicable State or federal laws, regulations, or guidelines.

A post-processing analysis was performed for the 82-year simulation period of CalSim II to evaluate Shasta exchanges under a series of criteria that were assumed for the Sacramento River at Clear Creek, Keswick flow, Shasta storage, and water year types.

Figure 5-1 shows the exceedance probability of the annual volume of exchangeable water (TAF) for the nine scenarios evaluated. Overall, the annual exchange with Shasta ranges from 0 to 300 TAF for the scenarios with no Delevan Pipeline.

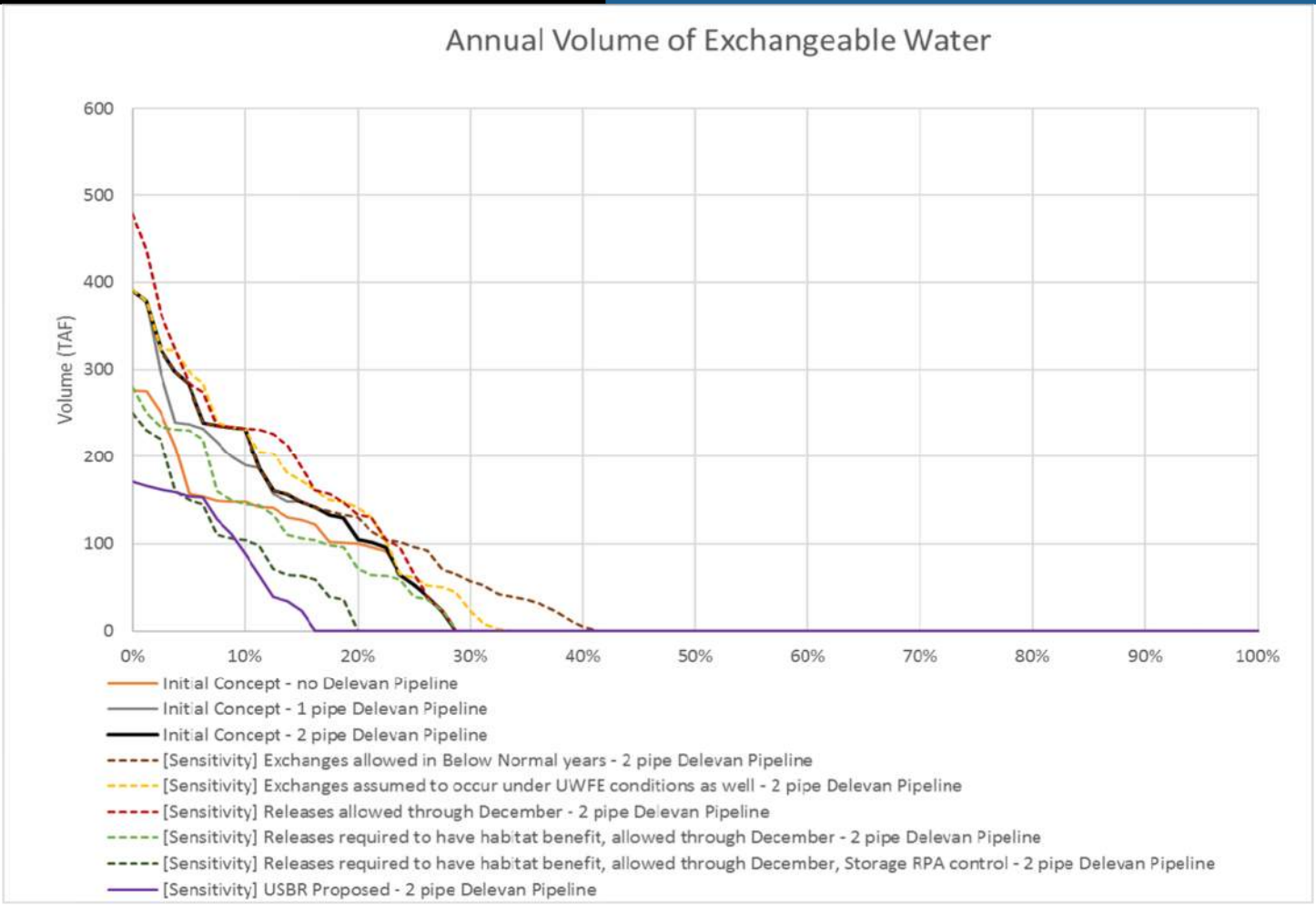


FIGURE 5-1. ANNUAL VOLUME OF EXCHANGEABLE WATER WITH SHASTA LAKE

5.4 Evaluation of T-C Canal Available Capacity

A screening analysis of historical daily diversion data was completed to estimate available capacity in the lower T-C Canal below Funks Reservoir for conveyance of releases from Sites Reservoir. Based on an approximation of the proportion of total T-C Canal diversions that were conveyed in the canal below Funks Reservoir, it appears the lower T-C Canal may have up to 1,000 cfs of available capacity for Project releases on an average monthly basis, during the peak summer diversion season when TCCA contractors receive a 100 percent contract allocation.

A check was then conducted to verify that the T-C Canal had enough available capacity to convey Sites releases to TCCA members, plus additional Sites releases to the Sacramento River. An analysis was conducted of Sites Reservoir monthly releases through the T-C Canal to the TCCA members using a 1,000 cfs conveyance capacity and three different storage capacities (1.0, 1.3, and 1.5 MAF). For this particular analysis, the releases assume no exchange with Shasta Lake. The results of this analysis indicate that simulated monthly Sites deliveries to T-C Canal members along the canal never exceed more than 500 cfs, while total deliveries through the T-C Canal, including South of Delta releases, rarely exceed 1,100 cfs. Based on this preliminary analysis, the lower T-C Canal appears to have sufficient capacity to convey CVP TCCA contractor deliveries, Sites releases to TCCA members, plus additional Sites releases to the Sacramento River, during the peak summer diversion season.

5.5 Evaluation of Colusa Basin Drain Available Capacity

The rate of flow from the Colusa Basin Drain into the Sacramento River through the Knight's Landing Outfall Gates (KLOG) depends on the differential stage in the Sacramento River and in the CBD at KLOG. The stage

in the CBD at KLOG is dependent upon the operation of both KLOG and the Wallace Weir. The flow in the CBD has historically been difficult to measure due to backwater effects.

RD 108 completed an appraisal level assessment of historical flows through KLOG to estimate a range of flows that generally result in flooding of adjacent agricultural fields. Flooding was estimated to occur with flows ranging from 1,370 cfs to 2,220 cfs indicating that flows of 1,000 cfs from Sites are possible, though further analysis should be conducted.

Using the CBD for conveyance of Sites Reservoir water will include coordination with the local landowners regarding the project operation and timing of the additional flows. In order to understand how water released from Sites Reservoir could be moved through the CBD and into the Sacramento River at Knights Landing, the hydraulics between the CBD, KLOG, and Wallace Weir need to be investigated.

5.6 Operations Conclusions

Based on the preliminary analysis performed, the value planning alternatives with reservoir sizes of 1.3 to 1.5 MAF, including Scenario B Diversion Criteria, would be able to provide enough water to meet current participant demands. In addition, the use of the T-C Canal and the CBD as the conveyance systems appears possible based on preliminary analysis. Additional hydraulic analyses will be needed to confirm downstream conveyance conditions in the CBD, and the capacity of the T-C Canal downstream of Funks Reservoir should be confirmed. Discussions with Reclamation on non-investment exchanges with Shasta Lake are ongoing. Annual average Shasta Lake exchanges included with Scenario B analyses are estimated at about 60 TAF. While field verification and additional analysis are required, the value planning alternatives with reservoir sizes of 1.3 to 1.5 MAF appear feasible from an operations standpoint.

6. Environmental and Permitting Assessment of Alternatives

Appendix C summarizes considerations for the value planning effort from the environmental planning and permitting perspective and includes the following:

- Key differences between the value planning alternatives when compared with Alternative D, as described in the Draft EIR/EIS
- Species within the alternative's footprint that could potentially be affected through construction and operation of the Project
- Key permits and approvals required to construct and operate the Project, including any additional regulatory requirements beyond those identified in the Draft EIR/EIS
- Environmental planning considerations related to California Environmental Quality Act/National Environmental Policy Act (CEQA/NEPA) analysis
- Qualitative change in mitigation cost as compared with Alternative D
- A relative weighting associated with environmentally related criteria (and associated metrics) compared with Alternative D.

6.1 Environmental Permitting Assessment

The analysis of the value planning alternatives determined that the alternatives considered (Alternatives 1 through VP7) would result in little, if any, substantial change in timing or cost of key permits because of the same relative magnitude of impacts associated with the Project footprint and operations when compared with Alternative D. However, using the scoring methodology provided in Table 4 of Appendix C, obtaining permits from regulatory resource agencies for Alternatives 5a, 6a, VP1, VP2, VP5, and VP7 would be relatively easier because of the (1) reduced inundation areas (within reservoir footprint), (2) lack of a pipeline easement to the Sacramento River, (3) removal of the northern regulating reservoir facilities, and (4) shorter conveyance off the T-C Canal (to CBD).

6.2 Environmental Planning Assessment

The Draft EIR/EIS identified potentially significant environmental effects on aquatic, botanical, and terrestrial biological resources. However, with the exception of golden eagles, mitigation was identified to reduce effects to less than significant levels. Similarly, effects on wetlands and other jurisdictional waters were considered less than significant after implementation of proposed mitigation. However, the Draft EIR/EIS determined that Alternative D (as well as the other build alternatives) would result in potentially significant and unavoidable direct and indirect effects to (1) terrestrial biological resources (golden eagle), (2) paleontological resources, (3) cultural resources (historical and tribal resources, human remains), (4) land use (community of Sites and existing land uses), (5) air quality, (6) climate change and greenhouse gas emissions, and (7) growth-inducing impacts.

Appendix C provides CEQA/NEPA considerations for each alternative vetted during the value planning process. As with permitting, considerations were developed in a screening-level comparison to Alternative D. Table 6-1 briefly discusses the CEQA/NEPA considerations associated with each of the refined value planning alternatives identified on March 2, 2020. It should be noted that each of the value planning alternatives addressed below rely substantially on the use of existing conveyance facilities and minimize the need for new construction and associated ground disturbance, thereby reducing overall environmental effects.

TABLE 6-1. VALUE PLANNING CEQA/NEPA CONSIDERATIONS

Alternative	CEQA/NEPA Key Considerations
VP5 Alternate 1	Reduction in reservoir size may reduce effects on cultural, biological, and land use (agriculture) resources, but not to less-than-significant levels. Elimination of the Delevan pipeline or canal would potentially reduce land use (agricultural) effects, but effects would likely still be considered significant and unavoidable for the overall Project. Earthfill dam rather than rockfill dam would need to be analyzed for potential changes in environmental effects. Release from the southern terminus of the T-C Canal to the CBD would require additional study.
VP6 Alternate 1A	Similar to Alternative VP5, reduction in reservoir size may reduce effects on cultural, biological, and land use (agriculture) resources, but not to less-than-significant levels. Elimination of Delevan pipeline or canal would potentially reduce agricultural effects, but effects would likely still be considered significant and unavoidable for the overall Project. Release from the southern terminus of the T-C Canal would require additional study; the proposed Dunnigan pipeline to Sacramento River may affect federal project levees (though likely less than Alternative D). Earthfill dam rather than rockfill dam would need to be analyzed for potential changes in environmental effects.
VP7 Recommended	Similar to VP5 and VP6, reduction in reservoir size may reduce effects on cultural, biological, and land use (agriculture) resources, but not to less-than-significant levels. Elimination of Delevan pipeline or canal would potentially reduce agricultural effects, but effects would likely still be considered significant and unavoidable for the overall Project. Earthfill dam rather than rockfill dam would need to be analyzed for potential changes in environmental effects. Release from the southern terminus of the T-C Canal to the CBD would require additional study.

7. Costs and Repayment

7.1 Cost Estimates

Construction cost estimates were derived from detailed appraisal-level estimates for a 1.3 MAF reservoir (Alternative A in the EIR/EIS and feasibility report) and for a 1.8 MAF reservoir (Alternative D in the EIR/EIS and feasibility report). These estimates reflect the current Project concepts and conceptual level of Project design, with appropriate allowances for contingencies, non-contracts costs, and forward escalation. Other project-related costs are also provided, including environmental mitigation and temporary and permanent easement acquisition. Estimated prices were developed in October 2015 dollars in support of the Authority's

WSIP application and have been escalated in this estimate. Additional details on the estimate are provided in Appendix A.

7.2 Repayment Analyses

7.2.1 Methodology

A repayment analysis based on the estimated construction, operations, and maintenance costs, and the estimated releases, was conducted to estimate the annual repayment costs per AF of releases from Sites Reservoir. The analysis was conducted both with and without a Water Infrastructure Finance and Innovation Act (WIFIA) loan. The methodology was very similar to prior value planning analysis conducted in late 2019 and as described in the full financial model technical memorandum in Appendix D. One item of significant note is that the reporting base year has changed versus that analysis, resulting in an increase of cost per acre-feet due to inflation. Participants' annual costs are provided in 2020 dollars. When comparing with the prior metric of using 2018 dollars, a $600/AF cost at a 2% inflation rate will add approximately $25 by reporting in 2020 dollars.

7.3 Key Assumptions

The analysis was conducted using the full amount of the U.S. Department of Agriculture (USDA) loan available to construct the Maxwell Intertie. This loan of $439 million is at a lower interest rate (3.85 percent) than the revenue bond assumed interest rate (5.00 percent). This analysis assumes that Project changes would not affect the terms of the USDA loan. The use of the USDA loan results in an overall reduction in the cost by approximately $20 per acre-foot. A full table of assumptions is provided in Appendix D.

7.4 Repayment Results

The ability to reduce project costs to approximately $3 billion while still constructing a 1.5 MAF reservoir and thereby maintaining higher releases (ranging from 230 to 243 TAF of average annual releases) results in a reduction in the dollar per acre-feet repayment down to the $600 range in 2020 dollars. This range of payments – which is lower than the VP1 through VP4 alternatives - can be seen in the VP5, VP6, and VP7 scenarios (Table 7-1). A cash flow tool, including operations and maintenance costs and annualized debt service, is included as Attachment D-2.

TABLE 7-1. ANNUAL REPAYMENT COSTS PER ACRE-FOOT OF RELEASE

	VP1			VP2			VP3		VP4		VP5	VP6	VP7
Reservoir Size (MAF)	1.0	1.3	1.5	1.0	1.3	1.5	1.3	1.5	1.3	1.5	1.3	1.3	1.5
Release Capacity (cfs)	750			750			1,500		1,000		1,000	1,000	1,000
Project Cost (2019 $, billions)	3.2	3.4	3.6	2.7	2.9	3.1	3.4	3.6	2.9	3.1	2.9	3.0	3.0
Annualized acre-feet/year Release (TAF)	191	230	236	191	230	236	243	253	234	243	234	234	243
PWA Annual Costs During Repayment Without WIFIA[a] Loan (2020 $, $/acre-feet)	862	776	805	730	667	693	738	754	660	678	644	674	661
PWA Annual Costs During Repayment With WIFIA Loan (2020 $, $/acre-feet)	799	724	755	665	614	641	689	708	608	628	592	621	611

[a] Water Infrastructure Finance and Innovation Act

8. Recommended Project

The recommended Project was developed by the Ad Hoc Value Planning Workgroup through a sequential process that included initial and refined alternatives. Important considerations included total project cost, impacts on landowners, impacts on traffic and public safety, ability to meet participant demands, ability to provide public benefits to the State, relative magnitude of environmental impacts, and the estimated cost per acre-foot of water delivered. The recommended Project and two options for consideration are shown in Table 8-1.

TABLE 8-1. VALUE PLANNING GROUP RECOMMENDED PROJECTS

	VP5	VP6	VP7
	Option 1	Option 2	Recommended
Reservoir Size	1.3 MAF	1.3 MAF	1.5 MAF
Dunnigan Release Capacity (cfs)	1,000 cfs to CBD	1,000 cfs to River	1,000 cfs to CBD
Estimated Cost (2019 dollars)	$2,855,000,000	$2,988,000,000	$3,037,000,000
Estimated Cost per Acre-Foot with WIFIA[a] (2020)	$592	$621	$611
Estimated Deliveries (Long-Term Average in TAF)	234	234	243

[a] Water Infrastructure Finance and Innovation Act

The recommended project (Alternative VP7) includes a 1.5 MAF reservoir to provide additional storage for dry and critical years. All options include a bridge to minimize travel times and provide emergency access for communities on the west side of the reservoir. The bridge for all options was sized based on the maximum water surface elevation for a 1.5 MAF facility to avoid future traffic impacts that could arise if climate change or other factors necessitated expanding a smaller reservoir. All alternatives also include a new unpaved road to maintain access for residents along the southern portion of the reservoir.

All options, including the recommended alternative, would release water through the T-C Canal. A 1,000 cfs release near the end of the canal would deliver water to either the CBD (Alternatives VP5 and VP7) or to the Sacramento River (Alternative VP6).

The Value Planning Workgroup recommends the Project proceed as Alternative VP7. Although Alternative VP5 had the lowest overall cost and lower cost per acre-foot, the Value Planning Workgroup recommends VP7 based on higher deliveries at a comparable cost and improved operational flexibility with a 1.5 MAF reservoir. The proposed facility locations associated with VP7 are shown in Figure 8-1.

The Value Planning Workgroup also recommends the subsequent analyses of the Project include a 1.3 MAF reservoir (per VP5) and a Dunnigan to Sacramento River 1000 cfs release pipeline (per VP6) in order to provide flexibility to respond to any future condition changes that might result in such facilities becoming preferable.

The Recommended Project results in the following significant changes to the original Alternative D 1.8 MAF Project:

- Reduced project size and footprint
- Reduced Sacramento River diversions
- Elimination of Delevan Sacramento River diversion and release facility
- Elimination of Delevan Pipeline and associated impacts to landowners and wildlife refuges along that alignment
- Reduced costs and improved affordability to the Project's funding participants.

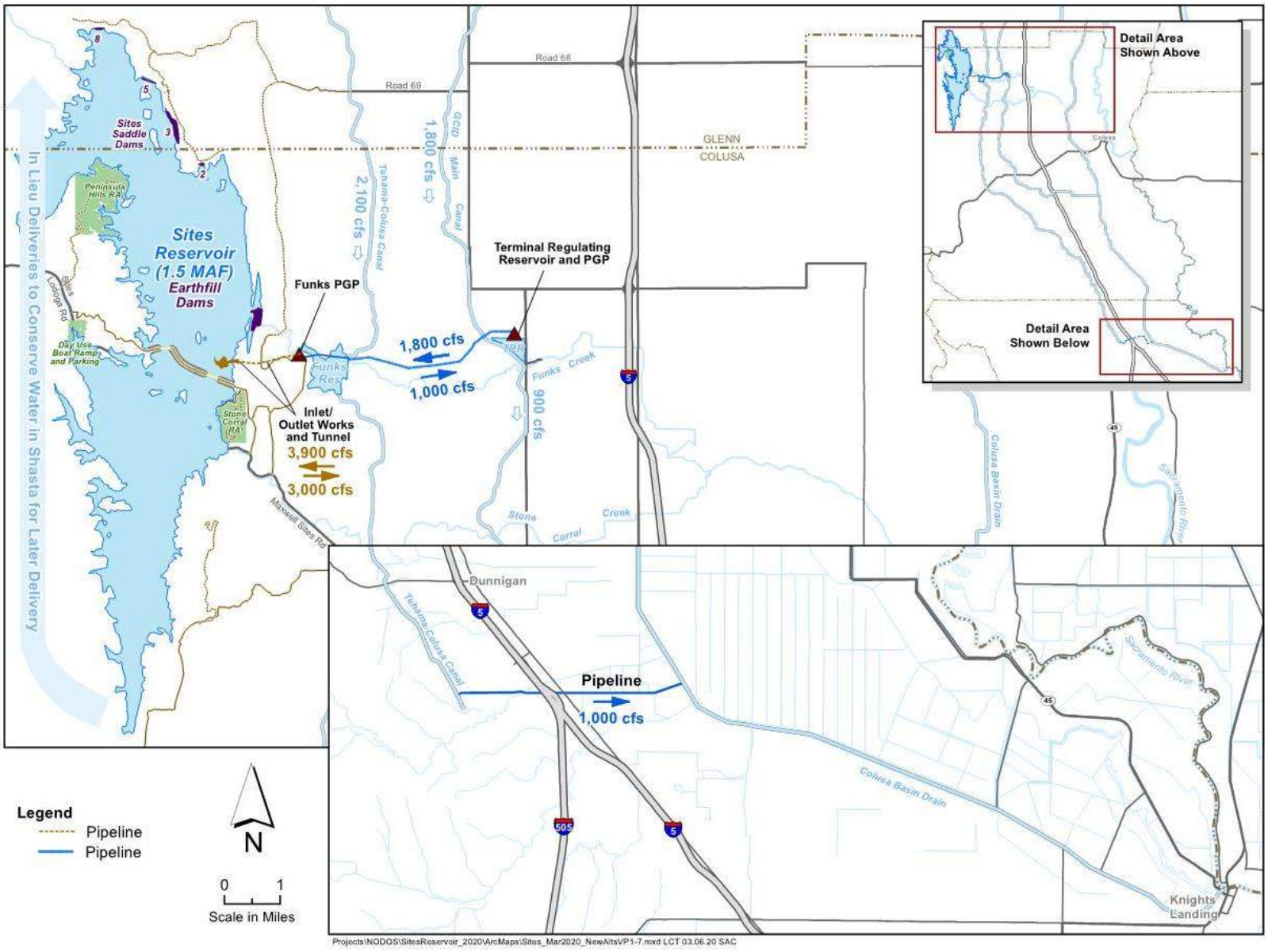


FIGURE 8-1. RECOMMENDED VALUE PLANNING ALTERNATIVE (VP7)

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Appendix A – Value Planning Alternatives and Costs

Value Planning Analysis Technical Memorandum

Sites Program Management Team

To:	Mike Azevedo, Lewis Bair, Thad Bettner, Gary Evans, Rob Kunde, Shelly Murphy, Randall Neudeck, Dan Ruiz, Jeff Sutton, Jamie Traynham, Bill Vanderwaal
CC:	Rob Tull
Date:	November 13, 2019
From:	Joe Barnes, Jeff Herrin, Pete Rude (Jacobs), Jeff Smith (Jacobs)

1.0 Value Planning Effort

Representatives from the Reservoir Committee and Authority Board met on October 2, 2019 to discuss approaches that could potentially lower the cost of the project. Several facility modifications were identified, and appraisal level costs are provided in this analysis to allow a comparison of alternatives.

At this level of evaluation, the analysis is useful for identifying alternatives that merit further evaluation. The analysis is not sufficiently refined to distinguish between two alternatives of similar cost (e.g., + 10 to 15%).

Construction cost estimates for many of the facilities were derived from appraisal-level estimates for a 1.3 million acre feet (MAF) reservoir (Alternative A in the Environmental Impact Report/Environmental Impact Statement [EIR/S] and feasibility report) and for a 1.8 MAF reservoir (Alternative D in the EIR/S and feasibility report). Several new facilities were estimated, where possible using the unit rates from similar facilities in the existing estimates. Estimated prices were developed in October 2015 dollars and have been escalated in this estimate.

The actual project construction cost ultimately would depend on the final design details of the preferred project alternative and the labor and material costs, market conditions, and other variable factors existing at the time of bid. Accordingly, the final project cost is expected to vary from the preliminary estimates presented in this section.

2.0 General Limitations

AECOM represents that our services were conducted in a manner consistent with the standard of care ordinarily applied as the state of practice in the profession within the limits prescribed by our client. No other warranties, either expressed or implied, are included or intended in this brief appraisal-level cost estimate.

We have used background information, conceptual designs, and data by others to prepare this appraisal-level cost estimate. We have relied on this information, as furnished, and is neither responsible for nor has confirmed the accuracy of this information.

The appraisal-level cost estimate presented herein is for the current study only and should not be extended or used for any other purposes.

3.0 Value Planning Facility Options and Alternatives

The meeting on October 2, 2019 identified both modifications to previously evaluated facilities and alternative facilities to reduce cost. A comprehensive table showing approximately 59 facility options that were considered in this analysis, along with their respective costs, is provided in Attachment 2.

There are numerous ways of combining the individual facility options into alternatives. To speed the analysis, we have looked at nine complete alternatives. There are many other ways of combining the facilities that can be further evaluated at the direction of the Value Planning working group.

The initial alternatives are shown in Table 1.

Table 1. Initial Alternatives for consideration.

Features	Initial Alternatives								
	1	2	3	4a	4b	5a	5b	6a	6b
1.5 MAF Reservoir	•	•	•	•	•	•	•	•	
1.3 MAF Reservoir									•
Funks/Sites PGP	•	•		•	•	•	•		
TCRR and Upgraded TRR PGP			•					•	•
Delevan Canal/Pipeline Release	•	•	•	•	•				
Dunnigan Canal to CBD Release						•		•	
Dunnigan to River Release							•		•
Multi-Span Bridge	•		•	•	•	•	•	•	•
South Road to Lodoga		•							
South Road to Residents	•		•	•	•	•	•	•	•
Rockfill Embankment Dam	•	•	•			•	•		
Earthfill Dam				•				•	•
Hardfill Dam					•				

MAF = million acre feet
PGP = Pumping/Generating Plant
TCRR = Tehama-Colusa Regulating Reservoir
TRR = Terminal Regulating Reservoir

For purposes of comparison, we have included Alternative D, the alternative presented in the WSIP application in the comparison of alternatives. The new alternatives include the following:

- Alternative 1 – Refer to Figure 1. This alternative reduces the size of the reservoir to 1.5 MAF and uses a multi-span bridge to reduce costs. The other features are generally consistent with Alternative D.

- Alternative 2 – Refer to Figure 2. This alternative is very similar to Alternative 1 but uses the southern road with the more direct route to Lodoga in place of the bridge.

- Alternative 3 – Refer to Figure 3. This alternative eliminates the Sites Pumping/Generating Plant and replaces it with the Tehama-Colusa Regulating Reservoir (TCRR) and Pumping Plant near Road 69 in combination with an upgraded Terminal Regulating Reservoir (TRR) to fill Sites Reservoir. Water would be released to the Sacramento River through a canal/pipeline to the Delevan release structure. The canal portion would begin at the TRR and continue east to the Colusa Basin Drain (CBD). It would be necessary to siphon under the CBD and pump the water to the river. The two-span bridge is used in this alternative.

- Alternatives 4a and 4b – Refer to Figures 4a and 4b. These alternatives include the single Sites Pumping/Generating Plant (PGP) with releases through the Delevan Canal/Pipeline. Alternative 4a uses an earthfill dam and Alternative 4b uses a hardfill dam in place of the zoned rockfill dam.

- Alternatives 5a and 5b – Refer to Figures 5a and 5b. These alternatives replace the Delevan Canal/Pipeline with a southern release near the southern terminous of the Tehama-Colusa (T-C) Canal. Alternative 5a releases water to the CBD. Water released to the CBD would be conveyed through the lower portion of the CBD to the Sacramento River. Alternative 5b conveys water by canal to the CBD, then uses a siphon and pumping plant to convey water on to the river.

- Alternatives 6a and 6b – Refer to Figures 6a and 6b. These alternatives combine the TCRR and upgraded TRR with the southern release structure and an earthfill dam. Alternative 6a appears to have the lowest construction cost.

A summary of alternative costs, including a cost comparison with Alternative D, is included in Table 2.

Table 2. Summary of Estimated Costs

Alternative	Estimated Costs ($2018) (financing cost not included)	Cost Reduction from Alternative D
Alternative D	$5,235 million	0%
Alternative 1	$3,970 million	24%
Alternative 2	$3,988 million	24%
Alternative 3	$3,868 million	26%
Alternative 4a	$3,828 million	27%
Alternative 4b	$3,861 million	26%
Alternative 5a	$3,548 million	32%
Alternative 5b	$3,876 million	26%
Alternative 6a	$3,417 million	35%
Alternative 6b	$3,584 million	32%

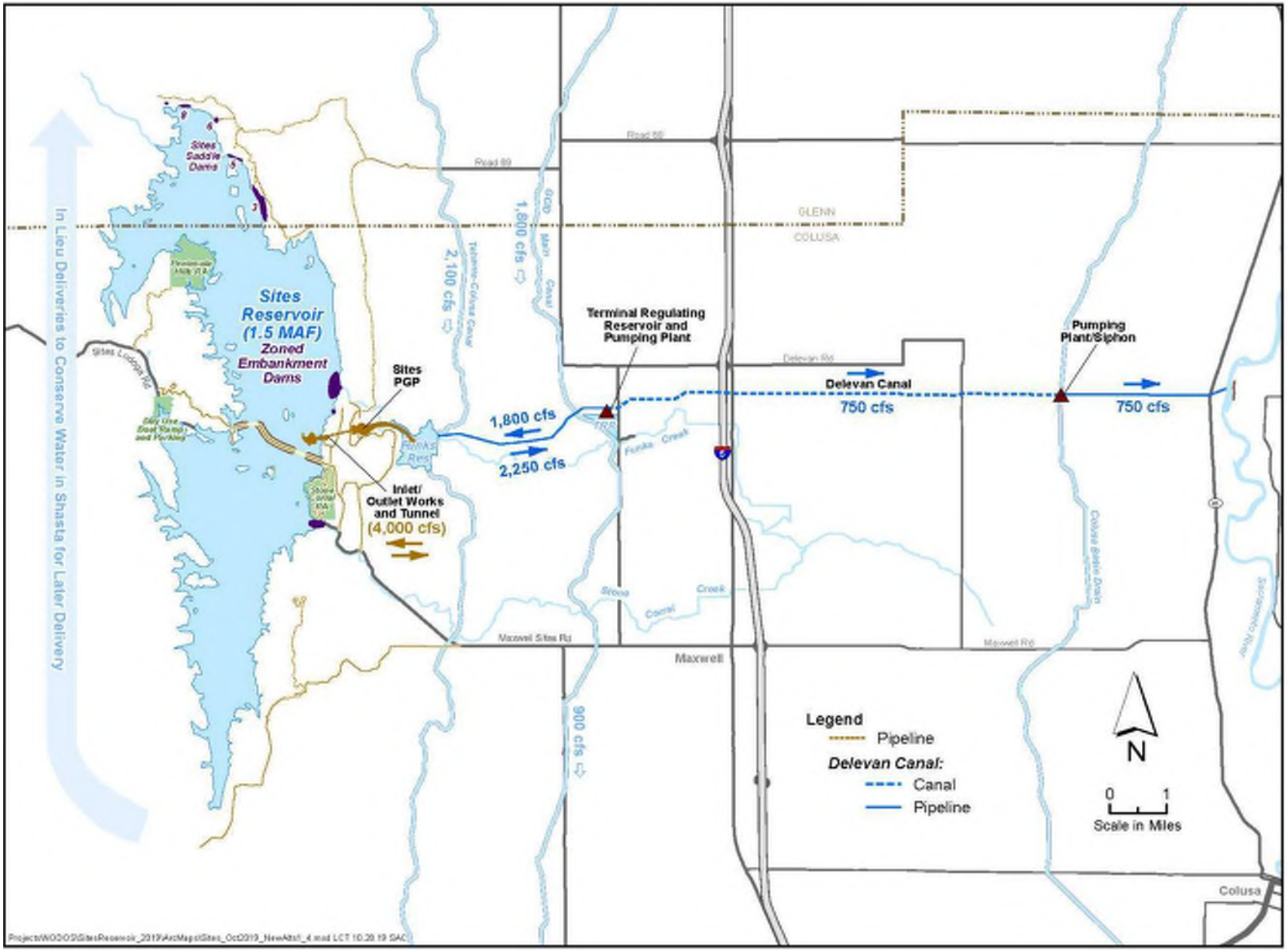


Figure 1. Alternative 1 (Estimated cost - $3,970 million)

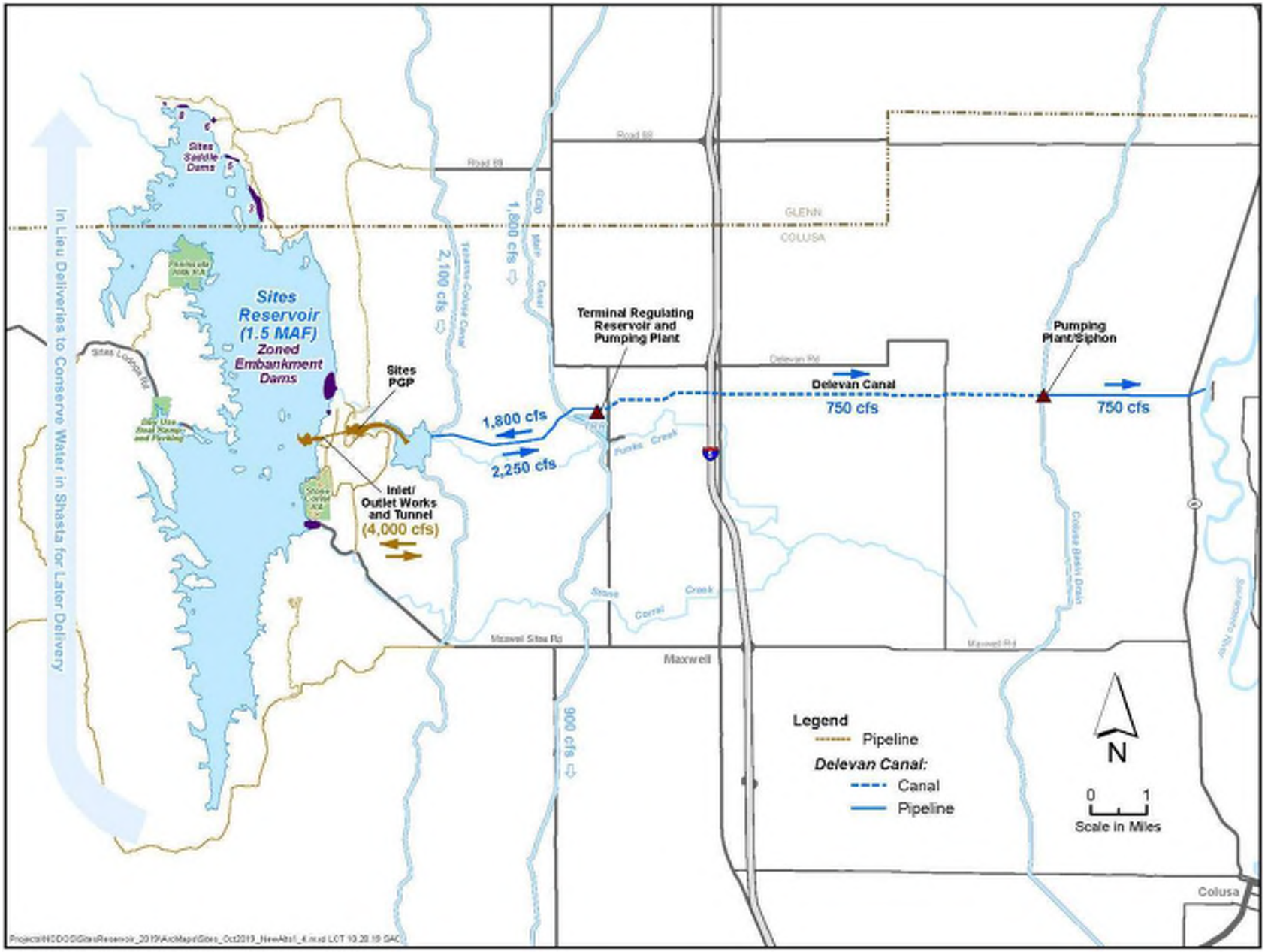


Figure 2. Alternative 2 (Estimated cost - $3,988 million)

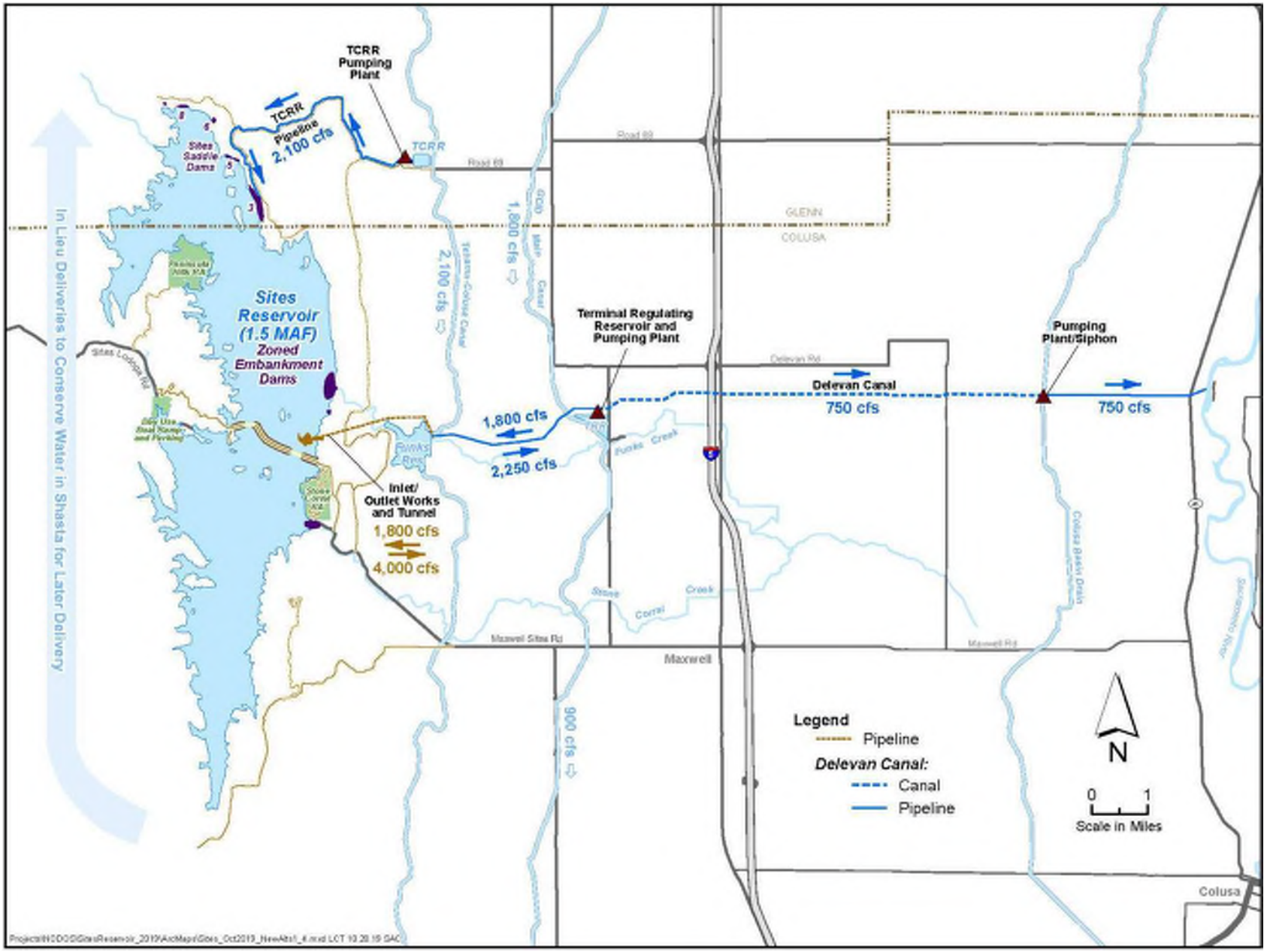


Figure 3. Alternative 3 (Estimated cost - $3,868 million)

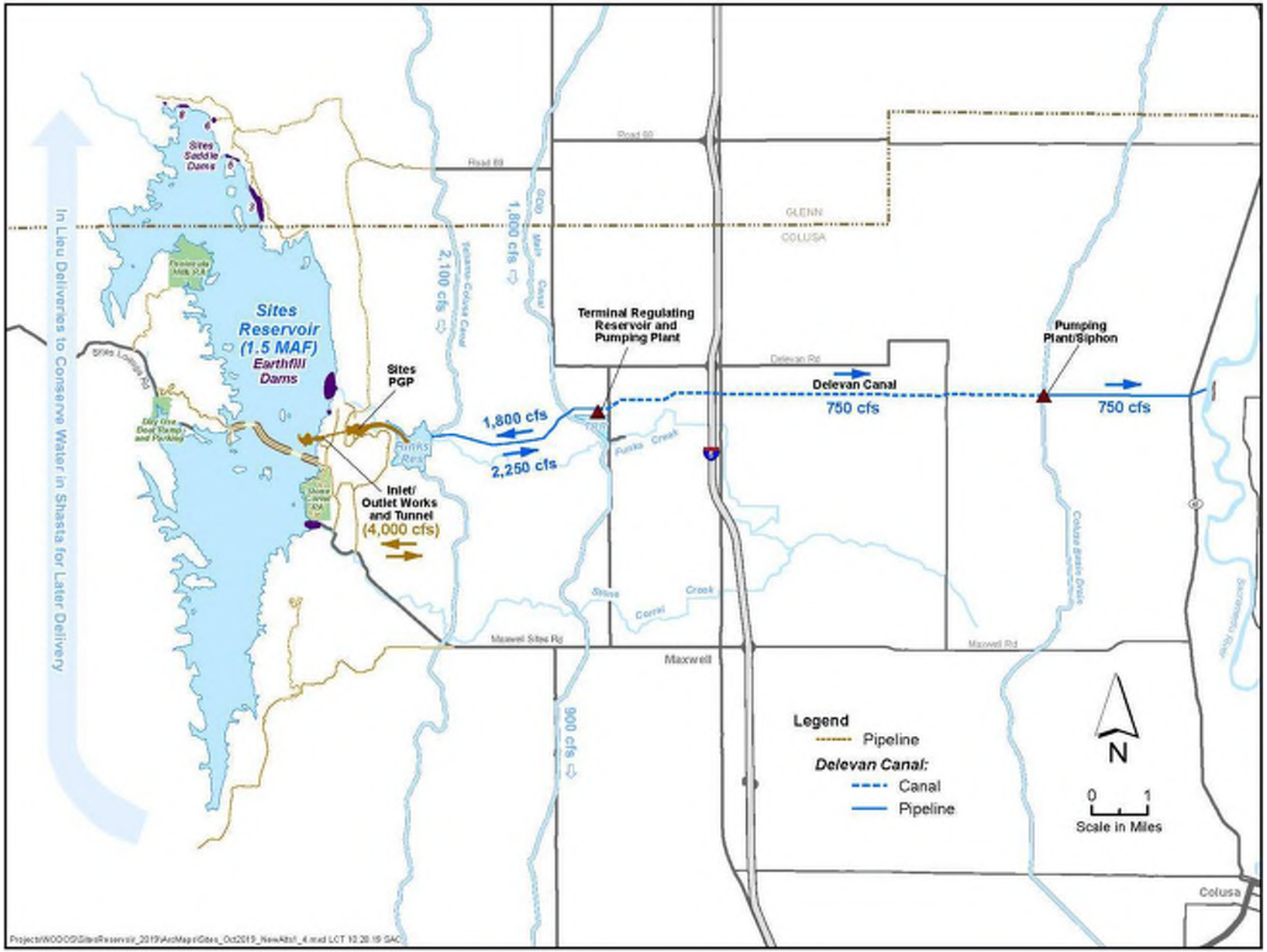


Figure 4a. Alternative 4a (Estimated cost - $3,828 million)

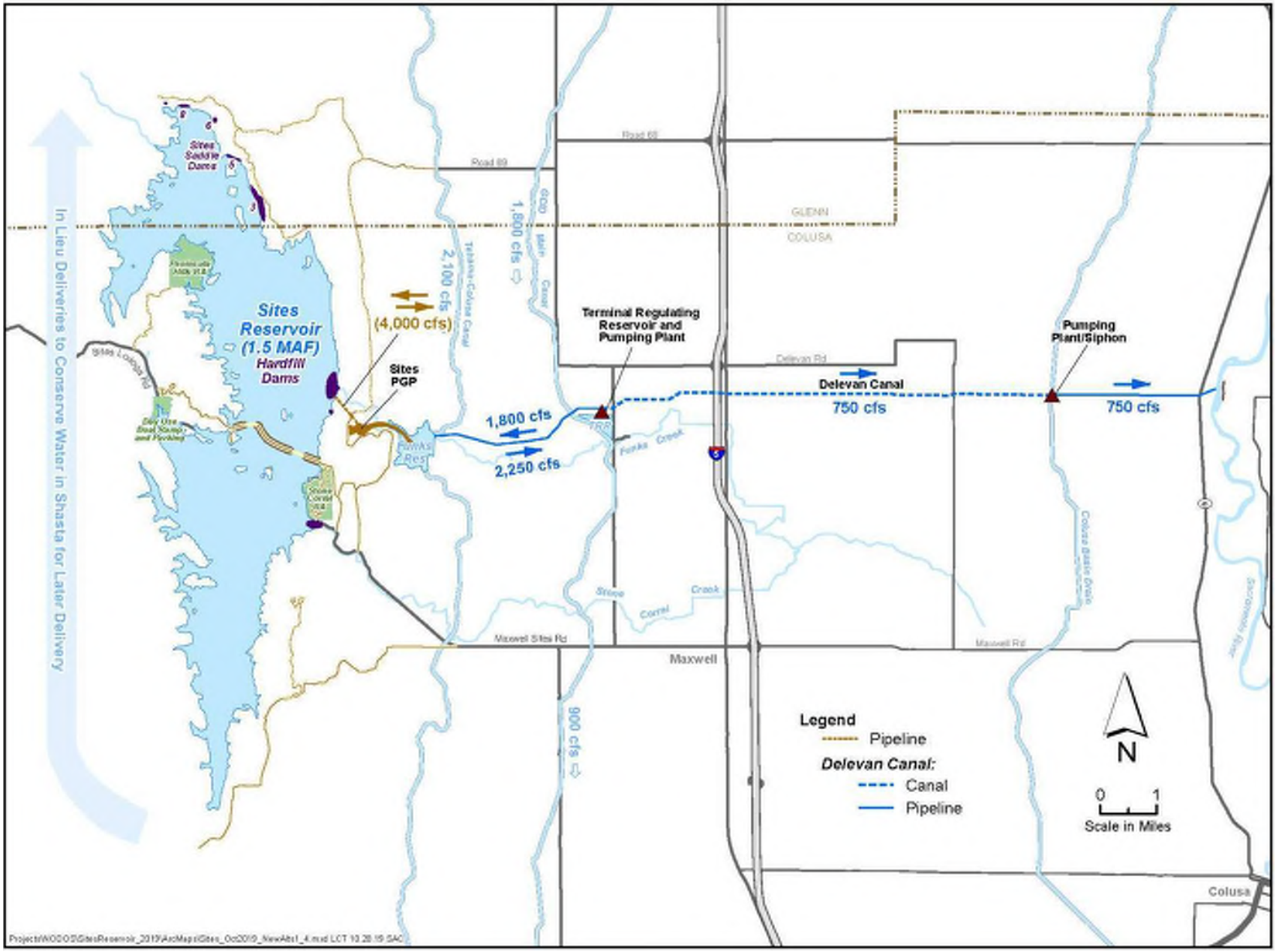


Figure 4b. Alternative 4b (Estimated cost - $3,861 million)

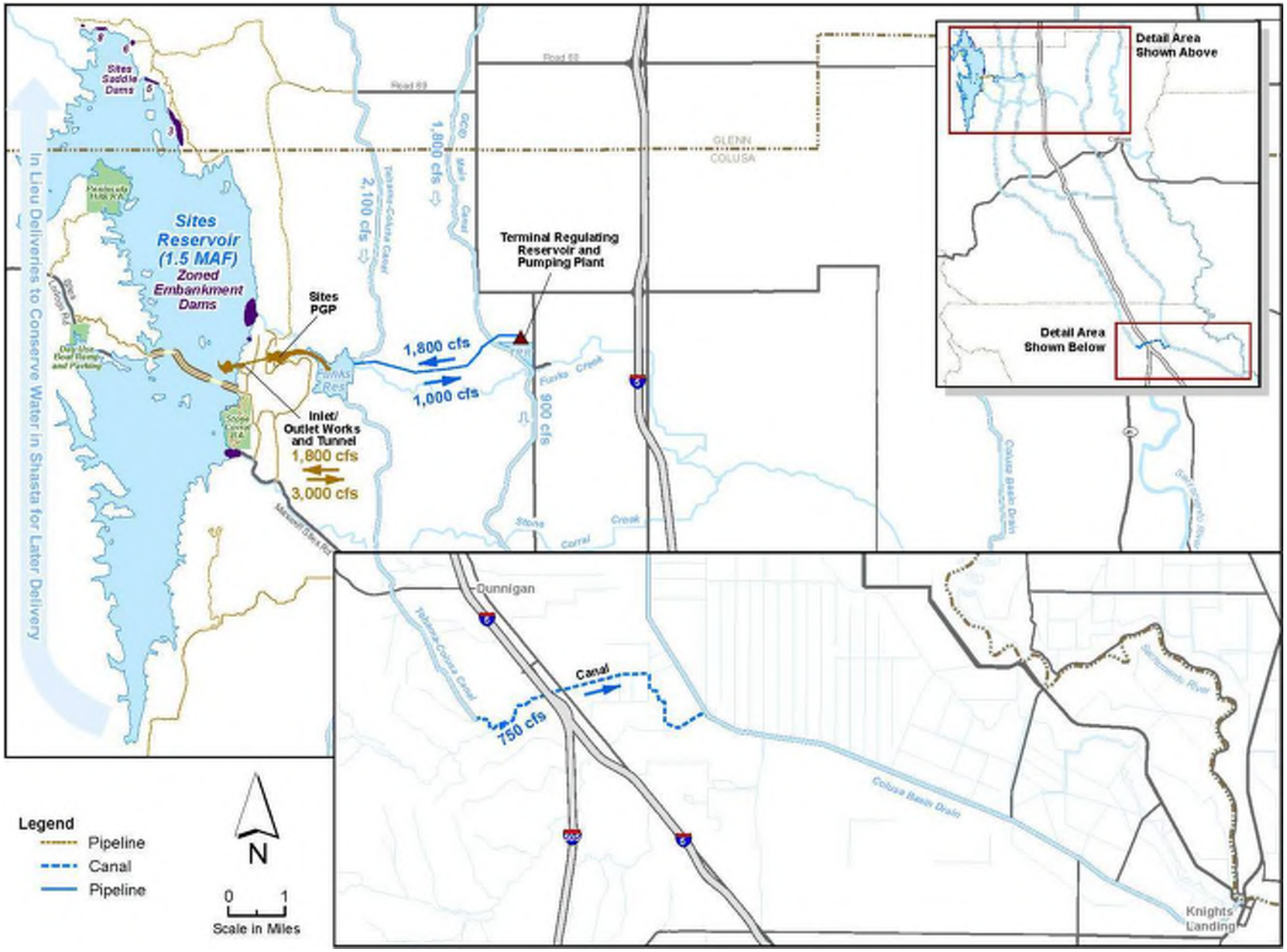


Figure 5a. Alternative 5a (Estimated cost - $3,548 million)

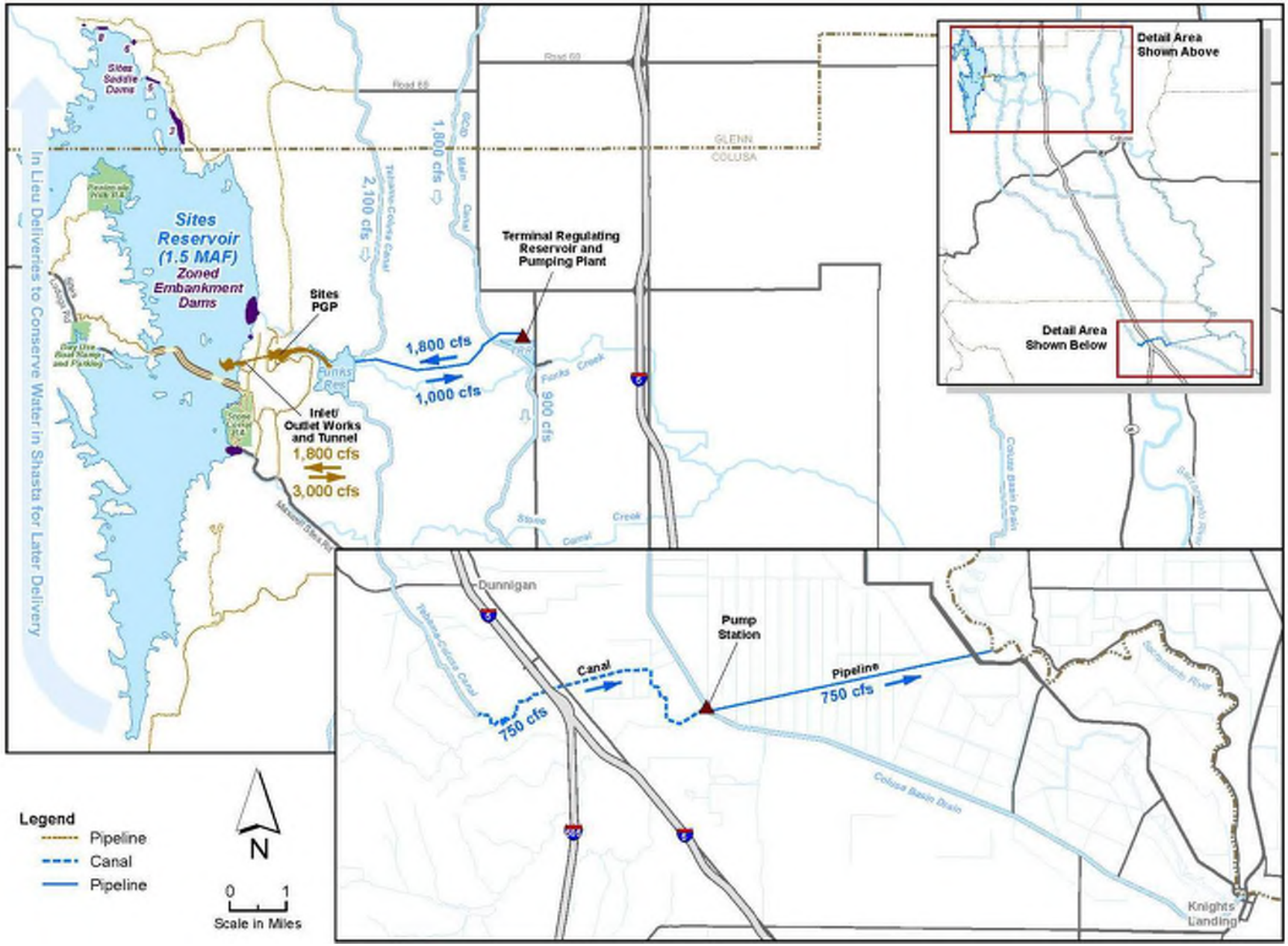


Figure 5b. Alternative 5b (Estimated cost - $3,876 million)

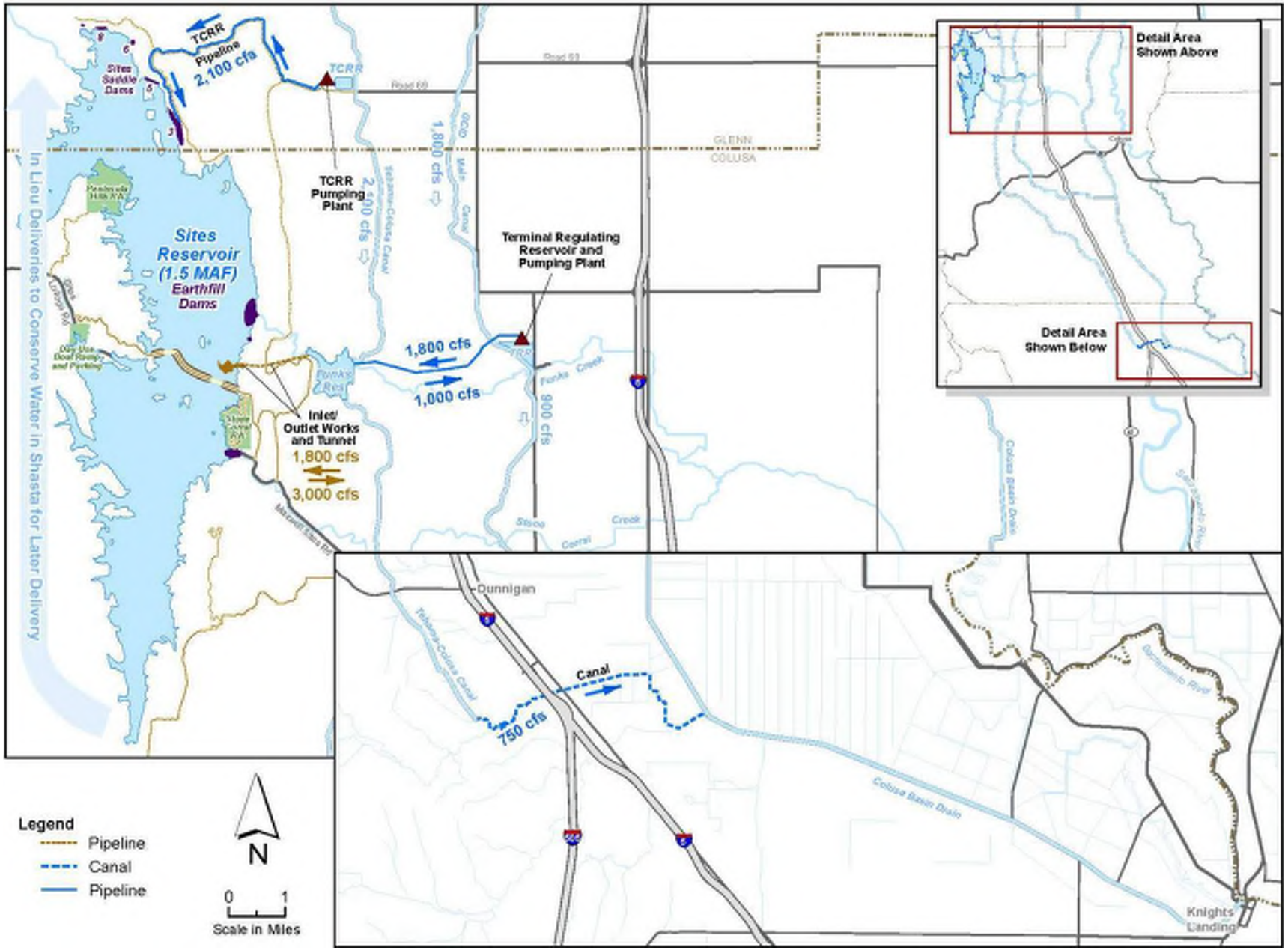


Figure 6a. Alternative 6a (Estimated cost - $3,417 million)

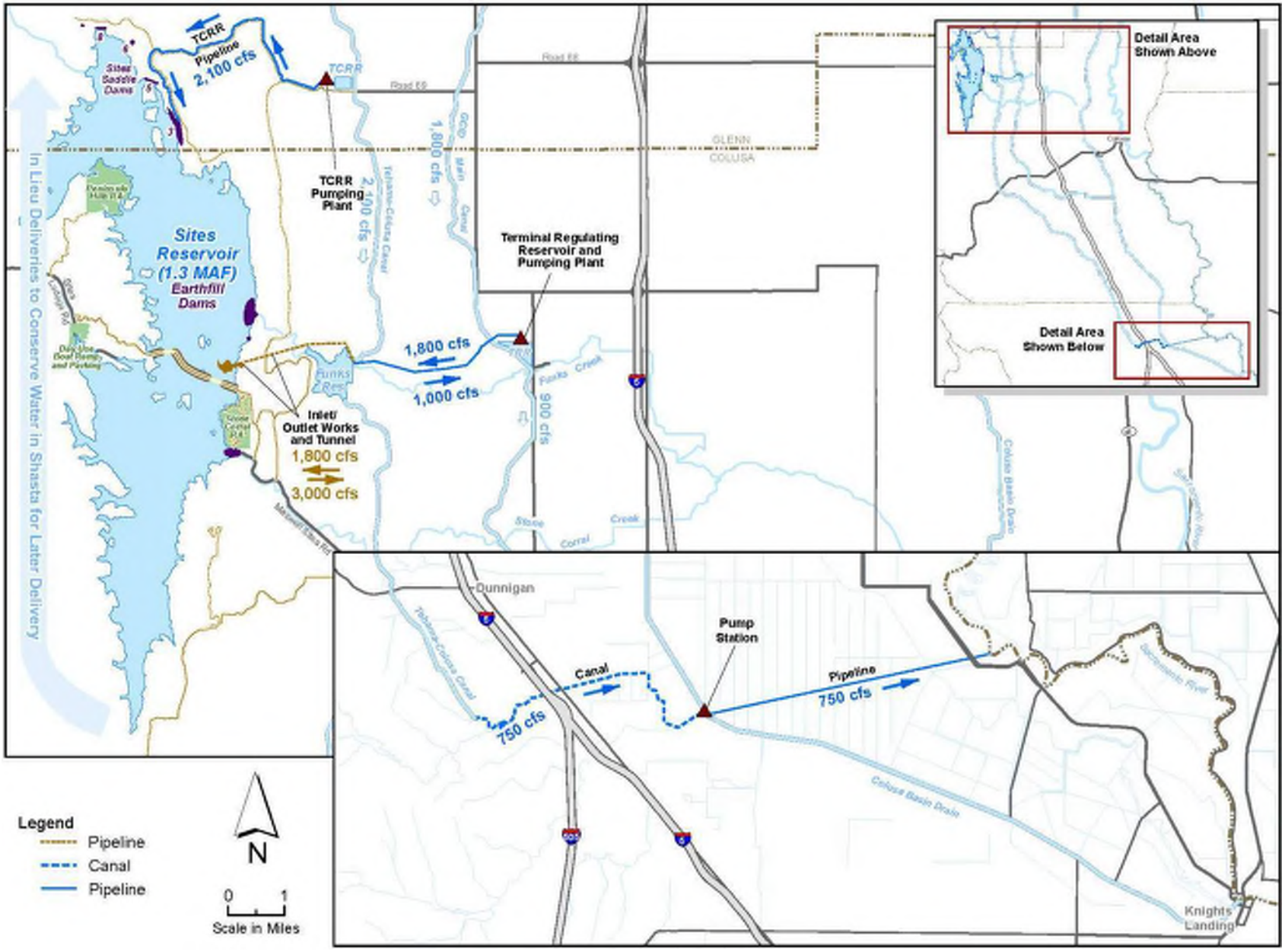


Figure 6b. Alternative 6b (Estimated cost - $3,584 million)

4.0 Environmental Mitigation

HDR reviewed the existing mitigation cost estimates currently being used and found that when applied to the Value Planning Alternatives, the estimated mitigation costs do not result in any significant changes in estimated mitigation costs (>$50M). Their October 11, 2019 memorandum concluded that until additional analysis can be performed on a specific project description, the existing $500M estimate should be retained.

5.0 Emergency Reservoir Drawdown

It is proposed to distribute the emergency reservoir release flow required by the State of California Department of Water Resources, Division of Safety of Dams (DSOD) to different locations around Sites Reservoir. For the alternative project evaluation, it is assumed that these release points would include Hunters Creek, Stone Corral Creek, Funks Creek, the Glenn-Colusa Irrigation District (GCID) and T-C Canals, and an open channel that would connect the TRR with the CBD. For the channel, it is assumed that emergency release water would be conveyed to TRR through the TRR Pipeline.

The emergency release flow required is a function of the size of Sites Reservoir. DSOD requires that 10-percent of the height of the reservoir must be reduced over a period of seven days. Table 3 provides an estimate of the average 7-day emergency release flow required for various reservoir sizes to meet the criteria. Also shown in the table is AECOM's assumed distribution of the required release to the creeks and canals listed above. Additional evaluation of the downstream watersheds and the downstream impacts will be needed to refine the distribution of releases between the candidate release points.

Regarding the canal to the CBD, AECOM assumes that the capacity would be between 750 and 1,000 cubic feet per second (cfs), which would be the equivalent release for one of the two 12-foot-diameter Delevan Pipes. A flow of 1,000 cfs is used in the table. In distributing the remaining flows as shown in the table, the following assumption were made:

1. The flows allocated to Stone Corral Creek and Funks Creek are approximately equivalent to 50-year flows estimated from published regression curves for Coastal Range areas. These flows are estimated at the Sites and Golden Gate Dams.

2. The flows allocated to the GCID and TC Canals represent minimum spare capacity that could be available to convey emergency releases. Capacity could be higher during certain time of the year.

3. After accounting for the releases described above, the balance of the required release was assigned to Hunters Creek at the north end of the valley. This release could be distributed to two or three of the larger saddle dams at the north end of Sites Reservoir, which are adjacent to Hunters Creek, or are on tributaries. At each release point, an outlet works pipeline would be provided at the base of the dam with energy dissipation valve(s) at the downstream end.

4. The release to Hunters Creek is sizeable. One feasible approach to reduce impacts would be to provide a dry dam on the creek with sized outlet works that would use storage routing to reduce the flow released to the creek downstream. There is at least one suitable site for such a dam on the creek where it passes out of the eastern ridge into the valley. This is not included with this cost estimate.

Also shown on the Table 3 is the estimated size of the twin outlet works tunnels required to pass the water being released to Funks Creek, the GCID and T-C canals, and the canal to the CBD. Tunnel size is based on the assumed distribution of the required emergency release to the various discharge points.

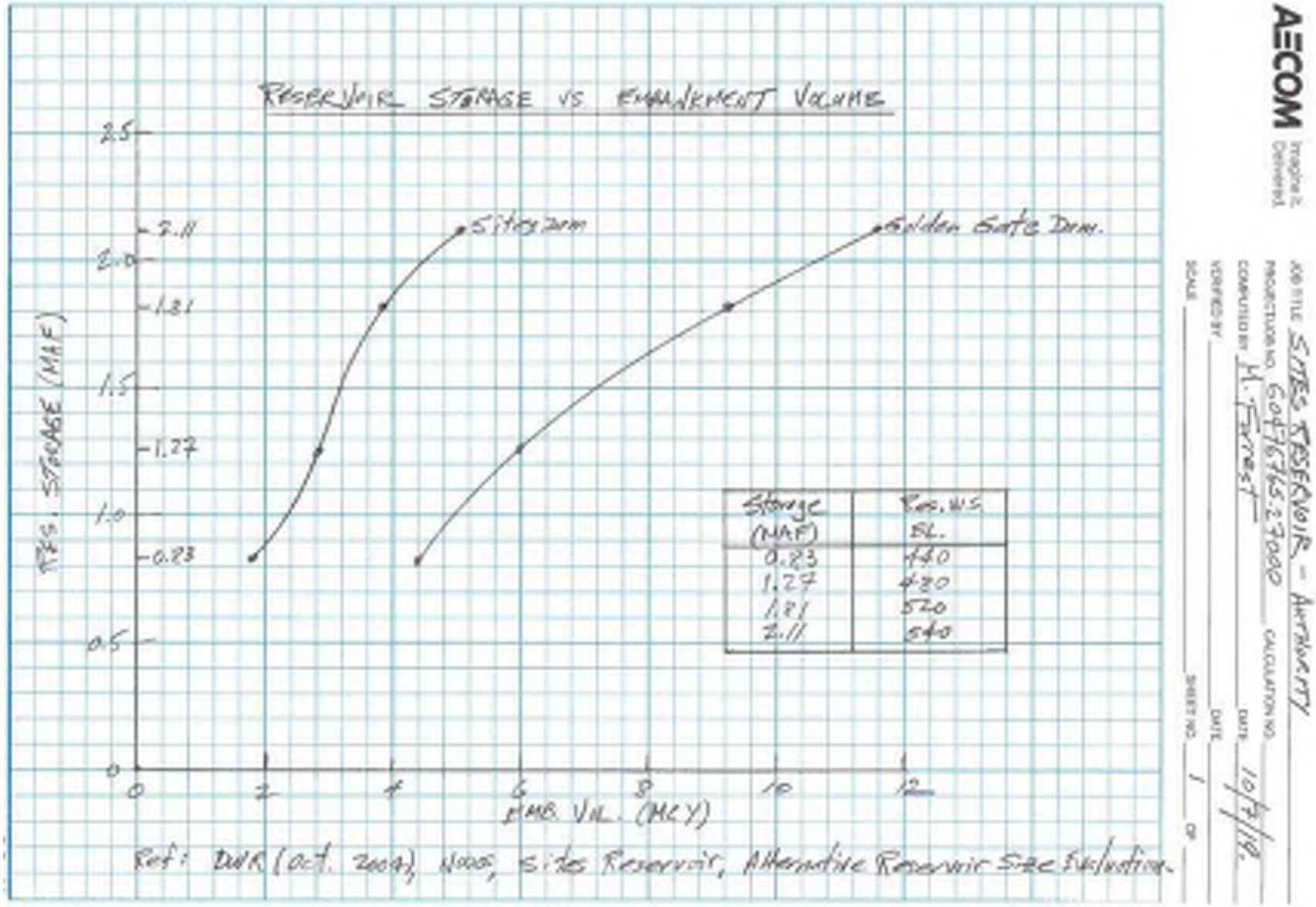
Table 3. Emergency Release – Assumed Distribution of Flows

Reservoir Size	1.8 MAF	1.5 MAF	1.3 MAF	1.0 MAF	0.8 MAF
Emergency Release Required (cfs)	21,700	17,950	15,450	12,000	9,650
Stream Releases (cfs)					
Hunters Creek Release Structure	11,250	7,500	5,000	4,500	3,000
Stone Corral Creek	3,500	3,500	3,500	3,500	3,500
Total =	14,750	11,000	8,500	8,000	6,500
Remaining Release Required =	**6,950**	**6,950**	**6,950**	**4,000**	**3,150**
I/O Tower and Tunnel Releases					
Funks Creek	4,500	4,500	4,500	2,550	3,150
GCID Main Canal	700	700	700	700	0
T-C Canal	750	750	750	750	0
Canal Conveyance to Colusa Basin Drain	1,000	1,000	1,000	0	0
Total =	6,950	6,950	6,950	4,000	3,150
I/O Tunnel Required Release (cfs) =	**6,950**	**6,950**	**6,950**	**4,000**	**3,150**
Estimated Twin I/O Tunnel Sizes (feet) for 20 feet per second (fps) maximum velocity (ft) =	**15**	**15**	**15**	**11**	**10**

6.0 Attachments

	Component Cost	Alternative D	Alternative 1	Alternative 2	Alternative 3	Alternative 4a	Alternative 4b	Alternative 5a	Alternative 5b	Alternative 6a	Alternative 6b
Total ($2018) w/o financing cost		$5,234,596,920	$3,969,916,920	$3,988,276,920	$3,868,396,920	$3,828,436,920	$3,860,836,920	$3,547,636,920	$3,875,956,920	$3,416,956,920	$3,584,356,920
% cost reduction		0%	24%	24%	26%	27%	26%	32%	26%	35%	32%
Total ($2015)		$4,846,849,000	$3,675,849,000	$3,692,849,000	$3,581,849,000	$3,544,849,000	$3,574,849,000	$3,284,849,000	$3,588,849,000	$3,163,849,000	$3,318,849,000
RESERVOIRS AND DAMS											
Develop Sites Reservoir Area	$255,000,000	$255,000,000	$255,000,000	$255,000,000	$255,000,000	$255,000,000	$255,000,000	$255,000,000	$255,000,000	$255,000,000	$255,000,000
Single Span Bridge	$215,000,000	$215,000,000									
Short Span Bridges	$125,000,000		$125,000,000		$125,000,000	$125,000,000	$125,000,000	$125,000,000	$125,000,000	$125,000,000	$125,000,000
Lodoga Road (Long Route)	$114,000,000										
Lodoga Road (Direct Route)	$180,000,000			$180,000,000							
South Road Property Access	$38,000,000		$38,000,000		$38,000,000	$38,000,000	$38,000,000	$38,000,000	$38,000,000	$38,000,000	$38,000,000
Construct Main Dams (1.8 MAF) - Zoned Embankment	$610,000,000	$610,000,000									
Construct Main Dams (1.5 MAF) - Zoned Embankment	$511,000,000		$511,000,000	$511,000,000	$511,000,000			$511,000,000	$511,000,000		
Construct Main Dams (1.5 MAF) - Earthfill	$380,000,000					$380,000,000				$380,000,000	
Construct Main Dams (1.5 MAF) - Hardfill	$690,000,000						$690,000,000				
Construct Main Dams (1.3 MAF) - Zoned Embankment	$400,000,000										
Construct Main Dams (1.3 MAF) - Earthfill	$320,000,000										$320,000,000
Construct Saddle Dams (1.8 MAF)	$270,000,000	$270,000,000									
Construct Saddle Dams (1.5 MAF)	$183,000,000		$183,000,000	$183,000,000	$183,000,000	$183,000,000	$183,000,000	$183,000,000	$183,000,000	$183,000,000	
Construct Saddle Dams (1.3 MAF)	$94,000,000										$94,000,000
Construct Forebay/Afterbay (Fletcher/Holthouse)	$190,000,000	$190,000,000									
Funks Reservoir Structures/Dredging	$22,000,000		$22,000,000	$22,000,000		$22,000,000	$22,000,000	$22,000,000	$22,000,000		
Construct TRR Reservoir	$39,000,000	$39,000,000	$39,000,000	$39,000,000	$39,000,000	$39,000,000	$39,000,000	$39,000,000	$39,000,000	$39,000,000	$39,000,000
North T-C Regualting Reservoir	$39,000,000				$39,000,000					$39,000,000	$39,000,000
Hunters Creek Release Structures (at 3 Saddle Dams)	$84,000,000		$84,000,000	$84,000,000	$84,000,000	$84,000,000	$84,000,000	$84,000,000	$84,000,000	$84,000,000	$84,000,000
PUMPING AND GENERATING PLANTS											
Construct I/O Structure and Single 30' Diameter Tunnel	$210,000,000	$210,000,000					$0				
Construct I/O Struture and Twin 15" Diameter Tunnels	$280,000,000		$280,000,000	$280,000,000	$280,000,000	$280,000,000	$0	$280,000,000	$280,000,000	$280,000,000	$280,000,000
Sites Pumping-Generating Plant (5,900 cfs) - with Delevan	$800,000,000	$800,000,000									
Sites Pumping-Generating Plant (4,000 cfs) - w/o Delevan	$634,000,000		$634,000,000	$634,000,000		$634,000,000	$634,000,000	$634,000,000	$634,000,000		
T-C North Pumping Plant - 2100 cfs	$185,000,000				$185,000,000					$185,000,000	$185,000,000
TRR Pumping-Generating Plant - 1800 cfs	$160,000,000	$160,000,000	$160,000,000	$160,000,000		$160,000,000	$160,000,000	$160,000,000	$160,000,000		
Increased Head TRR PumpGen Plant - 1800 cfs	$185,000,000				$185,000,000					$185,000,000	$185,000,000
CBD Pumping Plant for Delevan Release (750 cfs)	$34,000,000		$34,000,000	$34,000,000		$34,000,000	$34,000,000				
Sacramento River Pumping-Generating Plant (2000 cfs)	$260,000,000	$260,000,000									
Sacramento River Release Structure - 1500 cfs	$16,000,000										
Sacramento River Release Structure - 750 cfs	$8,000,000		$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000				
Sacramento River Fish Screen Structure	$55,000,000	$55,000,000									
Red Bluff Pump Addition	$3,849,000	$3,849,000	$3,849,000	$3,849,000	$3,849,000	$3,849,000	$3,849,000	$3,849,000	$3,849,000	$3,849,000	$3,849,000
CBD Pumping Plant for T-C Extension (750 cfs)	$34,000,000								$34,000,000		$34,000,000
Canals and Conduits											
Construct Channel to Holthouse	$49,000,000	$49,000,000									
Reduced Channel with Hunters Creek Discharge	$31,000,000		$31,000,000	$31,000,000	$31,000,000	$31,000,000	$31,000,000	$31,000,000	$31,000,000	$31,000,000	$31,000,000
Construct Delevan Pipeline - Two Pipeline	$660,000,000	$660,000,000									
Construct Delevan Pipeline - One Pipeline	$389,400,000										
Delevan Canal to CBD (750 cfs)	$150,000,000		$150,000,000	$150,000,000	$150,000,000	$150,000,000	$150,000,000				
CBD Siphon and Pipeline to River (750 cfs)	$210,000,000		$210,000,000	$210,000,000	$210,000,000	$210,000,000	$210,000,000				
TCRR Pipeline to Sites Reservoir (2100 cfs)	$410,000,000				$410,000,000					$410,000,000	$410,000,000
Construct TRR Pipeline - Four Pipelines (with Afterbay)	$350,000,000	$350,000,000									
Construct TRR Pipeline - Three Pipelines	$280,000,000		$280,000,000	$280,000,000		$280,000,000	$280,000,000				
Construct TRR Pipeline - Two Pipelines	$210,000,000				$210,000,000			$210,000,000	$210,000,000	$210,000,000	$210,000,000
T-C Canal Extension to CBD	$73,000,000							$73,000,000	$73,000,000	$73,000,000	$73,000,000
Siphon, Turnout, and Pipeline from CBD to River	$270,000,000								$270,000,000		$270,000,000
Release Structure - 750 cfs for South Outfall	$8,000,000							$8,000,000	$8,000,000	$8,000,000	$8,000,000
Stony Creek Diversion to TC	$37,000,000										
Transmission Lines, Switchyards and Substations											
Sites PGP and Colusa Substations,Switchyards, Transmission	190,000,000	190,000,000									
Sites PGP Substation, Switchyard, Transmission	98,000,000		98,000,000	98,000,000		98,000,000	98,000,000	98,000,000	98,000,000		
TRR and T-C from Cogen Substation	105,000,000				$105,000,000					$105,000,000	$105,000,000
General Property											
Recreation and O&M Facility	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000	30,000,000
Mitigation ($350M construction + $150M operation)											
Construction Impacts	350,000,000	350,000,000	350,000,000	350,000,000	350,000,000	350,000,000	350,000,000	350,000,000	350,000,000	350,000,000	350,000,000
Operation Impacts	150,000,000	150,000,000	150,000,000	150,000,000	150,000,000	150,000,000	150,000,000	150,000,000	150,000,000	150,000,000	150,000,000

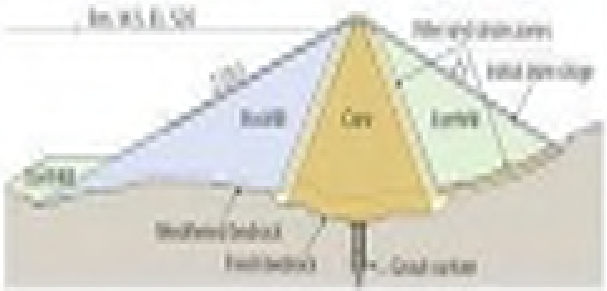
Attachment 2. Res Storage vs Embank Vol Plot.pdf and Alt Dam ROM Costs



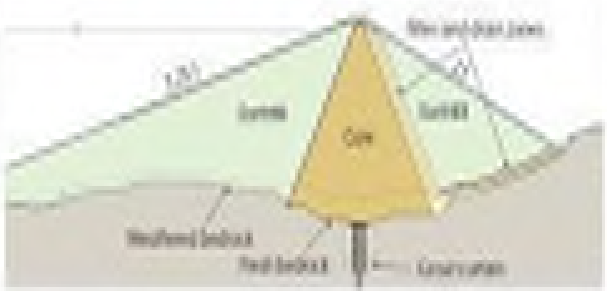
Attachment 3. Alternative-section_dams

Dam Types Drive Affordability

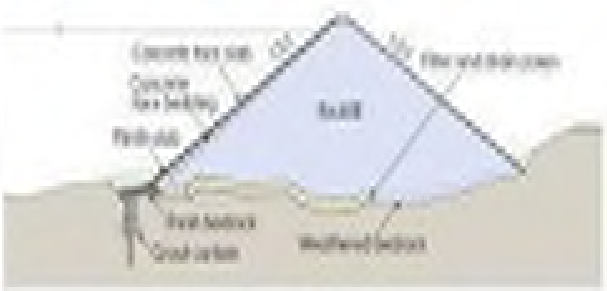
Option #1 Zoned Earth- and Rockfill Dams



Option #2 Zoned Earthfill Dams

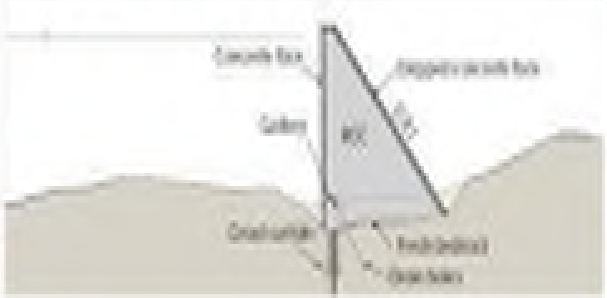


Option #3 Concrete Faced Rockfill Dams

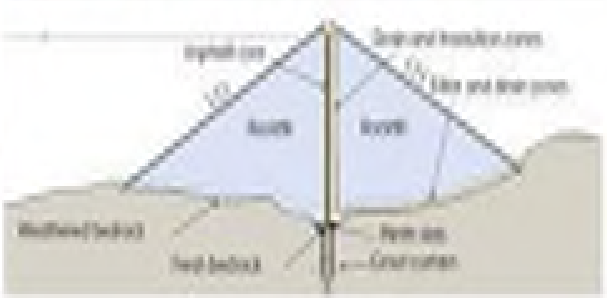


Option #4 RCC Hardfill Dams

Option #5 RCC Dams



Option #6 Asphalt Core Rockfill Dams



Value Planning Analysis Authority Staff Review Comments

Date: October 22, 2019

Subject: Value Planning Analysis Authority Staff Review Comments

1.0 Purpose

On October 18, 2019, representatives from the Reservoir Committee requested staff to identify potential issues with the Sites Reservoir Project Alternatives presented three Technical Memorandums. The memorandums that were reviewed included the following:

1. Value Planning: Mitigation Cost Estimate Update of 2016 Technical Memorandum, October 11, 2019.
2. Value Planning Analysis Technical Memorandum, October 14, 2019.
3. Value Planning Effort Technical Memorandum, October 15, 2019.

2.0 Review Comments

In their review, staff did not identify anything that would be considered a "fatal flaw". Staff review comments are presented below:

General

1. The value planning effort included development of appraisal level costs. The draft Sites Authority Principles and Requirements for Feasibility Study and the Technical Reference for the Water Storage Investment Program (WSIP) reference their cost estimates to the Association for the Advancement of Cost Engineering (AACE) International classifications. The AACE classifications correspond to the percent that project design has been completed and the associated expected range in accuracy of the cost estimate. It is recommended that the value planning cost estimates and contingencies follow the AACE classifications and guidelines.
2. The I/O structure changes from a single 30 foot diameter tunnel in Alternative D to twin 15 foot diameter tunnels. Because this change increases costs by around $70 million, it would be beneficial to explain the reasoning.
3. It is recognized that many of the staff comments would be addressed after the value planning effort is complete and the alternatives are being further evaluated to screen them down to identify a preferred plan. Examples are as follows:
    a. Incorporate an emergency spillway and revise the freeboard and dam crest elevation, if appropriate.
    b. Finalize the emergency drawdown facilities and associated flowage easements, if appropriate.
    c. Further evaluate the compatibility of the portion of the Delevan Canal that will be located in the right overbank floodplain of the CBD, as well as potential upstream hydraulic impacts.
4. The CEQA Guidelines, Section 15088.5 (a) addresses the requirements associated with changes in a project and the need for recirculation of an EIR prior to certification. Specifically:

    "A lead agency is required to recirculate an EIR when significant new information is added to the EIR after public notice is given of the availability of the draft EIR for public review under Section 15087 but

before certification. As used in this section, the term “information” can include changes in the project or environmental setting as well as additional data or other information. New information added to an EIR is not “significant” unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project's proponents have declined to implement.”

Each alternative should be reviewed for potential changes in the significance of an impact and/or inability to implement mitigation previously identified in the EIR.

5. According to CEQA, an EIR must describe a reasonable range of alternatives to a proposed project that could feasibly attain most of the basic project objectives, and would avoid or substantially lessen any of the proposed project's significant effects. Any new alternative should be reviewed in light of comments received on the Draft EIR/EIS and in consideration of reducing significant adverse effects.

Specific

1. The EIR/EIS found that the Project’s conversion of Prime Farmland, Unique Farmland or Farmland of Statewide importance to non-agricultural use would result in significant and unavoidable impacts. In all alternatives, replacement of the Delevan pipeline with open canal may result in additional environmental effects associated with agricultural land conversion as it may render additional land unsuitable for agricultural production; while this may not substantially increase an already significant and unavoidable effect, it would increase costs for mitigation at the 1:1 ratio currently proposed.
2. Alternative 2 proposes the use of a roadway around the southern end of the reservoir rather than a bridge crossing. This may result in additional vehicle miles traveled and associated air quality and greenhouse gas effects as well as affect emergency response times. Other effects that may be in excess of those associated with Alternative D would be ground disturbing effects to cultural and/or biological resources; however, it is likely that the roadway could be designed to avoid significant resources.

   Alternatives 5a, 5b, 6a and 6b would be implemented outside of the previously analyzed project footprint and would be most likely to trigger recirculation of the Draft EIR/EIS due to the change in environmental setting and potential for previously undisclosed environmental effects.

Feature	Potential Major Permitting Effect Compared to Alt D
1.5 MAF Reservoir	• Reduce effect to grassland threatened and endangered (T&E) species • Reduced effect to streams, wetlands and cultural resources
1.3 MAF Reservoir	• Reduce effect to grassland T&E species • Reduced effect to streams, wetlands and cultural resources
Funks/Sites PGP	• Reduce impact to grassland T&E species • Reduced effect to streams, wetlands and cultural resources
TCRR and Upgraded TRR PGP	• No major change in effects anticipated • Unknown effects to cultural resources
Delevan Canal/Pipeline Release	• Reduced effect to river channel • Reduced effect to riparian vegetation • Reduced effect to riverine species (aquatic and terrestrial)
Dunnigan Canal to CBD Release	• Reduced effect to riverine species (aquatic and terrestrial • Increased (new) effect to CA tiger salamander • Reduced effect to Giant Garter Snake • New water quality effect • New in-river flow reduction effect • Unknown effects to cultural resources
Dunnigan to River Release	• Reduced effect to riparian vegetation • Reduced effect to riverine species (aquatic and terrestrial • Increased (new) effect to CA tiger salamander • New in-river flow reduction effect • Unknown effects to cultural resources
Multi-Span Bridge	• No major change in effects anticipated
South Road to Lodoga	• No major change in effects anticipated • Unknown effects to cultural resources
South Road to Residents	• Minor change in impacts/mitigation for grassland T&E species • Unknown effects to cultural resources
Rockfill Embankment Dam	• Assuming fill comes from within the current project footprint, no major change in effects anticipated; If fill sites outside of the current project footprint are necessary, additional analysis would be needed
Earthfill Dam	• Assuming fill comes from within the current project footprint, no major change in effects anticipated; If fill sites outside of the current project footprint are necessary, additional analysis would be needed
Hardfill Dam	• Assuming fill comes from within the current project footprint, no major change in effects anticipated; If fill sites outside of the current project footprint are necessary, additional analysis would be needed

Alternative 1

1. No issues to consider.

Alternative 2

1. The community's "preferred" road connection is the bridge. The South Road will require extensive local community engagement to get "acceptance" of the road.
2. South Road affects landowners who are not currently impacted by the project – will require extensive outreach to "newly" impacted landowners.
3. South Road increases the amount of property that would be needed to acquire…increases land that would need TROE agreements for studies.

Alternative 3

1. TCRR and pumping plant affects landowners who are not currently impacted by the project – will require extensive outreach to "newly" impacted landowners.
2. Any revisions to the GCID TRR (size/footprint) could create landowner issues.
3. Depending on the sizing and location of the Delevan Canal…could be an increase in land needed for acquisition, would move us to permanent take rather than easements over the buried pipeline, could cause the created of bifurcated/remnant parcels, could be a bigger impact to existing farming operations.

Alternative 4a

1. Same issues as Alternative 3 – Delevan Canal.

Alternative 4b

1. Same issues as Alternative 3 – Delevan Canal.

Alternative 5a

1. TC Canal Southern Release affects landowners who are not currently impacted by the project – will require extensive outreach to "newly" impacted landowners – as well as Yolo County.

Alternative 5b

1. TC Canal Southern Release affects landowners who are not currently impacted by the project – will require extensive outreach to "newly" impacted landowners – as well as Yolo County.

Alternative 6a

1. TCRR and pumping plant affects landowners who are not currently impacted by the project – will require extensive outreach to "newly" impacted landowners.

2. TC Canal Southern Release affects landowners who are not currently impacted by the project – will require extensive outreach to “newly” impacted landowners – as well as Yolo County.

Alternative 6b

1. TCRR and pumping plant affects landowners who are not currently impacted by the project – will require extensive outreach to “newly” impacted landowners.
2. TC Canal Southern Release affects landowners who are not currently impacted by the project – will require extensive outreach to “newly” impacted landowners – as well as Yolo County.

Appendix A-2 Road and Bridge Analysis
Technical Memorandum

To:	Value Planning Work Group
CC:	Lee Frederiksen
Date:	February 28, 2020
From:	AECOM
Subject:	Road and Bridge Analysis

1.0 Introduction

Several alternatives for realigning Sites-Ladoga Road across and around the planned reservoir have been considered. These alternatives were discussed with Colusa and Glenn Counties on January 28, 2020. Important considerations include the following:

- Avoid comingling construction traffic with the general public
- An access road is required for residents at the southern end of Sites Reservoir
- Consider travel time and maintenance costs in the development of alternatives
- Consider public safety in developing the designs, including high winds and potential jumping hazards/nuisance

It is proposed to bring construction traffic in from the north via Road 68 onto a paved construction bypass. The general public would continue to travel on the existing Sites-Lodoga Road until either a new road/bridge across the reservoir or southern bypass road is constructed and opened for use, at which point the existing Sites-Lodoga Road could be closed and construction on Sites Dam could begin.

Four realignment alternatives for the Sites-Ladoga Road are being considered. Three road/bridge realignment alternatives (A, B, and C) and one fully road realignment alternative (D) are depicted in Figure F-1 below. The combination of roadway fill and bridge is being considered for access across the reservoir to reduce the project cost associated with a full-length bridge. Approximate travel times for these alternatives are provided in Table A2-1.

Table A2-1. Approximate Travel Times for Road Options (1.8 MAF Reservoir)

	SQUAW CREEK TO COLUSA CANAL			
Alternative	**A - BLUE**	**B - ORANGE**	**C - GREEN**	**D - PINK**
Align. Length (mi)	16.5	18.3	21.3	18.9
Assumed Ave Travel Speed (mph)	35	30	30	30
Time of Travel (min)	28	37	43	38
Relative Travel Time (min)	-	(8)	(14)	(10)

Alternative A, the South Road/Bridge alignment, is the most direct route with the shortest travel time.

2.0 South Road/Bridge Alignment (Alternative A – Blue)

Recently, three varying sizes of reservoir have been considered – 1.0 MAF, 1.3 MAF, and 1.8 MAF. As the size of the reservoir increases, the water surface elevation also increases, which elevates the road/bridge crossing. Larger reservoirs require longer bridges with taller piers and taller roadway fill prisms. When considering various size reservoirs and possibly phasing the reservoir to increase water storage over time, Table F-2 shows how road and bridge costs vary for different reservoir sizes. The table includes a least cost 1 MAF, non-phasable alternative with a tunnel; A least cost 1 MAF, non-phasable alternative without a tunnel; A least cost 1.3 MAF, non-phasable alternative; And phaseable options from 1 MAF to 1.8 MAF, plus 1.3 MAF to 1.8 MAF.

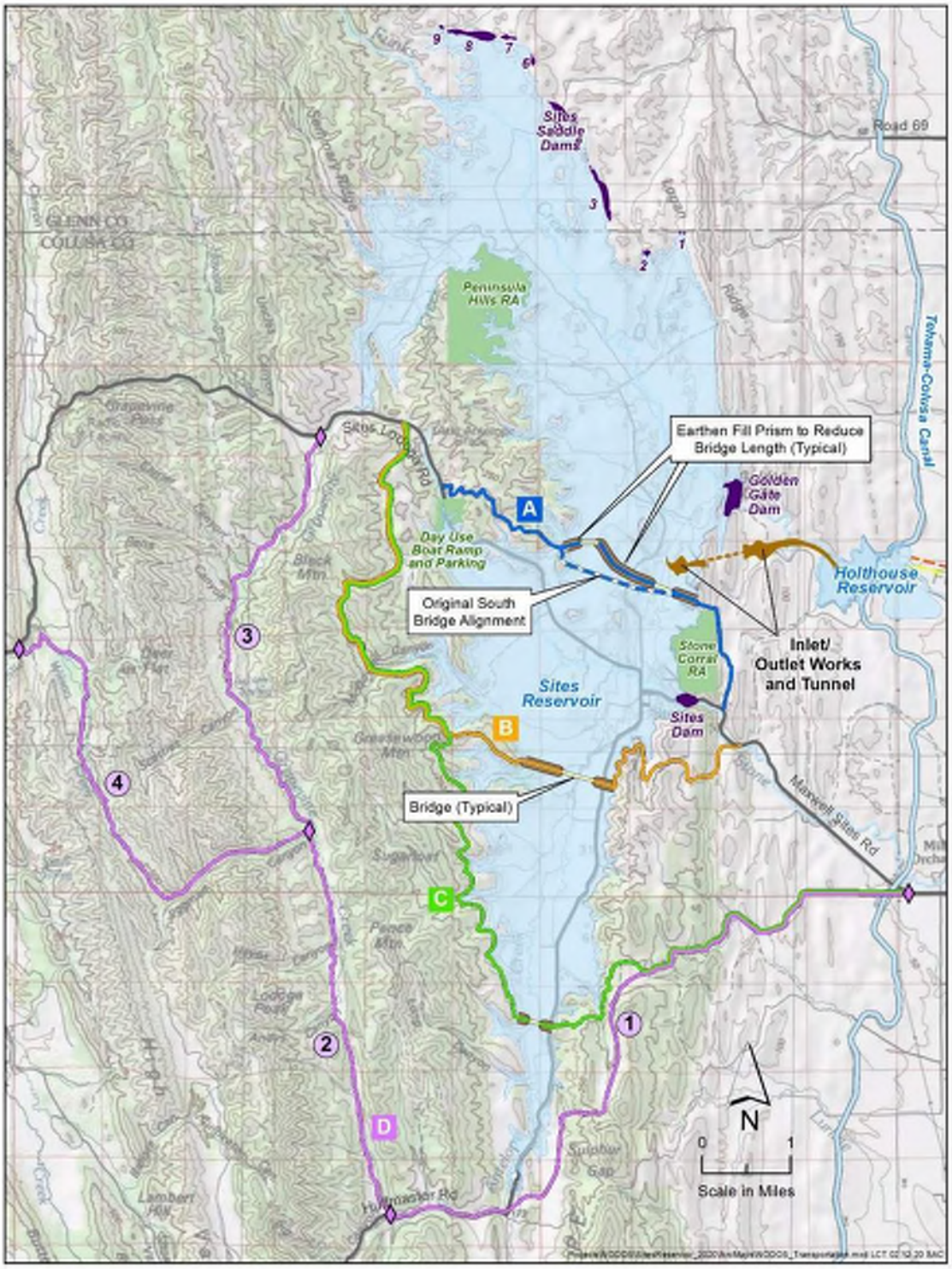


Figure A2-1. Public Transportation Route Alternatives

Table A2-2. Approximate Cost for South Bridge Options (Option A in Figure F-1)

Reservoir Data				Blue Alternative - Planning-Level Construction Cost Estimate ($M)								
MAF	Storage WSE	Max Flood Δ in WSE + Wave Ht. (ft') =	10	Road	Reservoir Crossing			Tunnel	Phase 1 Total	Phase 2 (to 1.8 MAF)	Total Phase 1 & 2	Total Blue Alternative
		= Roadway Hinge Point Elevation			Bridge		Road					
					L (ft)	Cost	Fill					
1	457	467		$43	748	$23	$30	$95	$191	Not Phasable	$191	$191
1	457	467		$47	748	$23	$30	$0	$99	Not Phasable	$99	$99
1	457	467		$47	748	$23	$79	$0	$149	$65	$213	$213
1.3	481	491		$47	844	$26	$53	$0	$126	Not Phasable	$126	$126
1.3	481	491		$47	844	$26	$97	$0	$170	$35	$205	$205
1.5	498	508		$46	1106	$25	$47	$0	$118	Not Phasable	$118	$118
1.8	520	530		$45	1500	$46	$105	$0	$196	NA	$196	$196

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3.0 Southern Road Alignment (Alternative D – Pink)

The alternative to avoid constructing a bridge is the southern road alignment. As noted in Section F.1, an access road to properties at the southern end of Sites Reservoir is required regardless of which alternative is selected. If a bridge were not constructed, it would be necessary to construct a paved road to the southern end of the reservoir that would continue north and west on the west side of the reservoir to maintain access to Lodoga and other communities to the west.

Table A2-3 provides an approximate cost for a paved road for each of the four numbered road segments depicted in Figure F-1.

Table A2-3. Conceptual Cost for Road Segments

Southern Road (Pink Alternative in Figure F-1)		
Road Segment	**Segment Length (mi)**	**Construction Cost Est. ($M)**
1	7.4	$85.3
2	6.0	$69.7
3	5.6	$64.4
4	5.9	$68.7
Total Cost of Seg. 1, 2, & 4		$224
Total Cost of Seg. 1, 2, & 3		$219

4.0 Other Roads

Additional public and project roads are included in all alternatives. These include access to the communication towers on the east side of the reservoir; access to Stone Corral, Peninsula Hills, and boat ramps; roads internal to the recreation areas, and roads to access all project facilities for maintenance. Costs budgeted for public roads include the following:

Construction Bypass Road - $30M
Stone Corral Eastside Access and Boat Ramp - $9.7M
Westside Boat Ramp Access and Access to Peninsula Hills Recreation - $5.2M
Eastside Road to Communication Tower - $6.3M
Peninsula Hills Park Roads - $2.7M (excludes parking lots)

Appendix A-3 Conveyance System Technical Memorandum

To:	Value Planning Work Group
CC:	Lee Frederiksen
Date:	April 9, 2020
From:	Jacobs
Subject:	Conveyance System

1.0 Background

In October 2019, a Value Planning analysis draft technical memorandum was completed with the objective of looking at alternative project components to reduce the cost of the Sites reservoir project. This technical memorandum provided several viable alternatives that reduced the overall project costs from the original $5.2B to a new range of $3.4 to $4.0B. The lowest cost alternative, known as Alternative 6A, includes a 1.5 million acre-foot reservoir, a pump station on the Tehama-Colusa (T-C) Canal to lift water to the reservoir, and use of the Tehama-Colusa Canal to discharge water from the Reservoir to the Sacramento River. Specifically, water would be discharged from the reservoir into the T-C canal, conveyed down the T-C canal near the end in Dunnigan and then new facilities built to convey it from T-C canal to either the Colusa Basin Drain (CBD) or the Sacramento River.

2.0 Purpose

The purpose of this TM is to look at various alternatives to convey water from the end of T-C canal to the CBD or Sacramento River for flows of 750 cfs and 1,000 cfs. Members of the Reservoir Committee visited the area on January 14, 2020 to look at conveyance alternatives to be analyzed.

3.0 Alternatives Development

The alternatives developed by members of the Reservoir Committee are as follows and provided as exhibits at the end of this Technical Memorandum:

3.1 Alternative 6A-1

This alternative is sized for a flow of 750 cfs and includes a turnout on the T-C canal located about 1,500 feet upstream of the end of T-C canal, then a pipeline east until it intercepts Bird Creek and then flow is discharge into Bird Creek where it flows to the Colusa basin Drain. Total length of this alternative is 20,000 feet with 6,600 feet of pipeline and 13,400 feet of open channel (Bird Creek).

3.2 Alternative 6A-2 CBD

This alternative is sized for a flow of 750 cfs and includes a turnout on the T-C canal located about 1,500 feet upstream of the end of T-C canal, then a pipeline east all the way to the Colusa basin Drain, and ends with a flow control/pressure reducing valve to discharge to the CBD. This pipeline follows roughly the same alignment as Alt 6A-1. Total length of this alternative is 20,000 feet.

3.3 Alternative 6A-2 Sac Riv

This alternative is sized for a flow of 750 cfs and includes a turnout on the T-C canal located about 1,500 feet upstream of the end of T-C canal, then a pipeline east all the way to the Sacramento River, and ends with a flow control/pressure reducing valve to discharge to the Sacramento River. This pipeline follows roughly the same alignment as Alt 6A-1, but then continues east across farmland to the Sacramento River. Total length of this alternative is 51,000 feet.

3.4 Alternative 6A-3

This alternative is sized for a flow of 750 cfs and includes a turnout on the end of the T-C canal that discharges to a small, winding ditch (created by discharges from T-C Canal), then intercepts Bird Creek and continues to flow in Bird Creek where it ends by flowing into the Colusa basin Drain. Total length of this alternative is 24,600 feet with 4,000 feet of small ditch and 20,600 feet of open channel (Bird Creek).

3.5 Alternative 6A-4

This alternative is sized for a flow of 750 cfs and includes a turnout on the T-C canal located about 27,000 feet upstream of the end of T-C canal where it crosses Hunter Creek. Flow is discharge to Hunter Creek where it ends by flowing into the Colusa basin Drain. Total length of this alternative is about 32,500 feet of open channel (Hunter Creek).

3.6 Alternative 6A-5 CBD

This alternative is essentially the same layout as Alterative 6A-2 CBD except the flow is increased from 750 cfs to 1,000 cfs.

3.7 Alternative 6A-5 Sac River

This alternative is essentially the same layout as Alterative 6A-2 Sac River except the flow is increased from 750 cfs to 1,000 cfs.

4.0 Initial Screening of Alternatives

Based on a field visit on February 11, 2020, it was determined that discharging flow directly to the existing open channels would result in significant water loss due to seepage and evaporation. This is based on the visual evidence of the existing creek beds showing sandy and gravels that have high infiltration rates. In addition, these creeks have significant debris to impede flow and would require high maintenance to reshape. Lastly, these creeks are wide and the 750 cfs flow would be very shallow, contributing to an increase in evaporation and seepage. As a result, it was determined that all open channels will need to be lined. Given that Hunter Creek is significantly longer than the other open ditch options, it was decided to eliminate Alternative 6A-4 from further consideration.

A second criteria used to evaluate these alternatives includes an assumption that Bird Creek needs to maintain their current shape to accommodate storm runoff flows that created them. Calculations were performed using topographic data to determine the canal cross required for the 750 cfs flow for the different segments. The existing ditch has depth that varies from 7-10 feet. Using a water depth of 5 feet, a 2:1 side slope, frictional coefficient of 0.02, calculations showed the bottom width of a trapezoidal channel to be about 12 feet. The existing channel has a bottom width that ranges from 20-25 feet and a top width of about 50 feet. Lining the existing channel to accommodate stormwater flows (as a criteria), would be very expensive and unnecessary given that the channel needs to accommodate the 750 cfs is less than half of the channel width. If this channel was lined, then significant maintenance would be required to remove all the debris accumulated from stormwater runoff. As a result, it was decided to eliminate using the existing creeks for conveying the water. Therefore, alternatives 6A-1 and 6-A3 were eliminated, leaving only the piping alternatives.

5.0 Evaluation of Alternative 6A-2 and 6A-5 Alternatives

Calculations were performed to determine the pipeline sizes required for the two remaining options. An assumption was made to have both pipelines sized to allow for gravity flow. Following are the assumptions used in these calculations:

- Water Surface elevation in T-C Canal =175 feet
- Water surface elevation in Colusa Basin Drain = 32 feet
- Water surface elevation at Sacramento river = 40 feet (typically lower, but required to go high in levee per Army Corps Standards)
- Hazen-Williams Friction Factor C-value = 130

The results of these calculations resulted in the following:

5.1 Alternative 6A-2 CBD

The pipeline will carry 750 cfs and be 7.5-foot (90-inch) internal diameter with two tunneled crossings (I-5 and 99W/RR) that require 9-foot (108") casings. The total length of pipeline is 20,000 feet with 300-foot and 250-foot tunneled crossings. A 72-inch flow control/pressure reducing valve will be placed at the discharge to dissipate energy and adjust the flow.

5.2 Alternative 6A-2 Sac Riv

The pipeline will be 9.5-foot (114-inch) internal diameter with three tunneled crossings (I-5 and 99W/RR and CBD) that require 11-foot (132") casings. The total length of pipeline is 51,600 feet with 300-, 250-, and 250-foot tunneled crossings. A 72-inch flow control/pressure reducing valve will be placed at the discharge to dissipate energy and adjust the flow.

5.3 Alternative 6A-5 CBD

The pipeline will carry a flow of 1,000 cfs and be 9-foot (108-inch) internal diameter with three tunneled crossings (I-5 and 99W/RR and CBD) that require 10.5-foot (126") casings. The total length of pipeline is 20,000 feet with 300-foot and 250-foot tunneled crossings. A 78-inch flow control/pressure reducing valve will be placed at the discharge to dissipate energy and adjust the flow.

5.4 Alternative 6A-5 Sac River

The pipeline will carry a flow of 1,000 cfs and be 10.5-foot (126-inch) internal diameter with three tunneled crossings (I-5 and 99W/RR and CBD) that require 12-foot (144") casings. The total length of pipeline is 51,600 feet with 300-, 250-, and 250-foot tunneled crossings. A 78-inch flow control/pressure reducing valve will be placed at the discharge to dissipate energy and adjust the flow.

6.0 Cost Analysis

A Class 5 cost estimate was prepared based on limited information, where little more than proposed plant type, its location, and the capacity are known. Strategic planning purposes include but are not limited to, market studies, assessment of viability, evaluation of alternate schemes, project screening, location and evaluation of resource needs and budgeting, and long-range capital planning. Examples of estimating methods used would include cost/capacity curves and factors, scale-up factors, and parametric and modeling techniques. Typically, little time is expended in the development of this estimate. The expected accuracy ranges for this class estimate are –20 to –50 percent on the low side and +30 to +100 percent on the high side. These estimate includes a Contractors overhead and profit, a 10% contingency, and 17% for soft costs (admin, design, construction management). These estimates include costs for real estate acquisition based on a 100-foot wide corridor at $15,000 per acre.

Cost for Alt 6A-2 750 cfs to Colusa Basin Drain = **$54.8M ($30/di-lf)**

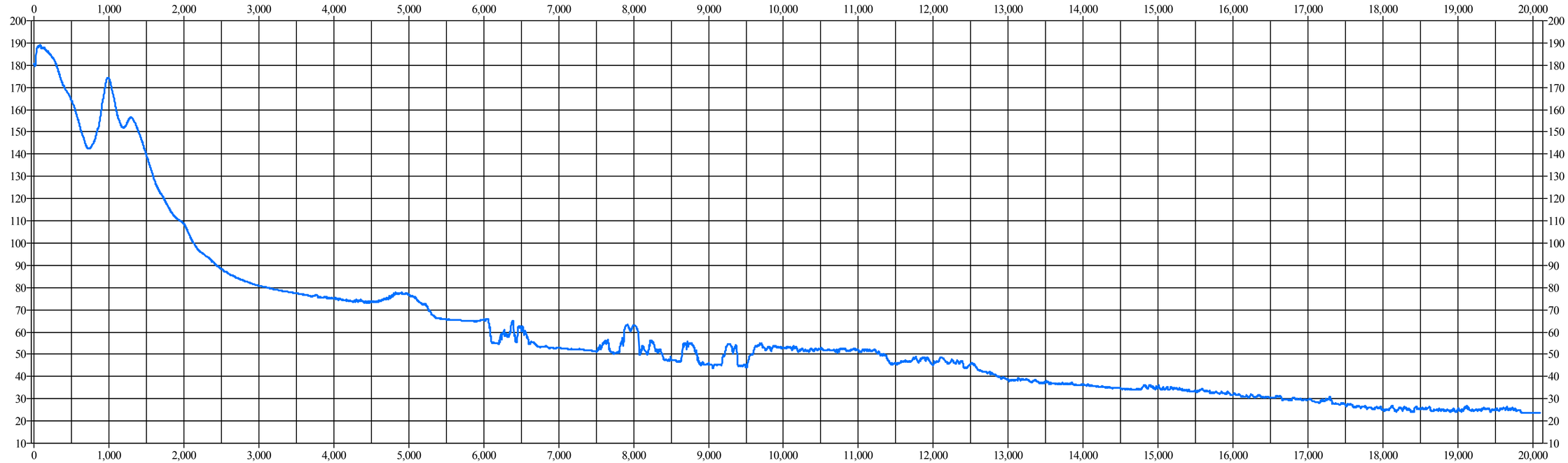
Cost for Alt 6A-2 750 cfs to Sacramento River = **$175.2M ($30/di-lf)**

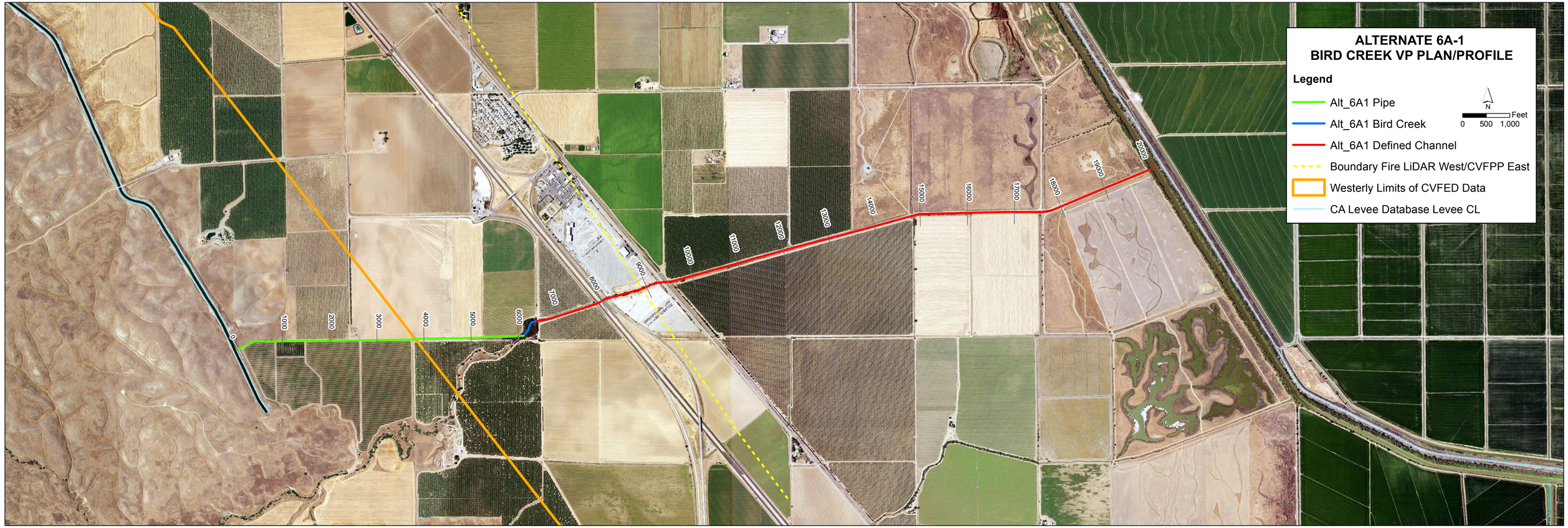
Cost for Alt 6A-5 1,000 cfs to Colusa Basin Drain = **$65.2M ($30/di-lf)**

Cost for Alt 6A-5 1,000 cfs to Sacramento River = **$192.5M ($30/di-lf)**

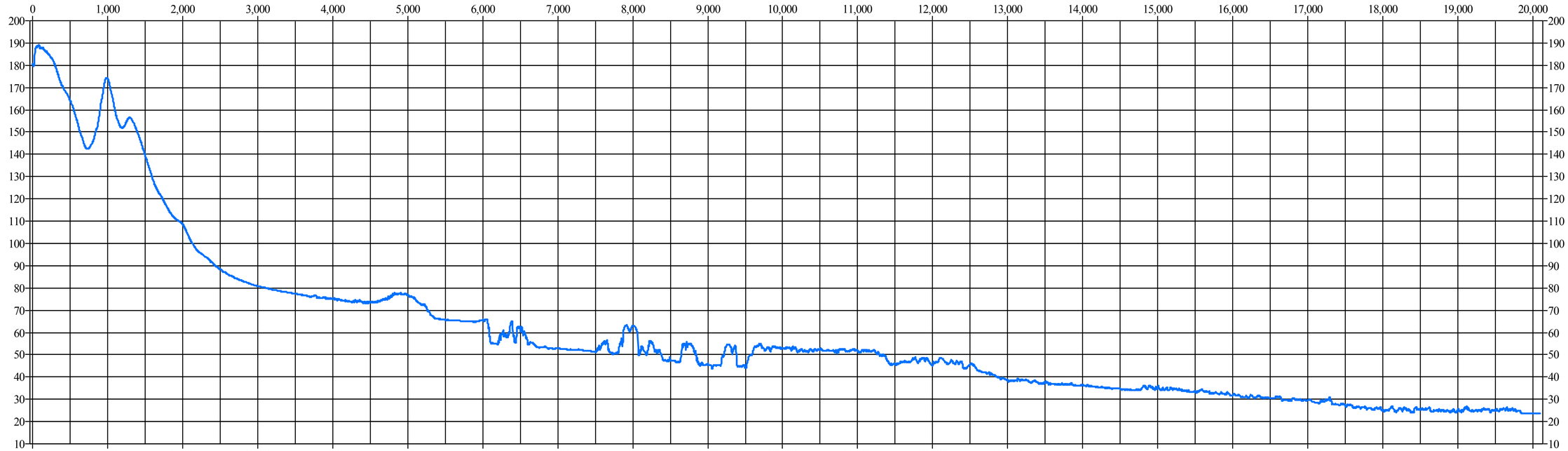
The comparison of costs shows extending the pipeline to the Sacramento River will cost an additional $120M for the 750 cfs flow and $130M for the 1,000 cfs flow. These differences are primarily due to the added length and the additional tunnel to get under the Colusa Basin Drain, as well as the larger diameter pipes for the 1,000 cfs case.

ALTERNATE 6A-1 BIRD CREEK

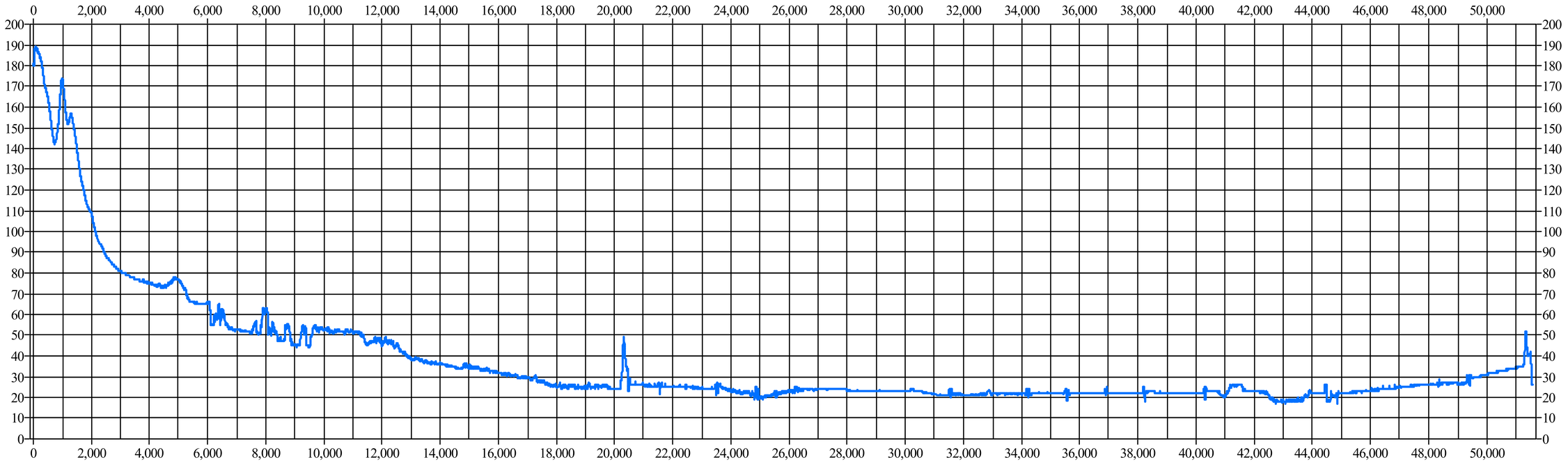




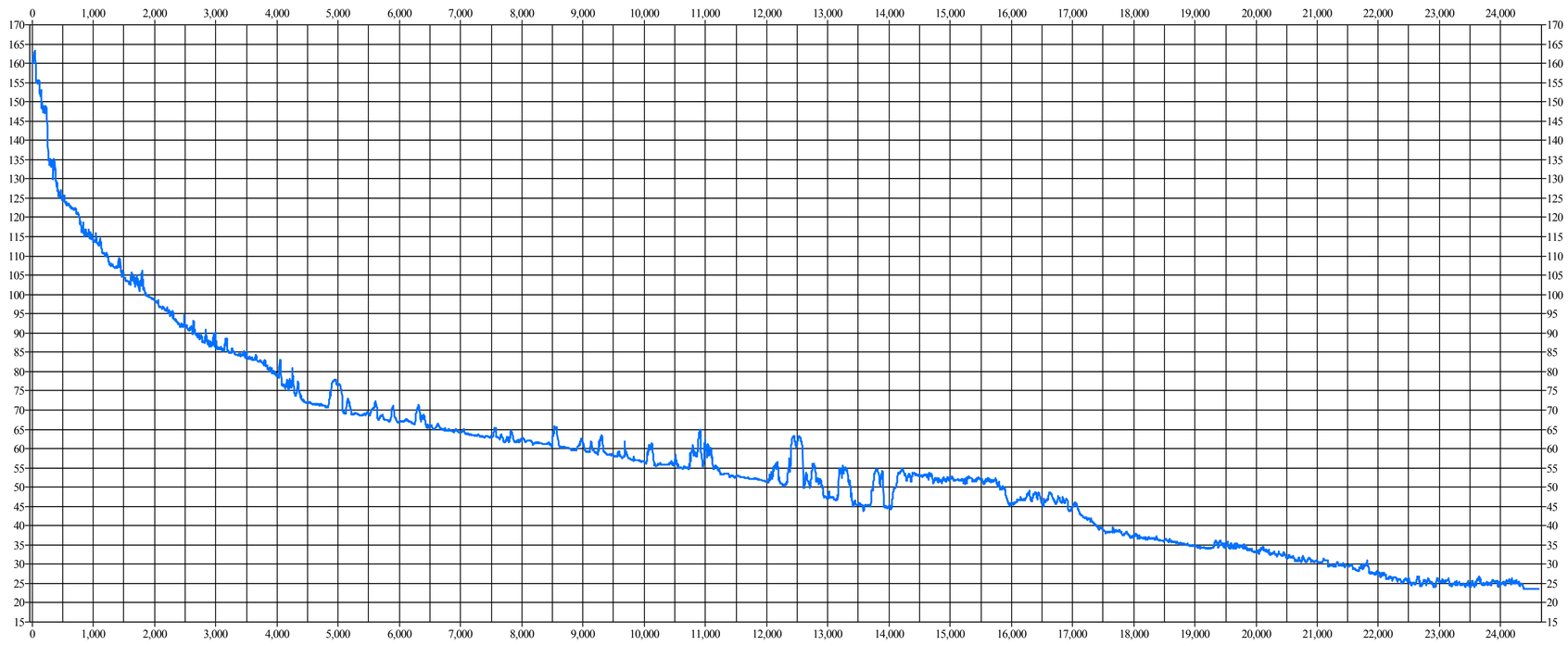
ALTERNATE 6A-2-CBD

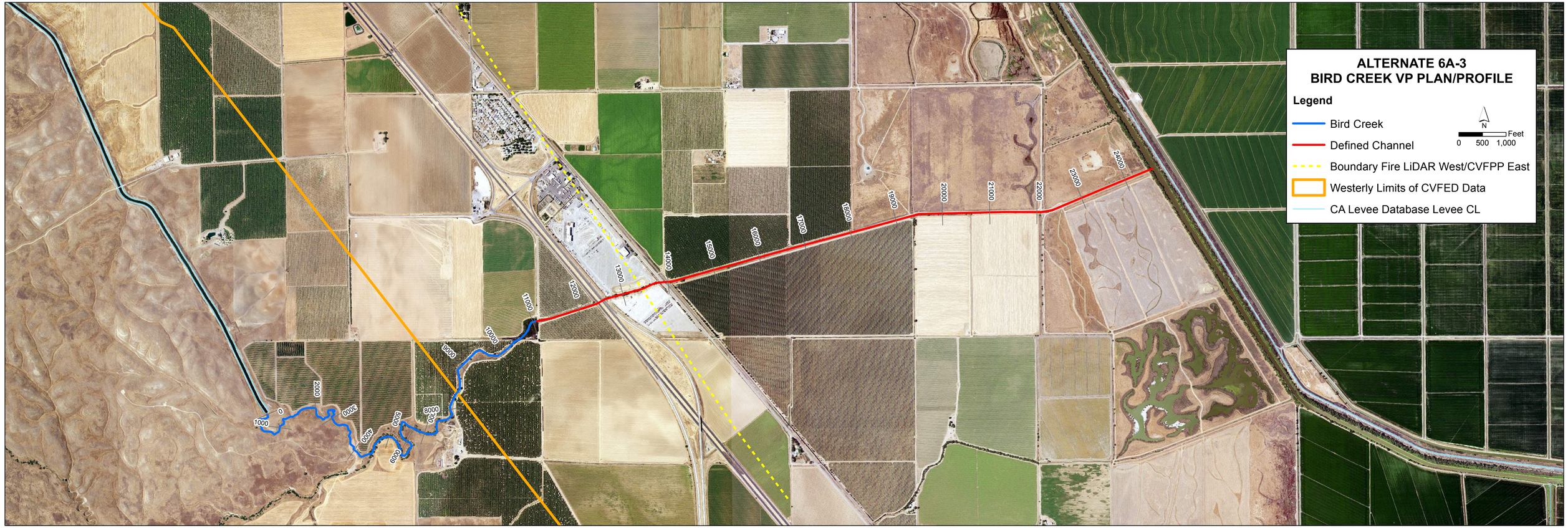


Alternate 6A-2, Tehama Colusa Canal to Sacramento River

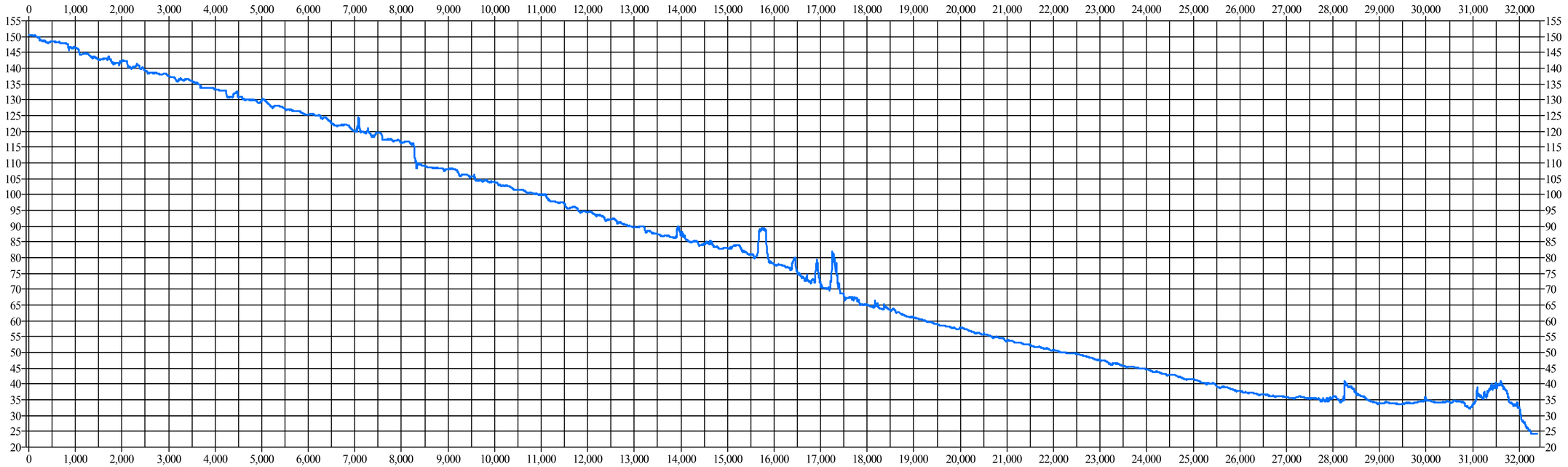


ALTERNATE 6A-3 BIRD CREEK





ALTERNATE 6A-4 HUNTER CREEK



Appendix A-4 Cost Estimate Technical Memorandum

To:	Sites Value Planning Group
CC:	Lee Frederiksen
Date:	January 28, 2020
From:	AECOM
Subject:	Cost Estimate

Construction cost estimates were derived from detailed appraisal-level estimates for a 1.3 MAF reservoir (Alternative A in the EIR/S and feasibility report) and for a 1.8 MAF reservoir (Alternative D in the EIR/S and feasibility report). These estimates reflect the current project concepts and conceptual level of project design, with appropriate allowances for contingencies, non-contracts costs, and forward escalation. Other project-related costs are also provided, including environmental mitigation, and temporary and permanent easement acquisition. The Alternative D estimate was used to support the Authority's WSIP application. Estimated prices were developed in October 2015 dollars and have been escalated in this estimate.

The actual project construction cost ultimately would depend on the final design details of the preferred project alternative and the labor and material costs, market conditions, and other variable factors existing at the time of bid. Accordingly, the final project cost would vary from the preliminary estimates presented in this section.

Major assumptions made to prepare the preliminary feasibility cost estimates include:

- Competitive market conditions would prevail at the time of bid tender.
- Work would be packaged for bidding so that the magnitude of the contract would not unduly restrict competition.
- The construction schedule assumes a start of field construction activities in the second quarter of 2022 for all scenarios.
- Environmental mitigation and ecosystem enhancement measures would be consistent with those currently used in practice and would be the same for each alternative.
- Builder's Risk Insurance would be available to the contractor.
- Materials such as sand, gravel, and cement would remain available within the haul distances used to prepare the estimates.

1.0 Level and Classification of Cost Estimates

The availability of site data and design information to support preparing cost estimates varies between the facilities that constitute the Sites Reservoir project. Some facilities (like the main dams) are advanced enough to support a lower-bound Class 3 estimate as defined by the Association for Advancement of Cost Engineering, International. Other facilities, like the Dunnigan conveyance from the T-C Canal to the CBD have no supporting geotechnical evaluation and only a preliminary screening of potential utility conflicts. These estimates are considered to be at a Class 5 level.

The estimate for the 1.8, 1.3, and 0.8 MAF reservoir dams used dimensions, quantities, and cost ratios previously developed by DWR (DWR DOE. 2004. Sites Reservoir Engineering Feasibility Study – Sites

Reservoir Alternative Reservoir Size Evaluation. October.). The estimate for the 1.0 MAF reservoir was interpolated from the 0.8 MAF and 1.3 MAF facilities.

1.1 Estimate Base and Escalation

The contract, field, and construction cost estimates presented in this section were compiled using individual-estimate worksheets for each NODOS/Sites Reservoir Project feature. All costs are provided in October 2015 dollars. Escalation of construction costs to a notice to proceed date in mid-2022 has been included. Escalation was evaluated using various sources, including the USACE Civil Works Construction Cost Index and the Consumer Price Index. Results varied from 15.3 percent to 15.8 percent over the escalation period. For the project alternatives, 15 percent over 7 years has been applied for each alternative.

1.2 Allowances and Contingency

Construction contingency is a percentage allowance added to develop the field cost. Contingencies are funds for use after construction starts to compensate the contractor for such issues as unforeseen or changed site conditions, owner-directed orders for change, and differences between estimated and actual quantities. Contingency allowances are generally higher for appraisal-level estimates than for feasibility-level estimates.

For a Class 4 estimate, the overall cost variability can range per AACE from negative 15% to 30% on the low range to positive 20% to 50% on the high range, depending on the level of design information available to support the estimate. This report uses a construction contingency of 15 percent to establish for all features, but also applies a higher contingency to high risk and new facilities developed during the value planning effort where less supporting information is available.

- A 30% contingency was applied for an upper end estimate for the new Funks pumping facilities. Although these were not previously studied, they are in the footprint where geotechnical investigations have been performed in the past.
- A 65% contingency was applied to establish the upper range of costs for the Dunnigan release facilities. There is no information from prior investigations or topography for these facilities. These facilities are at a Class 5 level.
- A 40% contingency was applied to establish the upper range of costs for the TRR. Geotechnical information is limited and there is a potential liquefaction concern.

Table A4-1 presents the allowances and average contingency percentages adopted and applied to the feasibility-level cost estimate for the alternative projects.

Table A4-1. Allowances and Contingencies for Estimating

Allowances and Contingencies	Percentages
Mobilization/Demobilization	5 percent
Design Contingency	10 percent
Construction Contingency	15 to 65 percent
Non-Contract Costs	17 percent

The mobilization/demobilization allowance and design and construction contingencies were applied to the contractor costs to develop the contract cost. The construction contingency was applied to the contract cost to arrive at the field cost.

1.3 Non-Contract Costs

Non-contract costs include Authority staff, engineering and design, surveying, geotechnical investigation, construction management and inspection, project close-out, administration, legal services, permitting, etc. For the estimates presented in this section, the non-contract costs were estimated to be 17 percent of the total field costs (contract cost plus contingency). Actual non-contract costs would vary from facility to facility; however, 17 percent is assumed to represent the average value.

1.4 Environmental Mitigation

Many environmental laws affect the State's major water supply programs, and environmental concerns play a major role in water policy and planning. Mitigation costs for the original alternatives were based on *Sites Reservoir Feasibility Study Technical Memorandum: Mitigation Measure Evaluation and Cost Estimate* (AECOM 2016).

2.0 Estimates

Estimate summaries are provided for Alternatives VP1 through VP 3 in Tables A4-2 through A4-4, respectively.

The Value Planning Work Group subsequently selected three alternatives for further analysis. These are shown in Table A4-5.

Table A4-2. Estimate Summary for Alternative VP 1

Facility	1.0 MAF ($ Millions)	1.3 MAF ($ Millions)	1.5 MAF ($ Millions)
Develop Sites Reservoir, including Land and Project Roads, Clearing and Demolition	$143,000,000	$143,000,000	$143,000,000
Other Roads (Project and Recreation)	$79,000,000	$79,000,000	$79,000,000
South Road to Residents (Unpaved)	$41,000,000	$41,000,000	$41,000,000
Bridge	$99,000,000 To $116,000,000	$126,000,000 To $147,000,000	$154,000,000 To $180,000,000
North Construction Access Road (Paved)	$30,000,000	$30,000,000	$30,000,000
Construct Sites Dam and Golden Gate Dam	$255,000,000	$345,000,000	$410,000,000
Construct Saddle Dams	$92,000,000	$101,000,000	$197,000,000
Construct TRR	$42,000,000 To $51,000,000	$42,000,000 To $51,000,000	$42,000,000 To $51,000,000
Construct TCRR	$42,000,000 To $51,000,000	$42,000,000 To $51,000,000	$42,000,000 To $51,000,000
Funks Reservoir Dredging/Structures	$24,000,000	$24,000,000	$24,000,000
Hunters Creek Release Structures	$91,000,000	$91,000,000	$91,000,000
Construct I/O Structure and Tunnels for Reservoir	$183,000,000	$280,000,000	$302,000,000
Construct TCRR Pumping/Generating Plant	$200,000,000	$200,000,000	$200,000,000
Construct TRR Pumping/Generating Plant	$200,000,000	$200,000,000	$200,000,000
Red Bluff Pump Addition	$4,000,000	$4,000,000	$4,000,000
Construct Funks Release Channel	$34,000,000	$34,000,000	$34,000,000
Construct TCRR Pipeline	$443,000,000 To $508,000,000	$443,000,000 To $508,000,000	$443,000,000 To $508,000,000
Construct TRR Pipeline	$227,000,000	$227,000,000	$227,000,000
Construct Dunnigan Pipeline to River	$177,000,000 To $292,000,000	$177,000,000 To $292,000,000	$177,000,000 To $292,000,000
River Release Structure	$9,000,000	$9,000,000	$9,000,000
Transmission Lines, Substations, Switchyards	$113,000,000	$113,000,000	$113,000,000
General Property, including Recreation Areas and OM&R Facilities	$32,000,000	$32,000,000	$32,000,000
Mitigation	$540,000,000	$540,000,000	$540,000,000
Construction Cost (2019)	$3,057,000,000 To $3,262,000,000	$3,281,000,000 To $3,490,000,000	$3,493,000,000 To $3,707,000,000

Key:
I/O = inlet/outlet
OM&R = operation, maintenance, and replacement
TCRR = Regulating Reservoir for T-C Canal
TRR = Terminal Regulating Reservoir for GCID Main Canal

Table A4-3. Estimate Summary for Alternative VP 2

Facility	1.0 MAF ($ Millions)	1.3 MAF ($ Millions)	1.5 MAF ($ Millions)
Develop Sites Reservoir, including Land and Project Roads, Clearing and Demolition	$143,000,000	$143,000,000	$143,000,000
Other Roads (Project and Recreation)	$79,000,000	$79,000,000	$79,000,000
South Road to Residents (Unpaved)	$41,000,000	$41,000,000	$41,000,000
Bridge	$99,000,000 To $116,000,000	$126,000,000 To $147,000,000	$154,000,000 To $180,000,000
North Construction Access Road (Paved)	$30,000,000	$30,000,000	$30,000,000
Construct Sites Dam and Golden Gate Dam	$255,000,000	$345,000,000	$410,000,000
Construct Saddle Dams	$92,000,000	$101,000,000	$197,000,000
Construct TRR	$42,000,000 To $51,000,000	$42,000,000 To $51,000,000	$42,000,000 To $51,000,000
Funks Reservoir Dredging/Structures	$24,000,000	$24,000,000	$24,000,000
Hunters Creek Release Structures	$91,000,000	$91,000,000	$91,000,000
Construct I/O Structure and Tunnels for Reservoir	$183,000,000	$280,000,000	$302,000,000
Construct TRR Pumping/Generating Plant	$200,000,000	$200,000,000	$200,000,000
Construct Funks Pumping/Generating Plant	$200,000,000	$200,000,000	$200,000,000
Construct Funks Release Channel	$34,000,000	$34,000,000	$34,000,000
Red Bluff Pump Addition	$4,000,000	$4,000,000	$4,000,000
Construct Funks Release Channel	$31,000,000	$31,000,000	$31,000,000
Construct TRR Pipeline	$227,000,000	$227,000,000	$227,000,000
Construct Dunnigan Pipeline to CBD	$56,000,000 To $90,000,000	$56,000,000 To $90,000,000	$56,000,000 To $90,000,000
Transmission Lines, Substations, Switchyards	$113,000,000	$113,000,000	$113,000,000
General Property, including Recreation Areas and OM&R Facilities	$32,000,000	$32,000,000	$32,000,000
Mitigation	$540,000,000	$540,000,000	$540,000,000
Construction Cost (2019)	$2,613,000,000 To $2,754,000,000	$2,837,000,000 To $2,982,000,000	$2,996,000,000 To $3,199,000,000

Key:
I/O = inlet/outlet
OM&R = operation, maintenance, and replacement
TRR = Terminal Regulating Reservoir

Table A4-4. Estimate Summary for Alternative VP 3

Facility	1.3 MAF ($ Millions)	1.5 MAF ($ Millions)
Develop Sites Reservoir, including Land and Project Roads, Clearing and Demolition	$143,000,000	$143,000,000
Other Roads (Project and Recreation)	$79,000,000	$79,000,000
South Road to Residents (Unpaved)	$41,000,000	$41,000,000
Bridge	$126,000,000 To $147,000,000	$154,000,000 To $180,000,000
North Construction Access Road (Paved)	$30,000,000	$30,000,000
Construct Sites Dam and Golden Gate Dam	$345,000,000	$410,000,000
Construct Saddle Dams	$101,000,000	$197,000,000
Construct TRR	$42,000,000 To $51,000,000	$42,000,000 To $51,000,000
Funks Reservoir Dredging/Structures	$24,000,000	$24,000,000
Hunters Creek Release Structures	$91,000,000	$91,000,000
Construct I/O Structure and Tunnels for Reservoir	$280,000,000	$302,000,000
Construct TRR Pumping/Generating Plant	$200,000,000	$200,000,000
Construct Funks Pumping/Generating Plant	$200,000,000	$200,000,000
Construct Funks Release Channel	$34,000,000	$34,000,000
Red Bluff Pump Addition	$4,000,000	$4,000,000
Construct Funks Release Channel	$31,000,000	$31,000,000
Construct TRR Pipeline	$227,000,000	$227,000,000
Construct Delevan Pipeline	$713,000,000	$713,000,000
Transmission Lines, Substations, Switchyards	$113,000,000	$113,000,000
General Property, including Recreation Areas and OM&R Facilities	$32,000,000	$32,000,000
Mitigation	$540,000,000	$540,000,000
Construction Cost (2019)	$3,373,000,000 To $3,402,000,000	$3,585,000,000 To $3,619,000,000

Key:
I/O = inlet/outlet
OM&R = operation, maintenance, and replacement
TRR = Terminal Regulating Reservoir

The estimated costs for Alternatives VP1 through VP 3 were determined for the 1.0 MAF, 1.3 MAF, and 1.5 MAF reservoir sizes. Estimated costs are presented in Table A4-5.

Table A4-5. Alternative Costs ($millions)

Reservoir Size	Alternative VP 1 TCRR, TRR, 750 cfs Release to Sacramento River	Alternative VP 2 Funks Reservoir, TRR, 750 cfs Release to CBD	Alternative VP 3 Funks Reservoir, TRR, 1,500 cfs Delevan Release
1.0 MAF	$3,057 to $3,262	$2,613 to $2,754	NA
1.3 MAF	$3,281 to $3,490	$2,837 to $2,982	$3,373 to $3,402
1.5 MAF	$3,493 to $3,707	$2,996 to $3,199	$3,585 to $3,619

The Value Planning Work Group subsequently selected three alternatives for consideration as the Authority's proposed project description. These are shown in Table A4-6. Alternative VP7 was chosen as the recommended project.

Table A4-6. Estimate Summary for Recommended Alternative and Alternates

Facility	VP-5 ($ Millions)	VP-6 ($ Millions)	VP-7 ($ Millions)
Develop Sites Reservoir, including Land and Project Roads, Clearing and Demolition	$143,000,000	$143,000,000	$143,000,000
Other Roads (Project and Recreation)	$79,000,000	$79,000,000	$79,000,000
South Road to Residents (Unpaved)	$41,000,000	$41,000,000	$41,000,000
Bridge (Corresponds to 1.5 MAF reservoir for all alternatives)	$180,000,000	$180,000,000	$180,000,000
North Construction Access Road (Paved)	$30,000,000	$30,000,000	$30,000,000
Construct Sites Dam and Golden Gate Dam (1.5 MAF)			$450,000,000
Construct Sites Dam and Golden Gate Dam (1.3 MAF)	$386,000,000	$386,000,000	
Construct Saddle Dams (1.5 MAF)			$198,000,000
Construct Saddle Dams (1.3 MAF)	$102,000,000	$102,000,000	
Construct TRR	$51,000,000	$51,000,000	$51,000,000
Funks Reservoir Dredging/Structures	$24,000,000	$24,000,000	$24,000,000
Hunters Creek Release Structures	$91,000,000	$91,000,000	$91,000,000
Construct I/O Structure and Tunnels for Reservoir (1.5 MAF)			$302,000,000
Construct I/O Structure and Tunnels for Reservoir (1.3 MAF)	$280,000,000	$280,000,000	
Construct TRR Pumping/Generating Plant	$200,000,000	$200,000,000	$200,000,000
Construct Funks Pumping/Generating Plant	$200,000,000	$200,000,000	$200,000,000
Construct Funks Release Channel	$34,000,000	$34,000,000	$34,000,000
Red Bluff Pump Addition	$4,000,000	$4,000,000	$4,000,000
Construct TRR Pipeline	$227,000,000	$227,000,000	$227,000,000
Construct Dunnigan Pipeline to CBD (1,000 cfs)	$66,000,000		$66,000,000
Construct Dunnigan Pipeline to River (1,000 cfs)		$194,000,000	
Release Structure	$8,600,000	$8,600,000	$8,600,000
Transmission Lines, Substations, Switchyards	$136,000,000	$136,000,000	$136,000,000
General Property, including Recreation Areas and OM&R Facilities	$32,000,000	$32,000,000	$32,000,000
Mitigation	$540,000,000	$540,000,000	$540,000,000
Construction Cost (2019)	$2,855,000,000	$2,988,000,000	$3,037,000,000

Key:
I/O = inlet/outlet
OM&R = operation, maintenance, and replacement
TRR = Terminal Regulating Reservoir

3.0 Operations, Maintenance, and Replacement Costs

The financial model requires estimated costs for OM&R. Many long-term OM&R costs are proportional to diversions (e.g., energy for pumping and wheeling costs for GCID and Reclamation facilities). Variable and fixed repair and replacement costs were estimated using INEL Guidelines (Estimation of Economic Parameters of U.S. Hydropower Resources for estimating O&M, 2003) and through comparison to costs for the Central Utah and Animas La Plata Projects. Estimated OM&R costs are summarized in Table A4-7 Wheeling costs are conservatively estimated at $22/AF. Power costs were derived from modeling by PARO (DWR, 2016).

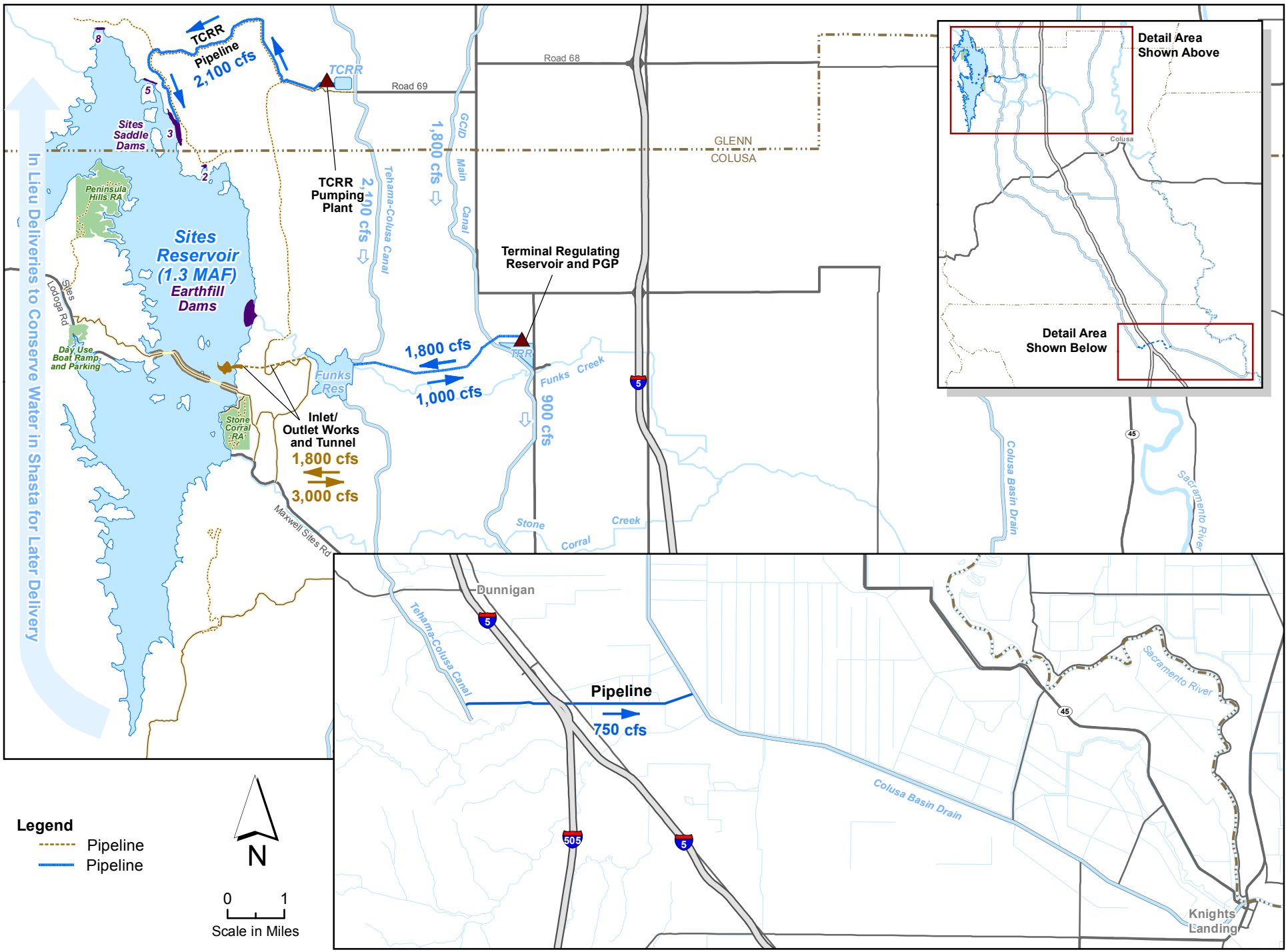
The resulting cost per acre foot was used to adjust the cost estimate to correspond to modeling results.

Table A4-7. OM&R Costs (2016)

Size	Total Flow	Est. Div	SOD Flow	Pump ($1000s)	Wheeling ($1000s)	Variable ($1000s)	Var/AF	Fixed/ AF	$/AF	Total without Generation ($M/yr)	Gen/AF	Potential Savings
1.5	375	394	98	$8,679	$10,819	$19,498	$50	$20	$70	$26,064	$11	$4,052
1.3	359	377	88	$8,309	$10,229	$18,538	$49	$21	$70	$25,149	$10	$3,713
1.0	317	333	60	$7,337	$8,643	$15,980	$48	$24	$72	$22,713	$9	$2,895

Attachment A-4-1

Value Planning Alternatives



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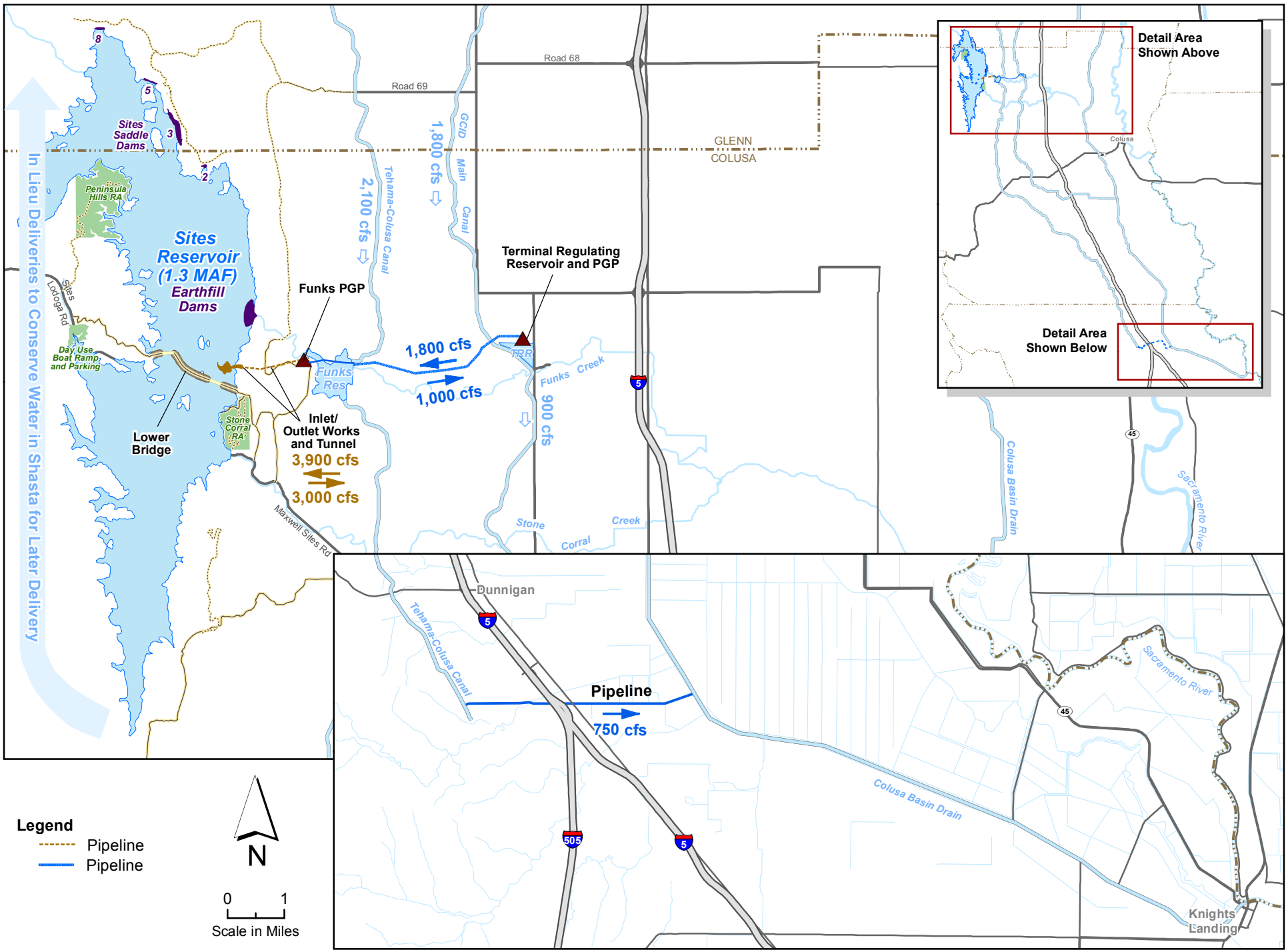
VP1


In Lieu Deliveries to Conserve Water in Shasta for Later Delivery
Sites Reservoir (1.3 MAF) Earthfill Dams
Sites Saddle Dams
Peninsula Hills RA
Day Use Boat Ramp and Parking
Stone Corral RA
Lower Bridge
Inlet/ Outlet Works and Tunnel
3,900 cfs
3,000 cfs
Funks PGP
Funks Res
1,800 cfs
1,000 cfs
Terminal Regulating Reservoir and PGP
TRR
900 cfs
2,100 cfs
1,800 cfs
Tehama-Colusa Canal
GCID Main Canal
Road 68
Road 69
GLENN
COLUSA
Maxwell Sites Rd
Sites Lodoga Rd
Funks Creek
Stone Corral Creek
Colusa Basin Drain
Sacramento River
Detail Area Shown Above
Detail Area Shown Below
Colusa
Dunnigan
Pipeline
750 cfs
Knights Landing
Legend
Pipeline
Pipeline
N
0 1
Scale in Miles
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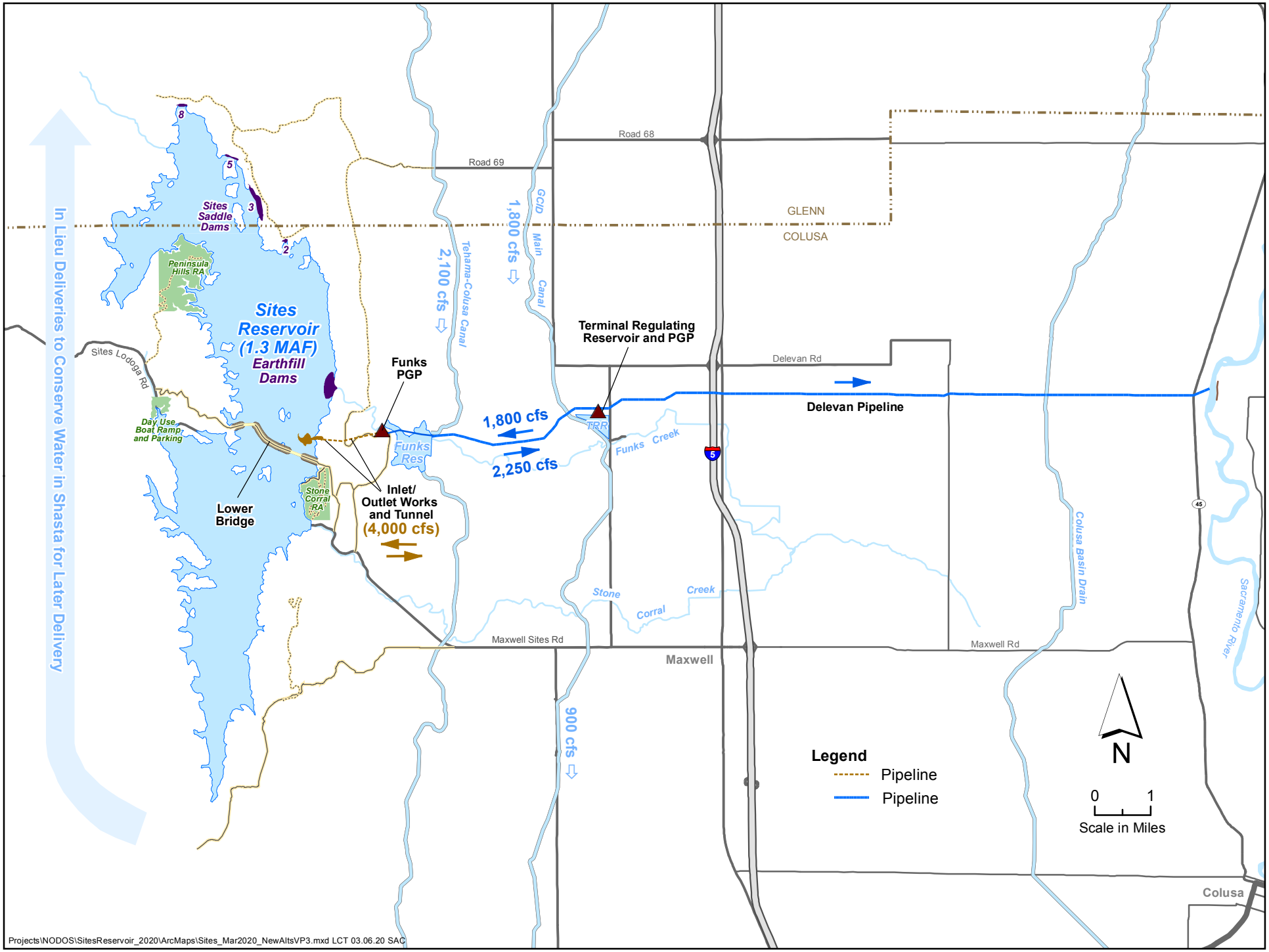
VP2


In Lieu Deliveries to Conserve Water in Shasta for Later Delivery
Sites Saddle Dams
8
5
3
2
Peninsula Hills RA
Sites Reservoir (1.3 MAF) Earthfill Dams
Sites Lodoga Rd
Day Use Boat Ramp and Parking
Stone Corral RA
Lower Bridge
Inlet/ Outlet Works and Tunnel (4,000 cfs)
Funks PGP
Funks Res
1,800 cfs
2,250 cfs
2,100 cfs
Tehama-Colusa Canal
1,800 cfs
GCID Main Canal
Terminal Regulating Reservoir and PGP
TRR
Delevan Pipeline
Road 68
Road 69
GLENN
COLUSA
Delevan Rd
Funks Creek
Stone Corral Creek
Maxwell Sites Rd
Maxwell
Maxwell Rd
900 cfs
Colusa Basin Drain
Sacramento River
Colusa
Legend
Pipeline
Pipeline
N
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Scale in Miles
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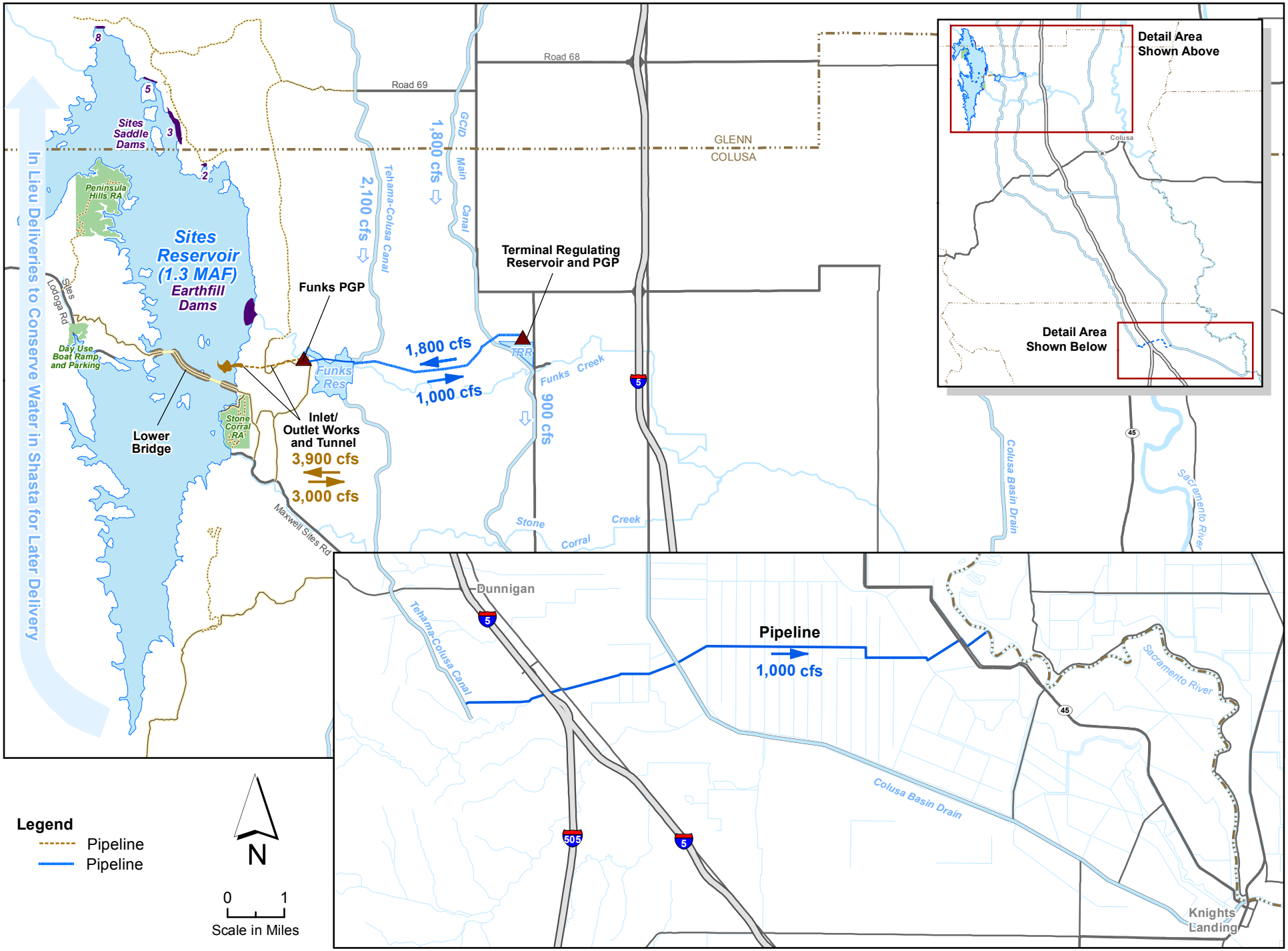
VP3


In Lieu Deliveries to Conserve Water in Shasta for Later Delivery
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Sites Saddle Dams
Peninsula Hills RA
Day Use Boat Ramp and Parking
Stone Corral RA
Lower Bridge
Inlet/ Outlet Works and Tunnel
3,900 cfs
3,000 cfs
Funks PGP
Funks Res
1,800 cfs
1,000 cfs
Terminal Regulating Reservoir and PGP
TRR
900 cfs
2,100 cfs
1,800 cfs
Tehama-Colusa Canal
GCID Main Canal
Road 68
Road 69
GLENN
COLUSA
Funks Creek
Stone Corral Creek
Colusa Basin Drain
Sacramento River
Maxwell Sites Rd
Sites Lodoga Rd
Detail Area Shown Above
Detail Area Shown Below
Colusa
Dunnigan
Pipeline
1,000 cfs
Knights Landing
Legend
Pipeline
Pipeline
N
0
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Scale in Miles
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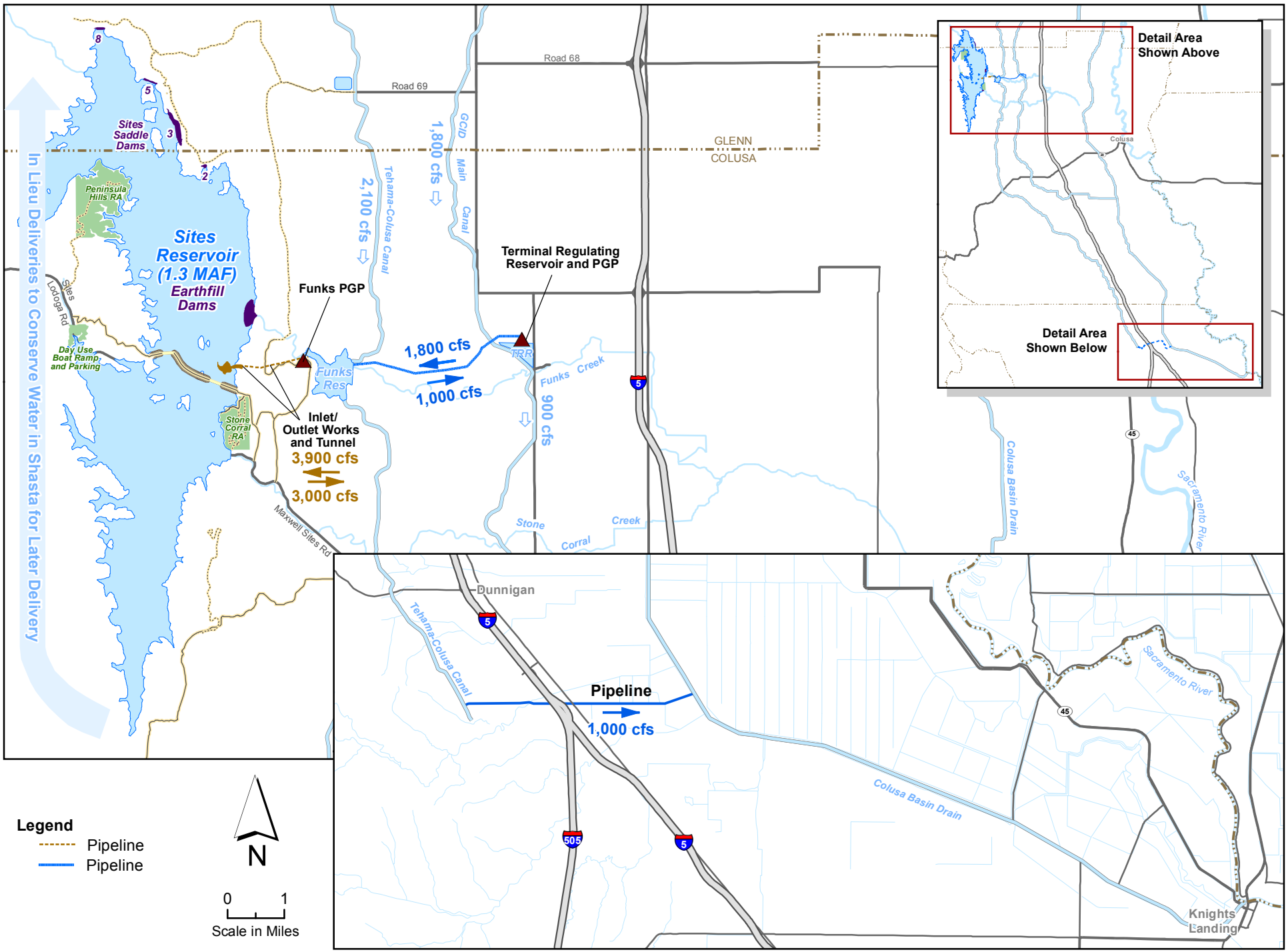
VP4



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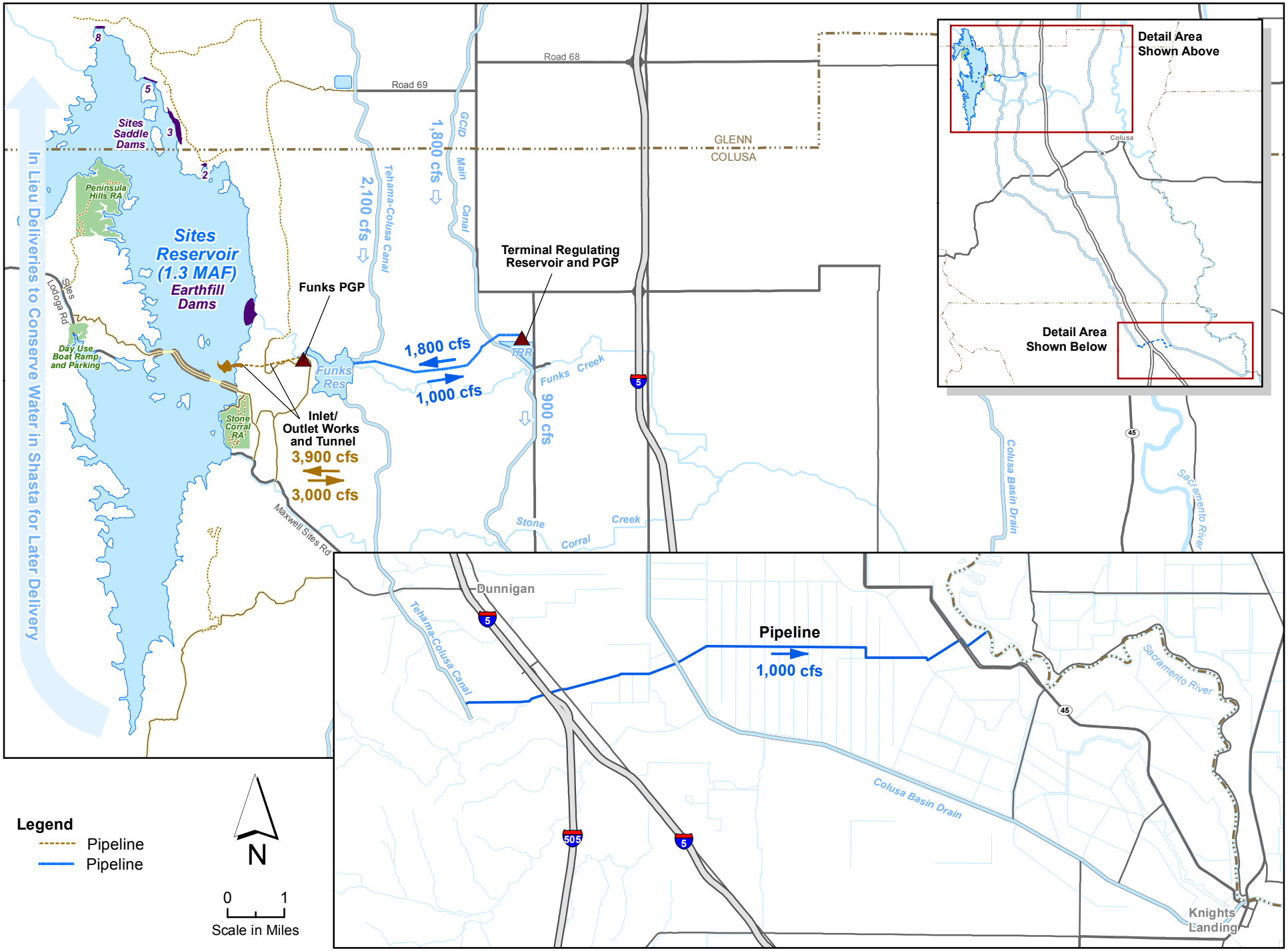
VP5



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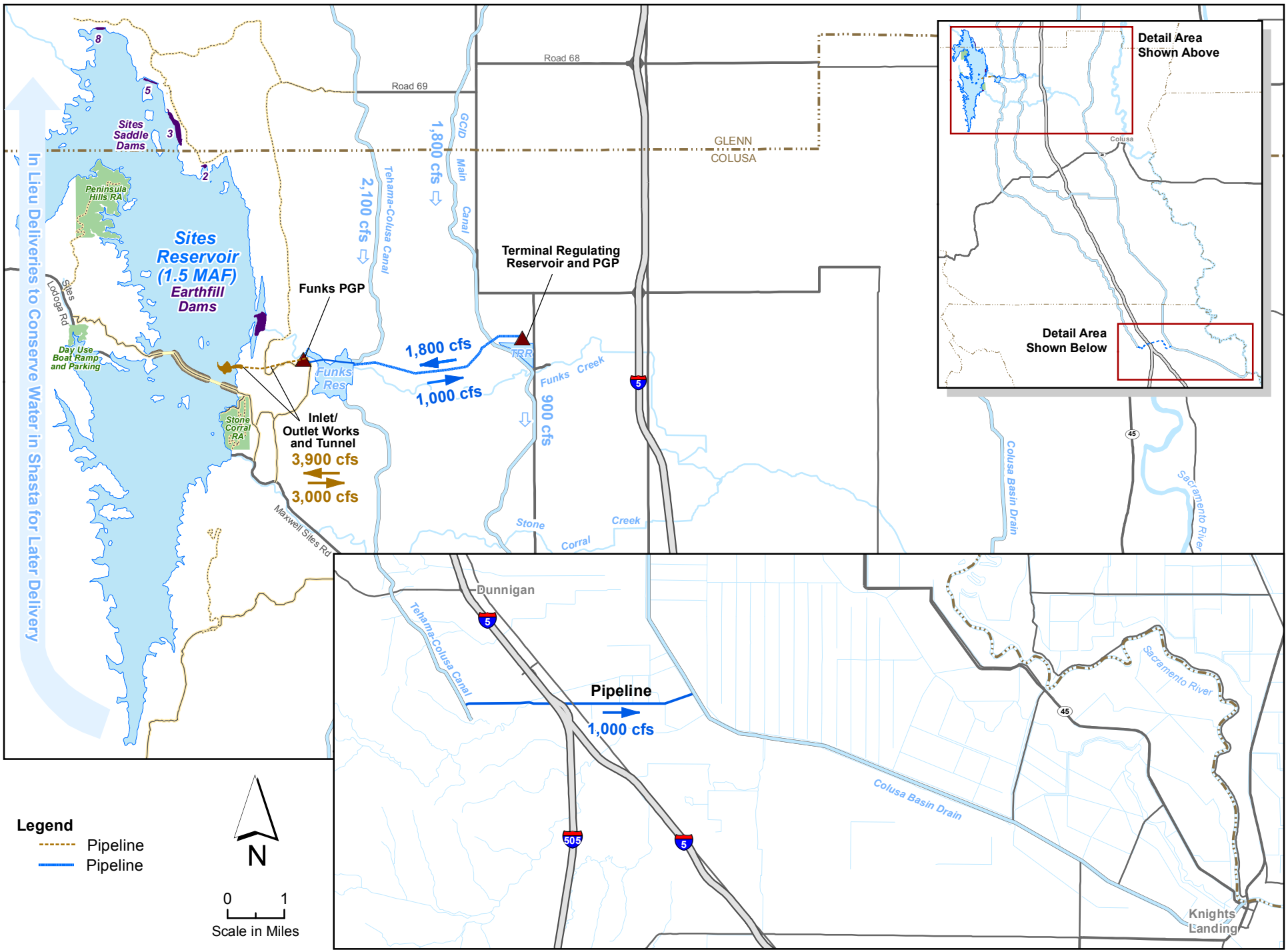
VP6


In Lieu Deliveries to Conserve Water in Shasta for Later Delivery
Sites Reservoir (1.5 MAF) Earthfill Dams
Sites Saddle Dams
Peninsula Hills RA
Day Use Boat Ramp and Parking
Stone Corral RA
Sites Lodoga Rd
Maxwell Sites Rd
Funks PGP
Inlet/ Outlet Works and Tunnel
3,900 cfs
3,000 cfs
Terminal Regulating Reservoir and PGP
1,800 cfs
1,000 cfs
900 cfs
2,100 cfs
1,800 cfs
Funks Res
Funks Creek
Stone Corral Creek
Tehama-Colusa Canal
GCID Main Canal
Road 68
Road 69
GLENN
COLUSA
Colusa
Colusa Basin Drain
Sacramento River
Detail Area Shown Above
Detail Area Shown Below
Dunnigan
Pipeline
1,000 cfs
Knights Landing
Legend
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Scale in Miles
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VP7

Appendix B – Operations

Appendix B-1 Release Capacity and Reservoir Size Technical Memorandum

To:	Value Planning Work Group
CC:	Lee Frederiksen
Date:	March 12, 2020
From:	Rob Tull, CH2M
Quality Review by:	Erin Heydinger
Authority Agent Review by:	Ali Forsythe
Subject:	Release Capacity and Reservoir Size

This memorandum includes a sensitivity analysis for a range of reservoir sizes and release capacities for Sites Reservoir. The purpose of this analysis is to evaluate the quantity of water from Sites Reservoir that could be released under different conveyance capacities.

1.0 Assumptions

Three conveyance capacities for Sites Reservoir releases were evaluated: 750 cubic feet per second (cfs), 1,000 cfs, and 1,500 cfs. Each conveyance capacity was assessed using three storage capacities for the reservoir: 1.5 million acre-feet (MAF), 1.3 MAF, and 1.0 MAF. All nine combinations were run under Scenario B, an operations scenario that was developed through previous discussions with the California Department of Fish and Wildlife (CDFW). Assumptions and diversion criteria for Scenario B operations are detailed in Attachment 1.

The following scenarios were evaluated:

1. Scenario B – 750 cfs conveyance capacity & 1.5 MAF storage capacity
2. Scenario B – 750 cfs conveyance capacity & 1.3 MAF storage capacity
3. Scenario B – 750 cfs conveyance capacity & 1.0 MAF storage capacity
4. Scenario B – 1,000 cfs conveyance capacity & 1.5 MAF storage capacity
5. Scenario B – 1,000 cfs conveyance capacity & 1.3 MAF storage capacity
6. Scenario B – 1,000 cfs conveyance capacity & 1.0 MAF storage capacity
7. Scenario B – 1,500 cfs conveyance capacity & 1.5 MAF storage capacity
8. Scenario B – 1,500 cfs conveyance capacity & 1.3 MAF storage capacity
9. Scenario B – 1,500 cfs conveyance capacity & 1.0 MAF storage capacity

For each scenario, releases from Sites Reservoir were quantified using monthly releases, as reported by CalSim II modeling. Deliveries include releases for Phase 2 project participants including members along the Tehema-Colusa Canal (T-C Canal), Glenn-Colusa Irrigation District, Reclamation District 108, Colusa County, other Sacramento Valley participants, South of Delta participants, plus Proposition 1 deliveries for Incremental Level 4 refuge water supply (Refuge Level 4) and Yolo Bypass.

The type of facility selected to convey Sites Reservoir releases is yet to be determined (at the time the analysis was conducted). Releases may be through a canal, creek, or pipe. The results of this sensitivity analysis are unaffected by facility choice and additional analysis to account for seepage losses and downstream hydraulic conditions will be needed in the future.

These sensitivity analyses include a surrogate approximation of the potential to exchange water between Sites Reservoir and Shasta Lake. This exchange would be implemented through the release of Sites water to meet Sacramento Valley Central Valley Project (CVP) contract demands and Delta regulatory obligations. There would be a corresponding reduction in Shasta Lake releases that preserves storage in the lake and contributes to water temperature management and Sacramento River flow stability benefits. Based on previous analyses it is assumed that about 60 thousand acre-feet (TAF) could be exchanged on an average annual basis with the majority of these exchanges occurring in dry and critical water year types. This also assumes integration with the State Water Project (SWP) to facilitate operations and deliveries to South-of-Delta members. Work is on-going to develop the capability to simulate the Reclamation no investment exchange and integration of operations with the SWP.

2.0 Release Results

Table B1-1 shows the reservoir releases for Scenario B under all nine combinations of Sites storage and release capacities. The table includes average annual deliveries for the full 82-year simulation period and each water year type, as classified by DWR's Sacramento Valley Water Year Hydrologic Index.

Overall, decreasing Sites' release capacity from 1,500 cfs to 1,000 cfs reduces average annual releases by 4.0% to 6.2%. Bringing the release capacity down to 750 cfs reduces average annual deliveries by another 1.6% to 2.7%.

Releases from Sites are greatest during Dry years. Consequently, dry years are more critical to the conveyance capacity of Sites releases than any other year type. For example, the average annual delivery of a 1.5 MAF reservoir decreases by 13.5% when its' release capacity is reduced from 1,500 cfs to 750 cfs.

Based on this sensitivity analysis, the combination of a 1.3 MAF reservoir and a 750 cfs release capacity provides about a 230 TAF average annual release for Sites Reservoir.

It is recommended that a lower range estimate also be considered, to account for uncertainty, that is 30 TAF less than the simulated values shown in Table B1-1.

Table B1-1. Sites Reservoir Releases under Varying Storage and Release Capacities

Preliminary - Sensitivity			
Conveyance Release Analysis – Scenario B			
Reservoir Release (TAF)			
Long-term Average			
Storage Capacity (MAF)	Scenario B – 1,500 cfs Release Capacity	Scenario B – 1,000 cfs Release Capacity	Scenario B – 750 cfs Release Capacity
1.5	253	243	236
1.3	243	234	230
1.0	207	195	191
Wet Years			
Storage Capacity (MAF)	Scenario B – 1,500 cfs Release Capacity	Scenario B – 1,000 cfs Release Capacity	Scenario B – 750 cfs Release Capacity
1.5	115	116	112
1.3	122	115	113
1.0	118	112	109
Above Normal Years			
Storage Capacity (MAF)	Scenario B – 1,500 cfs Release Capacity	Scenario B – 1,000 cfs Release Capacity	Scenario B – 750 cfs Release Capacity
1.5	275	286	280
1.3	287	299	303
1.0	185	186	194
Below Normal Years			
Storage Capacity (MAF)	Scenario B – 1,500 cfs Release Capacity	Scenario B – 1,000 cfs Release Capacity	Scenario B – 750 cfs Release Capacity
1.5	285	273	277
1.3	278	263	266
1.0	237	217	213
Dry Years			
Storage Capacity (MAF)	Scenario B – 1,500 cfs Release Capacity	Scenario B – 1,000 cfs Release Capacity	Scenario B – 750 cfs Release Capacity
1.5	422	382	365
1.3	392	364	345
1.0	343	309	301
Critically Dry Years			
Storage Capacity (MAF)	Scenario B – 1,500 cfs Release Capacity	Scenario B – 1,000 cfs Release Capacity	Scenario B – 750 cfs Release Capacity
1.5	243	237	225
1.3	205	204	204
1.0	185	184	177

3.0 T-C Canal Capacity Analysis

It is necessary to determine whether there is enough capacity in the T-C Canal to accommodate Sites releases to the Sacramento River in addition to releases for Tehama-Colusa Canal Authority (TCCA) members. It is assumed there is 750 cfs of available capacity through the canal.

To confirm the available capacity in the T-C Canal, historical daily diversion data were obtained. Figure B1-1 shows historical daily diversions through the T-C Canal for the period from January 2014 to February 2020. CVP TCCA contractors received a 100 percent contract allocation for 2016 through 2019. The total recorded diversions at Red Bluff Pumping Plant were reduced by one-third to approximate the level of flow in the reach of the TCC below Funks Reservoir. As shown, the estimated daily canal flows never exceed 800 cfs. Assuming the T-C Canal has a capacity of 1,900 cfs below Funks Reservoir, there would be at least 1,000 cfs capacity available for Sites releases even under 100 percent allocation years. Figure B1-2 shows the average monthly approximation for historical diversions through the lower T-C Canal. The figure shows that with some smoothing of the daily values that could be accomplished by forecasting, the lower T-C Canal may have up to 1,000 cfs capacity for Project releases on an average monthly basis, during the peak summer diversion season when TCCA contractors receive a 100 percent contract allocation.

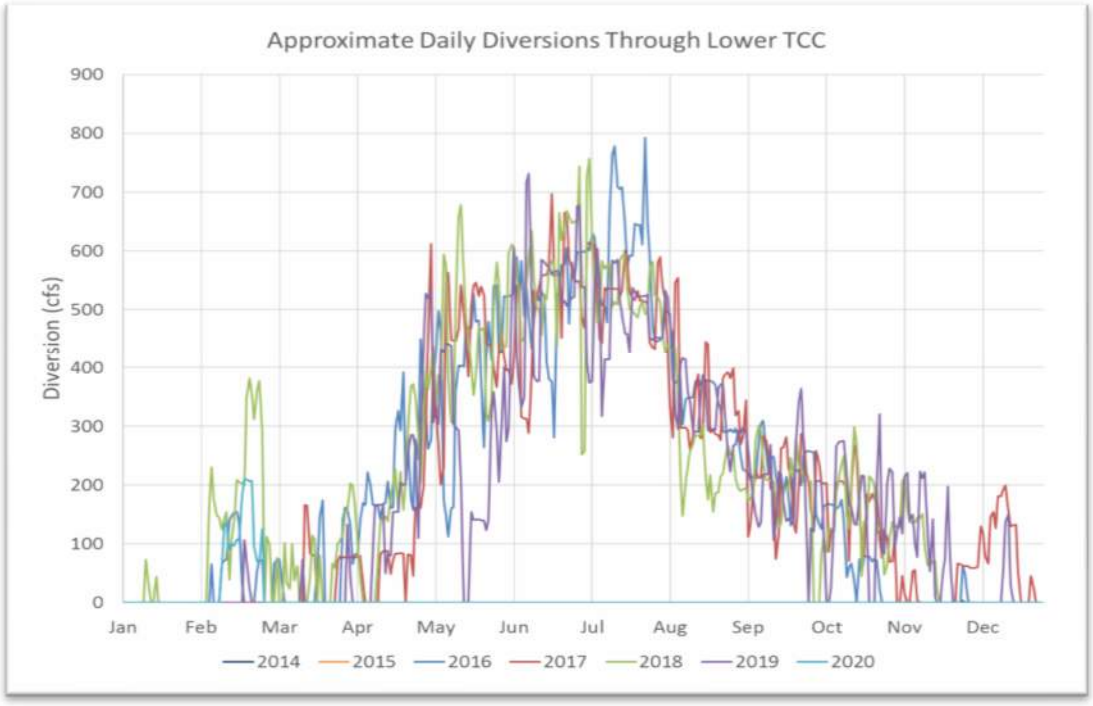


Figure B1-1. Approximated Daily Diversions through the Lower T-C Canal for 2014 to 2020

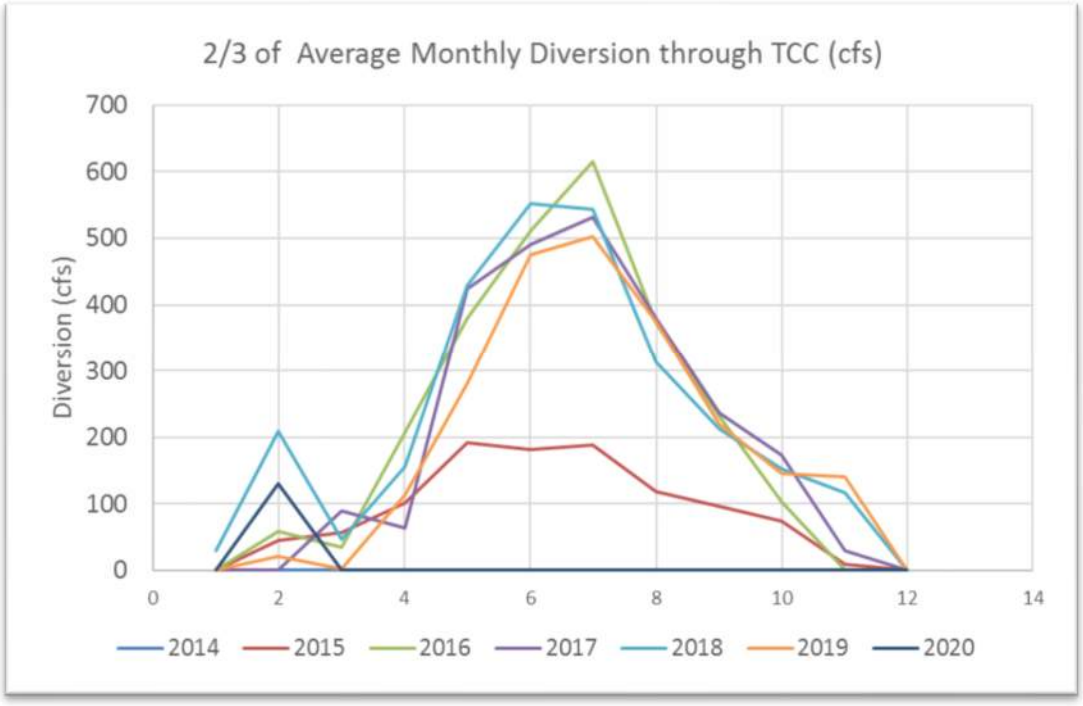


Figure B1-2. Approximated Average Monthly Diversion through the lower T-C Canal for 2014 to 2020

Figure B1-3 shows Sites Reservoir releases through the T-C Canal to the TCCA members under Scenario B using a 1,000 cfs conveyance capacity and three different storage capacities (1.0 MAF, 1.3 MAF, and 1.5 MAF). The releases assume no exchange with Shasta Lake. Figure B1-4 shows total release through the T-C Canal under the assumption that the T-C Canal is the only option for release conveyance. This release includes CVP deliveries to TCCA members and releases from Sites Reservoir under the assumption of no exchange with Shasta Lake. It also includes Sites releases for Colusa County, other Sacramento Valley members, South-of-Delta members, and state deliveries for Level 4 Refuges and Yolo Bypass objectives. As shown, simulated monthly Sites deliveries through T-C Canal to members along the canal never exceed much more than 500 cfs, while total deliveries through T-C Canal including South of Delta releases rarely exceeds 1,100 cfs. Based on this preliminary analysis, the lower T-C Canal appears to have sufficient capacity to convey CVP TCCA contractor deliveries, Sites releases to TCCA members, plus additional Sites releases to the Sacramento River, during the peak summer diversion season.

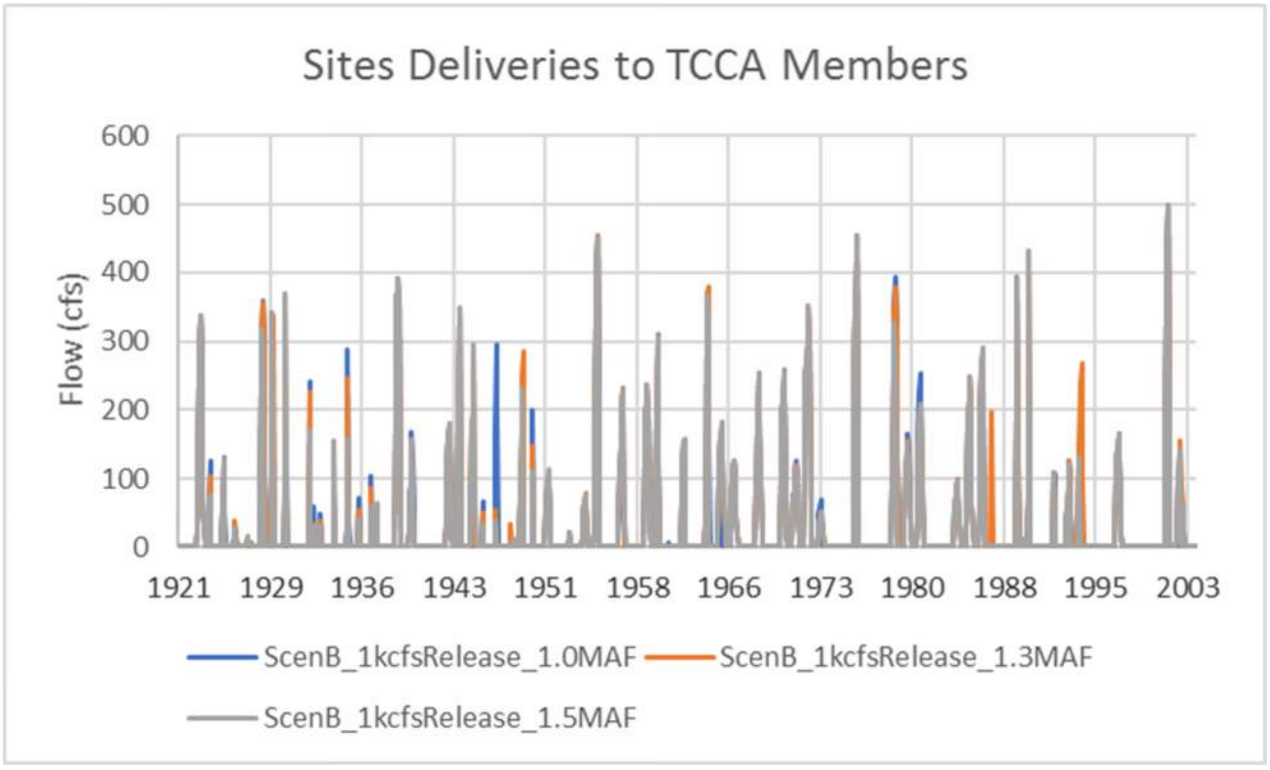


Figure B1-3. Sites Deliveries to TCCA Members under Scenario B

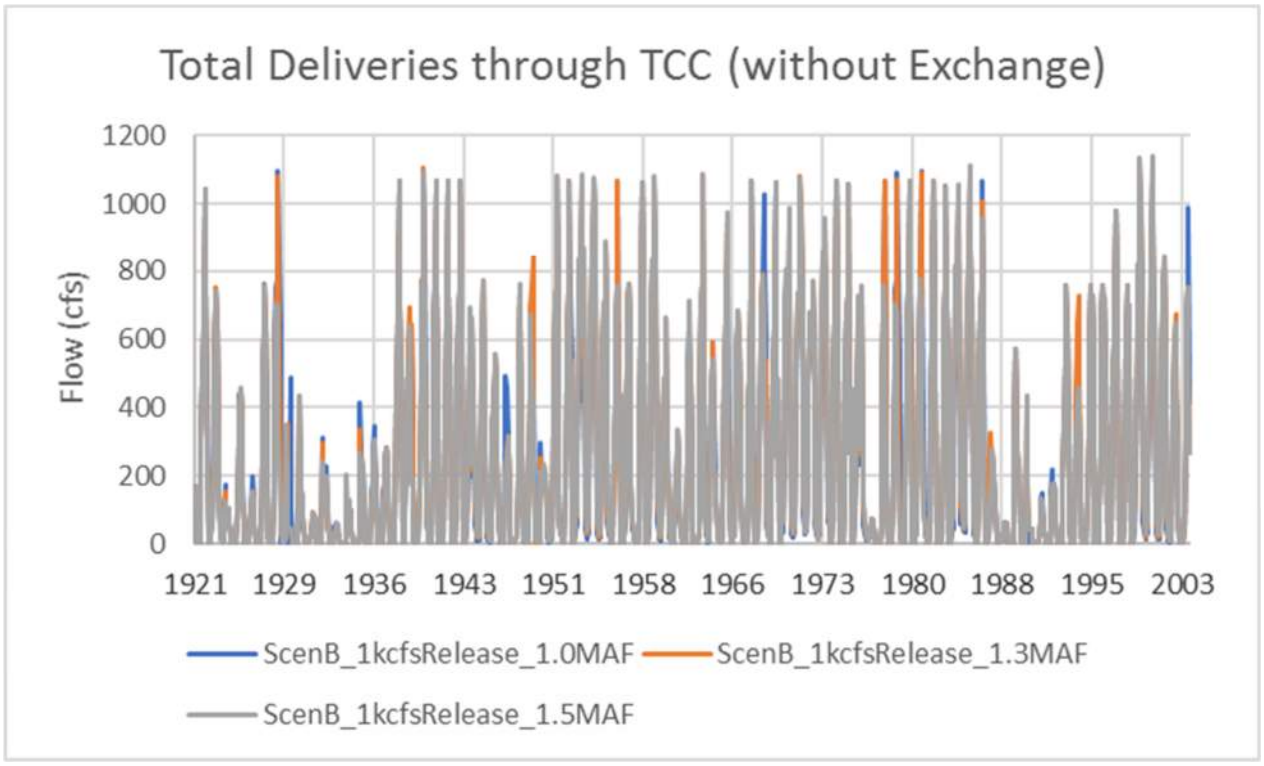


Figure B1-4. Total Deliveries through the T-C Canal under Scenario B

4.0 Limitations

This evaluation was conducted as a sensitivity analysis to support the value planning process and there are a number of limitations that need to be taken into consideration.

- This analysis evaluates conveyance sizing under assumed Scenario B diversion criteria.
- Monthly model time step is appropriate for value planning purposes. More detailed modeling analysis will be needed to confirm these results.
- Estimates of conveyance release capability presented in Table B1-1 are upper range estimates based on model simulated results and do not account for uncertainty.
- It is recommended that a lower range estimate also be considered to account for uncertainty. The lower range estimate values would be 30 TAF below the Table B1-1 values to account for uncertainty associated with 1) interpretation of Scenario B diversion criteria, 2) need to preserve functional spills into the Sutter and Yolo bypasses, 3) river flow routing and real-time operational controls and decisions, 4) need to further refine assumptions and model simulation of CVP no investment exchange and SWP operations integration.

Attachment B-1-1

Sites Operations Scenario B

Attachment 1. Operations Scenario B

This attachment provides modeling assumptions for Sites Project operations Scenario B used to evaluate the release capacity of Sites Reservoir. Scenario B was developed based on previous discussions with CDFW in December of 2019.

Criteria	Scenario B
Reservoir Size	1.0 MAF, 1.3 MAF, or 1.5 MAF
GCC Maintenance Window	2 weeks (Jan/Feb)
Upstream Pulse Flow Protection	Bypass the first pulse flow event in October – May for up to 7 days during pulse of 15,000 to 25,000 cfs as measured at Bend Bridge
Wilkins Slough Bypass Flow	8,000 cfs April/May; 5,000 cfs all other times
Fremont Weir Notch	Prioritize the Fremont Weir Notch, Yolo Bypass preferred alternative, flow over weir within 5%
Flows into the Sutter Bypass System	No restriction due to flow over Moulton, Colusa, and Tisdale Weirs
Freeport Bypass Flow	Modeled WaterFix Criteria (applied on a daily basis) Post-Pulse Protection (applied on a moving 7-day average) Post-Pulse (3 levels) = Jan-Mar Level 2 starts Jan 1 Level 1 is initiated by the pulse trigger
Net Delta Outflow Index (NDOI) Prior to Project Diversions	44,500 cfs between March 1 and May 31

Appendix B-2 Shasta Lake Exchanges with No Reclamation Investment Technical Memorandum

To:	Value Planning Work Group
CC:	Lee Frederiksen
Date:	March 9, 2020
From:	CH2M
Subject:	Shasta Lake Exchanges with No Reclamation Investment

1.0 Purpose

- Conduct a preliminary evaluation of the potential for exchanging Sites Project water with Shasta Lake without dedicated Bureau of Reclamation (Reclamation) investment in the Sites Project (Project).
- Implement feedback on exchange criteria provided by Reclamation.
- Investigate the potential temperature benefits of the operation.

2.0 Background

With Reclamation participation to the Project, but no investment, water stored in Sites Reservoir could be exchanged with Shasta Lake to meet Central Valley Project (CVP) Tehama Colusa Canal Authority (TCCA) Agricultural water Service and Settlement Contractor obligations and downstream flow and Delta water quality requirements. Therefore, a portion of the water demand within the CVP service area along the Tehama Colusa Canal (TCC) and the Glenn Colusa Canal (GCC) south of Sites Reservoir could be met from releases from Sites Reservoir in the spring and allow an equal amount of water to be retained in Lake Shasta (via exchange) to improve summer cold water pool management.

The exchange could occur when Sacramento River flows at Keswick and temperatures at Clear Creek are within a specific range and not compromised by reduced Lake Shasta releases into the Sacramento River. This exchange could likely occur in April through May (and possibly June) in Dry and Critical years.

Lake Shasta releases of exchange water would be scheduled to benefit downstream temperatures in the Sacramento River, which would likely occur in September, October, or November. Withdrawals from Shasta would be coordinated with Reclamation and no carry over storage of exchange water would be allowed between years.
The exchange operation would likely be subject to the following constraints provided by Reclamation to protect the interests of the CVP and to comply with State and Federal laws and regulations:

- All water stored in Shasta would be subject to spill at any date and would be the first water in Shasta to spill.
- All operations associated with this operation would be subject to river temperature constraints to ensure that there is not an impact by reducing releases to store and to ensure a benefit when released later in the year.

- All operations are subject to approval by the State Water Resources Control Board (SWRCB), and any applicable state or federal laws, regulations, or guidelines.

3.0 Operations Analysis

3.1 Approach

- A post-processing approach was used for this preliminary analysis due to extensive code changes that will be needed to implement this operation in the CalSim II model.
- All calculations were performed using results from the CalSim II DCR 2015 Merged Model No Action Alternative (NAA).
- The post-processing analysis was performed for the years 1922 through 2002, consistent with the time period modeled in CalSim II.
- A series of criteria was established, as defined in the attached table, for each scenario. If all criteria were met, the operation was permitted for that year. Criteria included Sacramento River temperature at Clear Creek, Keswick flow, Shasta storage, and water year types. Additional criteria were provided by Reclamation for analysis.
- In all scenarios, Keswick outflow and Sacramento River at Clear Creek temperature requirements between April and June were protected to maintain NAA conditions.
- Nine scenarios were evaluated to assess the volume and frequency of water that could be exchanged between Sites and Shasta Lake.

    1) The “Initial Concept”, based on Thad Bettner’s Aug 8 email, allows for exchanges with Shasta Lake between April and July and releases between August and November 15 during Dry and Critical years. Releases from Shasta storage were based on available Banks Pumping Plant capacity. The exchange operation is only permitted when the Sacramento Valley is in “In-basin Use” (IBU) conditions. Under the “Initial Concept”, three scenarios were evaluated:
        a. No Delevan Pipeline, assuming that the exchange operation is not facilitated through the Delevan Pipeline.
        b. One-pipe Delevan Pipeline.
        c. Two-pipe Delevan Pipeline.
    2) Additionally, several sensitivity analyses were performed on the “Initial Concept” with a two-pipe Delevan Pipeline:
        a. Includes the exchange operation in Below Normal water years.
        b. Exchanges assumed to occur under UWFE conditions as well.
        c. Shasta Lake releases allowed through December.
    3) Two scenarios were designed to maximize Delta export and habitat benefits from the exchange operation with the release of the stored water:
        a. Releases are delayed to improve river temperatures and provide fall flow stability habitat benefits in August through December.
        b. The same criteria as above, with the additional requirement that Shasta Lake storage be above 1,900 TAF in September, consistent with the RPA.
    4) Reclamation provided additional criteria for the exchange operation on January 16, 2020:
        a. The exchange period is limited to April and May. This reflects Reclamation’s comments on what is needed to meet estimated targets for Sacramento River temperatures at Clear Creek, Keswick flows above minimum, and deliveries to the Sacramento River Settlement Contractors.

b. Withdrawals of Sites water stored in Shasta would most likely occur in September, October, and November.

c. The exchange is limited to Dry and Critically Dry water years.

d. Sacramento River Temperature at Clear Creek must be below the following targets for the exchange to occur:

Table B2-1. Temperatures (°F) on the Sacramento River at Clear Creek, from ROC on LTO Proposed Action

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
Wet (32%)	53.3	54.6	51.4	47.5	46.3	47.1	49.2	50.2	51.5	52.0	52.8	52.9
Above Normal (16%)	53.1	53.9	50.8	47.7	46.4	47.4	49.9	50.3	51.0	51.4	52.8	53.7
Below Normal (13%)	54.3	54.7	51.5	48.2	47.4	49.0	51.1	50.6	51.2	52.1	53.0	54.2
Dry (24%)	54.0	54.6	51.1	48.4	48.0	49.0	51.2	51.1	51.5	52.7	53.6	54.4
Critical (15%)	59.5	56.3	51.4	48.6	48.2	49.6	51.6	52.2	53.4	55.0	57.4	60.5

	Within 1 °F of Tier 1 limit (52.5 °F – 53.5 °F)
	53.6 °F – 55.9 °F
	Tier 4 (> 56 °F)

3.2 General Assumptions

- The exchange concept with Shasta Lake is permissible by the Bureau of Reclamation.
- Water year types are based on the Sacramento Valley D-1641 index and are assigned on a January-December calendar-year basis.
- It is assumed that no Sites Project water is carried over in Shasta Lake between calendar years.
- It is assumed that there is sufficient water in Sites Reservoir to facilitate the operation.
- It is assumed that all active storage in Sites Reservoir is available for exchange.
- The exchange operation is based on the replacement of both CVP agricultural deliveries and water released from Shasta to meet Delta requirements.

3.3 Results

Results are summarized in the attached time series, bar chart, and exceedance figures. A summary of the results is provided below.

Table B2-2. Summary of Average Annual Exchange Volumes by Water Year (TAF)

WYT	Initial Concept - no Delevan Pipeline Exchange	Initial Concept - 1 pipe Delevan Pipeline	Initial Concept - 2 pipe Delevan Pipeline	[Sensitivity] Exchanges allowed in Below Normal years - 2 pipe Delevan Pipeline	[Sensitivity] Exchanges assumed to occur under UWFE conditions as well - 2 pipe Delevan Pipeline	[Sensitivity] Releases allowed through December - 2 pipe Delevan Pipeline	[Sensitivity] Releases required to have habitat benefit, allowed through December - 2 pipe Delevan Pipeline	[Sensitivity] Releases required to have habitat benefit, allowed through December, Storage RPA control - 2 pipe Delevan Pipeline	[Sensitivity] USBR Proposed - 2 pipe Delevan Pipeline
W	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
AN	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BN	n/a	n/a	n/a	43	n/a	n/a	n/a	n/a	n/a
D	119	141	144	144	156	177	100	100	43
C	80	114	130	130	149	133	104	9	56

Depending on the scenario considered, Sites Reservoir storage may not be available for this type of operation due to constraints on diversions-to-fill and other constraints of the scenario. When compared against storage volumes for a simulated 1.3 MAF reservoir using CDFW Scenario B, in 10 of the 21 years that the exchange occurs, there is not sufficient water in Sites Reservoir to facilitate the exchange operation.

3.4 Recommendations

- This preliminary evaluation demonstrates there is enough volume and frequency of water available for exchange to warrant further evaluation of these potential operations in more detail in a systemwide CVP/SWP context.
- Based on comments, use the post-processing spreadsheet to evaluate additional combinations of operational exchange criteria.

Sites Project with no Reclamation Investment

Sites-Shasta Exchange Operation

Alternatives
Initial Concept - no Delevan Pipeline
Initial Concept - 1 pipe Delevan Pipeline
Initial Concept - 2 pipe Delevan Pipeline
[Sensitivity] Exchanges allowed in Below Normal years - 2 pipe Delevan Pipeline
[Sensitivity] Exchanges assumed to occur under UWFE conditions as well - 2 pipe Delevan Pipeline
[Sensitivity] Releases allowed through December - 2 pipe Delevan Pipeline
[Sensitivity] Releases required to have habitat benefit, allowed through December - 2 pipe Delevan Pipeline
[Sensitivity] Releases required to have habitat benefit, allowed through December, Storage RPA control - 2 pipe Delevan Pipeline
[Sensitivity] USBR Proposed- 2 pipe Delevan Pipeline

	Export required			
	Initial Concept - no Delevan Pipeline	Initial Concept - 1 pipe Delevan Pipeline	Initial Concept - 2 pipe Delevan Pipeline	[Sensitivity] Exchanges allowed in Below Normal years
	Exchange limited to conditions with limited flow/temperature impact potential			
	Storage accrued in Shasta by exchange			
	Banks export capacity must be available			
	Storage released from Shasta for export starting in August			
	No Delevan Pipeline	1-pipe Delevan Pipeline	2-pipe Delevan Pipeline	2-pipe Delevan Pipeline
	Storage must be released from Shasta by Nov 15	Storage must be released from Shasta by Nov 15	Storage must be released from Shasta by Nov 15	Storage must be released from Shasta by Nov 15
	Only Dry and Critically Dry years considered	Only Dry and Critically Dry years considered	Only Dry and Critically Dry years considered	Below Normal, Dry, and Critically Dry years considered
Exchange Operation Sac Flow check Prior to Summer - All scenarios	Keswick Flow (cfs)	Keswick Flow (cfs)	Keswick Flow (cfs)	Keswick Flow (cfs)
	April 6,000	April 6,000	April 6,000	April 6,000
	May 6,000	May 6,000	May 6,000	May 6,000
	Jun 10,000	Jun 10,000	Jun 10,000	Jun 10,000
	Jul 12,000	Jul 12,000	Jul 12,000	Jul 12,000
Exchange Operation Sac Temperature check Prior to Summer - All scenarios	Sac R blw Clear Creek Temp (F)	Sac R blw Clear Creek Temp (F)	Sac R blw Clear Creek Temp (F)	Sac R blw Clear Creek Temp (F)
	April No Rule	April No Rule	April No Rule	April No Rule
	May 56	May 56	May 56	May 56
	Jun 56	Jun 56	Jun 56	Jun 56
	Jul 53.5	Jul 53.5	Jul 53.5	Jul 53.5
Hold Operation Storage over Summer - Habitat scenarios	Shasta Storage (TAF)	Shasta Storage (TAF)	Shasta Storage (TAF)	Shasta Storage (TAF)
	April No Rule	April No Rule	April No Rule	April No Rule
	May No Rule	May No Rule	May No Rule	May No Rule
	Jun No Rule	Jun No Rule	Jun No Rule	Jun No Rule
	Jul No Rule	Jul No Rule	Jul No Rule	Jul No Rule
	Sep - low No Rule	Sep - low No Rule	Sep - low No Rule	Sep - low No Rule
	Sep - high No Rule	Sep - high No Rule	Sep - high No Rule	Sep - high No Rule
Release Operation - Habitat scenarios delayed release - other scenarios release starts in Aug	Maximum Keswick Flow (cfs)	Maximum Keswick Flow (cfs)	Maximum Keswick Flow (cfs)	Maximum Keswick Flow (cfs)
	Aug 10,000	Aug 10,000	Aug 10,000	Aug 10,000
	Sep 12,000	Sep 12,000	Sep 12,000	Sep 12,000
	Oct No Rule	Oct No Rule	Oct No Rule	Oct No Rule
	Nov No Rule	Nov No Rule	Nov No Rule	Nov No Rule
	Dec No Rule	Dec No Rule	Dec No Rule	Dec No Rule
Release Operation various	Release Schedule	Release Schedule	Release Schedule	Release Schedule
	Aug All month	Aug All month	Aug All month	Aug All month
	Sep All month	Sep All month	Sep All month	Sep All month
	Oct All month	Oct All month	Oct All month	Oct All month
	Nov Through Nov 15	Nov Through Nov 15	Nov Through Nov 15	Nov Through Nov 15
	Dec No Release	Dec No Release	Dec No Release	Dec No Release

Year Types
various

WYT Control	
W	0
AN	0
BN	0
D	1
C	1

WYT Control	
W	0
AN	0
BN	0
D	1
C	1

WYT Control	
W	0
AN	0
BN	0
D	1
C	1

WYT Control	
W	0
AN	0
BN	1
D	1
C	1

COA Conditions Permitted	
IBU UWFE	Yes No

COA Conditions Permitted	
IBU UWFE	Yes No

COA Conditions Permitted	
IBU UWFE	Yes No

COA Conditions Permitted	
IBU UWFE	Yes No

Export required		Habitat benefit and export required	
[Sensitivity] Exchanges assumed to occur under UWFE conditions as well	[Sensitivity] Releases allowed through December	[Sensitivity] Releases required to have habitat benefit, allowed through December	[Sensitivity] Releases required to have habitat benefit, allowed through December, Storage RPA control
Exchange limited to conditions with limited flow/temperature impact potential			
Storage accrued in Shasta by exchange			
Banks export capacity must be available			
Storage released from Shasta for export starting in August			
2-pipe Delevan Pipeline	2-pipe Delevan Pipeline	2-pipe Delevan Pipeline	2-pipe Delevan Pipeline
Storage must be released from Shasta by Nov 15	Storage must be released from Shasta by Nov 15	Storage is carried into December at risk of spill	Storage is carried into December at risk of spill
Only Dry and Critically Dry years considered	Only Dry and Critically Dry years considered	Only Dry and Critically Dry years considered	Only Dry and Critically Dry years considered

Exchange Operation
Sac Flow check
Prior to Summer
- All scenarios

Keswick Flow (cfs)	
April	6,000
May	6,000
Jun	10,000
Jul	12,000

Keswick Flow (cfs)	
April	6,000
May	6,000
Jun	10,000
Jul	12,000

Keswick Flow (cfs)	
April	6,000
May	6,000
Jun	10,000
Jul	12,000

Keswick Flow (cfs)	
April	6,000
May	6,000
Jun	10,000
Jul	12,000

Exchange Operation
Sac Temperature check
Prior to Summer
- All scenarios

Sac R blw Clear Creek Temp (F)	
April	No Rule
May	56
Jun	56
Jul	53.5

Sac R blw Clear Creek Temp (F)	
April	No Rule
May	56
Jun	56
Jul	53.5

Sac R blw Clear Creek Temp (F)	
April	No Rule
May	56
Jun	56
Jul	53.5

Sac R blw Clear Creek Temp (F)	
April	No Rule
May	56
Jun	56
Jul	53.5

Hold Operation
Storage over Summer
- Habitat scenarios

Shasta Storage (TAF)	
April	No Rule
May	No Rule
Jun	No Rule
Jul	No Rule
Sep - low	No Rule
Sep - high	No Rule

Shasta Storage (TAF)	
April	No Rule
May	No Rule
Jun	No Rule
Jul	No Rule
Sep - low	No Rule
Sep - high	No Rule

Shasta Storage (TAF)	
April	No Rule
May	No Rule
Jun	No Rule
Jul	No Rule
Sep - low	No Rule
Sep - high	No Rule

Shasta Storage (TAF)	
April	No Rule
May	No Rule
Jun	No Rule
Jul	No Rule
Sep - low	1,900
Sep - high	No Rule

Release Operation
- Habitat scenarios
  delayed release
- other scenarios
  release starts in Aug

Maximum Keswick Flow (cfs)	
Aug	10,000
Sep	12,000
Oct	No Rule
Nov	No Rule
Dec	No Rule

Maximum Keswick Flow (cfs)	
Aug	10,000
Sep	12,000
Oct	No Rule
Nov	No Rule
Dec	No Rule

Maximum Keswick Flow (cfs)	
Aug	10,000
Sep	12,000
Oct	12,000
Nov	6,000
Dec	5,000

Maximum Keswick Flow (cfs)	
Aug	10,000
Sep	12,000
Oct	12,000
Nov	6,000
Dec	5,000

Release Operation
various

Release Schedule	
Aug	All month
Sep	All month
Oct	All month

Release Schedule	
Aug	All month
Sep	All month
Oct	All month

Release Schedule	
Aug	All month
Sep	All month
Oct	All month

Release Schedule	
Aug	All month
Sep	All month
Oct	All month

Nov	Through Nov 15	Nov	All month	Nov	All month	Nov	All month
Dec	No Release	Dec	All month	Dec	All month	Dec	All month

Year Types
various

WYT Control		WYT Control		WYT Control		WYT Control	
W	0	W	0	W	0	W	0
AN	0	AN	0	AN	0	AN	0
BN	0	BN	0	BN	0	BN	0
D	1	D	1	D	1	D	1
C	1	C	1	C	1	C	1

COA Conditions Permitted		COA Conditions Permitted		COA Conditions Permitted		COA Conditions Permitted	
IBU	Yes	IBU	Yes	IBU	Yes	IBU	Yes
UWFE	Yes	UWFE	No	UWFE	No	UWFE	No

[Sensitivity] USBR Proposed
Exchange limited to conditions with limited flow/temperature impact potential
Storage accrued in Shasta by exchange
Banks export capacity must be available
Storage released from Shasta for export starting in September
2-pipe Delevan Pipeline
Storage must be released from Shasta by Nov 15
Only Dry and Critically Dry years considered

Exchange Operation
Sac Flow check
Prior to Summer

Keswick Flow (cfs)	
April	6,000
May	6,000

Exchange Operation
Sac Temperature check
Prior to Summer
- All scenarios

Sac R blw Clear Creek Temp (F)		
Month	D	C
April	51.2	51.6
May	51.1	52.2
Jun	51.5	53.4
Jul	52.7	55.0

Hold Operation
Storage over Summer
- Habitat scenarios

Shasta Storage (TAF)	
April	No Rule
May	No Rule
Jun	No Rule
Jul	No Rule
Sep - low	No Rule
Sep - high	No Rule

Release Operation
- Habitat scenarios
  delayed release
- other scenarios
  release starts in Aug

Maximum Keswick Flow (cfs)	
Aug	No Rule
Sep	No Rule
Oct	No Rule
Nov	No Rule
Dec	No Rule

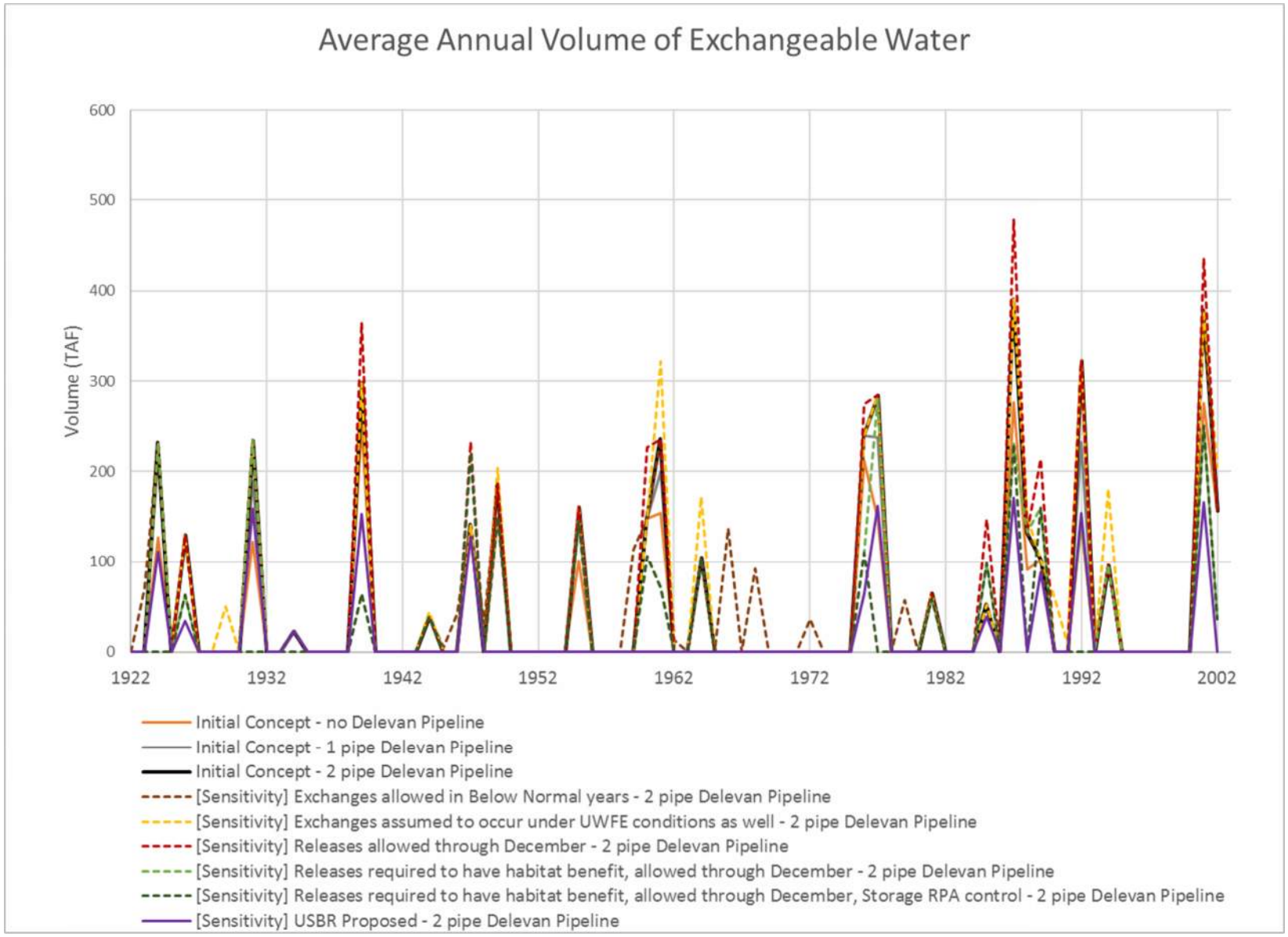
Release Operation
various

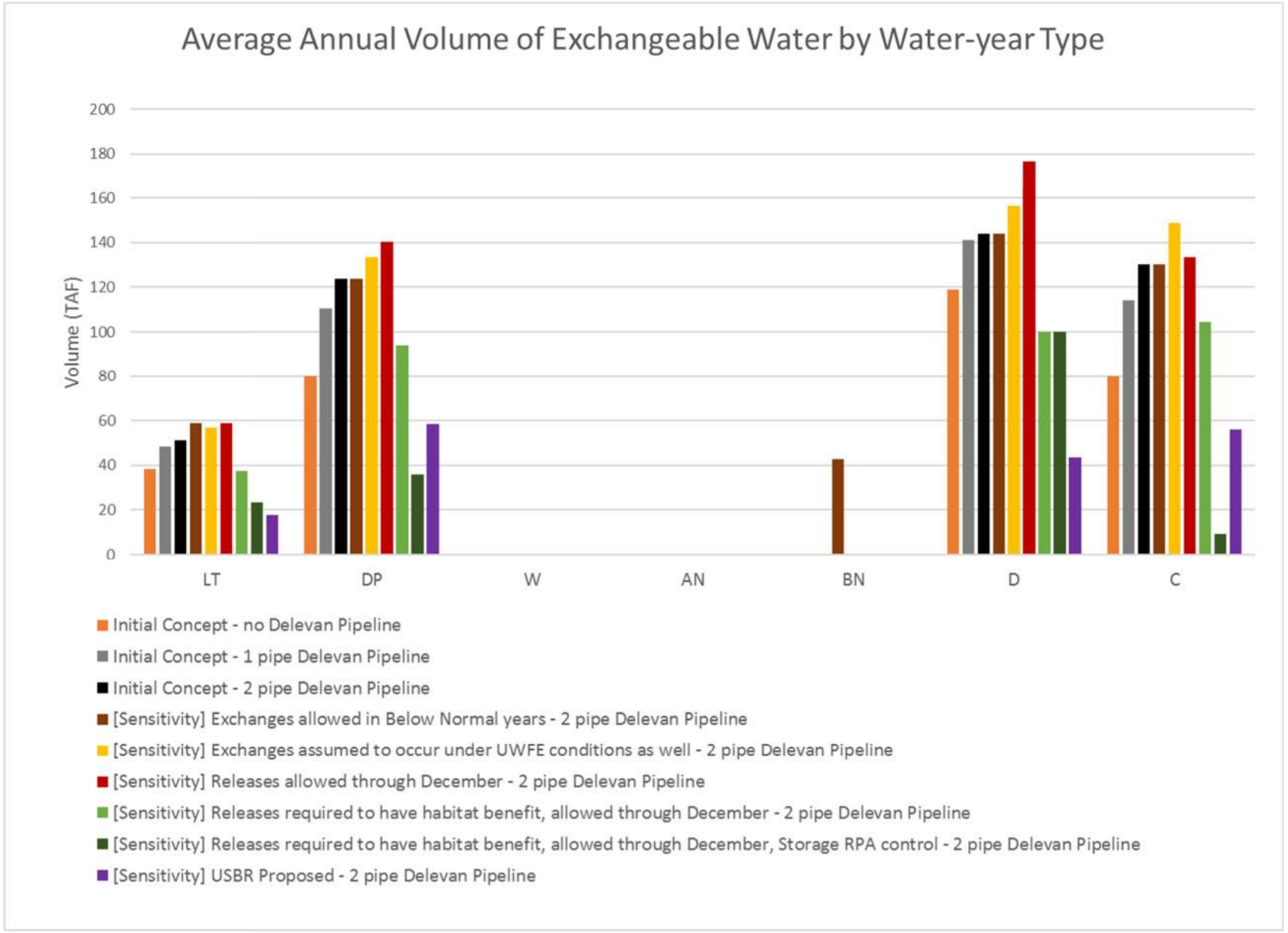
Release Schedule	
Aug	No Release
Sep	All month
Oct	All month
Nov	All Month
Dec	No Release

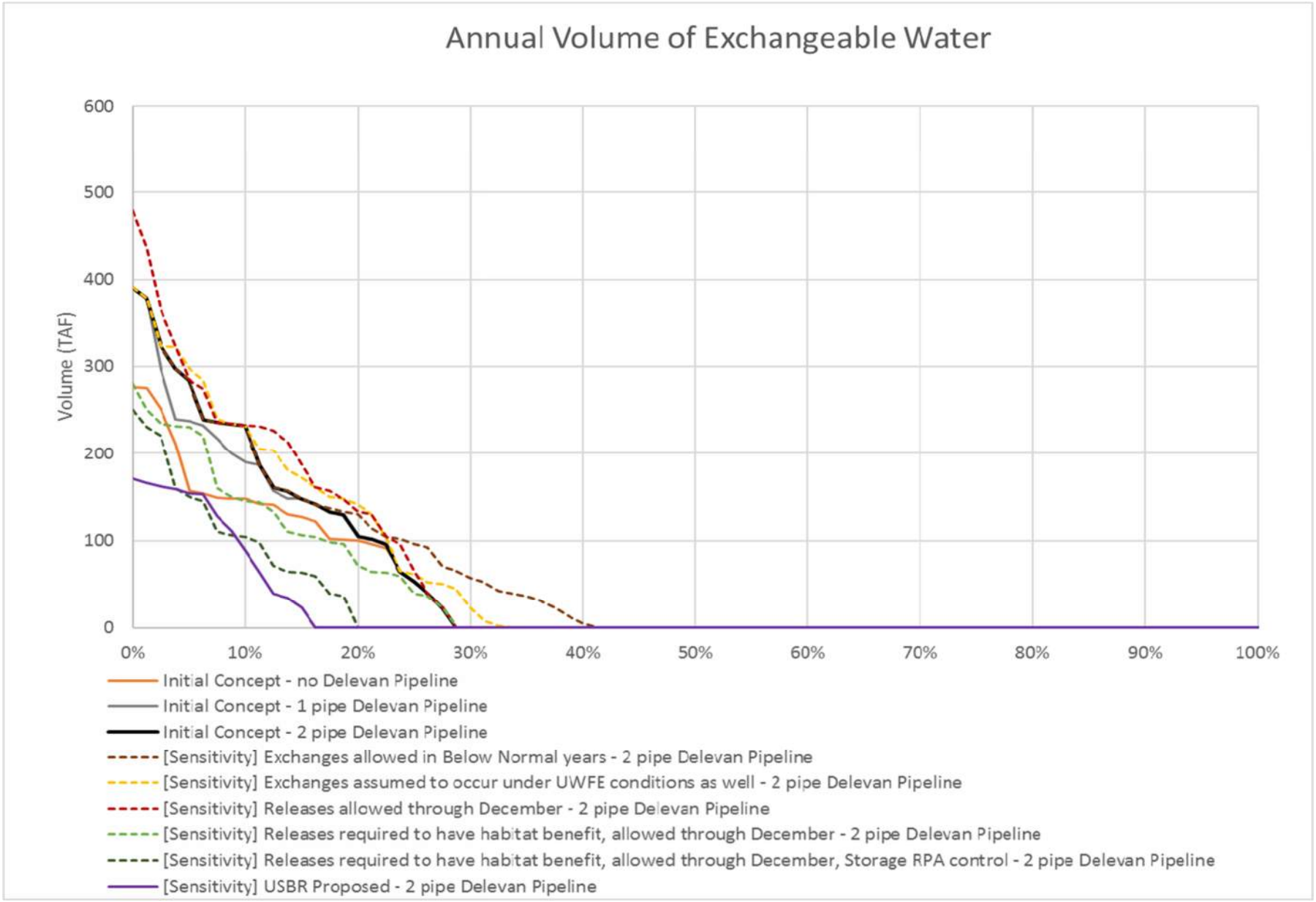
Year Types
various

WYT Control	
W	0
AN	0
BN	0
D	1
C	1

COA Conditions Permitted	
IBU	Yes
UWFE	No


Average Annual Volume of Exchangeable Water
Volume (TAF)
600
500
400
300
200
100
0
1922
1932
1942
1952
1962
1972
1982
1992
2002
Initial Concept - no Delevan Pipeline
Initial Concept - 1 pipe Delevan Pipeline
Initial Concept - 2 pipe Delevan Pipeline
[Sensitivity] Exchanges allowed in Below Normal years - 2 pipe Delevan Pipeline
[Sensitivity] Exchanges assumed to occur under UWFE conditions as well - 2 pipe Delevan Pipeline
[Sensitivity] Releases allowed through December - 2 pipe Delevan Pipeline
[Sensitivity] Releases required to have habitat benefit, allowed through December - 2 pipe Delevan Pipeline
[Sensitivity] Releases required to have habitat benefit, allowed through December, Storage RPA control - 2 pipe Delevan Pipeline
[Sensitivity] USBR Proposed - 2 pipe Delevan Pipeline


Average Annual Volume of Exchangeable Water by Water-year Type
Volume (TAF)
200
180
160
140
120
100
80
60
40
20
0
LT
DP
W
AN
BN
D
C
Initial Concept - no Delevan Pipeline
Initial Concept - 1 pipe Delevan Pipeline
Initial Concept - 2 pipe Delevan Pipeline
[Sensitivity] Exchanges allowed in Below Normal years - 2 pipe Delevan Pipeline
[Sensitivity] Exchanges assumed to occur under UWFE conditions as well - 2 pipe Delevan Pipeline
[Sensitivity] Releases allowed through December - 2 pipe Delevan Pipeline
[Sensitivity] Releases required to have habitat benefit, allowed through December - 2 pipe Delevan Pipeline
[Sensitivity] Releases required to have habitat benefit, allowed through December, Storage RPA control - 2 pipe Delevan Pipeline
[Sensitivity] USBR Proposed - 2 pipe Delevan Pipeline


Annual Volume of Exchangeable Water
Volume (TAF)
600
500
400
300
200
100
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Initial Concept - no Delevan Pipeline
Initial Concept - 1 pipe Delevan Pipeline
Initial Concept - 2 pipe Delevan Pipeline
[Sensitivity] Exchanges allowed in Below Normal years - 2 pipe Delevan Pipeline
[Sensitivity] Exchanges assumed to occur under UWFE conditions as well - 2 pipe Delevan Pipeline
[Sensitivity] Releases allowed through December - 2 pipe Delevan Pipeline
[Sensitivity] Releases required to have habitat benefit, allowed through December - 2 pipe Delevan Pipeline
[Sensitivity] Releases required to have habitat benefit, allowed through December, Storage RPA control - 2 pipe Delevan Pipeline
[Sensitivity] USBR Proposed - 2 pipe Delevan Pipeline

4.0 Temperature Post-processing Analysis

Several scenarios were further evaluated for temperature benefits to assess the viability of the exchange. The “Initial Concept - 2 pipe Delevan Pipeline” and “USBR Proposed” scenarios were evaluated as follows:

4.1 Approach

- A post-processing exercise was conducted using the estimated exchange volumes calculated in the previous section.
- Shasta Lake releases were adjusted in the CalSim II output for the DCR 2015 Merged Model No Action Alternative (NAA). This was performed for two scenarios:

1) “Releases Limited by Delivery Capacity”: From April through July, releases are reduced to match the exchange operation developed in the post-processing. From August through November, exchanged water is released at a rate no greater than the delivery capacity calculated in the post-processing until there is no exchanged water left to release. In November, any water remaining is released.
2) “Scheduled Releases”: This scenario assumes that the system can be re-operated to deliver any water released. In this scenario, from April through July, releases are reduced to match the exchange operation developed in the post-processing. In August, 40% of the exchanged water is released. In September, an additional 40% is released. In September, the final 20% is released. In the “USBR – Proposed” scenario, 40% is released in September, 40% is released in October, and 20% is released in November.
3) Since the operation only occurs in dry and critically dry water years, the averages for only those water year types are presented. Within those water year types, only years where the action is greater than 50 TAF are included. This includes 14 of the 18 dry years and 7 of the 12 critically dry years. In dry years with an exchange greater than 50 TAF, the average exchange operation was 182 TAF when releases were limited by delivery capacity and 311 TAF when releases were scheduled. In critically dry years with an exchange greater than 50 TAF, the average exchange was 220 TAF when releases were limited by delivery capacity and 225 TAF when releases were scheduled.
4) Under the USBR Proposed scenario, the exchange only occurred in 5 of the 18 dry years and 5 of the 12 critically dry years. In dry years with an exchange greater than 50 TAF, the average exchange operation was 141 TAF when releases were limited by delivery capacity and 167 TAF when releases were scheduled. In critically dry years with an exchange greater than 50 TAF, the average exchange was 130 TAF when releases were limited by delivery capacity and 130 TAF when releases were scheduled.
5) The Upper Sacramento River Water Quality Model (USRWQM) in HEC-5Q was run using the revised CalSim II outputs.

4.2 Results

Temperature results are in the tables below. Our preliminary screening analysis shows that there is some potential for temperature reduction below the targets specified by Reclamation, but further analysis will be needed to further evaluate the benefits of the exchange operation.

Temperature changes (ºF) between No Project and Project with no Reclamation Investment Initial Concept - 2-pipe Delevan Pipeline									
Releases Limited by Delivery Capacity Dry Year Averages (with action >50 TAF)									
		APR	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**
Sacramento River below Keswick	No Action	48.2	48.7	49.5	50.9	52.6	52.9	54.7	54.3
	With Project	48.2	49.0	49.6	50.8	52.1	52.6	54.0	53.9
	Difference	0.0	0.2	0.1	-0.1	-0.5	-0.4	-0.7	-0.4
Sacramento River below Clear Creek	No Action	49.7	50.3	51.0	52.2	54.0	54.6	55.2	54.1
	With Project	49.7	50.7	51.3	52.2	53.4	54.1	54.5	53.8
	Difference	0.0	0.4	0.3	0.1	-0.6	-0.5	-0.7	-0.3
Critically Dry Year Averages (with action >50 TAF)									
		APR	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**
Sacramento River below Keswick	No Action	48.9	50.6	51.8	53.0	55.5	58.1	57.9	55.4
	With Project	48.8	50.4	51.8	52.9	54.2	57.7	57.9	55.5
	Difference	0.0	-0.3	-0.1	-0.2	-1.3	-0.4	0.1	0.1
Sacramento River below Clear Creek	No Action	50.2	52.2	53.2	54.4	56.8	59.4	58.2	55.2
	With Project	50.3	52.2	53.3	54.3	55.4	58.9	58.3	55.2
	Difference	0.1	0.0	0.1	-0.1	-1.4	-0.5	0.0	0.1
Initial Concept - 2-pipe Delevan Pipeline									
Scheduled Releases (40% Aug, 40% Sep, 20% Oct) Dry Year Averages (with action >50 TAF)									
		APR	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**
Sacramento River below Keswick	No Action	48.2	48.7	49.5	50.9	52.6	52.9	54.7	54.3
	With Project	48.2	49.0	49.7	50.8	51.9	52.1	54.5	54.3
	Difference	0.0	0.2	0.1	-0.1	-0.6	-0.9	-0.1	0.0
Sacramento River below Clear Creek	No Action	49.7	50.3	51.0	52.2	54.0	54.6	55.2	54.1
	With Project	49.8	50.7	51.3	52.3	53.2	53.4	55.0	54.1
	Difference	0.0	0.4	0.3	0.1	-0.8	-1.2	-0.2	0.0
Critically Dry Year Averages (with action >50 TAF)									
		APR	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**
Sacramento River below Keswick	No Action	48.9	50.6	51.8	53.0	55.5	58.1	57.9	55.4
	With Project	48.9	50.4	51.8	52.9	54.3	57.3	58.0	55.6
	Difference	0.0	-0.2	0.0	-0.1	-1.2	-0.8	0.1	0.1
Sacramento River below Clear Creek	No Action	50.2	52.2	53.2	54.4	56.8	59.4	58.2	55.2
	With Project	50.3	52.2	53.3	54.3	55.5	58.4	58.3	55.3
	Difference	0.1	0.0	0.1	-0.1	-1.3	-1.0	0.1	0.1

Temperature changes (ºF) between No Project and Project with no Reclamation Investment USBR Proposed- 2-pipe Delevan Pipeline									
Releases Limited by Delivery Capacity Dry Year Averages (with action >50 TAF)									
		APR	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**
Sacramento River below Keswick	No Action	48.5	48.9	50.0	51.5	53.4	53.8	55.4	55.2
	With Project	48.5	49.4	49.8	51.2	53.2	53.2	55.3	55.1
	Difference	0.0	0.5	-0.2	-0.3	-0.2	-0.6	-0.1	-0.1
Sacramento River below Clear Creek	No Action	50.2	50.3	51.3	52.7	54.7	55.5	56.0	55.0
	With Project	50.2	51.3	51.2	52.4	54.6	54.7	55.8	54.9
	Difference	0.0	1.0	-0.1	-0.3	-0.2	-0.8	-0.2	-0.1
Critically Dry Year Averages (with action >50 TAF)									
		APR	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**
Sacramento River below Keswick	No Action	49.0	51.0	52.4	53.2	56.3	59.5	58.3	55.3
	With Project	49.0	50.9	52.3	53.1	55.3	58.7	58.5	55.4
	Difference	0.0	-0.1	-0.1	-0.1	-1.0	-0.9	0.2	0.1
Sacramento River below Clear Creek	No Action	50.3	52.5	53.8	54.6	57.6	60.6	58.7	55.1
	With Project	50.5	52.6	53.7	54.5	56.6	59.6	58.8	55.2
	Difference	0.2	0.1	-0.1	-0.1	-1.0	-1.0	0.1	0.1
USBR Proposed- 2-pipe Delevan Pipeline									
Scheduled Releases (40% Sep, 40% Oct, 20% Nov) Dry Year Averages (with action >50 TAF)									
		APR	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**
Sacramento River below Keswick	No Action	48.5	48.8	49.9	51.5	53.3	53.6	55.4	55.2
	With Project	48.5	49.4	49.8	51.2	53.1	53.1	55.3	55.0
	Difference	0.0	0.5	-0.2	-0.3	-0.2	-0.5	-0.1	-0.1
Sacramento River below Clear Creek	No Action	50.1	50.2	51.3	52.8	54.7	55.3	55.9	54.9
	With Project	50.1	51.2	51.2	52.5	54.5	54.6	55.8	54.8
	Difference	0.0	1.0	-0.1	-0.3	-0.2	-0.7	-0.2	-0.1
Critically Dry Year Averages (with action >50 TAF)									
		APR	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**
Sacramento River below Keswick	No Action	49.0	51.0	52.4	53.2	56.3	59.5	58.3	55.3
	With Project	49.0	50.9	52.3	53.0	55.3	58.5	58.4	55.5
	Difference	0.0	-0.1	-0.1	-0.1	-1.0	-1.0	0.0	0.1
Sacramento River below Clear Creek	No Action	50.3	52.5	53.8	54.6	57.6	60.6	58.7	55.1
	With Project	50.5	52.6	53.7	54.5	56.6	59.6	58.7	55.3
	Difference	0.2	0.1	-0.1	-0.1	-1.0	-1.0	0.0	0.2

Appendix B-3 Colusa Basin Drain Value Planning Evaluation Technical Memorandum

To:	Value Planning Work Group
CC:	Lee Frederiksen
Date:	April 7, 2020
From:	Anne Williams - MBK
Subject:	Colusa Basin Drain Value Planning Alternative

The Sites Reservoir Project is currently undergoing a value planning process to investigate various potential alternatives of the Sites Reservoir Project operations. As part of this process, one alternative proposes that water released from Sites Reservoir is conveyed through the Tehama Colusa Canal (TC Canal) to its terminus, and then to the Colusa Basin Drain (CBD) through Bird Creek or a pipeline near the same location. The alternative proposes to move up to 1,000 cfs of water during May through October through the CBD, and either through the Knights Landing Outfall Gates (KLOG) and into the Sacramento River near Knights Landing, or through the Knights Landing Ridge Cut (Ridge Cut) to the Yolo Bypass and then to the Sacramento River near Rio Vista. The purpose of this memorandum is to provide background information and MBK Engineer's (MBK) knowledge based on experience about the CBD, and to identify potential considerations or risks associated with this proposed alternative to the Sites Reservoir Project Value Planning Work Group (Work Group).

This memorandum is organized by topic, based on a list of questions provided by the Work Group. It is intended to identify initial considerations at a high level, based on MBK's experience and information that was readily available. Attached to this memorandum is a brief presentation with background information and key facilities along the CBD, which was provided and discussed with the Work Group at a meeting on February 13, 2020.

1.0 Flow

In order to understand how water released from Sites Reservoir could be moved through the CBD and into the Sacramento River at Knights Landing, the hydraulics between the CBD, KLOG, and Wallace Weir need to be investigated. MBK has requested any available analyses from Reclamation District 108 (RD 108), which may have been conducted for the KLOG and/or Wallace Weir rehabilitation projects.

The rate of flow from the CBD into the Sacramento River through KLOG, depends on the differential stage in the Sacramento River and in the CBD at KLOG. The stage in the CBD at KLOG is dependent upon the operation of both KLOG and the Wallace Weir. The flow in the CBD has historically been difficult to measure due to backwater effects. To fully understand how far upstream backwater may extend from KLOG, a hydraulic analysis would need to be conducted. Based on the experience of MBK and the landowners, it is estimated that water levels can be affected by the KLOG and Wallace Weir operation to County Line Road, approximately 15 miles upstream of the Ridge Cut and approximately 4 miles upstream of Bird Creek.

Currently, MBK is aware of measurements at the following locations, generally identified from upstream to downstream.

- Colusa Drain near Sidds Rd (Glenn-Colusa Irrigation District [GCID]: Flow, Stage, Water Temperature, pH, Specific Conductance, Salinity, Dissolved Solids, and Dissolved O2)
- Colusa Drain near Road 68 (GCID: Flow, Stage, Water Temperature, pH, Specific Conductance, Salinity, Dissolved Solids, and Dissolved O2)
- Colusa Drain at Lurline Road (GCID: Flow, Stage, Water Temperature, pH, Specific Conductance, Salinity, Dissolved Solids, and Dissolved O2)
- Colusa Drain near Highway 20 (CDEC – CDR: Flow & Stage)
- Colusa Drain at Davis Weir (GCID: Flow, Stage, Water Temperature, pH, Specific Conductance, Salinity, Dissolved Solids, and Dissolved O2)
- Colusa Basin Drain at Knights Landing (CDEC – KLG: Stage & Gate Openings)
- Sacramento River at Knights Landing (CDEC – KNL: Stage)
- Ridge Cut Slough at Knights Landing (CDEC – RCS: Flow, Stage, Velocity, and Water Temperature[1])
- Ridge Cut at Wallace Weir (RD 108 & the California Department of Water Resources [DWR] – RD 108 with approval by DWR: Flow & Stage)
- Yolo Bypass near Woodland (CDEC – YBY: Flow & Stage)

Pursuant to the 1937 Hershey Agreement, DWR limits water levels at KLOG during the irrigation season to no greater than 25.5 ft United States Engineering Datum (USED, also known as the U.S. Army Corps of Engineers Datum). During this period DWR also attempts to maintain a water level of no less than 24.5 ft USED. These elevations are identified to prevent localized flooding and impacts to the ability to drain fields in the lower portion of the CBD and the Ridge Cut (which may occur at levels greater than 25.5 ft) and avoid limiting the ability of diverters to pump water for irrigation purposes (which may occur at levels lower than 24.5 ft).

In July 2016, state and federal agencies and local water users and landowners coordinated an Emergency Action for Delta Smelt. The goal of the program was to generate a pulse flow in the Yolo Bypass, using about 400 cfs of water pumped from the Sacramento River into the CBD by GCID and RD 108 over a two-week period in July[2]. The approximate 400 cfs pulse flow was in addition to existing flows in the CBD at the time, about 200 cfs measured at Davis Weir. The resulting maximum flow in the CBD below Davis Weir during the effort was about 850 cfs. The pulse flow was conveyed to the Yolo Bypass using the CBD, Wallace Weir, and the Tule Canal. The action generated a total flow pulse of 12,700 acre-feet in the Yolo Bypass.

Additional Delta Smelt experiments occurred in the fall of 2018 and 2019, planned to generate estimated pulses of 24,000 acre-feet in the Yolo Bypass. These more recent experiments involved the rerouting of agricultural return flow/rice drain water (not the addition of Sacramento River water) from the CBD into the Yolo Bypass via the Ridge Cut (rather than discharging the water to the Sacramento River at KLOG). The 2018 flow action occurred for about one month, late August to late September, and water levels in the CBD at KLOG were raised to 27.0 ft. Measured CBD flows at the Davis Weir during the peak of the 2018 action were about 3,000 cfs. The actual pulse generated in the Yolo Bypass is estimated to have been about 20,000 acre-feet. Similarly, the 2019 flow action raised water levels in the CBD at KLOG to 27.0 ft over a several week period, during late August and September. Measured CBD flows at the Davis Weir during the peak of the 2019 action were about 2,500 cfs, and a pulse was generated in the Yolo Bypass. These efforts were possible with

[1] In addition, certain water quality data (i.e. dissolved oxygen, pH, specific conductance, turbidity, chlorophyll) is available during periods of the Delta Smelt actions, collected by DWR.

[2] The 2016 action occurred in July due to the construction schedule of the Wallace Weir. Similar programs in the future were identified as more likely to occur in the fall.

significant coordination with local landowners, although they did result in some localized flooding/drainage issues.

Any alternatives that utilize the CBD for conveyance of Sites Reservoir water, should include coordination with the local landowners regarding the project operation and timing of the additional flows. The project should also consider levee improvements (particularly along the western levee which is lower than the eastern Project levee) and other improvements or arrangements that would address flooding and drainage issues due to the increased flows.

The Work Group raised concerns regarding losses due to seepage and groundwater pumping. The area primarily consists of clay soils and therefore losses due to seepage are not a major concern; however, local landowners have expressed concern regarding the potential for seepage through the levees when water levels exceed 25.5 ft. Similarly, the effect of local groundwater pumping is likely minimal, although this has not been investigated. With the implementation of the Sustainable Groundwater Management Act, groundwater pumping in the area may be more restricted in the future.

2.0 Environmental

As previously described, in 2016, 2018, and 2019, as part of the Delta Smelt Emergency Action, pulse flows were generated through the Yolo Bypass. The purpose of these experiments were to improve the food supply in the Northern Delta, focusing on Delta smelt. It is MBK's understanding that these types of experiments may continue in the future.

Another consideration of the Work Group is related to water temperature. Temperature management for fish species is a major operational consideration on the upper Sacramento River. However, MBK is not aware of temperature concerns in the Sacramento River this far downstream (i.e. near Knights Landing). It seems that water released from Sites Reservoir would be the same temperature or colder than summer drain water in the CBD. There is currently water temperature data at several points in the Colusa Drain collected by GCID, in the Ridge Cut (CDEC – RCS) and in the Sacramento River: upstream of Knights Landing at Wilkins Slough (CDEC – WLK) and downstream at Verona (CDEC – VON).

The giant garter snake is the primary endangered species concern in this area. Other special status species identified as potentially found within the area include the California tiger salamander, yellow-billed cuckoo, Western snowy plover, least Bell's vireo, Delta smelt, Central Valley steelhead, Chinook salmon, green sturgeon, Conservancy fairy shrimp, vernal pool fairy shrimp, Valley elderberry longhorn beetle, vernal pool tadpole shrimp, Hoover's spruge, palmate-bracted bird's-beak, Colusa grass, hairy Orcutt grass, slender Orcutt grass, Keck's checker-mallow, and Greene's tuctoria[3].

3.0 Water Rights

Landowners and irrigation districts hold varying water rights along the CBD, Ridge Cut, Tule Canal, and Yolo Bypass. MBK conducted an initial review of existing water rights along the CBD downstream of Sites Reservoir using the State Water Resources Control Board's electronic files (see Draft Memorandum: Summary of Downstream Water Rights, dated September 17, 2019). Based on this research there are approximately ten water rights along the CBD between Bird Creek and the Knights Landing Outfall Gates[4]. Generally, these are licensed direct diversion water rights for irrigation purposes during April to October.

In addition, many lands are within the Colusa Drain Mutual Water Company (CDMWC), which holds a contract with the U.S. Bureau of Reclamation (Reclamation) for supplemental water supplies for its shareholders who divert water from the CBD under their respective water rights. As allowed under the contract with Reclamation the CDMWC has purchased supplemental water supplies from GCID for the past several years.

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[3] Source: https://www.usbr.gov/mp/nepa/includes/documentShow.php?Doc_ID=32942

[4] Research was not conducted to identify existing water rights along the Ridge Cut, Tule Canal, Sacramento River, or within the Delta.

Appendix C – Environmental Permitting and Planning

Appendix C-1 – Permitting and Environmental Planning Impacts Assessment Technical Memorandum

To:	Value Planning Work Group
CC:	Lee Frederiksen
Date:	March 3, 2020
From:	John Spranza, Jelica Arsenijevic - HDR
	Laurie Warner Herson – Phenix Environmental
Subject:	Permitting and Environmental Planning Impacts Assessment

1.0 Introduction

The Sites Project Authority (Authority) is pursuing development of the Sites Reservoir Project (Project), a new above-ground surface storage reservoir offstream of the Sacramento River in Colusa and Glenn counties, approximately 10 miles west of the town of Maxwell, California. The Project, in addition to providing other important water storage and operational benefits, is being proposed to increase the reliability of water supplies for environmental, agricultural and urban uses. A draft California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) Environmental Impact Report/Environmental Impact Statement (EIR/EIS)[1] has been prepared and was circulated for public review and comment in August, 2017.

In October 2019, the Authority began value planning efforts to identify an alternative that would serve the current needs of the Project participants and potentially reduce overall cost of the Project. The value planning effort has identified several facility modifications, which resulted in 16 new alternatives being considered.

This memorandum (memo) has been prepared to assist with the value planning effort from the environmental permitting and planning perspective. The memo summarizes the alternatives being considered, describing:

- Key differences of the value planning alternatives when compared to Alternative D as described in the Draft EIR/EIS;
- Species within the alternatives footprint that could potentially be impacted through construction and operation of the Project;
- Key permits and approvals required to construct and operate the Project including any additional regulatory requirements beyond those identified in the Draft EIR/EIS;
- Environmental planning considerations related to CEQA/NEPA analysis;
- Qualitative change in mitigation cost; and
- A relative weighting associated with environmentally related criteria (and associated metrics) compared to Alternative D in the Draft EIR/EIS.

Although qualitative in nature, the analysis and conclusions presented in this memo may be used to support the Authority in identifying a revised locally-preferred alternative.

[1] Sites Reservoir Project Draft Environmental Impact Report/Environmental Impact Statement (Sites Project Authority and Reclamation 2017)

2.0 Summary of Alternative D

The Draft EIR/EIS addressed a range of alternatives (Alternatives A, B, C, C1, and D). All alternatives included a Sites Reservoir that would be filled using existing Sacramento River diversion facilities and a proposed Delevan Pipeline on the Sacramento River to allow for release of flows into the Sacramento River. All but one alternative also used the proposed Delevan Pipeline to divert Sacramento River water. The proposed operations varied between Alternatives A, B, C, C1, and those included in Alternative D. The specific operational parameters included in the Draft EIR/EIS were identified to support/evaluate the upper bound of potential impacts. The operations evaluated for Alternative D were based on operations included in the application to the California Water Commission for the Water Storage Investment Program. The operations included in that application were specifically selected to respond to the requirements of that program and its evaluation criteria.

In a letter to Reclamation dated June 25, 2018, the Authority identified Alternative D as the locally preferred alternative:

> "As the planning process is nearing completion, the Authority requests Reclamation use Alternative D as the basis for implementing the project and for identifying the federal interest. The current Reclamation-prepared draft Feasibility Report, dated August 14, 2017, identified Alternative D as providing the highest net Regional Economic Development (RED) benefits and as representing the Locally Preferred Alternative; which aligns with the Authority's decision on June 13, 2016, to formally select Alternative D as our proposed project under CEQA and as the basis for our Proposition 1 application to the Water Commission."

Alternative D consists of constructing and operating a 1.8 million-acre-foot (MAF) reservoir. The reservoir would be created by constructing two main dams, one on Funks Creek and one on Stone Corral Creek, and nine saddle dams. Under Alternative D, Sites Reservoir would be filled by diverting unappropriated flows originating primarily from tributary streams to the Sacramento River below Keswick Dam. These flows would be diverted from the Sacramento River from using surplus capacity at the Tehama-Colusa Canal (T-C Canal) diversion facility near Red Bluff, and Glenn-Colusa Irrigation District's (GCID) diversion Facility near Hamilton City. A new diversion facility near Delevan would be constructed to provide additional diversion capacity for filling the reservoir. A pipeline would be constructed to carry water from the Delevan diversion to the forebay/afterbay for Sites Reservoir.

Under Alternative D, modifications would have to be made to the existing infrastructure to accommodate the operation of the reservoir. These include construction of a terminal reregulating reservoir (TRR) on the Glenn-Colusa Canal, expansion of the existing reregulation reservoir on the Tehama-Colusa Canal (known as Funks Reservoir) into a larger reservoir to serve as the forebay/afterbay for Sites Reservoir and to accommodate a pump storage power generating facility, and an inlet/outlet works for moving water in and out of Sites Reservoir. Alternative D has two options under consideration for expansion of Funks Reservoir one primarily to the south that would be named Holthouse Reservoir; and the other to the north and east would be named Fletcher Reservoir.

2.1 Species Potentially Affected

Table C1-1 identifies the federal and state special-status fish and wildlife species that were potentially affected by the construction and operation of Alternative D.

Table C1-1. Special-Status Species Potentially Affected by Alternative D

Species	Listing Status[1]	Critical Habitat
Keck's checkermallow	FE	
Palmate-bracted bird's beak	FE, SE	
Conservancy fairy shrimp	FE	
Vernal pool fairy shrimp	FT	
Vernal pool tadpole shrimp	FE	
Valley elderberry longhorn beetle	FT	
California red-legged frog	FT	
Foothill yellow-legged frog	ST	
California tiger salamander	FE,ST	
Giant garter snake	FT, ST	
Western yellow-billed cuckoo	FT, SE	X
Swainson's hawk	ST	
Bank swallow	ST	
Tricolored blackbird	ST	
Delta smelt	FT	X
Longfin smelt	ST, FC[2]	
Southern Distinct Population Segment of North American green sturgeon	FT	X
Sacramento River winter-run Chinook salmon Evolutionarily Significant Unit	FE	X
Central Valley spring-run Chinook salmon	FT	X
Central Valley steelhead	FT	X

[1] Acronyms: FE – federally listed as endangered FT – federally listed as threatened; FC – federally listed as a candidate species; SE – state listed as endangered ST – state listed as threatened

[2] Federal candidacy is only for San Francisco Bay-Delta distinct population segment.

2.2 Permits and Approvals Required

Alternative D identified over 20 permits that would be required from regulatory agencies, including, but not limited to California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), State Water Resources Control Board (SWRCB), National Marine Fisheries Service (NMFS), and State Historic Preservation Office (SHPO). Table C1-2 identifies the key permits and approvals required for Alternative D, as well as the agency responsible for issuance of permit/approval, recommended pre-requisites for submittal, and estimated processing time. Key permits are those permits that have the ability to significantly affect the cost or schedule of the construction and operation of the Project.

Table C1-2. Summary of Key Permits and Approvals Required for Alternative D

Agency and Associated Permit or Approval	Recommended Pre-requisites for Submittal	Estimated Processing Time
Federal		
USACE Clean Water Act (CWA) Section 404 Nationwide Permit or Individual Permit Rivers and Harbors Act Section 10 Permit	Application Biological Assessment for submittal to USFWS/NMFS Section 401 Water Quality Certification permit or application NEPA document Section 106 compliance documentation Wetland delineation Mitigation and Monitoring Plan Alternatives analysis (for Individual Permit)	4 to 6 months for Nationwide Permit 8 to 24 months for Individual Permit
USFWS/NMFS Endangered Species Act Section 7 Consultation Biological Opinion(s) Magnuson-Stevens Fisheries Conservation and Management Act	Ongoing informal technical consultation Biological Assessment NEPA document	135 days
USFWS Fish and Wildlife Coordination Act Report	Ongoing informal technical consultation Biological Assessment NEPA document	Generally accompanies USFWS's Biological Opinion
USFWS National Wildlife Refuge Special Use Permit	Application Biological Assessment Section 106 compliance documentation	Over 6 months
SHPO National Historic Preservation Act Section 106 Programmatic Agreement	Cultural Resources Survey and Evaluation Report (if mitigation is necessary to resolve adverse effects to historic properties, then additional reports would be required for SHPO consultation that detail the results of these efforts)	9 months (up to 18 months, if mitigation necessary)
State		
RWQCB Clean Water Act Section 401 Water Quality Certification	Application Fish and Game Code Section 1602 Notification or Alteration Agreement CWA Section 404 permit or application CEQA document	8 to 24 months
SWRCB Water Right Permit	Application Water Availability Analysis Coordination with SWRCB Staff Coordinate with potential protesters CEQA document and Mitigation Plan	18 to 24 months
CDFW California Endangered Species Act 2081 Incidental Take Statement	Ongoing informal technical consultation Application Biological document for 2081 Permit, if requesting Incidental Take Permit CEQA document and Mitigation Plan	6 to 24 months
CDFW	Notification Package	6 to 8 months

Agency and Associated Permit or Approval	Recommended Pre-requisites for Submittal	Estimated Processing Time
Fish and Game Code Section 1602 Notification Section 1603 Streambed Alteration Agreement	Section 401 Water Quality Certification or application CWA Section 404 permit or application CEQA document and Mitigation Plan	

2.3 Summary of Environmental Effects

The Project has the potential to influence Central Valley Project (CVP) and State Water Project (SWP) system operations and water deliveries. For the Draft EIR/EIS analysis, three study areas were developed to evaluate potential Project impacts: the Extended, Secondary, and Primary study areas. Based on the analysis, implementation of all alternatives would affect environmental resources in all three study areas to varying degrees, with most impacts potentially occurring in the Primary Study Area. Under Alternative D, potentially significant environmental effects to aquatic, botanical, and terrestrial biological resources were identified but mitigation was identified to mitigate effects to less than significant levels, except for effects to golden eagles. Similarly, effects to wetlands and other jurisdictional waters were considered less than significant after implementation of proposed mitigation.

The Draft EIR/EIS determined that Alternative D (as well as the other alternatives) would likely result in the following potentially significant and unavoidable direct and indirect environmental effects:

Terrestrial Biological Resources (Golden Eagle)

Construction and filling of the proposed Sites Reservoir Inundation Area, as well as construction of the proposed Recreation Areas, would result in the permanent loss of foraging and nesting habitat for the golden eagle. Although implementation of compensatory mitigation including land preservation and/or acquisition is proposed, these measures would not reduce this loss of habitat to less-than-significant levels.

Paleontological Resources

Construction of the proposed Project facilities could affect paleontological resources. Mitigation measures would reduce the impacts, but not to a less-than-significant level if such resources are encountered during construction.

Cultural Resources (Historical and Tribal Resources, Human Remains)

Construction of the proposed Project facilities would affect built historical and tribal resources, as well as human remains associated with a designated cemetery and adjacent areas. If these resources and/or areas are determined to be eligible for listing in the California Register of Historical Resources or National Register of Historic Places, mitigation measures would not reduce the impact to less-than-significant levels.

Land Use (Community of Sites and Existing Land Uses)

Construction and filling of the proposed Sites Reservoir Inundation Area would result in the physical division and loss of the community of Sites, resulting in a significant and unavoidable impact. Construction of the proposed Project facilities would result in conversion of Prime Farmland, Unique Farmland or Farmland of Statewide Importance to non-agricultural use, resulting in significant and unavoidable impacts. Implementation of mitigation measures would not reduce these impacts to less-than-significant levels.

Air Quality (PM10, ROG, and NOx)

Construction activities associated with all proposed Primary Study Area Project facilities, as well as activities (such as use of roads, recreation, electricity generation and consumption, and sediment dredging) associated with the long-term operation and maintenance of the Project, would result in significant and unavoidable emissions of particulate matter less than 10 microns in diameter (PM10), reactive organic gas (ROG), and nitrogen oxide (NOx).

Climate Change and Greenhouse Gas Emissions

The greenhouse gas (GHG) emissions estimated for construction, operation, and maintenance of the Project when compared to applicable county standards would contribute to a cumulatively considerable effect that would be significant and unavoidable.

Growth-inducing Impacts

Implementation of the Project would improve water supply reliability for agricultural, urban, and environmental uses; provide more options for water management; increase recreational opportunities; and increase temporary and permanent employment opportunities. Although it is not anticipated that the water made available from the Project would result in a direct increase in population or employment, the potential exists for the quantity of water made available by the Project to result in secondary effects of growth consistent with local general plans and regional growth projections in an agency's respective service area.

These significant and unavoidable environmental effects were common to all of the alternatives analyzed in the Draft EIR/EIS due to the magnitude of construction activities and future reservoir-related inundation of resources. There were changes in the level of effects for some alternatives depending on construction and operation of the Delevan Intake including:

- Impact Fish-1c: Hydrostatic Pressure Waves, Noise, and Vibration – Delevan Facilities.
- Impact Fish-1d: Predation Risk – Delevan Facilities.
- Impact Fish-1e: Stranding, Impingement, and Entrainment – Delevan Facilities.
- Impact Fish 1f: Modification of Pulse Flows and Entrainment during Diversions at the Delevan Facilities.

However, the Draft EIR/EIS concluded that these effects were less than significant after implementation of mitigation.

2.4 Estimated Mitigation Costs

In 2016, costs for potential mitigation requirements of Alternative D were estimated to be approximately $500 million. The 2016 estimated mitigation costs identified that there was uncertainty in the estimate as the Project's impact assessment and associated mitigation ratios/acres had yet to be finalized and determined by the state and federal regulatory agencies in their respective permits and approvals. The HDR Permitting Integration Team reviewed the 2016 estimated mitigation costs in late 2019 and found that the addition of new facilities and removal/refinement of proposed facilities resulting from the Value Planning provides the same challenges to providing an accurate estimate of mitigation requirements (see Attachment 1 of Sites Project Value Planning Alternatives Appraisal Report [2020]).

3.0 Value Planning Alternatives

As described above, 16 new alternatives have been developed during the value planning effort. Table C1-3 below presents the differences among each alternative, including cost, size of reservoir, diversion, conveyance, bridge and road considerations, and type of dam.

Table C1-3. Alternatives Considered During Value Planning

Features	Value Planning Alternatives															
	1	2	3	4a	4b	5a	5b	6a	6b	VP1	VP2	VP3	VP4	VP5	VP6	VP7
Cost ($billions)	$4.0	$4.0	$3.9	$3.8	$3.9	$3.5	$3.9	$3.4	$3.6	$3.3	$2.8	$3.3	$3.0	$2.7	$2.9	$2.9
Savings from 1.8 MAF Alternative D ($billions)	$1.2	$1.2	$1.3	$1.4	$1.3	$1.7	$1.3	$1.8	$1.6	$1.9	$2.3	$1.9	$2.1	$2.4	$2.2	$2.2
1.5 MAF Reservoir	•	•	•	•	•	•	•	•								•
1.3 MAF Reservoir									•	•	•	•	•	•	•	
Funks/Sites PGP	•	•		•	•	•	•									
Funks PGP											•	•	•	•	•	•
TRR and TRR PGP	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
TCRR with Pumping Plant and Pipeline			•					•	•	•						
Delevan Canal/Pipeline Release	•	•	•	•	•											
Delevan Pipeline												•				
Dunnigan Pipeline to CBD Release (750 cfs)						•		•		•	•					
Dunnigan Pipeline to CBD Release (1,000 cfs)														•		•
Dunnigan to River Release (750 cfs)							•		•							
Dunnigan Pipeline to River Release (1,000 cfs)													•		•	
Bridge (sized for 1.3 MAF)									•		•	•	•			
Bridge (sized for 1.5 MAF)	•		•	•	•	•	•	•		•				•	•	•
South Road to Lodoga		•														
South Road to Local Residents	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
Rockfill Embankment Dam	•	•	•			•	•									
Earthfill Dam				•				•	•	•	•	•	•	•	•	•
Hardfill Dam					•											

Note: Alternatives VP1, VP2, and VP3 were also evaluated at 1.0 MAF and 1.5 MAF. Alternative VP4 was also evaluated at 1.5 MAF.

Acronyms: PGP – pumping/generating plant; TCRR – Tehama-Colusa regulating reservoir; CBD – Colusa Basin Drain

3.1 Alternative 1

Compared to Alternative D in the EIR/EIS, Alternative 1 reduces the size of the reservoir to 1.5 MAF and uses a multi-span bridge to reduce costs (Figure C1-1 in Appendix A of main report). The other features are generally consistent with Alternative D, including a facility at Funks Reservoir, Delevan Canal, construction of a multi-spanning bridge and southern road for local residents, and conveyance of water through a pipeline to the Sacramento River.

It is assumed that the Delevan Canal would have a maximum capacity of approximately 750 cubic-feet-per-second (cfs) of water.

They key difference between Alternative D and Alternative 1, is that a new diversion facility at Delevan on the Sacramento River is not proposed. Only an outlet is proposed.

3.1.1 Species Potentially Affected

Alternative 1 would potentially affect the same species and critical habitat as Alternative D due to the same relative magnitude of impacts associated with the Project footprint and operations.

3.1.2 Permits and Approvals Required

Like Alternative D, the same environmental permits and approvals identified for Alternative D (Table C1-2) would be required for Alternative 1. There would be little, if any, substantial change in timing or cost of these permits due to the same relative magnitude of impacts associated with the Project footprint and operations.

3.1.3 CEQA/NEPA Considerations

The reduction in reservoir size may reduce effects to inundated cultural, biological, and land use (agricultural) resources but not to less-than-significant levels. A Delevan Canal rather than pipeline could increase significant and unavoidable effects to agriculture through severing parcels and leaving portions of parcels with challenging access for large agricultural equipment or leaving smaller parcels that would no longer be economically viable for production.

3.1.4 Mitigation Differences and Considerations

Due to this alternative's similar relative magnitude of impacts associated with the Project footprint and operations, the challenges of detailed costing for mitigation identified within Attachment 1 continue to place the approximate cost of mitigation at $500 million (ICF [2020] memorandum in Attachment 1). However, some mitigation costs associated with facilities that would not be built (i.e., Delevan diversion) or reduced in size (i.e., smaller construction footprint of river outfall pipeline) would result in some level of mitigation cost savings compared to those of Alternative D. These costs could be developed once a final Value Planning Alternative is selected and some level of initial design detail of the Project footprint is completed. Considerations for seeking to avoid and/or minimize impacts to the extent possible during the design process would also be important to reducing mitigation cost.

3.1.5 Summary of Score

Table C1-4, *Relative Permitability of Each Alternative Compared to Alternative D*, provides a comparison of relative permitting difficulty of each Value Planning Alternative to that of Alternative D (0 = more difficult; 1 = approximately the same; 2 = slightly less difficult; 3 = moderately less difficult). To provide a comparable permitability estimate Table C1-4 holds permitting regulations static from the time when the Draft EIR/EIS was first published (2017) and does not take into consideration new regulations, modeling or other changes in baseline conditions that would prevent an equitable relative comparison between Alternative D and a Value Planning Alternative.

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a slightly smaller inundation area (smaller size), a narrower easement to river and a river outfall/outlet, Value Planning Alternative 1 is relatively less difficult to permit than Alternative D with a total score of 15 points and an average score of 1.88.

3.2 Alternative 2

Alternative 2 (Figure C1-2 in Appendix A) is very similar to Alternative 1. Alternative 2 uses the southern road to the town of Lodoga in place of the multi-span bridge. Like Alternative 1, it is assumed that approximately 750 cfs of water would be conveyed to the Sacramento River through the Delevan Canal and pipeline. No diversion facility is proposed at Delevan on the Sacramento River.

3.2.1 Species Potentially Affected

Alternative 2 would potentially affect the same species and critical habitat as Alternative D due to the very similar footprint.

3.2.2 Permit Considerations

Like Alternative D, the same environmental permits and approvals would be required for Alternative 2. Table C1-2 identifies the key permits and approvals required for Alternative 2.

3.2.3 CEQA/NEPA Considerations

Similar to Alternative 1, the reduction in reservoir size may reduce effects to inundated cultural, biological, and land use (agricultural) resources but not to less-than-significant levels. For the same reasons as identified for Alternative 1, a Delevan Canal rather than pipeline could increase significant and unavoidable effects to agriculture.

The proposed addition of the South Road to Lodoga would require additional studies to determine environmental effects but it is assumed that through the additional ground disturbance associated with road construction there would be an increase in potential environmental effects.

3.2.4 Mitigation Differences and Considerations

Due to this alternative's similar relative magnitude of impacts associated with the Project footprint and operations, the challenges of detailed costing for mitigation identified within Attachment 1 continue to place the approximate cost of mitigation at $500 million (ICF [2020] memorandum in Attachment 1). However, some mitigation costs associated with facilities that would not be built (i.e., Delevan diversion) or reduced in size (i.e., smaller construction footprint of river outfall pipeline) would result in some level of mitigation cost savings compared to those of Alternative D. These costs could be developed once a final Value Planning Alternative is selected and some level of initial design detail of the Project footprint is completed. Considerations for seeking to avoid and/or minimize impacts to the extent possible during the design process would also be important to reducing mitigation cost.

3.2.5 Summary of Score

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a slightly smaller inundation area (smaller size), a narrower easement to river and a river outfall/outlet, Value Planning Alternative 2 is relatively less difficult to permit compared to Alternative D with a total score of 15 points and an average score of 1.88.

3.3 Alternative 3

Alternative 3 (Figure C1-3 in Appendix A) eliminates the Sites Pumping/Generating Plant and replaces it with the TCRR and Pumping Plant near Road 69 in combination with an upgraded TRR to fill Sites Reservoir. Water would be released to the Sacramento River through a canal/pipeline to the Delevan release structure. The two-span bridge is used in this alternative.

Like Alternatives 1 and 2, it is assumed that approximately 750 cfs of water would be conveyed to the Sacramento River through the Delevan Canal and pipeline. No diversion facility is proposed at Delevan on the Sacramento River.

3.3.1 Species Potentially Affected

Alternative 3 would potentially affect the same species as Alternative D due to the similar footprint. The newly proposed facilities at the northernmost portion of the future reservoir is outside of the footprint already analyzed; however, the same species would be analyzed for potential Project effects.

3.3.2 Permit Considerations

Like Alternative D, the same environmental permits and approvals would be required for Alternative 3. Table C1-2 identifies the key permits and approvals required for Alternative 3.

3.3.3 CEQA/NEPA Considerations

Similar to Alternatives 1 and 2, the reduction in reservoir size may reduce effects to inundated cultural, biological, and land use (agricultural) resources but not to less-than-significant levels. For the same reasons as identified for Alternative 1, a Delevan Canal rather than pipeline could increase significant and unavoidable effects to agriculture through stranding parcels that would no longer be viable for production.

Replacement of the Funks/Sites Pumping/Generating Plant (PGP) with the TCRR and upgraded TRR PGP would result in the potential for similar environmental effects but in areas on the northeast side of the proposed reservoir.

3.3.4 Mitigation Differences and Considerations

Due to this alternative's similar relative magnitude of impacts associated with the Project footprint and operations, the challenges of detailed costing for mitigation identified within Attachment 1 continue to place the approximate cost of mitigation at $500 million (ICF [2020] memorandum in Attachment 1). However, more specific costs could be developed once a final Value Planning Alternative is selected and some level of initial design detail of the Project footprint is completed. Considerations for seeking to avoid and/or minimize impacts to the extent possible during the design process would also be important to reducing mitigation cost.

3.3.5 Summary of Score

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a slightly smaller inundation area (smaller size), a narrower easement to river and a river outfall/outlet, Value Planning Alternative 3 is relatively less difficult to permit compared to Alternative D with a total score of 15 points and an average score of 1.88.

3.4 Alternatives 4a and 4b

Alternatives 4a and 4b (Figures C1-4a and C1-4b in Appendix A) include the single Sites PGP with releases through the Delevan Canal/Pipeline. Alternative 4a uses an earthfill dam and Alternative 4b uses a hardfill dam in place of the zoned rockfill dam.

Like Alternatives 1 and 2, it is assumed that approximately 750 cfs of water would be conveyed to the Sacramento River through the Delevan Canal/Pipeline. No diversion facility is proposed at Delevan on the Sacramento River.

3.4.1 Species Potentially Affected

Alternatives 4a and 4b would potentially affect the same species as Alternative D due to the similar footprint.

3.4.2 Permit Considerations

Like Alternative D, the same environmental permits and approvals would be required for Alternatives 4a and 4b. Table C1-2 identifies the key permits and approvals required for Alternatives 4a and 4b.

3.4.3 CEQA/NEPA Considerations

Similar to Alternatives 1, 2 and 3, the reduction in reservoir size may reduce effects to inundated cultural, biological, and land use (agricultural) resources but not to less-than-significant levels. For the same reasons as identified for Alternative 1, a Delevan Canal rather than pipeline could increase significant and unavoidable effects to agriculture.

Proposed construction under Alternative 4a of an earthfill dam and under Alternative 4b of a hardfill dam rather than rockfill embankment dam would need to be analyzed for potential changes in environmental effects associated with construction technique (e.g., borrow on site versus hauling) and materials (e.g., onsite cement batch plant) including potential air quality, greenhouse gas, noise and transportation effects.

3.4.4 Mitigation Differences and Considerations

Due to this alternative's similar relative magnitude of impacts associated with the Project footprint and operations, the challenges of detailed costing for mitigation identified within Attachment 1 continue to place the approximate cost of mitigation at $500 million (ICF [2020] memorandum in Attachment 1). However, more specific costs could be developed once a final Value Planning Alternative is selected and some level of initial design detail of the Project footprint is completed. Considerations for seeking to avoid and/or minimize impacts to the extent possible during the design process would also be important to reducing mitigation cost.

3.4.5 Summary of Score

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a slightly smaller inundation area (smaller size), a narrower easement to river and a river outfall/outlet, Value Planning Alternative 4a and 4b are relatively less difficult to permit compared to Alternative D with a total score of 15 points and an average score of 1.88.

3.5 Alternative 5a and 5b

Alternatives 5a and 5b (Figures C1-5a and C1-5b in Appendix A) replace the Delevan Canal/Pipeline with a southern release near the southern terminus of the T-C Canal. Alternative 5a releases water to the CBD. Water released to the CBD would be conveyed through the lower portion of the CBD to the Sacramento River. Alternative 5b conveys water by canal to the CBD, then uses a siphon and pumping plant to convey water to the Sacramento River.

Under Alternatives 5a and 5b, the canal and pipeline being considered to convey water to either the CBD or Sacramento River would have a capacity of 750 cfs.

Compared to Alternative D, no diversion facility or outlet is proposed at Delevan on the Sacramento River.

3.5.1 Species Potentially Affected

Alternatives 5a and 5b would potentially affect the same species as Alternative D due to the similar footprint. However, due to new facilities, diversions, conveyance features proposed south of Dunnigan, new species have the potential to occur and may be affected by the construction and/or operation of the Project. California tiger salamander is known to occur in the vicinity of those Project features.

3.5.2 Permit Considerations

Like Alternative D, the same environmental permits and approvals would be required for Alternatives 5a and 5b. Table C1-2 identifies the key permits and approvals required for Alternatives 5a and 5b. However, a USFWS special-use permit would not be required for Alternatives 5a and 5b, as the Delevan Canal/Pipeline is not proposed.

3.5.3 CEQA/NEPA Considerations

Similar to the prior alternatives, the reduction in reservoir size may reduce effects to inundated cultural, biological, and land use (agricultural) resources but not to less-than-significant levels. Eliminating releases

through a Delevan pipeline or canal would potentially reduce agricultural effects in that area but effects would still be considered significant and unavoidable for the Project as a whole due to effect of the reservoir inundation.

Release from the southern terminus of the T-C Canal to the CBD would require additional study. This expands the direct impact area of the Project beyond what was previously analyzed in the Draft EIR/EIS. While it is assumed that significant and unavoidable effects identified in the Draft EIR/EIS would be the same or similar, the potential for new significant effects would need to be analyzed. Areas that would need to be considered would include, but may not be limited to, seepage along the CBD and ensuring and additional use of the CBD does not affect its existing water delivery, flood control and flood conveyance purposes.

3.5.4 Mitigation Differences and Considerations

Due to these alternative's similar relative magnitude of impacts associated with the Project footprint and operations, the challenges of detailed costing for mitigation identified within Attachment 1 continue to place the approximate cost of mitigation at $500 million (ICF [2020] memorandum in Attachment 1). However, more specific costs could be developed once a final Value Planning Alternative is selected and some level of initial design detail of the Project footprint is completed. Considerations for seeking to avoid and/or minimize impacts to the extent possible during the design process would also be important to reducing mitigation cost.

3.5.5 Opportunities Associated with the CBD Alternatives

Moving water through the CBD provides multiple opportunities under Alternative 5a. Recent activities within the lower portions of the CBD have included integrating floodplain agricultural and water delivery activities to create pulse flows containing plankton blooms to provide food for the federally listed Delta smelt. Under the pulse flow, water is redirected from the Sacramento River down the CBD, through the Knights Landing Ridge Cut Slough, past Wallace Weir, through the Yolo Bypass and into the Delta where it is utilized by Delta smelt and other planktivorus fish.

Additional mitigation opportunities that could be realized include upgrading and/or adding gauge structures along the CDB, upgrading of grade control facilities in the CBD to better control the flow of water and the acquisition of CBD lands from willing sellers that are prone to flooding that could be used for wetland and state and federal listed species mitigation for the Project. The potential to improve water quality in the CBD also exists and would also need to be assessed in detail.

3.5.6 Summary of Score

3.5.6.1 Alternative 5a

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a slightly smaller inundation area (smaller size), no pipeline easement to river, a shorter conveyance off T-C Canal, and northern regulating reservoir facilities, Value Planning Alternative 5a is relatively less difficult to permit compared to Alternative D with a total score of 19 points and an average score of 2.38.

3.5.6.2 Alternative 5b

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a slightly smaller inundation area (smaller size), no Delevan pipeline easement to river, an easement to the river off the T-C Canal, a river outfall and northern regulating reservoir facilities, Value Planning Alternative 5b is relatively less difficult to permit compared to Alternative D with a total score of 13 points and an average score of 1.63.

3.6 Alternative 6a and 6b

Alternatives 6a and 6b (Figures C1-6a and C1-6b in Appendix A) combine the TCRR and upgraded TRR with the southern release structure and an earthfill dam. More specifically, the TCRR pipeline and TCRR pumping

plant would be constructed to release approximately 2,100 cfs of water into the northernmost portion of the 1.5 MAF proposed reservoir.

Under Alternatives 6a and 6b, the canal and pipeline being considered to convey water to either the CBD or Sacramento River would have a capacity of 750 cfs.

Compared to Alternative D, no diversion facility or outlet is proposed at Delevan on the Sacramento River.

3.6.1 Species Potentially Affected

Alternatives 6a and 6b would potentially affect the same species as Alternative D due to the similar footprint. However, due to new facilities, diversions, conveyance features proposed south of Dunnigan, new species have the potential to occur and may be affected by the construction and/or operation of the Project. California tiger salamander is known to occur in the vicinity of those Project features.

3.6.2 Permit Considerations

Like Alternative D, the same environmental permits and approvals would be required for Alternatives 6a and 6b. Table C1-2 identifies the key permits and approvals required for Alternatives 6a and 6b. However, a USFWS special-use permit would not be required for Alternatives 5a and 5b, as the Delevan Canal/Pipeline is not proposed.

3.6.3 CEQA/NEPA Considerations

As noted above, these alternatives combine the TCRR and upgraded TRR under Alternative 3 with the southern release structure of Alternatives 6a and 6b.

Similar to the prior alternatives, the reduction in reservoir size may reduce effects to inundated cultural, biological, and land use (agricultural) resources but not to less-than-significant levels. Eliminating releases through a Delevan pipeline or canal would potentially reduce agricultural effects in that area but effects would still be considered significant and unavoidable for the Project as a whole due to effect of the reservoir inundation.

Replacement of the Funks/Sites PGP with the TCRR and upgraded TRR PGP would result in the potential for similar environmental effects but in areas on the northeast side of the proposed reservoir.

Release from the southern terminus of the T-C Canal to the CBD would require additional study. This expands the direct impact area of the Project beyond what was previously analyzed in the Draft EIR/EIS. While it is assumed that significant and unavoidable effects identified in the Draft EIR/EIS would be the same or similar, the potential for new significant effects would need to be analyzed. Areas that would need to be considered would include, but may not be limited to, seepage along the CBD and ensuring and additional use of the CBD does not affect its existing water delivery, flood control and flood conveyance purposes.

3.6.4 Mitigation Differences and Considerations

Due to these alternative's similar relative magnitude of impacts associated with the Project footprint and operations, the challenges of detailed costing for mitigation identified within Attachment 1 continue to place the approximate cost of mitigation at $500 million (ICF [2020] memorandum in Attachment 1). However, more specific costs could be developed once a final Value Planning Alternative is selected and some level of initial design detail of the Project footprint is completed. Considerations for seeking to avoid and/or minimize impacts to the extent possible during the design process would also be important to reducing mitigation cost.

3.6.5 Opportunities Associated with the CBD Alternatives

Moving water through the CBD under Alternative 6a has the potential to provide the same benefits as described under Alternative 5a (see section 3.5.5).

3.6.6 Summary of Score

3.6.6.1 Alterative 6a

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a slightly smaller inundation area (smaller size), no pipeline easement to river, a shorter conveyance off T-C Canal, and northern regulating reservoir facilities, Value Planning Alternative 6a is relatively less difficult to permit compared to Alternative D with a total score of 19 points and an average score of 2.38.

3.6.6.2 Alternative 6b

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a slightly smaller inundation area (smaller size), no Delevan pipeline easement to river, an easement to the river off the T-C Canal, a river outfall and northern regulating reservoir facilities, Value Planning Alternative 6b is relatively less difficult to permit compared to Alternative D with a total score of 13 points and an average score of 1.63.

4.0 Refined Value Alternatives

Further refinement to alternatives occurred during the Value Planning process. This resulted in the identification of following additional alternatives, VP1 through VP7. All of the refined value planning alternatives propose earthfill dams and include reservoir sizes that are less than the 1.8 MAF proposed under Alternative D. Similar to the prior alternatives, the reduction in reservoir size may reduce effects to inundated cultural, biological, and land use (agricultural) resources but not to less-than-significant levels. Construction of an earthfill dam rather than rockfill embankment dam would need to be analyzed for potential changes in environmental effects associated with construction technique (e.g., borrow on site versus hauling) including potential air quality, greenhouse gas, noise and transportation effects. All of the VP alternatives also propose the south road to local residents and a bridge crossing to serve the western side of the reservoir, similar to Alternative D and therefore assumed to have similar environmental effects.

4.1 Alternative VP1

In addition to design features noted above, Alternative VP1 (Appendix A) uses the TCRR and TRR to fill Sites Reservoir and water is conveyed from the T-C Canal into the CBD at a maximum rate of 750 cfs. VP1 proposes construction of a bridge sized for a 1.5 MAF reservoir.

Compared to Alternative D, no diversion facility or outlet is proposed at Delevan on the Sacramento River.

4.1.1 Species Potentially Affected

Alternative VP1 would potentially affect the same species as Alternative D due to the similar footprint. However, due to new facilities, diversions, conveyance features proposed south of Dunnigan, new species have the potential to occur and may be affected by the construction and/or operation of the Project. California tiger salamander is known to occur in the vicinity of those Project features.

4.1.2 Permit Considerations

Like Alternative D, the same environmental permits and approvals would be required for Alternative VP1. Table C1-2 identifies the key permits and approvals required for Alternative VP1. However, a USFWS special-use permit would not be required for Alternative VP1, as the Delevan Canal/Pipeline is not proposed.

4.1.3 CEQA/NEPA Considerations

Replacement of the Funks/Sites PGP with the TCRR and upgraded TRR PGP would result in the potential for similar environmental effects to those identified under Alternative D but in areas on the northeast side of the proposed reservoir.

Release from the southern terminus of the T-C Canal to the CBD would require additional study. This expands the direct impact area of the Project beyond what was previously analyzed in the Draft EIR/EIS. While it is assumed that significant and unavoidable effects identified in the Draft EIR/EIS would be the same or similar, the potential for new significant effects would need to be analyzed. Areas that would need to be considered include, but may not be limited to seepage along the CBD and ensuring and additional use of the CBD does not affect its existing water delivery, flood control and flood conveyance purposes.

4.1.4 Mitigation Differences and Considerations

Due to this alternative's similar relative magnitude of impacts associated with the Project footprint and operations, the challenges of detailed costing for mitigation identified within Attachment 1 continue to place the approximate cost of mitigation at $500 million (ICF [2020] memorandum in Attachment 1). However, more specific costs could be developed once a final Value Planning Alternative is selected and some level of initial design detail of the Project footprint is completed. Considerations for seeking to avoid and/or minimize impacts to the extent possible during the design process would also be important to reducing mitigation cost.

4.1.5 Opportunities Associated with the CBD Alternatives

Moving water through the CBD (750 cfs) under Alternative VP1 has the potential to provide the same benefits as described under Alternative 5a (see section 3.5.5).

4.1.6 Summary of Score

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a reduced inundation area, no pipeline easement to river and a shorter conveyance off the T-C Canal, Alternative VP1 is relatively less difficult to permit compared to Alternative D with a total score of 19 points and an average score of 2.38.

4.2 Alternatives VP2 and VP3

In addition to design features noted above, VP2 and VP3 (Figures VP2 and VP 3 in Appendix A) fill the reservoir using the Funks Reservoir and TRR and include a bridge sized for a 1.3 MAF reservoir. Primary changes are related to where and how releases occur. VP2 proposes releases of 750 cfs from the T-C Canal to the CBD via a pipeline at Dunnigan. VP3 proposes releases of 1,500 cfs to the Sacramento River via a Delevan Pipeline.

Compared to Alternative D, no diversion facility or outlet is proposed at Delevan on the Sacramento River under VP2.

4.2.1 Species Potentially Affected

Alternatives VP2 and VP3 would potentially affect the same species as Alternative D due to the similar footprint. However, due to new facilities, diversions, conveyance features proposed south of Dunnigan under VP2, new species have the potential to occur and may be affected by the construction and/or operation of the Project. California tiger salamander is known to occur in the vicinity of those Project features being considered under VP2.

4.2.2 Permit Considerations

Like Alternative D, the same environmental permits and approvals would be required for Alternatives VP2 and VP3. Table C1-2 identifies the key permits and approvals required for Alternatives VP2 and VP3. However, a USFWS special-use permit would not be required for Alternative VP2, as the Delevan Canal/Pipeline is not proposed.

4.2.3 CEQA/NEPA Considerations

Changes in bridge configuration under VP2 and VP3 and use of a Delevan pipeline for releases to the Sacramento River under VP3 would result in effects similar to those identified in the Draft EIR/EIS under Alternative D.

Eliminating releases through a Delevan pipeline or canal as proposed under VP2 would potentially reduce agricultural effects in that area but effects would still be considered significant and unavoidable for the Project as a whole due to reservoir inundation.

Releases from the southern terminus of the T-C Canal to the CBD proposed under VP2 would require additional study. This expands the direct impact area of the Project beyond what was previously analyzed in the Draft EIR/EIS. While it is assumed that significant and unavoidable effects identified in the Draft EIR/EIS would be the same or similar, the potential for new significant effects would need to be analyzed. Areas that would need to be considered would include, but may not be limited to, seepage along the CBD and ensuring that the additional use of the CBD does not affect its existing water delivery, flood control and flood conveyance purposes.

4.2.4 Mitigation Differences and Considerations

Due to this alternative's similar relative magnitude of impacts associated with the Project footprint and operations, the challenges of detailed costing for mitigation identified within Attachment 1 continue to place the approximate cost of mitigation at $500 million (ICF [2020] memorandum in Attachment 1). However, more specific costs could be developed once a final Value Planning Alternative is selected and some level of initial design detail of the Project footprint is completed. Considerations for seeking to avoid and/or minimize impacts to the extent possible during the design process would also be important to reducing mitigation cost.

4.2.5 Opportunities Associated with the CBD Alternatives

Moving water through the CBD under Alternative VP2 has the potential to provide the same benefits as described under Alternative 5a and 6a.

4.2.6 Summary of Score

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a reduced inundation area, no pipeline easement to river and a shorter conveyance off T-C Canal, Value Planning Alternative VP2 is relatively less difficult to permit compared to Alternative D with a total score of 19 points and an average score of 2.38.

However, with VP3 proposing to release of 1,500 cfs to the Sacramento River via a Delevan Pipeline, a Section 408 permit would be trigged. Alternative VP3 is relatively less difficult to permit compared to Alternative D with a total score of 15 points and an average score of 1.88.

4.3 Alternative VP4

Alternative VP4 (VP4 in Appendix A) fills the reservoir from Funks Reservoir and the TRR with releases of 1,000 cfs from the southern end of the T-C Canal into the CBD. Similar to Alternatives 6b, VP2, and VP3, VP4 has a bridge that is sized for a 1.3 MAF reservoir.

Compared to Alternative D, no diversion facility or outlet is proposed at Delevan on the Sacramento River under VP2.

4.3.1 Species Potentially Affected

Alternative VP4 would potentially affect the same species as Alternative D due to the similar footprint. However, due to new facilities, diversions, conveyance features proposed south of Dunnigan under VP4, new species have the potential to occur and may be affected by the construction and/or operation of the Project. California tiger salamander is known to occur in the vicinity of those Project features being considered under VP4.

4.3.2 Permit Considerations

Like Alternative D, the same environmental permits and approvals would be required for Alternative VP4. Table C1-2 identifies the key permits and approvals required for Alternative VP4. However, a USFWS special-use permit would not be required for Alternative VP4, as the Delevan Canal/Pipeline is not proposed.

4.3.3 CEQA/NEPA Considerations

Changes in bridge configuration under VP4 would result in effects similar to those identified in the Draft EIR/EIS under Alternative D.

Eliminating releases through a Delevan pipeline or canal as proposed under VP4 would potentially reduce agricultural effects in that area but effects would still be considered significant and unavoidable for the Project as a whole due to reservoir inundation.

Releases from the southern terminus of the T-C Canal to the Sacramento River proposed under VP4 would require additional study. This expands the direct impact area of the Project beyond what was previously analyzed in the Draft EIR/EIS. While it is assumed that significant and unavoidable effects identified in the Draft EIR/EIS would be the same or similar, the potential for new significant effects would need to be analyzed. In addition, the pipeline be constructed in proximity to federal project levees which may also require supplemental environmental analysis under NEPA for the Section 408 permitting process.

4.3.4 Mitigation Differences and Considerations

Due to this alternative's similar relative magnitude of impacts associated with the Project footprint and operations, the challenges of detailed costing for mitigation identified within Attachment 1 continue to place the approximate cost of mitigation at $500 million (ICF [2020] memorandum in Attachment 1). However, more specific costs could be developed once a final Value Planning Alternative is selected and some level of initial design detail of the Project footprint is completed. Considerations for seeking to avoid and/or minimize impacts to the extent possible during the design process would also be important to reducing mitigation cost.

4.3.5 Opportunities Associated with the CBD Alternatives

Moving water through the CBD under Alternative VP4 has the potential to provide the same benefits as described under Alternative 5a and 6a.

4.3.6 Summary of Score

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a reduced inundation area, a pipeline easement to the Sacramento River off the T-C Canal, VP4 is relatively less difficult to permit compared to Alternative D with a total score of 15 points and an average score of 1.88. Similar to VP3, a Section 408 permit would be triggered with construction of a pipeline on the levee, east of the CBD.

4.4 Alternatives VP5, VP6, and VP7

During a meeting of the Ad Hoc Value Planning Work Group on March 2, 2020, the proposed value planning alternatives were further refined. Three alternatives were recommended for consideration in determining the preferred project. Table C1-4 provides a summary of facilities under each alternative.

Table C1-4. Recommended Alternatives and Alternates

Major Facilities	VP5	VP6	VP7 Recommended
Reservoir Size	1.3 MAF	1.3 MAF	1.5 MAF
Bridge Size (avoids future traffic Interruption)	1.5 MAF	1.5 MAF	1.5 MAF
South Road to Local Residents	Included	Included	Included
Misc. Local and Project Roads	Included	Included	Included
Diversion Locations	Funks and TRR	Funks and TRR	Funks and TRR
Dunnigan Release	1,000 cfs to CBD	1,000 cfs to River	1,000 cfs to CBD

As indicated in Table C1-4, VP5, VP6, and VP7 (Figures VP5, VP6, and VP7 in Appendix A) all propose the use of Funks PGP, the TRR and TRR PGP, an earthfill dam and a bridge sized for a 1.5 MAF reservoir. However, VP5 and VP6 propose a 1.3 MAF reservoir size while VP7, identified as the recommended preferred alternative, proposes a 1.5 MAF reservoir. Both VP5 and VP7 would release 1,000 cfs from the T-C Canal to the CBD via a pipeline at Dunnigan. VP6 would release 1,000 cfs from the T-C Canal through a pipeline to the Sacramento River at Dunnigan.

4.4.1 Species Potentially Affected

Alternatives VP5, 6, and 7 would potentially affect the same species as Alternative D due to the similar footprint. However, due to new facilities, diversions, conveyance features proposed south of Dunnigan under VP5, VP6 and VP7, new species have the potential to occur and may be affected by the construction and/or operation of the Project. California tiger salamander is known to occur in the vicinity of those Project features being considered under the three alternatives.

4.4.2 Permit Considerations

Like Alternative D, the same environmental permits and approvals would be required for Alternatives VP5, VP6, and VP7. Table C1-2 identifies the key permits and approvals required for Alternative VP5, VP6, and VP7. However, a USFWS special-use permit would not be required for these alternatives, as the Delevan Pipeline/Canal is not proposed.

4.4.3 CEQA/NEPA Considerations

As noted above, eliminating releases through a Delevan pipeline or canal would potentially reduce agricultural effects in that area but effects would still be considered significant and unavoidable for the Project as a whole due to reservoir inundation. Effects related to bridge size and configuration would likely be similar to those identified in the Draft EIR/EIS for Alternative D.

Releases from the southern terminus of the T-C Canal to the CBD proposed under VP5 and VP7 would require additional study. This expands the direct impact area of the Project beyond what was previously analyzed in the Draft EIR/EIS. While it is assumed that significant and unavoidable effects identified in the Draft EIR/EIS would be the same or similar, the potential for new significant effects would need to be analyzed. Areas that would need to be considered would include, but may not be limited to, seepage along the CBD and ensuring that the additional use of the CBD does not affect its existing water delivery, flood control and flood conveyance purposes.

Releases from the southern terminus of the T-C Canal to the Sacramento River proposed under VP6 would also require additional study. This expands the direct impact area of the Project beyond what was previously

analyzed in the Draft EIR/EIS. While it is assumed that significant and unavoidable effects identified in the Draft EIR/EIS would be the same or similar, the potential for new significant effects would need to be analyzed. In addition, the pipeline would be constructed in proximity to federal project levees which may require supplemental environmental analysis under NEPA for the Section 408 permitting process.

4.4.4 Mitigation Differences and Considerations

Due to this alternative's similar relative magnitude of impacts associated with the Project footprint and operations, the challenges of detailed costing for mitigation identified within Attachment 1 continue to place the approximate cost of mitigation at $500 million (ICF [2020] memorandum in Attachment 1). However, more specific costs could be developed once a final Value Planning Alternative is selected and some level of initial design detail of the Project footprint is completed. Considerations for seeking to avoid and/or minimize impacts to the extent possible during the design process would also be important to reducing mitigation cost.

4.4.5 Opportunities Associated with the CBD Alternatives

Moving water through the CBD under Alternatives VP5, VP6, and VP7 has the potential to provide the same benefits as described under Alternative 5a and 6a.

4.4.6 Summary of Score

Using the scoring methodology provided in Table C1-4, with no Delevan diversion, a reduced inundation area, no pipeline easement to river and a shorter conveyance off T-C Canal, VP5 through VP7 is relatively less difficult to permit compared to Alternative D with a total score of 19 points and an average score of 2.38. VP6 would release 1,000 cfs from the T-C Canal through a pipeline to the Sacramento River at Dunnigan, thereby has a reduced total score for VP6 is 15 and an average score of 1.88.

Table C1-5. Relative Permitability of Each Alternative Compared to Alternative D

Permits	Alternatives															
	D (EIR/EIS)	1	2	3	4a and 4b	5a	5b	6a	6b	VP1	VP2	VP3	VP4	VP5	VP6	VP7
Federal																
Clean Water Act (404)	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Section 408	1	2	2	2	2	3	2	3	2	3	3	1	1	3	1	3
Federal ESA (NMFS and USFWS)	1	2	2	2	2	3	2	3	2	3	3	2	2	3	2	3
Section 106	1	2	2	2	2	3	2	3	2	3	3	2	2	3	2	3
State																
Clean Water Act (401) and Wetland Policy	1	2	2	2	2	2	1	2	1	2	2	2	2	2	1	2
California ESA	1	2	2	2	2	3	2	3	2	3	3	2	2	3	2	3
1602 Lake and/or Streambed Alteration Agreements	1	2	2	2	2	2	1	2	1	2	2	1	2	2	1	2
Water Right(s)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
sum of points	8	15	15	15	15	19	13	19	13	19	19	15	15	19	15	19
Average	**1.00**	**1.88**	**1.88**	**1.88**	**1.88**	**2.38**	**1.63**	**2.38**	**1.63**	**2.38**	**2.38**	**1.88**	**1.88**	**2.38**	**1.88**	**2.38**

Notes:
Relative Permeability Scale: 0 = more difficult; 1 = approximately the same; 2 = slightly less difficult; 3 = moderately less difficult
higher number - relatively easier to obtain permit/approval from regulatory resource agency compared to Alternative D

	No Delevan diversion, slightly smaller inundation (smaller size), narrower Delevan easement to river, river outfall
	No Delevan diversion, slightly smaller inundation (smaller size), no easement to river, shorter conveyance off T-C Canal, northern regulating reservoir facilities (6a)
	No Delevan diversion, slightly smaller inundation (smaller size), no Delevan easement to river, easement to river off T-C Canal and river outfall, northern regulating reservoir facilities (6b)
	No Delevan diversion, slightly smaller inundation (smaller size), no Delevan easement to river, easement to river off T-C Canal and river outfall, northern regulating reservoir facilities removed
	No Delevan diversion, slightly smaller inundation (smaller size), Delevan Canal/Pipeline easement to river, easement to river off T-C Canal and river outfall, northern regulating reservoir facilities removed

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Attachment C-1-1

Sites Reservoir Project: Review of Value Planning - Mitigation Cost Estimate

Update of 2016 Technical Memorandum & Evaluation of Value Planning Alternatives

March 23, 2020

Mr. John Spranza, MS, CCN
Senior Ecologist/Regulatory Specialist
HDR
2379 Gateway Oaks Drive, Suite 200
Sacramento, CA 95833

Subject: **Sites Reservoir Project: Review of Value Planning - Mitigation Cost Estimate Update of 2016 Technical Memorandum & Evaluation of Value Planning Alternatives 1 – 7 (VP1 – VP7)**

Dear Mr. Spranza:

Per your request, ICF has completed our review of the Value Planning technical memorandum (memo), dated October 11, 2019, that was developed by Sites Project team members as part of the initial review and evaluation of the mitigation measures and associated costs for the Sites Project alternatives. The stated purpose of the Value Planning memo was to review the mitigation cost estimate prepared in 2016 (AECOM 2016), based on the then preferred project Alternative C, and to refine the mitigation cost estimate, if possible, to consider the current project alternatives 1, 2, 3, 4a, 4b, 5a, 5b, 6a and 6b being considered in the Value Planning process. In addition to memo review, ICF also evaluated the potential impacts, mitigation measures and associated costs for the recently formulated Value Planning (VP) Alternative 1 – 7.

The memo was developed based on Site's Permitting Integration Team's initial review and applicability of the 2016 mitigation cost estimate, a mitigation planning analysis performed in 2019 by ICF International, and Alternatives developed during the Value Planning process, including most recent versions of Alternatives 6a and 6b.

The findings of the memo are consistent with ICF's 2019 review of the 2016 mitigation acreage assumptions and mitigation cost estimate for the project alternatives, including Alternative 6a, 6b, and VP1- VP7. As stated in the Value Planning memo, a detailed comparison of the 2016 mitigation cost estimate to the present-day project mitigation requirements cannot be performed with precision because 1) the project's impact assessment on terrestrial and aquatic resources, including listed species, has yet to be finalized, and 2) the associated mitigation ratios/acres have yet to be determined by the state and federal regulatory agencies. ICF also concurs with the memo's finding that review of existing analyses and mitigation cost estimates currently being used do not result in any significant changes in estimated mitigation costs (>$50M) when applied to the Value Planning Alternatives.

ICF's 2019 evaluation of the 2016 mitigation assumptions and mitigation cost estimate did not include the more recently developed Alternatives 6a and 6b or VP1 – VP7. A detailed evaluation and comparison of mitigation and mitigation costs associated with Alternatives 6a, 6b and VP1 – VP7

cannot be performed with precision because the project's impact assessment on terrestrial and aquatic resources, including listed species, has yet to be finalized. Based on an evaluation of aerial imagery available on Google Earth, Alternative 6a would appear to affect fewer terrestrial and aquatic resources and Alternative 6b could have impacts comparable to a Delevan diversion. Other considerations that will factor into future evaluations of mitigation and mitigation costs associated with Alternatives 6a, 6b and VP1 – VP7 include the following:

- Alternatives 6a and 6b would eliminate the proposed Delevan diversion and rely on other existing diversions and would include either a Dunnigan release to the Colusa Basin Drain (Alternative 6a) or the Sacramento River (Alternative 6b).
- VP4 and VP7 would both have 1.5 million acre feet (MAF) and therefore more impacts than the other five VP alternatives which would have 1.3MAF reservoirs.
- VP2 – VP7 would include a Funks Pumping/Generating Plant (PGP). Alternatives 1 – 6b and VP1 would not include a Funks PGP however the biological impacts associated with this PGP would not significantly increase the overall project related impacts.
- VP3 would include a Delevan Pipeline to the Sacramento River. VP1, VP2, VP5 and VP7 alternatives would include a Dunnigan Pipeline to Colusa Basin Drain releases and would therefore have fewer impacts associated than VP3. VP4 and VP6 alternatives would include a Dunnigan Pipeline to the River and impacts would likely be comparable to VP3.

Thank you for the opportunity to review the Value Planning technical memo and the recently formulated VP alternatives. Please contact Monique Briard or me if you have any questions.

Sincerely,

Harry Oakes

Harry Oakes
Senior Restoration Ecologist

cc: Monique Briard - ICF

Value Planning: Mitigation Cost Estimate Update of 2016 Technical Memorandum

Sites Reservoir Project

To:	Robert J. Kunde, P.E.
CC:	Jeff Herrin, AECOM
Date:	October 11, 2019
From:	John Spranza, HDR-Sites Integration
Reviewed by:	Jelica Arsenijevic, HDR-Sites Integration
Subject:	Mitigation Measure Evaluation and Cost Estimate Review of 2016 Technical Memorandum

1.0 Background

In October 2016, AECOM, on behalf of the Sites Project Authority (Authority), prepared a technical memorandum (TM) that presented the results of a mitigation measure evaluation and cost estimate that was developed as a planning-level tool for assessing costs associated with implementing select mitigation measures for the Sites Reservoir (AECOM 2016). The 2016 evaluation and cost estimate was based on the mitigation measures developed for North-of-the-Delta-Offstream Storage (NODOS) Mitigation Monitoring Plan (DWR and Reclamation 2013) and then applied to Alternative C, which are directly applicable in scale and magnitude to Alternative D that was included in the Joint Draft EIR/EIS. These estimates have also been included in the current cost planning and financing efforts that have been occurring for project.

A Value Planning effort has been undertaken by Sites Project members to revisit the current Project (Alternative D) and identify items and actions that could be included, excluded or undertaken to provide clarification on the following items:

A. ***Operational*** – as measured by the participants in the Reservoir Project committee based on the storage and delivery reports and progress on the Principles of Agreement with Reclamation and DWR
B. ***Permittable*** – as measured by the inclusion of the Sites Project in the California Water Resiliency Portfolio and by discussions with permitting agencies with CDFW and NMFS.
C. ***Affordable*** – as measured by the participants in the Reservoir Project committee based on the Affordability Analysis.
D. ***Feasible*** – as identified and addressed in the value planning activity and defined by the Authority Feasibility Criteria. This also includes the refinement of operational criteria and the further development of the Principles of an Agreement with Reclamation and DWR.

This memorandum (memo) summarizes HDR's Permitting Integration Team's initial review and applicability of the 2016 mitigation cost estimate, a mitigation planning analysis performed by ICF International (ICF 2019) and Alternatives developed during the Value Planning process to add to the evaluation process of A through D above.

2.0 Purpose

The purpose of this review is to evaluate the mitigation cost estimate included in the 2016 TM, refine the mitigation cost estimate if/where possible to (+/- $50M) and take into consideration the Alternatives being considered in the Value Panning process. To accomplish this and provide the appropriate context this memo includes: 1) a broad-level review of the line items included in the 2016 mitigation cost estimate; 2) mitigation acreage requirements, unit costs, total costs, and assumptions in the 2016 mitigation cost estimate to identify

and assess their applicability to the project's present mitigation needs and; 3) current market costs that were provided by ICF (2019).

It's important to note that this review is focused on large changes in mitigation liability based off of information that had already been prepared for the project. This evaluation is intended to provide the Sites Project Authority context in mitigation costing and a summary of the issues and concerns that result in the current wide-ranging estimates of mitigation costs during the Value Planning process. It is a gross relative estimation and is for comparison/discussion purposes during the Value Planning process only.

3.0 Alternatives Resulting from the Value Planning

The initial Value Planning meeting on October 2, 2019 identified both modifications to previously evaluated facilities and alternative facilities to reduce cost. To speed the analysis, nine alternatives were developed. They are listed below and in Table 1.

- ***Alternative 1*** – This alternative reduces the size of the reservoir to 1.5 MAF and uses a multi-span bridge to reduce costs. The other features are generally consistent with Alternative D.
- ***Alternative 2*** – This alternative is very similar to Alternative 1, but uses the southern road with the more direct route to Lodoga in place of the bridge.
- ***Alternative 3*** – This alternative eliminates the Sites Pumping/Generating Plant and replaces it with the Tehama-Colusa Regulating Reservoir (TCRR) and Pumping Plant near Road 69 in combination with an upgraded Terminal Regulating Reservoir (TRR) to fill Sites Reservoir. Water would be released to the Sacramento River through a canal/pipeline to the Delevan release structure. The canal portion would begin at the TRR and continue east to the Colusa Basin Drain (CBD). It would be necessary to siphon under the CBD and pump the water to the river. The two-span bridge is used in this alternative.
- ***Alternatives 4a and 4b*** – These alternatives include the single Sites Pumping/Generating Plant (PGP) with releases through the Delevan Canal/Pipeline. Alternative 4a uses an earthfill dam and Alternative 4b uses a hardfill dam in place of the zoned rockfill dam.
- ***Alternatives 5a and 5b*** – These alternatives replace the Delevan Canal/Pipeline with a southern release near the southern terminus of the T-C Canal. Alternative 5a releases water to the CBD. Water released to the CBD would be conveyed through the lower portion of the CBD to the Sacramento River. Alternative 5b conveys water by canal to the CBD, then uses a siphon and pumping plant to convey water on to the Sacramento River.
- ***Alternatives 6a and 6b*** – These alternatives combine the TCRR and upgraded TRR with the southern release structure and an earthfill dam. These alternatives appear to have the lowest construction cost.

Table 1. Initial Value Planning Alternatives for Consideration.

	Initial Alternatives								
Features	1	2	3	4a	4b	5a	5b	6a	6b
1.5 MAF Reservoir	•	•	•	•	•	•	•	•	
1.3 MAF Reservoir									•
Funks/Sites PGP	•	•		•	•	•	•		
TCCR and Upgraded TRR PGP			•					•	•
Delevan Canal/Pipeline Release	•	•	•	•	•				
Dunnigan Canal to CBD Release						•		•	
Dunnigan to River Release							•		•
Multi-Span Bridge	•		•	•	•	•	•	•	•
South Road to Lodoga		•							
South Road to Residents	•		•	•	•	•	•	•	•
Rockfill Embankment Dam	•	•	•			•	•		
Earthfill Dam				•				•	•
Hardfill Dam					•				

4.0 Review and Applicability of 2016 Cost Estimate to Alternative D and Value Planning Alternatives

This section provides a discussion of the estimated mitigation costs by resource category that resulted from the 2016 TM as well as a comparison of that estimate, and it's applicability to Alternative D. This then provides a basis for evaluating potential changes in mitigation costs of +/-$50M resulting from the Value Planning alternatives. As previously discussed, review is a gross relative estimation and is for comparison/discussion purposes during the Value Planning process only.

A detailed comparison of the 2016 cost estimate to the present-day project mitigation requirements cannot be performed with precision as the project's impact assessment and associated mitigation ratios/acres have yet to be finalized and determined by the state and federal regulatory agencies[1]. It is anticipated that this information will be obtained in 2020/21 during the permitting and agreement process. However, ICF (2019) did identify assumptions used for the 2016 AECOM TM and Cost Estimate (Table 2) that could result in changes in mitigation-related cost and should be re-evaluated as the project design and environmental documentation phases move forward. These changes are also applicable to any refinements resulting from the Value Planning process and could result in an increase or decrease to the overall $350M[2] – $500M[3] mitigation-related cost estimate. However, as discussed in the bullets below, ICF (2019) determined there are too many unknown variables to accurately estimate a percent change in total cost at the time their review was undertaken. Similarly, the HDR's Permitting Integration Team's current review and mitigation cost analysis continues to find that the addition of new facilities and removal/refinement of proposed facilities resulting from the Value Planning provides the same challenges to providing an accurate estimate of mitigation requirements.

Table 2. Initial 2016 Cost Estimation for Alternative C Mitigation

Habitat Type	Estimated Mitigation Costs
Construction-Related Mitigation[1]	
Vegetation Communities/Botanical Resources	$91,800,000.00
Wetlands/Surface Waters	$83,000,000.00
Aquatic Resources	$56,000,000.00
Wildlife Habitat	$53,000,000.00
Cultural/Historic/Paleontological Resources	$35,000,000.00
Land and Agriculture	$31,000,000.00
Air Quality	$200,000.00
Total Construction Mitigation	**$350,000,000.00**
Operational-Related Mitigation[2]	
Riverine-based species and habitats	$150,000,000.00
Total Estimated Mitigation	**$500,000,000.00**

Note: Total includes Mobilization and Contract Cost Allowances
[1]Source: Sites Reservoir Feasibility Study Technical Memorandum Mitigation Measure Evaluation and Cost Estimate, October 2016, AECOM
[2] Source: Estimate from WISP Application for Alternative D

- ***Project Alternative***: The 2016 TM was based on impacts for the Alternative C project features and presumed mitigation ratios required by the state and federal regulatory agencies in 2016. Alternative D is now the preferred project alternative. Although the two alternatives are similar, Alternative D includes components that were either not part of Alternative C or have been modified since the 2016 evaluation.

[1] California Endangered Species Act, federal Endangered Species Act and Clean Water Act
[2] $350M taken from the AECOM 2016 TM
[3] $500M taken from the updated estimate provided during the September 2019 Joint Workshop.

The addition of new facilities and removal/refinement of proposed facilities resulting from the Value Planning provides the same challenges.

- ***Impact Acreage***: The TM impact assessment for the proposed project, both Alternative D and any refinements resulting from the Value Planning continues to be under development and the total acreage of compensatory state and federal regulatory agency mitigation that will ultimately be required for the project is unknown. Therefore, a direct and accurate 1:1 comparison of mitigation measures related to impact/mitigation acreage to the current project alternative and Value Planning refinements cannot be developed at this time but a comparison that applies some general assumptions and analysis has been included below to provide the requested Value Planning update.
- ***Mitigation Ratios***: Mitigation ratios for Alternative D and any Value Planning refinements have yet to be determined by the regulatory agencies. Although some of the presumed mitigation ratios presented in the 2016 TM may ultimately be applied, some of the mitigation ratios in the "Estimate Worksheet" tables in Attachment 2 of the 2016 evaluation appear to be low and could be subject to change. For example, the mitigation ratio used for permanent impacts to the Blue Oak Woodland vegetation community is 1:1, current mitigation ratios required for onsite/offsite Blue Oak Woodland creation are higher that 1:1. Additionally, it is unknown at this time how mitigation ratios may be applied, or overlap, in terms of permanent/temporary impacts for vegetation communities and for special-status species mitigation. This information will be developed during the mitigation planning phase once a preferred project has been identified.
- ***Land Acquisition Costs***: Some of the mitigation measures assumed the purchase of land through fee-title or the establishment of conservation easement. The unit prices used in the 2016 evaluation for natural vegetation communities ranged from $2,500/acre for annual grassland to $3,000/acre for blue/valley oak woodland. The unit prices used in the 2016 evaluation for agricultural land cover types ranged from $2,000/acre for dryland grain and seed crops to $4,500/acre for deciduous orchards. It is likely that the land acquisition costs assumed in the 2016 evaluation have increased, or will have increased, by the time land is acquired for mitigation purposes. In some instances, higher-than-market prices may be realized because willing sellers could raise the asking prices based on the nature of the project and the conservation easement requirements that could be placed upon their lands.
- ***Mitigation Bank Credit Availability***: Based on the anticipated mitigation acreage required it is unlikely that there will be sufficient mitigation bank credits available for purchase on the open market to meet the need of Alternative D and/or any Value Planning refinements that may occur. It may be beneficial to develop a project specific bank(s) to address some of the mitigation requirements. Bank development costs were not assumed in the 2016 TM, although the mitigation bank unit prices per acre that were assumed may adequately cover bank development costs. Further investigation of mitigation banking feasibility and costs will occur during the mitigation planning phase once a preferred project has been identified.
- ***Vegetation Community Unit Costs***: The accuracy of the estimated costs based on present-day rates vary based on the type of habitat.
    - The unit cost for wetland habitats was based on mitigation bank credit prices and are comparable to present-day unit costs.
    - The unit cost for riparian restoration ($65,000) may be low because there are numerous variables that could factor in to restoring riparian habitat (e.g., grading costs, water costs).
    - Oak woodland mitigation is assumed to be covered by conservation easements of existing habitat. The current cost estimate does not include oak woodland creation which could be considerably higher than $3,000/acre.
- ***Onsite Mitigation and Associated Costs***: Costs assumptions for onsite mitigation were not included in the "Estimate Worksheet" tables in the 2016 evaluation and could not be reviewed. Onsite mitigation was assumed for impacts to streams and aquatic habitat and some terrestrial communities. Stream impacts are presented on an acreage basis as determined by stream length and width categories (e.g., streams 5-10 feet wide). Based on an assumed 2:1 mitigation ratio, a total of 455 acres of onsite stream restoration would be required. It is unknown if this mitigation could be restored/created onsite

and what level of planning and construction would be required to implement onsite restoration for streams, aquatic habitat and terrestrial communities.

- ***O&M Phase Mitigation Costs***: Table 3 in the 2016 TM summarizes the O&M mitigation phase costs. The total estimated annual cost was approximately $5.5 million. The estimate annual cost for some mitigation categories appears to be low and should be re-evaluated in more detail as project mitigation measures are developed and finalized (e.g., vegetation communities/botanical resources [$85,000]; wildlife habitat [$12,400]).
- ***Onsite Land Management***: Annual mitigation land management and monitoring costs for on-site restoration were assumed to be $400/acre. Onsite restoration monitoring was assumed to be required for 31 acres ($12,400/year). This cost appears to be low and should be re-evaluated in more detail as project mitigation measures are developed and finalized.
- ***Design Contingency***: Table 1 in the 2016 TM summarizes the cost estimate allowances and contingencies for mitigation costs and recommended that the design contingency be increased to 12% of project costs to account for design and scope changes and cost estimate refinements. This increase could cover costs of future opportunities and constraints analysis, mitigation site suitability assessments, and studies required to develop mitigation site plans (e.g., hydraulic studies, soil and rare plant surveys).
- ***Cultural Resources Costs***: The potential mitigation costs for each individual measure are estimates based on finding from surveys that still need to be conducted, conditions found during construction, and mitigation that will be developed during consultation so conducting a cost estimate at an individual measure level was not performed. However, the overall estimated cost of $27M should be sufficient for these variables.
- ***Air Quality Costs***: ICF (2019) confirmed that neither Colusa nor Glenn County currently have a voluntary offset program that will require annual mitigation fees to offset construction NOx emissions. The overall cost of $200,000 appears to be reasonable.

4.1 Potential Mitigation Cost Refinements for Value Planning

Construction-based Mitigation Costs

After assessing estimated relative changes in construction-based mitigation types and volumes among the Value Planning Alternatives no substantial changes (>$50M) in the costs of mitigation from those identified in the 2016 TM are readily apparent. The reason for this is twofold. First there is a general lack of readily available data on impacts by habitat/resource type for the Value Planning Alternatives which makes direct computational comparisons not possible. Second, when looked at as a package by each Alternative, construction-based impacts tend to have counterbalancing effects that nullify the overall increase/decrease of any specific effect.

An example of this is that Alternatives 1, 2, and 3 all have a change from a Delevan pipeline to a Delevan canal. While this may have substantial construction cost savings, the footprint of the two variations are approximately the same and although there would undoubtedly be a change in mitigation costs, that difference would be muted by the overall magnitude of the residual mitigation requirement. Table 3 provides an example of this for the changes estimated mitigation costs associated with impacts to vegetation communities. In this case, the largest difference between the all Alternatives is the size of the reservoir and the resulting effects to vegetation communities/botanical resources, which is the largest overall construction-related mitigation cost Table 3. The Alternative C and D reservoirs are 1.8 MAF and would impact 14,200 acres of annual grassland where Alternative 6b is 1.3 MAF impacting 12,500 acres of annual grassland. When those values are used in the calculation of potential annual grassland mitigation costs, it results in an approximate 9 percent reduction of annual grassland mitigation costs ($8.26M), which equates to an approximately 2.3 percent reduction in overall construction mitigation costs. Consequently, although a 1,700 acre reduction in grassland impacts is substantial, when working at such large scales it is a relatively small change in the overall project's estimated construction-related mitigation costs and the $350M estimate in Table 3 should be retained until additional analysis can be performed on a better-defined project description.

Operational-based Mitigation Costs

The removal of the Delevan diversion results in the elimination of a major operational component that would reduce the overall operational effects of the Value Planning Alternatives. It would eliminate the need for approximately $7.5M in aquatic studies (15 @$500k) as well as the cost of mitigating for the entrainment/impingement of fish at the diversion and mitigation costs associated with the diversion of up to 2,000 cfs from the River. Although the Alternatives would be taking less water overall, the place of diversion would be shifted upstream from a priority at Delevan, to Red Bluff and Hamilton City. As the River reach from below Keswick Dam to Hamilton City has a higher biological value to spawning and rearing salmonids, the reduction in overall pumping from three diversions to two does not directly relate to a net reduction in riverine effects and resulting mitigation costs due to the change in pumping locations and resulting effects on riverine resources. Review of existing modeling and analysis performed for the Joint draft EIR/EIS, Biological Assessment and CDFW 60-day negotiations, as well as discussions with the Jacobs modeling team has not resulted in the identification of any currently-available analysis that is reliable enough to identify and quantify the net change in potential operational-mitigation costs. Consequently, the $150M estimate in Table 3 should been retained until additional modeling can be performed.

Table 3. Mitigation Cost Comparison Example

Habitat Type	Estimated Mitigation Costs Alt C	Estimated Potential Change	Estimated Change in Costs
Construction-Related Mitigation[1]			
Vegetation Communities/Botanical Resources	$91,800,000.00	-9%	-$8,262,000.00
Wetlands/Surface Waters	$83,000,000.00		
Aquatic Resources	$56,000,000.00		
Wildlife Habitat	$53,000,000.00		
Cultural/Historic/Paleontological Resources	$35,000,000.00		
Land and Agriculture	$31,000,000.00		
Air Quality	$200,000.00		
Total Construction Mitigation	**$350,000,000.00**		
Operational-Related Mitigation[2]			
Riverine-based species and habitats	$150,000,000.00	unknown	unknown
Total Estimated Mitigation	**$500,000,000.00**	**-2.3%**	**-**$8,262,000.00

Note: Total includes Mobilization and Contract Cost Allowances
[1]Source: Sites Reservoir Feasibility Study Technical Memorandum Mitigation Measure Evaluation and Cost Estimate, October 2016, AECOM
[2] Source: Estimate from WISP Application for Alternative D

5.0 Findings

Review of existing analyses and mitigation cost estimates currently being used did not result in any significant changes in estimated mitigation costs (>$50M) when applied to the Value Planning Alternatives. While there will certainly be changes in cost among and between mitigation categories in Table 3 when a final project description is selected, until additional analysis can be performed on a specific project description the $500M estimate in Tables 2 and Table 3 should be retained.

6.0 Sources

AECOM. 2016. Sites Reservoir Feasibility Study Technical Memorandum Mitigation Measure Evaluation and Cost Estimate, October.

DWR and Reclamation 2013. Mitigation Monitoring Plan Costs for North-of-the-Delta Off stream Storage. Prepared for the California Department of Water Resource and United States Department of Interior, Bureau of Reclamation. Sacramento, CA. November.

ICF International. 2019. Mitigation Measure Evaluation and Cost Estimate Review of 2016 AECOM Technical Memorandum. May.

Appendix D – Repayment

Appendix D Financial Analysis in Support of March 2020 Value Planning

To:	Value Planning Work Group
CC:	JP Robinette
Date:	April 10, 2020
From:	Brian Grubbs
Quality Review by:	Doug Montague
Authority Agent Review by:	Lee Frederiksen
Subject:	Financial Analysis in Support of March 2020 Value Planning

1.0 Purpose and Background

This memorandum documents the financial evaluation of the delivered cost of water given variations in project facility configuration and operational flows in support of the Value Planning Analysis. Montague DeRose and Associates (MDA) provided the following analysis in support of the overall project affordability analysis for the Sites Project Authority (SPA).

- Review of public agencies similar to SPA to determine the potential credit rating for revenue bonds
- Review of historical tax-exempt revenue bond interest rates to determine a projected cost of borrowing for SPA
- Review of Bureau of Labor Statistics indices to determine appropriate escalation factors for construction and labor costs
- Development of an enterprise financial model (FM) to support projected revenues, expenses and appropriate cash balances during the design and construction and through project operations.

2.0 Analysis

2.1 Description of Scenarios

Scenarios analyzed consisted of various combinations of construction costs, hydrological conditions and financing options. AECOM and Jacobs coordinated to provide costs for 13 different facility cost scenarios based on reservoir size and amount of water available for release at FOB Holthouse. The financial model did not add additional costs for transportation of water past that point. These scenarios were entered in the financial model and run through potential financing options including with and without a Water Infrastructure Finance and Innovation Act (WIFIA) Loan of $1.1 billion. There was no funding from the US Bureau of Reclamation (USBR) assumed in these scenarios. The below table provides a summary of these scenarios with relevant details for financial modeling. Additional details of specific items to be constructed are provided in the engineering technical memorandum.

Scenario Name	Reservoir Size	Water Release at Holt House	Average Cost from AECOM Range
	(MAF)	(TAF)	(2019$ billion)

VP1	1.0	191	3.160
	1.3	230	3.386
	1.5	236	3.600
VP2	1.0	191	2.684
	1.3	230	2.910
	1.5	236	3.098
VP3	1.0	not analyzed	
	1.3	243	3.388
	1.5	253	3.602
VP4	1.0	not analyzed	
	1.3	234	2.927
	1.5	243	3.115
VP5	1.3	234	2.855
VP6	1.3	234	2.988
VP7	1.5	243	3.037

2.2 Methodology

MDA developed an enterprise financial model (FM) based on monthly cash flows of the expected revenue and expense streams. The difference between revenue and expense streams determines that amount of funding needed from external borrowing (revenue bonds) and the monthly cash flow modeling provides the timing of when those funds are needed. While many of the revenues are technically grants or loans, this document will refer to all sources of funds as revenues.

Funding Priority: The FM sets up two primary funds to transfer money for construction. The first is the Construction Fund. Inflows are (in order of priority based on lowest cost): WSIP funds, WIIN Act Funds (if available), Cash from Participants, Interim Loan Draws, WIFIA Loan Draws and finally revenue bond draws. Transfers from the Construction Fund will fund the Interim Loan Payoff at the end of Phase 2 and Construction Expenses. The model is programmed to maintain a minimum Construction Fund balance each month to reflect prudent cash flow management practices. When expenses would result in the monthly ending balance dropping below the minimum balance, draws are initiated from the available sources in priority order. Each year in June from 2023 to 2029, revenue bonds are issued to provide enough funds to cover expenses and not allow the Construction fund to fall below the minimum balance before the next revenue bond issue is sold.

The other fund utilized during project construction is the Revenue Bond Fund. Starting in June 2023, a revenue bond is issued to refinance the Phase 2 interim loan balance and provide funds (along with the other sources of revenue) to pay for construction expenses until the next revenue bonds are issued. The initial revenue bond sale in 2023 provides the initial deposit to the Revenue Bond Fund and each month a draw is made to transfer funds from the Revenue Bond Fund to the Construction Fund. Funds remaining in the Revenue Bond Fund earn interest at a short-term rate. Additionally, with each revenue bond offering, a portion of the proceeds will be deposited in a Revenue Bond Fund subaccount called the Debt Service Reserve Fund (DSRF) where it will be held for the benefit of revenue bondholders if there is ever a shortfall in debt service payments on revenue bonds. The DSRF balance earns interest at a long-term rate. These interest earnings add to the Revenue Bond Fund balance and are used pay construction costs. For the VP7 scenario (with WIFIA loan), the interest earned from 2023-2030 on the Revenue Bond Fund balance is projected to be $31 million. The interest earned on the DSRF from 2023-2030 is $5 million. Following the end of construction, interest earned in the DSRF is used to reduce the annual revenue bond debt service cost.

Construction Cost Expense: AECOM provided monthly pre-construction and quarterly construction cash flows for a 1.8 MAF reservoir in June 2018 in 2015$. These estimated cash flows were for January 2019 through June 2030. With guidance from AECOM, the Value Planning scenarios have a reduced construction schedule due to no longer constructing the Delevan Pipeline. Instead of starting construction in July 2022, it now begins

in July 2023. Construction is still completed in June 2030. This is seven years of construction as compared to the prior analysis having eight years of construction. AECOM provided scenarios of construction costs in 2019$, however these were not provided as monthly or quarterly cash flow, but instead for total costs for construction. As the total construction costs varied by scenario, the prior AECOM 2015$ monthly and quarterly cash flows were scaled with the Excel Goal Seek function to output the desired total cost in 2019$. Once 2019$ construction costs had been calculated, escalation factors were applied for inflation to determine total pre-construction and construction costs in nominal$. Pre-construction and construction nominal costs were further escalated by a 4.2% risk mitigation factor provided by AECOM to account for project delays or cost overruns. A sub-category in the construction costs of environmental mitigation costs was escalated for inflation, however it was not escalated by the risk mitigation factor, under guidance from AECOM.

The table below shows the cost schedule for the VP7 scenario (with WIFIA) in 2019$, the cost escalation factor used for escalating construction costs (pre-construction costs are escalated by a different percentage), and the total costs for the reservoir in nominal$. Additional detail on cost escalation is provided in the Assumptions section.

	Costs Schedule ($millions, 2019$)						**Percent Cost Escalation for Construction**		**Costs Schedule ($millions, nominal$)**				
	Pre Const	**Cons**	**Enviro**	**Risk Adder**	**Total**				**Pre Const**	**Cons**	**Enviro**	**Risk Adder**	**Total**
2021	75	-	-	3	78		4.1%		77	-	-	3	80
2022	84	-	-	4	88		6.2%		88	-	-	4	92
2023	64	182	13	10	270		8.3%		68	198	14	11	291
2024	-	431	22	18	471		10.5%		-	476	24	20	520
2025	-	439	10	18	467		12.7%		-	494	11	21	526
2026	-	367	10	15	393		15.0%		-	423	11	18	452
2027	-	367	10	15	393		17.3%		-	431	12	18	461
2028	-	367	10	15	393		19.7%		-	440	12	18	470
2029	-	367	10	15	393		22.1%		-	449	12	19	480
2030	-	184	5	8	196		24.6%		-	229	6	10	245
Total	**223**	**2,705**	**89**	**123**	**3,140**				**233**	**3,139**	**102**	**142**	**3,616**

Water Storage Investment Program (WSIP) Revenues: WSIP revenues are projected to total $816 million. WSIP revenues do not escalate for inflation or vary based on the size of the reservoir. The FM draws WSIP revenues to cover the construction expenses allocated to the State. Based on input provided by Larsen Wurzel & Associates, Inc., each March, 75% of the current year's costs allocated to the State are drawn and transferred to the Construction Fund. Also in March, an additional 20% of the prior year's costs are drawn and transferred to the Construction Fund. The final 5% of State allocated costs are drawn upon when significant construction points are completed which was estimated to occur every three years during construction. This formulation results in WSIP revenues being provided each year through 2030. The highest WSIP revenue year is 2026 when $139 million is provided.

Water Infrastructure Improvements for the Nation (WIIN Act) Revenues: In the Value Planning analysis no WIIN Act revenues are assumed.

US Department of Agriculture (USDA) Loan: In November 2018, the U.S. Department of Agriculture approved a $439 million USDA Community Facilities Direct Loan for the permanent financing of the Maxwell Intertie. The FM transfers the full USDA loan proceeds to the Revenue Bond Fund in December 2024 and treats the transfer as it would a transfer of the proceeds of a revenue bond sale. The USDA loan debt service is based on 40-year principal amortization starting in December 2025 and with last payment in December 2064. Per the USDA Letter of Conditions, a $10 million Depreciation Fund will be funded that "may be used only for emergency maintenance and for replacement of short-lived assets which have a useful life significantly

less than the repayment period of the loan." Additionally, a debt service reserve fund will also be funded to equal 10% of the annual loan debt service.

Interim Loan: To provide funds during the balance of Phase 2 an interim loan is modeled as a bank line of credit. Interest is due each month based on the outstanding balance of the bank line. Any un-utilized amount of the bank line is also charged a lower un-utilized bank fee. The first revenue bonds issued will refinance the principal balance of the interim loan.

Water Infrastructure Finance and Innovation Act (WIFIA) Loan: While the SPA has not yet applied for a WIFIA loan, a scenario run using the FM was the inclusion of a $1.1 billion loan. The main benefit of a WIFIA loan is the potential for a lower interest rate than revenue bond financing. Upon loan closing, the WIFIA loan rate will be set based on the yield of the US Treasury Bond that most closely matches the projected average life of the WIFIA loan plus 1 basis point (.01%). Once the loan is approved, the WIFIA loan performs like a line-of-credit that can be drawn upon over time. The FM assumes the first draw from the WIFIA line of credit occurs in June 2023 and because it is expected to have a lower borrowing cost than revenue bonds, it eliminates the need for any revenue bond financing for the next several years. Interest is due each month on the total amount drawn to date, with the amortization of the full amount beginning within five years of substantial project completion. The WIFIA loan must be fully repaid within 35 years of substantial project completion. The FM assumes the amortization will begin in 2030 with final payments made in 2064.

Revenue Bonds: To meet the construction draw schedule, revenue bonds are generally assumed to be issued each year in June from 2023 through 2029. The first issue in June 2023 is the largest as if must refinance the interim loan that paid for pre-construction costs as well as fund construction costs for the next year. For the VP7 scenario without a WIFIA loan this first revenue bond issue is $401 million. Follow-on issuances are less than $400 million each. The bonds are issued as 40-year bonds with interest-only payments until the project is complete. The first bonds issued in June 2023 have eight years of interest-only payments and 32 years of principal and interest payments. The last bond issuance in June 2029 has two years of interest-only payments and 38 years of principal and interest payments. All revenue bond principal payments begin in 2032 which is the "worst-case" year to begin water deliveries, assuming the reservoir takes two years to fill.

The funding schedule for VP7 scenario with and without a WIFIA loan is:

Funding Schedule ($millions, nominal$)					
	WSIP	**WIINACT**	**Revenue Bonds**	**USDA**	**WIFIA**
2020	8	-	-	-	-
2021	18	-	-	-	-
2022	10	-	-	-	-
2023	37	-	561	-	-
2024	97	-	-	439	-
2025	112	-	331	-	-
2026	139	-	327	-	-
2027	98	-	361	-	-
2028	100	-	350	-	-
2029	119	-	379	-	-
2030	79	-	-	-	-
Total	**816**	**-**	**2,309**	**439**	**-**

WIFIA - Funding Schedule ($millions, nominal$)					
	WSIP	**WIINACT**	**Revenue Bonds**	**USDA**	**WIFIA**
2020	8	-	-	-	-
2021	18	-	-	-	-
2022	10	-	-	-	-
2023	37	-	-	-	382
2024	97	-	-	439	423
2025	112	-	-	-	295
2026	139	-	118	-	-
2027	98	-	362	-	-
2028	100	-	352	-	-
2029	119	-	381	-	-
2030	79	-	-	-	-
Total	**816**	**-**	**1,213**	**439**	**1,100**

Following the construction of the project there will be ongoing operational revenues and expenses.

Operation, Maintenance and Repair Expenses: AECOM provided annual estimates of expenses for various categories of OM&R.

Fixed Expenses: These costs were split into Operation and Maintenance, and Administrative and General categories based on files from AECOM provided in June 2018. Updated expenses were provided for the

Value Planning in 2016$. These expenses were fixed and did not vary by the size of the reservoir. These costs, on a per AF basis, are higher for the smaller sized reservoirs. This is due to the fact that there is less water being released across which to spread the costs. The costs in 2016$ are escalated each year by the inflation rate as found in the assumptions section.

Variable Expense: These costs were split into sub-categories of Fill Wheeling Cost and Pumping Costs based on files provided by AECOM in June 2018. Updated expenses were provided in 2016$. These costs are impacted by the reservoir size as they are dependent on the amount of water passing through the reservoir. These costs were annualized and tied to the amount of water being filled for each reservoir size. The 2016$ costs were escalated each year by the inflation rate found in the assumptions section. Since each annualized cost is based on a projected level of water flows, when the water flows are adjusted by various operational scenarios the expense is scaled proportionally.

Electrical Generation Revenue: AECOM provided electrical generation revenue estimates in June 2018 and updated them in 2016$. These revenues are impacted by the reservoir size as they are a function of the amount of water being released. These revenues were annualized and tied to the amount of water being released for each reservoir size. The 2016$ revenues were escalated each year by the inflation rate found in the assumptions section. Since each annualized revenue is based on the projected level of water releases when the water releases are adjusted by various operational scenarios the revenue is scaled proportionally. Following AECOM scenarios, there are no pump-back operations in the Value Planning scenarios.

2.3 Assumptions

Item	Value	Notes
Interim Loan		
Interest Rate	3.00%	
Unutilized Rate	0.75%	
Revenue Bonds		
Interest Rate	5.00%	1
DSRF% of Maximum Annual Debt Service	50%	
DSRF Earnings Rate	4.00%	
Bond Fund Interest Earnings Rate	2.00%	
First Maturity	12/1/2032	
Final Maturity	6/1/2066	
USDA Loan		
Interest Rate	3.875%	
WIFIA Loan		
Interest Rate	3.500%	2
Construction Risk Mitigation Percentage	4.20%	3
Inflation Escalators		
Pre-Construction Escalation/year	1.50%	4
Construction Escalation/year	2.02%	5
Labor Inflation Rate/year	2.00%	6
Non-Labor inflation rate/year	2.00%	7
Electrical Generation Price Escalation/year	2.00%	8
Months for Generation post COD	24	

Note 1: Based on the 20-year average (Jul 1999-Jun 2019) of the Municipal Market Data Index of 30-year "AAA" rated municipal revenue bond issues. 40 basis points has been added to the interest rate to reflect the higher borrowing cost for an "A" rated water utility. The resultant average interest rate was 4.87%. The FM uses 5%.

Note 2: Based on the 10-year average of the 30-year Treasury Bond (Aug 2009-Jul 2019) and adding one basis point. This equaled 3.27%. The FM uses 3.50%.

Note 3: As provided by AECOM.

Note 4: Based on average of BLS Series PCU5416-5416, the PPI for management and technical consulting = 0.98% over last 10 years and BLS Series PCU5413-5413, the PPI for architectural and engineering services = 1.32% over last 10 years.

Note 5: Based on discussions with AECOM, based on the type of construction involved which is mainly the movement of dirt as opposed to construction of office buildings or hotels which would be a much higher rate. This amount is equal to 15% over seven years and is supported by the Army Corps of Engineers and the Bureau of Reclamation.

Note 6: Based on BLS Series CWUR0400SA0, the CPI for all West urban wage earners = 1.45 over last 10 years.

Note 7: Based on BLS Series CUUR0400SA0, the CPI for all West urban consumers = 1.53 over last 10 years.

Note 8: June-2018 NYMEX ticker for California ISO NP 15 peak and off-peak power was 3.6% per year over the next 54 months. MDA believes this is too high for conservative estimation of future revenues. MDA believes 2% per year escalation is more prudent.

2.4 Results

Additional details for these scenarios are provided in the attached file: “Sites Value Planning-FM-VP Alternatives - 04-10-2020.xlsx”

Scenario			VP1			VP2			VP3			VP4			VP5	VP6	VP7
Reservoir Size		(MAF)	1.0	1.3	1.5	1.0	1.3	1.5	1.0	1.3	1.5	1.0	1.3	1.5	1.3	1.3	1.5
Project Cost	(2019$)	($millions)	3,160	3,386	3,600	2,684	2,910	3,098		3,388	3,602		2,927	3,115	2,855	2,988	3,037
Project Cost	($nominal)	($millions)	3,784	4,055	4,311	3,214	3,485	3,710		4,057	4,313		3,505	3,730	3,419	3,578	3,637
Capital Funds																	
PWA (revenue bonds)	($nominal)	($millions)	2,529	2,800	3,056	1,959	2,230	2,455		2,802	3,058		2,250	2,475	2,164	2,323	2,382
PWA (USDA loan)	($nominal)	($millions)	439	439	439	439	439	439		439	439		439	439	439	439	439
Total PWA	($nominal)	($millions)	2,968	3,239	3,495	2,398	2,669	2,894		3,241	3,497		2,689	2,914	2,603	2,762	2,821
State (WSIP)	($nominal)	($millions)	816	816	816	816	816	816		816	816		816	816	816	816	816
Federal (WIIN Act)	($nominal)	($millions)	-	-	-	-	-	-		-	-		-	-	-	-	-
Capital Funds Percentage																	
PWA		(%)	78%	80%	81%	75%	77%	78%		80%	81%		77%	78%	76%	77%	78%
State		(%)	22%	20%	19%	25%	23%	22%		20%	19%		23%	22%	24%	23%	22%
Federal		(%)	0%	0%	0%	0%	0%	0%		0%	0%		0%	0%	0%	0%	0%
Annualized AF/year Releases																	
PWA NOD		(TAF)	44	53	55	42	52	54		56	59		53	55	52	53	55
PWA SOD		(TAF)	117	143	148	113	139	144		151	159		141	149	141	142	148
PWA		(TAF)	**161**	**196**	**203**	**155**	**191**	**198**		**207**	**218**		**194**	**204**	**193**	**195**	**203**
State		(TAF)	30	34	33	36	39	38		36	35		40	39	41	39	40
Federal		(TAF)	-	-	-	-	-	-		-	-		-	-	-	-	-
Total		(TAF)	191	230	236	191	230	236		243	253		234	243	234	234	243
PWA Annual Costs During Repayment																	
Debt Service (w/o WIFIA)	(2020$)	($millions)	124	135	146	99	111	121		136	147		112	121	108	115	117
Operating Costs	(2020$)	($millions)	16	19	19	16	18	19		19	20		18	19	18	19	19
Operating Revenue	(2020$)	($millions)	(1)	(2)	(2)	(1)	(2)	(2)		(2)	(2)		(2)	(2)	(2)	(2)	(2)
Total	(2020$)	($millions)	139	152	164	114	127	137		153	164		128	138	124	131	134
	(2020$)	**($/AF)**	**862**	**776**	**805**	**730**	**667**	**693**		**738**	**754**		**660**	**678**	**644**	**674**	**661**
With WIFIA Loan of $1.1 Billion (Operating Cost and Operating Revenue do not change)																	
Debt Service (w/WIFIA)	(2020$)	($millions)	114	125	136	89	101	110		125	136		102	111	98	105	107
Total	(2020$)	($millions)	129	142	153	103	117	127		143	154		118	128	114	121	124
	(2020$)	**($/AF)**	**799**	**724**	**755**	**665**	**614**	**642**		**689**	**708**		**608**	**628**	**592**	**622**	**611**
Cost Difference Due to WIFIA loan			(63)	(52)	(50)	(65)	(53)	(51)		(49)	(46)		(52)	(50)	(52)	(52)	(50)

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3.0 Limitations and Risks

All scenarios were prepared using a projected revenue bond interest rate of 5.00% and scenarios with WIFIA loans were based on a 3.50% loan rate. These interest rates are dependent on interest rate levels at the time of the initiation of each revenue bond series and the closing of the WIFIA loan, respectively. While current interest rates are lower than these projected rates, MDA used long-term historical averages to determine the most prudent interest rate for this analysis and then used a discount rate when necessary to provide costs in current dollars as desired by SPA.

The value of the results from this modeling is dependent on the quality and reasonableness of the inputs provided by the other members of the Sites project team. The FM is built as a cash flow model that incorporates the time value of money through interest rates and inflation escalators. If construction is delayed, pushing costs farther into the future, this will escalate those costs. Additionally, if State and Federal funds are not made available at the times and in the amounts projected in our modeling, the costs the Federal and/or State monies would have funded will need to be funded with additional revenue bonds or interim loans. This will increase costs. Likewise, if the construction schedule proves to be conservative and actual construction occurs ahead of schedule, this would have the potential to lower both construction costs and debt costs.

4.0 Conclusions and Recommendations

As with any long-term construction project steps can be taken to lower the final construction and borrowing cost. These include:

1. Reduction in the cost of construction.
2. Pursuit of the additional funding grants from State and Federal programs.
3. Pursuit of low interest loans such as WIFIA and similar programs such as the Reclamation Infrastructure Finance and Innovation Act (RIFIA). The analysis used a $1.1 billion WIFIA loan, however the WIFIA program may be able to provide more funds, if pursued.
4. Working to have grants and lower cost financing made available earlier in the construction period to reduce interim financing costs before permanent financing begins.
5. Increasing the strength of the Participant credit pool by either adding new rated participants to the project or increasing the percentage participation of existing rated Participants, allowing lower cost financing to be obtained in the credit markets.

Additionally, MDA recommends a review of the value of the future water Sites Reservoir will make available. Any financial decision is most easily understood when it can be brought down to the basics of revenue and expenses over time. The certainty of 30 years of un-escalating level debt service payments provides an opportunity for substantial value if the potential revenue stream is not level but increases each year with inflation. The analysis provided here has focused solely on the expenses in building the Sites Reservoir. If clarity can be obtained on the potential revenue stream (or avoided expenses) that the AF of released water represents then clarity can be obtained on the best financial course for participants to take.

Topic: **Authority Board Agenda Item 2.1d** **2020 April 22**

Subject: **Prepare a Revised Draft EIR based on Value Planning Report Results**

Requested Action:

Consider direction for staff to revise and recirculate a Draft Environmental Impact Report (EIR) to analyze the environmental effects of the options identified in the Final Sites Project Value Planning Alternatives Appraisal Report dated April 13, 2020 (Report), including VP7.

Detailed Description/Background:

In August 2017, the Authority and the Bureau of Reclamation (Reclamation) jointly issued a Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Project pursuant to their respective lead agency obligations under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA)[1]. The public comment period on the Draft EIR/EIS was subsequently extended and then closed on January 15, 2018. A total of 141 comments letters were received on the Draft EIR/EIS along with comments received at two public hearings held during the public review period. From approximately March 2019 thru the end of September 2019, staff were developing responses to the comments received on the Draft EIR/EIS. On October 1, 2019, this work was put on hold in order to focus on the Value Planning Effort by the Ad Hoc Value Planning Workgroup.

The Ad Hoc Value Planning Workgroup completed their effort and has provided the Sites Project Value Planning Alternatives Appraisal Report (Report) for your consideration in Agenda Item 2.1a today. The Report identifies additional project alternatives through a screening process that considered total project cost, impacts on landowners, impacts on traffic and public safety, ability to meet participant demands, ability to provide public benefits to the State, relative magnitude of environmental impacts, and the estimated cost per acre-foot of water delivered.

Staff recommends that the Draft EIR be revised to analyze the environmental effects of the new alternatives in the Report, including VP7, and recirculated for public review. The alternatives considered in the Report generally have smaller footprints and reduced diversions into Sites Reservoir, thus resulting in fewer adverse environmental impacts than the alternatives evaluated in the 2017 Draft EIR/EIS. VP7 consists of a 1.5 million acre-foot reservoir, 1,000 cubic feet per

[1] Release of the draft EIR/EIS for public comment coincided with release of Reclamation's draft Feasibility Report and the Authority's submission of its Proposition 1 (WSIP) application to the California Water Commission.

second release capacity to the Colusa Basin Drain, a bridge to provide access to the west of the reservoir, an unpaved road to maintain access to residents along the southern portion of the reservoir, and would utilize the existing Tehama-Colusa Canal and Glenn-Colusa Canal facilities for diversions into Sites Reservoir.

For full and open disclosure, to provide the opportunity for the public to comment on the new alternatives, and to promote informed decision-making by the Authority and other governmental agencies with approval authority over the Project, Staff will begin development of the revised draft EIR and will return to the Board to (1) identify a preferred alternative once a more complete description of the range of alternatives has been developed; and (2) review and approve release of the recirculated Draft EIR. Direction is needed from the Committee and the Authority Board on how best to move forward with CEQA compliance in consideration of the additional alternatives identified in the Report.

Reclamation will need to make a separate decision on how to proceed with the EIS under NEPA, including possible continuation of the joint EIR/EIS approach followed previously for this Project. Staff will work cooperatively with Reclamation on a joint path forward.

Prior Action:

February 26, 2020: Approved a recommendation to re-start efforts on the EIR for the Sites Reservoir Project and assess the most appropriate approach for completing the EIR pursuant to CEQA.

July 20, 2017: Approved a recommendation to forward the Draft EIR/EIS to the Authority Board for its consideration to formally receive and adopt the document for inclusion in the Authority's Water Storage Investment Project application.

July 31, 2017: Approved the release of the Draft EIR for public and agency review, in connection with the Authority's application to the California Water Commission by August 14, 2017. The document was published as joint Draft EIR/EIS by the Authority under CEQA and Reclamation under NEPA.

December 19, 2016: Approved release of a revised Notice of Preparation to transfer CEQA lead agency status from the Department of Water Resources to the Sites Project Authority. Public scoping meetings were conducted on February 14 and 15, 2017.

Fiscal Impact/Funding Source:

Costs to begin this effort were included in the Phase 1B Work Plan which was approved by the Sites Project Authority at its January 22, 2020 Board meeting.

Costs to complete the recirculated Draft EIR/EIS and begin preparation of the Final EIR/EIS are considered in the Amendment 2 Work Plan.

Costs to complete the Final EIR/EIS will be considered in a future Work Plan.

Staff Contact:

Ali Forsythe

Attachments:

None.

Topic: **Authority Board Agenda Item 3.1** **2020 August 26**

Subject: **Key Comments from Conservation Organizations and Plan for Addressing Those Moving Forward**

Requested Action:

Review and comment on the approach being taken to address comments from conservation organizations on the 2017 Draft Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) in the development of the Revised EIR/Supplemental EIS.

Detailed Description/Background:

Staff has begun work on preparation of the Revised EIR/Supplemental EIS. As part of this effort, staff has reviewed comments on the 2017 Draft EIR/EIS from conservation organizations and has formulated draft approaches to addressing these comments in the Revised EIR/Supplemental EIS. Key comments from conservation organizations on the 2017 Draft EIR/EIS and staff's proposed approach to addressing them are provided in the attached document.

The organization assessment (OA) findings identified the need to review key comments on the 2017 Draft EIR/EIS with the Reservoir Committee and Authority Board which this report accomplishes.

Also, by posting these materials on the website they can be referenced should there be any questions or concerns raised by conservation groups or media about the intentions of the Project to review and address these comments.

Prior Action:

April 2020: Directed staff to begin preparation of a Revised EIR to analyze the environmental effects of the options identified in the April 2020 Value Planning Report.

Fiscal Impact/Funding Source:

Sufficient funding exists in the revised work plan to address these comments in the Revised EIR/Supplemental EIS.

Staff Contact:

Ali Forsythe

Attachments:

Attachment A: Key Comments from Conservation Organizations and Approach for Addressing in the Revised EIR/Supplemental EIS

**Key Comments from Conservation Organizations and
Approach for Addressing in the Revised EIR/Supplemental EIS
August 13, 2020**

In August 2017, the Sites Project Authority (Authority) and the Bureau of Reclamation (Reclamation) jointly issued a Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Sites Reservoir Project (Project) pursuant to their respective lead agency obligations under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The public comment period on the Draft EIR/EIS was subsequently extended and then closed on January 15, 2018. A total of 137 comments letters and emails were received on the Draft EIR/EIS along with comments received at two public hearings held during the public review period. Of these 137 comment letters, 11 were from conservation organizations (generally defined as non-governmental organizations that work to conserve species and their habitats). Comments and/or issued raised in these letters include:

- Project description and range of alternatives
- Modeling approach, modeling baseline, and modeling analysis
- Operational impacts to fisheries
- Impacts to Trinity River resources
- Indian Trust Assets (ITAs) and impacts to Tribal Cultural Resources
- Impacts to terrestrial species
- Water quality
- Water rights
- Geotechnical and geological data and seismicity
- Additional cumulative impacts

Additional comments were received after the close of the public review period from conservation organizations that generally raised similar issues and concerns to those received during the public comment period.

All letters with comments on the Draft EIR/EIS, including those received after the public comment period ended, have been reviewed. Staff and the consultant teams are working to address the key comments and concerns in these letters in the preparation of the Revised EIR/Supplemental EIS. Table 1 provides a summary of the comments and concerns expressed from conservation organizations on the 2017 Draft EIR/EIS (during the comment period and in subsequent correspondence) along with a summary of the approach to addressing the comment / concern in the preparation of the Revised EIR/Supplemental EIS. A listing of the conservation organizations that commented on the 2017 Draft EIR/EIS either during the comment period or in subsequent correspondence is provided following the table.

Table 1 - Comments and Concerns Expressed by Conservation Organizations on the 2017 Draft EIR/EIS and Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS

Comments and Concerns Expressed	Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS
Project Description and Range of Alternatives	
Inadequate project description: • Lacks detail regarding operations including who will operate • Operating rules too vague • Needs to describe prioritization of releases - needs to include an operations plan and diversion schedule • Inadequate statement of objectives • EIR/EIS should be prepared a part of a FERC license application • No discussion as to how water transfers would be facilitated • Increased Sacramento River flows and increased outflows from the Delta are necessary to support native fish and wildlife; EIR/EIS fails to provide a consistent operational plan • Recreational opportunities will be practically nonexistent due to shallow lake levels	• Revise project description to address changes to the Project and clarify operation of the reservoir, including Authority's role in coordination with Reclamation and DWR. • Update the CEQA project objectives to better reflect the Authority's objectives and the range of alternatives that will ultimately be analyzed. • Work with Reclamation to update the NEPA purpose and need, as appropriate. • Revise project description to reflect that hydropower would be limited to incidental power upon release for Alternatives 1 and 2 and therefore no hydropower licensing from the Federal Energy Regulatory Commission would be required. • Identify development of a Recreation Management Plan that would include a detailed discussion of the methods to be used to prioritize the potential recreation areas to be constructed and operated.

Table 1 - Comments and Concerns Expressed by Conservation Organizations on the 2017 Draft EIR/EIS and Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS

Comments and Concerns Expressed	Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS
Scope of alternatives is too narrow: • Need for alternative that includes WaterFix • Consider more restrictive bypass requirements • Consider smaller reservoirs • Include alternatives that reduce water diversions from the Sacramento River • Analyze more than one operational alternative • Consider other storage alternatives	• Simplify the description of the range of alternatives and alternatives screening process and create a new chapter (or appendix) discussing the alternatives screening process and the range of alternatives analyzed. The information in the Value Planning Report will be used for this effort and the Value Planning Report itself may be attached as an appendix. • Include a discussion of different operational scenarios considered and how/why different operational scenarios were screened out from further consideration. • Describes changes made to the operational scenario since the 2017 Draft EIR/EIS, including changes to operations resulting from the elimination of the Delevan Intake. • Integrate the criteria used in the Value Planning Report into a new chapter (or appendix) to tell the story of how the alternatives were further screened and refined after the 2017 Draft EIR/EIS. • Keep Appendix 2A, Alternatives Analysis of the 2017 Draft EIR/EIS as support for the information ultimately to be included in the document.
No Action Alternative and existing conditions are inappropriately defined: • The assumption that the existing conditions and No Action alternatives are the same compromises the ability to compare impacts across alternatives and may minimize the magnitude of some of the impacts • Use of Existing Conditions/No Project/Action baseline biases the analysis and avoids CEQA mitigation requirements • Does not evaluate how No Project Alternative could satisfy consumptive and instream water supply needs	• Incorporate information on the purpose for, and establishment of baseline under CEQA and NEPA along with the purpose for, and establishment of the No Project/No Action Alternative. • Clarify how Existing Conditions/No Project/No Action baseline is consistent with CEQA. • The baseline (existing conditions for CEQA and No Action Alternative for NEPA) will be revised based on updated modeling assumptions. • The Future No Project/No Action will be updated to reflect recent projects / actions (e.g., ROC on LTO and SWP ITP).

Table 1 - Comments and Concerns Expressed by Conservation Organizations on the 2017 Draft EIR/EIS and Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS

Comments and Concerns Expressed	Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS
Modeling Approach, Modeling Baseline and Modeling Analysis	
Inaccurate modeling baseline: • Use of old information in the modeling; outdated and insufficient model • Monthly modeling insufficient for addressing fisheries needs • Fails to include several permit conditions imposed prior to the NOP which will be implemented prior to 2030 (primarily the Revised Shasta RPA and Yolo Bypass restoration including the proposed Fremont Weir notch) • Entire project based on the false premise that there is excess water in the Sacramento River not needed for the environment • Flawed because it is assumed full contract deliveries which have never occurred (never more than 75% of contract amounts) • Averaging of model results masks real impacts • Fall X2 per 2008 Delta Smelt BO not appropriately addressed • Need to include climate change assumptions in baseline • Review of appendices indicates alarming flow impacts to the Sacramento River and Sutter Bypass, particularly in drought years • Must demonstrate that future instream flow requirements will not render Sites Reservoir a "stranded asset" • Analysis based on false premise that current flow and water quality standards for the river are adequate	• The baseline in the hydrologic model is being updated. However, some actions suggested by commenters are not included in the CALSIM modeling framework and thus, will not be updated (such as the 1959 contract between the United States and Humboldt County, monthly timestep in CALSIM, and other components that are part of the CALSIM model platform). The document will include an explanation of these components and why they were not modified. • Reservoir operations will be modified and system operations will be updated as compared to what was described in the 2017 Draft EIR/EIS to reflect new baseline conditions such as the ROC on LTO and SWP ITP. • Detailed modeling results will continue to be provided in appendices and summarized in the main document.

Table 1 - Comments and Concerns Expressed by Conservation Organizations on the 2017 Draft EIR/EIS and Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS

Comments and Concerns Expressed	Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS
Operational Impacts to Fisheries	

Evaluation of fishery impacts is lacking:
• CDFW operational criteria to protect flows and reduce adverse effects on salmon, sturgeon, longfin smelt, Delta smelt, and other native fish species need to be evaluated
• Includes arbitrary thresholds of significance for
  ○ Longfin smelt impacts greater than 0 are significant (mandatory finding of significance)
  ○ Operational impacts of greater than 5% are not called significant
• Does not adequately account for importance of flow fluctuations and fishery habitat needs
• Impacts to important floodplains (including Sutter and Yolo bypasses) need to be identified
• Assumes no impact at fish screens
• Diversion will further impact water temperatures downstream of the proposed diversions
• Failure to assess impacts from reduced floodplain inundation
• Fail to use existing life cycle models
• Consider feasible mitigation measures, including minimum bypass flows
• Need to demonstrate compliance with California Endangered Species Act (CESA)
• Overstates project benefits for threatened and endangered salmonids – not a net benefit
	• Eliminate project components/analysis that are no longer applicable (e.g., entrainment at Delevan intake) and revised project description to reflect new alternative components.
	• Add shaded riverine aquatic habitat analysis.
	• Add missing descriptions of channel and habitat elements (e.g., bank swallow habitat, riparian veg).
	• Ensure all elements are discussed for each river reach.
	• Complete an updated analysis using revised project description and operational scenario and update document and appendices to reflect the analysis and findings.
	• Complete water temperature modeling for Sites Reservoir and releases and update document and appendices to reflect the analysis and findings.
	• Cross reference appropriately to either water resources chapters or other hydrologic appendices specifically identifying why certain aspects of the study area are eliminated.
	• Consolidate methods and delete extraneous material.
	• Develop more detailed approach to releases into Funks and Stone Corral creeks.
	• Appropriately define all mechanisms for potential impacts to special-status fish species and identify methods for those mechanisms.
	• Provide justifications for any criteria used to evaluate thresholds.
	• Address why a Natural Communities Conservation Plan is not required.

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Comments and Concerns Expressed	Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS
Evaluation of Delta water quality and fishery impacts is lacking: • Reduced Delta Outflows and impacts on Delta Smelt and other important Bay-Delta species • Delta and Longfin Smelt impacts due to Old and Middle River reverse flows	• Cite to and incorporate current data and information regarding species. • Enhance/clarify numerous discussions (e.g., effects on turbidity in Delta, food web, Delta water quality, non-native species effect on native species). • Support impact determinations with substantial evidence, including updated modeling, and align the species evaluated with appropriate study areas. • Align mitigation correctly with impacts.
Impacts to Trinity River Resources	
Trinity River impacts are not adequately evaluated and mitigated: • Need to 'honestly' evaluate foreseeable impacts to Trinity River water temperature objectives associated with project operations – revised Trinity River Division (TRD) water operations associated with Sites Projects violates 2000 Trinity River Restoration Program (TRRP) Record of Decision (ROD) • Need to analyze foreseeable impacts to the Trinity River associated with Trinity Lake carryover storage – analysis assumes minimum Trinity Reservoir carryover storage, without sufficient carryover storage would not achieve Trinity River temperature objectives • Temperature modeling of potential impacts in Trinity River water temperatures should be conducted • Impacts to Klamath and Trinity River salmon populations not properly analyzed – need to reference recent legal decisions since the TRRP ROD • Baseline associated with TRD water operations – analysis did not consider use of Humboldt County's 50 TAF water contract included in the Trinity River Division Act • Concerns expressed regarding meeting fishery/fish habitat management objectives for the Trinity River and Lower Klamath River, including cold water releases and resulting loss of power generation • Mitigation for Trinity River/Lower Klamath impacts needed.	• The Trinity River analysis will be fully described in the alternatives description, hydrology, and modeling and will be cross referenced in the Indian Trust Assets (ITA) chapter. • Appendix 6a Surface Water Resources Modeling will be revised to better explain the Trinity River and TRRP ROD and the results of the impact analysis. • Trinity River aquatic resource impacts will be analyzed based on the results of the revised CALSIM modeling effort. • Re-evaluate the analysis of effects to Trinity River resources and further support the impact determination. • Clarify the relationship between Reclamation's obligation on the Trinity River including the TRRP ROD, Long-Term Plan to Protect Adult Salmon in the Lower Klamath River ROD, 1959 contract between the United States and Humboldt County, and Reclamation's tribal trust responsibilities and the Sites Project operations. • Include additional discussion of operations and exchanges that include Shasta, based on alternatives description. • The document will be revised to be clear, including additional supporting analyses as identified above, that the Project will not negatively affect the Trinity River or fisheries on the Trinity River.

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Comments and Concerns Expressed	Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS
Indian Trust Assets and Tribal Cultural Resources	
• Tribal Consultation and mitigation absent • Indian Trust Assets (ITAs) need to be identified and impacts addressed, including Tribal water demands • Tribal beneficial uses (i.e., water and salmon) impacts not disclosed as well as public trust resources – need to reference reintroduction of salmon and fish passage above Shasta Dam and potential Project effects • Compliance with Public Trust Doctrine and Tribal Trust Obligations – reduced flows would occur in Sacramento, Trinity and Klamath rivers and result in failure to comply with Public Trust doctrine and protect Tribal Trust resources	• Consult with Native American Tribes regarding ITAs. • Explain more fully the TRRP ROD and modeling results and why no impact would occur to Indian Trust Assets on the Trinity River.
• Tribal Consultation and Mitigation absent - no consultation outside of footprint area, need to conduct additional AB 52 consultation • Cultural resources evaluations, impacts, and mitigation not completed or appropriately identified (including cumulative impacts)	• Consult with Native American Tribes regarding the Value Planning Report and revised alternatives. • Continue tribal consultation consistent with AB 52, including identification of Tribal Cultural Resources (TCRs), impacts to TCRs, and mitigation strategies.

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Comments and Concerns Expressed	Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS
Impacts to Terrestrial Resources	
Inadequate assessment of terrestrial biological resources: • Coordination with CDFW not consistently identified • Giant garter snake impacts and mitigation inadequate • Outdated survey information – inaccurate estimation of impacts • Inadequate assessment of impacts to wildlife refuges – bird strikes associated with powerlines and overall impacts to Delevan National Wildlife Refuge (NWR) as well as surrounding private lands; need to evaluate impacts to Colusa and Sutter NWRs • Additional wetland surveys and mitigation required • Ecological effects of the Project inadequately analyzed - should address from the top of contributing watersheds	• The environmental baseline will be updated as follows: ○ Focused updating of old references in resource sections; ○ Desktop update based on more recent data, focusing on update for key resources (e.g., water quality, wildlife, aquatics); and ○ Update information for threatened and endangered species habitats based on biological assessments and additional information developed for state listed special-status species information will be collected on species occurring in the expanded study area. • The EIR/EIS analysis will be supported through the ongoing coordination/consultation with resource agencies, including CDFW. • Add shaded riverine aquatic habitat analysis. • Address why a Natural Communities Conservation Plan is not required.
Wildlife mitigation actions are too broad: • Mitigation measures are too broad and need to be more specific by species including ratios/performance standards	• Information/analysis in Fluvial Geomorphology Chapter would be added to Wildlife Resources chapter for impacts to various riparian species (i.e., riparian to Wildlife Resources to keep terrestrial habitat discussions together and habitat complexity to Wildlife Resources to keep habitat discussions together). • Information/analysis from Vegetation Resources would be cross referenced to Wildlife Resources. • Impacts will be addressed under umbrella headings (e.g., GGS locations/impacts), redefine/re-organize impact types and not make multiple findings for each project component but will consolidate findings. • Golden eagle analysis will be expanded to support future permits. • More robust mitigation measures will be developed to avoid deferred mitigation comments.

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Comments and Concerns Expressed	Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS
Inadequate evaluation of rare plants and botanical resources: • Analysis should include guidelines and sufficient information for informed evaluation • Information is insufficient to determine the impacts on botanical resources within the Project area. Botanical surveys must be redone. Data included are from the late 1990s and early 2000s, and do not include all of the Project area • Accepted scientific protocols should be used to conduct surveys • Biological surveys, including rare plants, are inadequate	• Consolidate wetland and other waters discussion with special-status plant species discussion into one chapter called Vegetation Resources. • Conduct updated species desk top documentation and vegetation mapping. • Use available LIDAR data. • Base impacts primarily on updated aerial interpretations and species models rather than earlier survey results. • Ensure impacts appear under umbrella headings, redefine and re-organize impact types. Do not make multiple findings for each project component – consolidate findings. • More robust mitigation measures will be developed to avoid deferred mitigation comments.
Water Quality	
Water Quality issues related to the reservoir and downstream impacts: • Need to further address selenium, mercury, hazardous materials, salt / salinity impacts in Sites Reservoir and in the Delta • Reduced flows from Shasta and Keswick – concerns over metals and reduced dilution; reduced cold/fresh water to the Delta • Potential salinity issues from Sites Reservoir releases – need a reservoir management plan o Inadequate description of changes in salinity at Contra Costa Water District's diversion facilities • Inadequate description of impacts on Sacramento River water quality o Models inadequate to accurately assess temperature impacts	• Update the Surface Water Quality discussion with more information and analyses on the following: o Harmful Algae Blooms (HABs) o Mercury o Salinity changes in Sites Reservoir and downstream (in Delta) o Overall water quality data, including sport fishing tissue testing • Describe antidegradation policies as a requirement of the Water Board. • Complete the following updates to the Surface Water Quality analysis: o Update data with water quality results provided by modeling o Include HAB qualitative analysis o Include mercury/methylmercury analysis addressing airborne, soil born, reservoir fluctuation, other sources/mechanisms of mercury/methylmercury in the reservoir and in other areas (e.g., Yolo Bypass) o Revise and expand Delta salinity evaluation o Address issues related to Salt Lake water quality and revise the analysis to account for changes in Project construction or design measures that

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Comments and Concerns Expressed	Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS
	may be implemented to address this natural feature in the reservoir footprint ○ Add standard construction impacts, including impacts of tunneling ○ Add operation impacts related other Project components not specifically related to the intake/release of the reservoir ○ Incorporate model results and address potential impacts (including beneficial effects) to water quality in the Colusa Basin Drain. • Incorporate reservoir water temperature modeling and analysis of release water temperatures to the Colusa Basin Drain and/or Sacramento River.
Water Rights	
• Inadequately addresses required water right amount, timing, and relationship with CVP and SWP • Lack of meaningful information about water rights – how will the project ensure only tributary water will be diverted to Sites • Compliance with California Reasonable Use Doctrine not demonstrated - reasonableness requires evaluation of alternative water supplies to meet given need and evaluation of the impacts of new water uses on existing legal uses and water users	• Identify the water rights necessary to implement the Project in the project description. • Describe the water rights approval process and how the information contained in the EIR/EIS will support that process. This will incorporate relevant text that is currently in the 2017 Draft EIR/EIS Public Services/Utilities chapter into the alternatives description chapter.
Geology and Geomorphology	
• Fluvial geomorphology analysis is adversely affected by Sacramento River between Colusa and Red Bluff being considered part of Secondary Study area	• Comments related to Delevan intake/release location would not be explicitly addressed as this is no longer part of the Project. • Incorporate revised model results and update / revise potential impacts, as appropriate. • Reference new sedimentation information included in the update to 2019 Appendix 8A, Sedimentation and River Hydraulics Model. • Develop components of the Reservoir Management Plan regarding sediment management and include as part of the Project to add more clarity on future operations and maintenance activities.

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Comments and Concerns Expressed	Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS
Geology analysis is lacking information necessary to adequately evaluate impacts: • Fails to adequately address reservoir-triggered seismicity (RTS) on local communities and structures – needs to fully examine the role of frequent filing/emptying of reservoir in triggering earthquakes • Site-specific geotechnical data missing • Source of rockfill material for riprap - further field investigation is needed to verify local bedrock is suitable • Number of saddle dams indicative of poor project feasibility	• Include specific information from project description on how project design or environmental commitments will address impacts. For example, expand on this sentence from Chapter 17, Faults and Seismicity: "Project design would address the potential for such instability such that there would be a less-than-significant impact." • Describe requirements of California Department of Water Resources (DWR), Division of Safety of Dams, for both seismic and nonseismic design. • Discuss the multiple lines of defense or design redundancy required to meet DWR Division of Safety of Dams design standards. • Cross reference information from project description to show that dams will be designed to withstand seismic events, including reservoir triggered seismicity. • Will update analysis based on recent and ongoing geotechnical investigations.
Additional Cumulative Impacts	
Incomplete cumulative impact assessment: • Fails to adequately analyze cumulative impacts and fails to disclose potentially significant adverse impacts to aquatic resources • Need to incorporate WaterFix and Shasta Lake Water Resources Investigation • Not fully analyzed including recent water transfers • Inadequate in addressing greenhouse gases - recommends use of World Bank's guidelines on greenhouse gas measurement • Incomplete cumulative impact assessment pertaining to TRD operations – impact of carryover storage to meet temperature objectives during multi-year droughts; impact on CVP power generation	• Update cumulative analysis using surface model results/operational scenario and with additional projects (e.g., Delta Conveyance). • Clarify that Project will not affect Reclamation's commitment to implement the TRRP ROD or Long-Term Plan to Protect Adult Salmon in the Lower Klamath River ROD. • Describe cumulative effects using the same methodology presented in the 2017 EIR/EIS Cumulative Chapter, but add more clarity about what projects are included in the cumulative impact analysis and why. Add additional details about the model representing cumulative conditions. Include more robust discussion of individual resources. • Incorporate information and identify that projects noted by commenters were (and are) included in the cumulative analysis. Crosswalk between the

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Comments and Concerns Expressed	Summary of the Approach to Addressing in the Preparation of the Revised EIR/Supplemental EIS
	commenter-suggested plans and projects and demonstrate that the commenter suggestions either were considered or were not applicable. • Update Appendix 31B, CVP-SWP Power Modeling with new operational assumptions, analysis based on these new assumptions, and resulting impact determinations.

Conservation Organizations and Tribal Nations with Species / Habitat Comments that Commented on the 2017 Draft EIR/EIS Either During the Comment Period or in Subsequent Correspondence

AquAlliance
Bay Institute
Butte Environmental Council
California Indian Water Commission
California Native Plant Society, Sacramento Valley Chapter
California Sportfishing Protection Alliance
California Water Impact Network
California Wilderness Coalition
Center for Biological Diversity
Chico 350
Coast Action Group
Colusa Indian Community Council
Conservation Fly Fishers International Northern California Council
Defenders of Wildlife
Environmental Justice Coalition for Water
Environmental Water Caucus
Fly Fishers of Davis
Fly Fishers International
Freedom Earth Democracy
Friends of the River
Golden Gate Salmon Association
Institute for Fisheries Resources
Karuk Tribe
Klamath Riverkeeper
Natural Resources Defense Council
The North Coast Environmental Center
Northern California Watershed Alliance
Pacific Coast Federation of Fishermen's Associations
Planning and Conservation League
Protect American River Canyons
Sacramento River Council
Sacramento River Preservation Trust
Safe Alternatives for our Forest Environment
San Francisco Baykeeper
Save the American River Association
Save California Salmon
Save the Klamath-Trinity Salmon
Sierra Club
Southern California Watershed Alliance
Water Climate Trust
Winnemem Wintu Tribe
Women's International League for Peace

NGO Workshop and Small Group Participants

This document provides a listing of the non-governmental organizations (NGOs) that were invited to the December 2020 Sites Project NGO Workshops along with those that are invited to the NGO Small Technical Groups. Information in this document is current as of April 22, 2021. Please contact Ali Forsythe at aforsythe@sitesproject.org if you have questions, would like more detail or would like the Authority to reach out to a specific NGO organization.

1.0 December 2020 Workshops

The following organizations were invited to the December 2020 Workshops. This list was based on the NGOs that commented on the 2017 Draft EIR/EIS.

1. AquAlliance
2. The Bay Institute
3. Butte Environmental Council
4. California Indian Water Commission
5. California Native Plant Society, Sacramento Valley Chapter
6. California Sportfishing Protection Alliance
7. California Water Impact Network
8. California Wilderness Coalition
9. Center for Biological Diversity
10. Chico 350
11. Coast Action Group
12. Defenders of Wildlife
13. Environmental Justice Coalition for Water
14. Environmental Water Caucus
15. Fly Fishers of Davis
16. Fly Fishers International Northern California Council
17. Friends of the River
18. Golden Gate Salmon Association
19. Natural Resources Defense Council
20. North Coast Environmental Center
21. Pacific Coast Federation of Fishermen's Associations, Institute for Fisheries Resources
22. Planning and Conservation League
23. Protect American River Canyons
24. Sacramento River Council
25. Sacramento River Preservation Trust
26. Safe Alternatives for our Forest Environment -
27. San Francisco Baykeeper
28. Save the American River Association
29. Save California Salmon
30. Sierra Club, Mother Lode Chapter
31. Southern California Watershed Alliance
32. Water Climate Trust

33. Women's International League for Peace and Freedom Earth Democracy

Tribes

1. Winnemem Wintu Tribe

2.0 Additions to Distribution List in January

In the January 2021 timeframe, staff added a number of organizations to the internal NGO distribution list. This expanded the list to include NGOs that may be interested in the Project but that did not comment on the 2017 Draft EIR/EIS. The following organizations were added to the distribution list.

1. Audubon Society
2. California Trout
3. California Waterfowl
4. Ducks Unlimited
5. Environmental Defense Fund
6. Grasslands Water District*
7. Humboldt County Planning Department*
8. Nature Conservancy
9. Point Blue Conservation Science
10. Public Policy Institute of California
11. Restore the Delta
12. River Partners
13. Trout Unlimited

* Grasslands Water District and Humboldt County are not NGO organizations, but expressed interest in participating in the discussions and thus, were added to the distribution list and the NGO Small Working Groups as identified below.

3.0 NGO Small Working Groups

The following NGOs have "self-selected" and have been invited to the following NGO Small Working Groups. Note, all NGOs were invited to attend the Small Working Group. NGOs were asked to respond to a survey or contact staff to be added to the distribution list for each group.

	Fisheries Protections and Effects	**Project Benefits**	**Terrestrial Species Effects**	**Trinity River Effects**	**Water Quality**	**Water Rights**
AquAlliance	X				X	
The Bay Institute	X	X			X	X
California Wilderness Coalition	X		X		X	
Defenders of Wildlife	X	X	X		X	
Environmental Defense Fund	X	X				X

	Fisheries Protections and Effects	Project Benefits	Terrestrial Species Effects	Trinity River Effects	Water Quality	Water Rights
Friends of the River	X	X	X	X	X	X
Grasslands Water District		X				X
Humboldt County Planning Department				X		X
Natural Resources Defense Council	X				X	X
Pacific Coast Federation of Fishermen's Associations	X			X		
Save California Salmon	X	X	X	X	X	X
Sierra Club, Mother Lode Chapter	X		X		X	