Re-initiation of the Ad Hoc Environmental Planning and Permitting Work Group for 2020 Meeting Minutes

Sites Program Management Team

Meeting Information:

Date: January 29, 2020

Time: 1:00 PM to 4:30 PM

Notes By: HDR – Sites Integration

Location: Dial in: 866-583-7984; 4974650#
ICF - 980 9th St #1200, Sacramento, CA 95814

Meeting Particpants

Thad Bettner, GCID
Mike Azevedo, Colusa Co.
Robert Cheng, CVWD
Heather Dyer, SBVMWD
Jeff Davis, SGPWA
Dee Bradshaw
Jim Watson, Sites Authority
Eric Leitterman, SCVWD
Bill Vanderwaal, RD 108
Ben Barker (phone), PCWA
Ali Forsythe, Sites Authority
Jelica Arsenijevic, Sites Integration
Linda Fisher, Sites Integration
John Spranza, Sites Integration
Laurie Warner Herson, Sites Integration
Monique Briard, ICF
Teresa Chan, ICF
Greg Roy, ICF
Chris Elliot, ICF
Amy Rucker, ICF
Susan Lassell, ICF

Action items

Action Item		Owner	Deadline	Notes
1	Edit Project Description Flow Chart			Show interconnecivity of operations to the rest of boxes. Add in graphic how to resolve conflicts.
2	PR Brochure			PR effort to highlight Sties 2.0.committment to a new document.

Meeting Minutes:

1. Introductions
2. Current Status
    - Updated work group on various 2019 efforts accomplished by Sites Authority, Integration, and ICF team
        - Worked through Section 7 for ESA. Draft BA produced and will be used moving forward.Draft will be very useful and will be used after value planning anlaysis effort. BA written on Alternative D as a preferred alternative/proposed action and will need revision based on preferred alternative developed out of value planning analysis effort.
        - Reclamation is still identified as lead agency.

- Continue to have discussions with Reclamation / USFWS regarding terrestrial species.
- Had discussions with NMFS – informational transition, life cycle modeling (need project description) before going further down the road). NMFS open to discussions and sharing information.
- CDFW application package for a 2081 ITP (CESA) – Multiple meetings (over 30). Intensive workshops between staff to executive level staff. Started with a process that everything was rejected; however, reached a point where they CDFW isn't rejecting and has flexed in some areas related to flow. Dialogue/coordination would continue as part of 2020 efforts.
- Section 106 process – initiated discussion with consultation with Reclamation to identify to what they will consider as their undertaking (the trigger). Need to engage with tribes, etc.
- Water rights – started working with MBK towards the end of July/August. MBK provided discussion of data needs, approach how water rights would move forward with draft schedule, technical studies with attachments identified prior to the slow down. Continue discussions/coordination with MBK in 2020.
- Geotechnical Investigations:
  - Reclamation preparing their own feasibility study. Geotechnical investigation supporting
- EIR/EIS – Began work on final EIR/EIS in March 2019. Developed response to comments in batches, as well as reader-guides.

- DFW executive meeting summary
  - Monthly meetings
  - 1/29/2020 meeting – CDFW looking to us to identify project to move project forward

3. Consider Restarting Efforts
   - Reviewed graphic describing approach on tackling project description
   - Action Item – show interconnecivity of operations to the rest of boxes. Add in graphic how to resolve conflicts.
4. Upcoming Work and Priorities
   - Project description based on value planning analysis effort. More detail needed for project description to be used in permits. Utilize coordination efforts identified in graphic to develp project description
   - Discussed rirculation of EIR/EIS
     - Agreement amongst group to do full recirculation
     - PR effort to highlight Sties 2.0.committment to a new document.
     - Recommendation from working group to do a full recirculation .
     - Staff report to dicuss impact on schedule.
   - Continue coordination efforts with agencies (CDFW, NMFS, etc.)
5. Schedule Next Meeting
   - February 19th from noon to 2pm via teleconference.
   - Prepare "cliffnote" readers version of operations plan – talking points with intention of having reservoir committee and others speak to (one uniform understanding)
6. Action Item Review

From: Frederiksen, Lee E. [Lee.Frederiksen@hdrinc.com]
Sent: 2/3/2020 3:32:23 PM
To: Alicia Forsythe [aforsythe@sitesproject.org]; Laurie Warner Herson (laurie.warner.herson@phenixenv.com) [laurie.warner.herson@phenixenv.com]; Spranza, John [John.Spranza@hdrinc.com]; Heydinger, Erin [Erin.Heydinger@hdrinc.com]; Arsenijevic, Jelica [Jelica.Arsenijevic@hdrinc.com]; Jim Watson [jwatson@sitesproject.org]; Boling, Robert M. [Robert.Boling@hdrinc.com]; JP Robinette (JRobinette@BrwnCald.com) [JRobinette@BrwnCald.com]
Subject: FW: Alternatives for Appraisal Report of Value Planning Alternatives

FYI

Lee Frederiksen, PE
D 916.817.4883 M 916.213.0569

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From: Herrin, Jeff [mailto:jeff.herrin@aecom.com]
Sent: Monday, February 3, 2020 3:26 PM
To: Rude, Pete/RDD (Pete.Rude@jacobs.com) <Pete.Rude@jacobs.com>; Tull, Robert/SAC (Robert.Tull@jacobs.com) <Robert.Tull@jacobs.com>; Frederiksen, Lee E. <Lee.Frederiksen@hdrinc.com>
Cc: Lambert, Ileisa <ileisa.lambert@aecom.com>
Subject: Alternatives for Appraisal Report of Value Planning Alternatives

All,

Lee and I spoke earlier today about the alternative evaluation approach for the appraisal report. The approach we agreed on is to begin with the 1.3 MAF reservoir.

- Diversion Conveyance: diverting from a new T-C Canal regulating reservoir to the north or diverting from the existing Funks Reservoir.
- Public Access: Bridge versus a new road to Lodoga wrapping around the southern end of the reservoir
- Release Conveyance (Jacobs Focus): release from the southern end of the T-C Canal. Jeff Sutton confirmed a year round capacity of 800 cfs with over 900 cfs from September to April. We suggest Pete look at two options. 1) Pipeline down the hill from the T-C canal to the Bird Creek channel near I-5 with an engineered channel to the Colusa Basin Drain. 2) Pipeline all the way to the Colusa Basin Drain. You may want to consider plastic pipe.

We will screen the facilities above for the 1.3 MAF reservoir. We will take the best performing combination of facilities and also show the results for a 1.5 MAF and 1.0 MAF reservoir.

Please let me know if this makes sense and if you have any other ideas to improve.

We are shooting to have a draft with costs by February 16 so we can start getting things set up in the MDA spreadsheet to add financing costs.

Thank you,

Jeff Herrin
Water Resources Planner, Water Business Unit, Sacramento, CA
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M +1-916-432-0956
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Sites

February 7, 2020

Ms. Nancy Vogel
Director of the Governor's Water Portfolio Program
California Natural Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Dear Ms. Vogel:

On behalf of the Sites Project Authority, I would like to thank the Governor and the Administration for their leadership in developing the draft Water Resilience Portfolio and for proposing to advance smart surface water storage projects that provide multiple benefits in a manner that protects and enhances fish and wildlife and provides water dedicated for environmental purposes.

As stated in the draft Water Resilience Portfolio, water is central to nearly everything we value in California. Our communities, farms, ecosystems and economies depend on a steady supply of safe and affordable water. However, as we are now beginning to experience, a reliable and affordable water supply that also protects and enhances our environment is increasingly being put at risk due to extreme drought conditions, floods, rising temperatures, depleted groundwater basins, aging infrastructure and other water management challenges magnified by the effects of climate change.

Sites Reservoir is unique for its ability to adapt to variable climate conditions in a manner that will release more water in drier periods. This was demonstrated through the Prop 1 selection process where two future climate change scenarios were used in the evaluation process. Under the more-severe scenario, releases from Sites Reservoir, in drier periods, were greater than releases from either the current conditions or the early climate change scenario. Sites Reservoir conserves stored water for later release in drier times when it's needed most by communities, farms and the environment.

To protect and enhance at risk fish and wildlife, the State's proposed investment under Prop 1 will create a proportionate share of the reservoir's storage that will be dedicated to the environment through the active management, by state resource agencies, of their share of the stored water to address their environmental priorities, which are expected to change over time. The Sites Reservoir creates a sizeable, flexible, and adaptable environmental water asset that does not currently exist.

P.O. Box 517
Maxwell, CA 95955
530.438.2309

Sites

Another unique aspect of the Sites Reservoir Project is the level of partnerships and spirit of collaboration by a broad coalition of participants and stakeholders that are 'breaking down the old binaries' to advance this vital project. The local counties where the project is located, cities, water and irrigation districts from the Sacramento Valley, San Joaquin Valley, Bay Area, and Southern California are funding and actively engaged in this process; which also includes both the California Department of Water Resources and the US Bureau of Reclamation, who are working with us to develop a cooperative operations that will further improve the resiliency and reliability of both the State Water Project and Central Valley Project.

We believe strongly that Sites Reservoir offers a unique opportunity to construct and operate a surface water storage project that provides multiple benefits in a manner that protects and enhances fish and wildlife and will provide a sizable amount of water dedicated for environmental purposes over the project's expected 100-year life.

Creating a resilient and reliable water future for California is essential to our communities, farms, ecosystems and economies. We are committed to working in collaboration with the Governor and his Administration to advance this vital project, as it embodies the principles the Water Resilience Portfolio is aggressively working to achieve.

Sincerely,

Fritz Durst

Fritz Durst
Chair, Sites Project Authority

Cc:
Wade Crowfoot, Secretary for Natural Resources
Jared Blumenfeld, Secretary for Environmental Protection
Karen Ross, Secretary of Department of Food and Agriculture
U.S Senator Dianne Feinstein
Congressman John Garamendi
Congressman Doug LaMalfa
State Senator Jim Nielsen
Assemblyman James Gallagher

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530.438.2309

From: Tull, Robert/SAC [Robert.Tull@jacobs.com]
Sent: 2/12/2020 4:11:09 PM
To: Rob Kunde [rkunde@wrmwsd.com]; druiz@westsidewd.com
CC: Heydinger, Erin [Erin.Heydinger@hdrinc.com]; Alicia Forsythe [aforsythe@sitesproject.org]; Frederiksen, Lee E. [Lee.Frederiksen@hdrinc.com]; Herrin, Jeff [jeff.herrin@aecom.com]; Rude, Pete/RDD [Pete.Rude@jacobs.com]; Leaf, Rob/SAC [Rob.Leaf@jacobs.com]; Thayer, Reed/SAC [Reed.Thayer@jacobs.com]; Whittington, Chad/SAC [Chad.Whittington@jacobs.com]
Subject: Sites Project North of Delta Delivery Patterns
Attachments: Draft DeliveryPatternMemoNOD 2_12_20.docx

Rob/Dan,

As requested by the Operations Work Group, attached is a brief memo summarizing Sites Project Sacramento Valley delivery patterns used in analyses of Sites operations for the Draft EIS/EIR, CWC WSIP application, and subsequent analyses.

We will plan to discuss on the Friday Ops call.

Thanks,
Rob

From: Tull, Robert/SAC [Robert.Tull@jacobs.com]
Sent: 2/13/2020 3:43:27 PM
To: Heydinger, Erin [Erin.Heydinger@hdrinc.com]; Westcot, Cathy [Cathy.Westcot@hdrinc.com]; Spranza, John [John.Spranza@hdrinc.com]; Alicia Forsythe [aforsythe@sitesproject.org]; Laurie Warner Herson [laurie.warner.herson@phenixenv.com]
CC: Leaf, Rob/SAC [Rob.Leaf@jacobs.com]; Frederiksen, Lee E. [Lee.Frederiksen@hdrinc.com]; Herrin, Jeff [jeff.herrin@aecom.com]
Subject: RE: Sites Draft Schedule
Attachments: Sites Project Modeling Analysis Framework.pdf

Erin,

The original 4 months was for a baseline and two alternatives. I explained last Friday it may take an additional 1 or 2 months to add an alternative from the Feasibility Study and said I needed to follow up after discussing with Jeff Herrin and Rob Leaf. Based on my discussions with them the USBR modeling is only being conducted at a cursory sensitivity analysis level due to time constraints and will only include evaluation of Power and Ag econ. The feasibility study baseline will also not be consistent with the Authority and as I noted below, there will be significant work required to redo the USBR alternative so it is comparable with the baseline and alternatives being evaluated by the Authority. The USBR sensitivity will be based on the Reclamation Opflex investment concept which is a completely different operation and accounting from what is being considered by the Authorities VP efforts. The feasibility sensitivity will also not include running or iterations with the daily model, temp models (Sac, Feather, American), SALMOD, early mortality, DSM2, OBAN, IOS, and M&I econ analyses so that will all have to be developed as part of the Authority process. See the attached model framework diagram.

We are therefore essentially starting from scratch to develop a new version of the feasibility study alternative that is consistent and can be analyzed at the same level of detail as the Authority alternatives as a basis for the evaluation of operations and biological effect analysis.

Let me know if you need anything further.

Rob

From: Heydinger, Erin <Erin.Heydinger@hdrinc.com>
Sent: Thursday, February 13, 2020 1:01 PM
To: Tull, Robert/SAC <Robert.Tull@jacobs.com>; Westcot, Cathy <Cathy.Westcot@hdrinc.com>; Spranza, John <John.Spranza@hdrinc.com>; Ali Forsythe <aforsythe@sitesproject.org>; Laurie Warner Herson <laurie.warner.herson@phenixenv.com>
Cc: Leaf, Rob/SAC <Rob.Leaf@jacobs.com>; Frederiksen, Lee E. <Lee.Frederiksen@hdrinc.com>; Herrin, Jeff <jeff.herrin@aecom.com>
Subject: [EXTERNAL] RE: Sites Draft Schedule

Hi Rob,

Can you provide us with a bit more detail of what will be filling out the extra time? When we originally discussed this process, you said it would take four months. During our schedule meeting last week, we upped it to five months. Can you help me understand what is leading to the need for an additional 2 months overall? I recognize you will have some work to do on Alt A, but my understanding is the majority of it will be done as a part of Reclamation's Feasibility Study.

Thanks,
Erin

Erin Heydinger PE, PMP
D 916.679.8863 M 651.307.9758

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From: Tull, Robert/SAC <Robert.Tull@jacobs.com>
Sent: Thursday, February 13, 2020 10:19 AM
To: Westcot, Cathy <Cathy.Westcot@hdrinc.com>; Spranza, John <John.Spranza@hdrinc.com>; Ali Forsythe <aforsythe@sitesproject.org>; Heydinger, Erin <Erin.Heydinger@hdrinc.com>; Laurie Warner Herson <laurie.warner.herson@phenixenv.com>
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Cathy,

As a follow up to our operations discussion last Friday, I confirmed with our team that the request to incorporate a USBR Feasibility Study Alternative into the Full Operations Analysis 2A Ops OP-00-AN will extend the work period to 6 months vs the 5 months we included. The revised work period will go from **12-Jun-20 to 11-Dec-20** instead of 06-Nov-20.

The USBR Feasibility Study alternative will require significant work to make it comparable with the baseline and alternative analyses being conducted for the Authority. Also the feasibility study is only conducting a partial analysis and will not include any of the analysis results needed to conduct the biological effects evaluation for the EIR/EIS.

Everything else looks consistent with our discussion from last week.
Let me know if you have any questions

This is very helpful

Thanks,
Rob

From: Westcot, Cathy <Cathy.Westcot@hdrinc.com>
Sent: Tuesday, February 11, 2020 5:11 PM
To: Monique Briard (Monique.Briard@icf.com) <Monique.Briard@icf.com>; Spranza, John <John.Spranza@hdrinc.com>; Ali Forsythe <aforsythe@sitesproject.org>; Frederiksen, Lee E. <Lee.Frederiksen@hdrinc.com>; Herrin, Jeff <jeff.herrin@aecom.com>; Heydinger, Erin <Erin.Heydinger@hdrinc.com>; JP Robinette <JRobinette@BrwnCald.com>; Laurie Warner Herson <laurie.warner.herson@phenixenv.com>; Fisher, Linda <Linda.Fisher@hdrinc.com>; Arsenijevic, Jelica <Jelica.Arsenijevic@hdrinc.com>; Rude, Pete/RDD <Pete.Rude@jacobs.com>; Tull, Robert/SAC <Robert.Tull@jacobs.com>; Boling, Robert M. <Robert.Boling@hdrinc.com>
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Attached is the latest version of the schedule, PLEASE take a minute to review and provide me any updates or comments by Thursday Feb 13th. The sooner the better as I plan on meeting with the Authority's Agents early Friday morning for one more review.

You can mark up the pdf or hand write the changes and scan and email it back to me. I appreciate all the time and effort everyone has taken to get us a schedule that we can use going forward.

Thanks,

Cathy Westcot, PMP
Project Controls Director, Sites Reservoir

HDR
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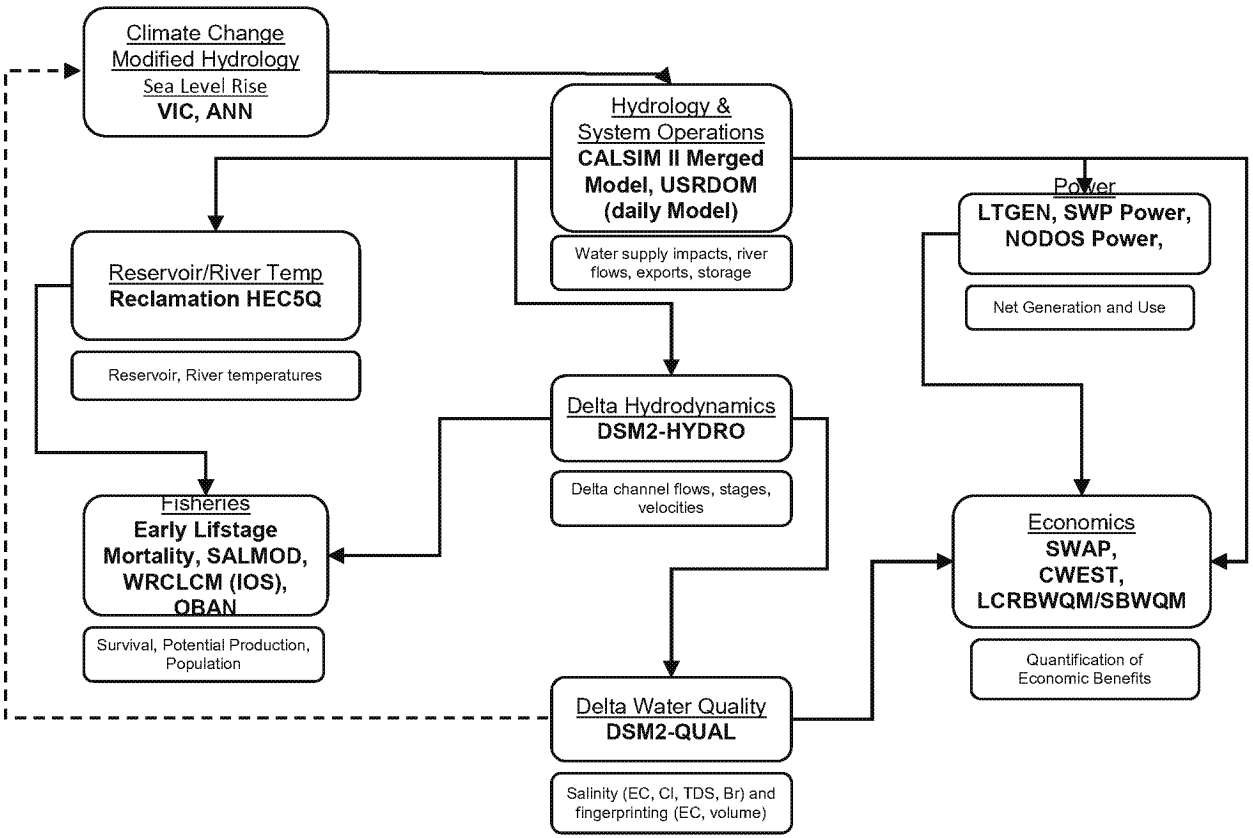
Sites Project
Analytical Modeling Framework



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Agree. We are only doing sensitivity modeling for Alternative A for the Reclamation Feasibility Report. The modeling will be incomplete. This was agreed with Reclamation (Leaf is working on my contract for this effort). Otherwise we must delay the Reclamation Feasibility Report until September. Reclamation agreed to sensitivity only modeling to maintain the schedule.

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Thanks,

Cathy Westcot, PMP
Project Controls Director, Sites Reservoir

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Sites Project Group Presentation

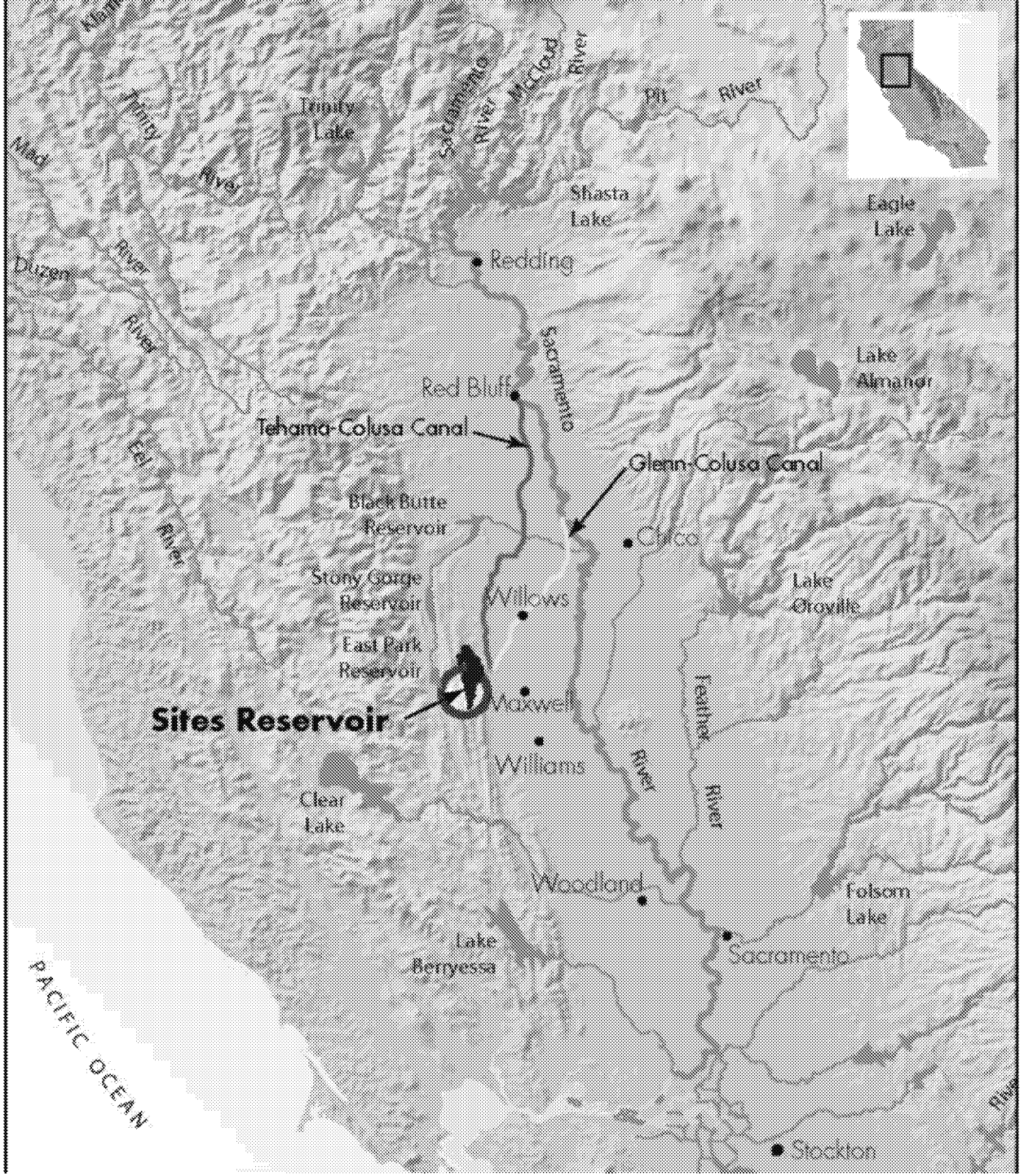
Colusa Basin Drain

Facilities and Background

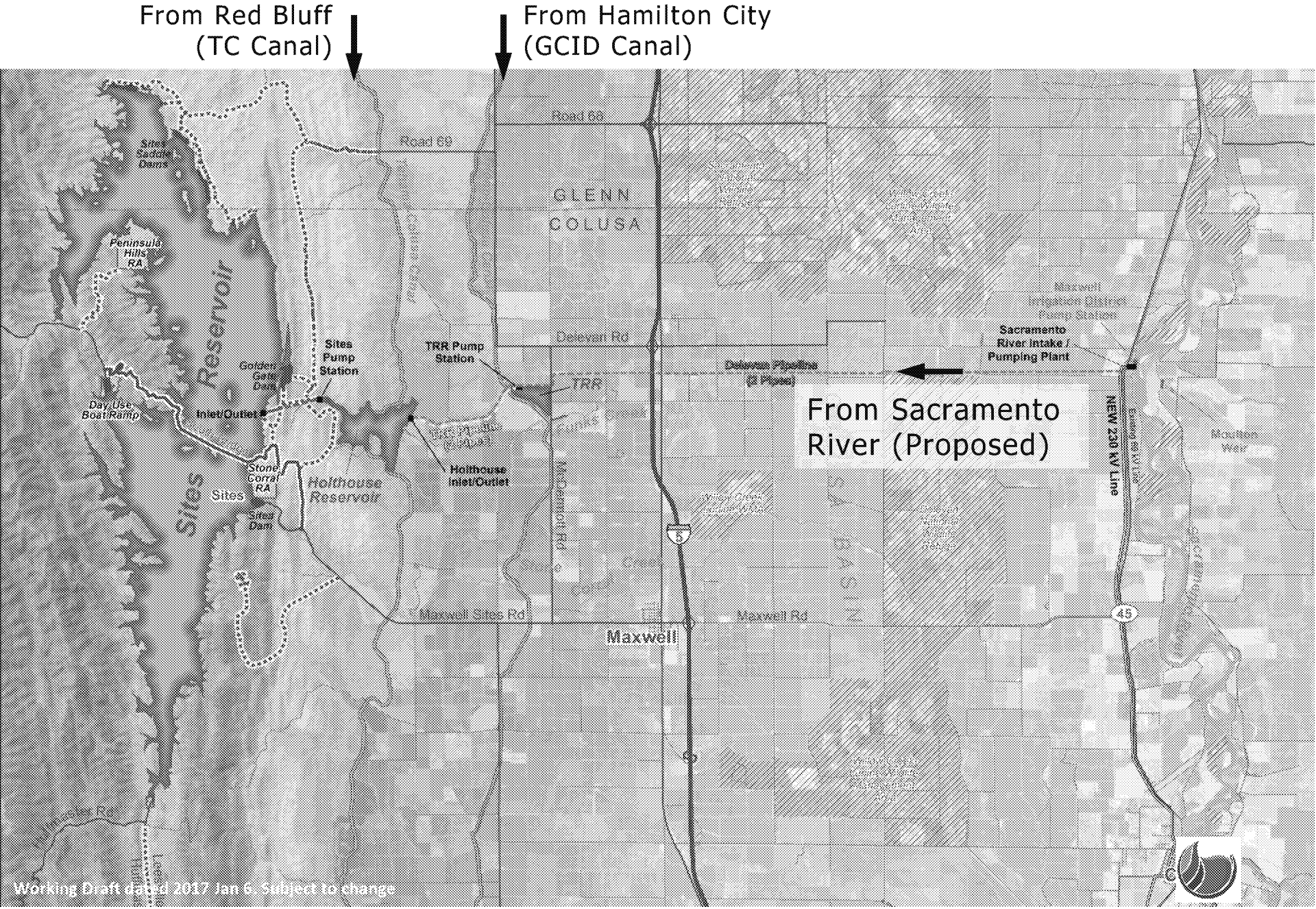
February 13, 2020

Summary

- Overview of Colusa Drain
  - Key Facilities
  - Operational Considerations
- Questions and Discussion



Overview: Facilities



Colusa Drain Key Facilities
Control Structures

- Colusa Basin Drain
  - Maxwell Dam
  - Colusa NW Refuge Weir
  - Davis Weir
  - Balsdon Weir
  - Knights Landing Outfall Gates (KLOG)
- Knights Landing Ridge Cut
  - Ridge Cut
  - Wallace Weir
- Tule Canal/Yolo Bypass
  - Swanston Weir
  - Lisbon Weir
  - Cache Slough

Key Facilities
Measurement

- Colusa Drain at Highway 20 (CDEC - Flow & Stage)
- Colusa Drain at Davis Weir (GCID – Flow & Stage)
- Colusa Drain at KLOG (CDEC – Stage & Gate Openings)
- Sacramento River at Knights Landing (CDEC - Stage)
- Knights Landing Ridge Cut (CDEC - Flow & Stage)
- Wallace Weir ???
- Yolo Bypass near Woodland (CDEC - Flow & Stage)

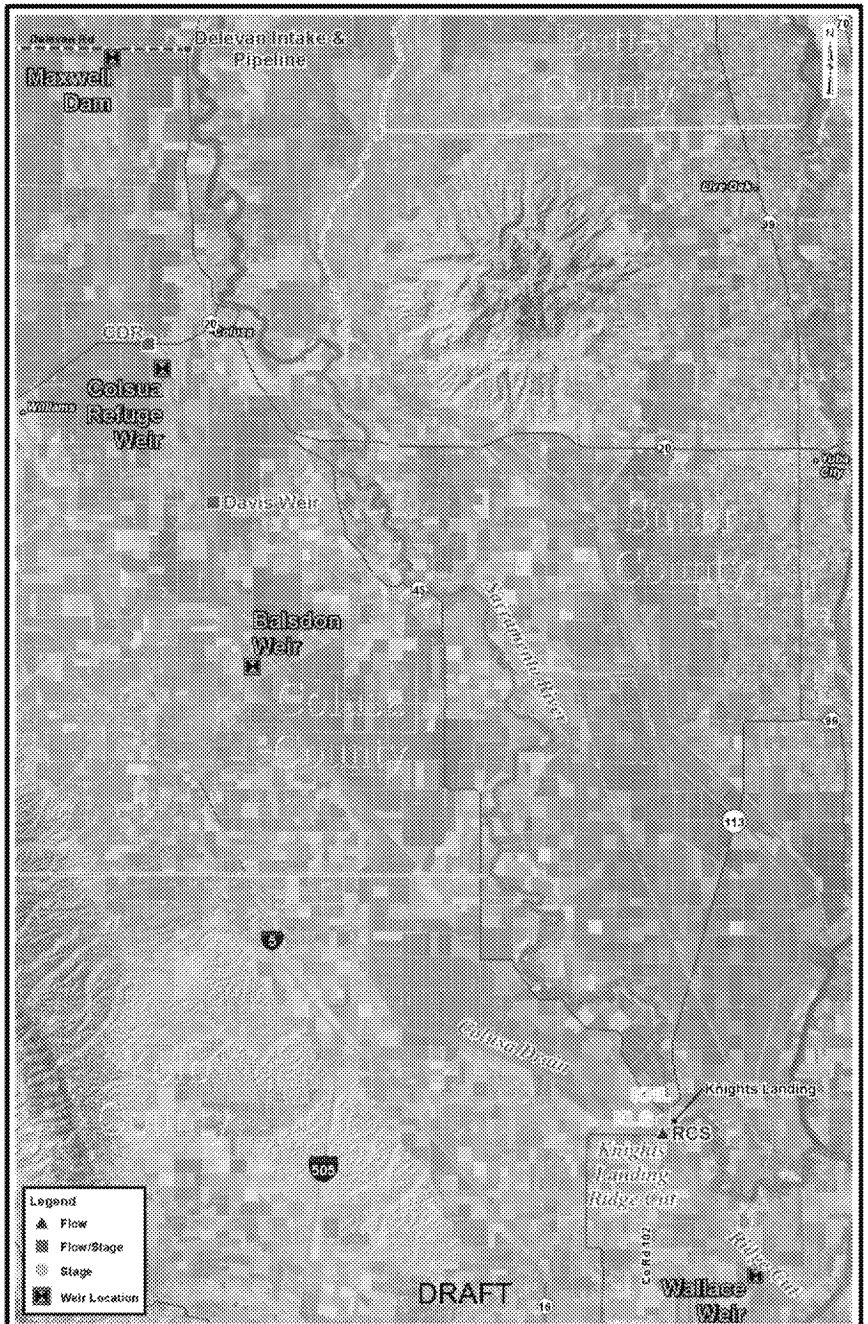

Delevan Intake & Pipeline
Maxwell Dam
Colusa Refuge Weir
Davis Weir
Sacramento River
Princeton
Knights Landing
RCS
Knights Landing Ridge Cut
Colusa Drain
Wallace Weir
DRAFT
Legend
Flow
Flow/Stage
Stage
Weir Location
MBK
Colusa Drain - Key Facilities

Figure 1 of 2

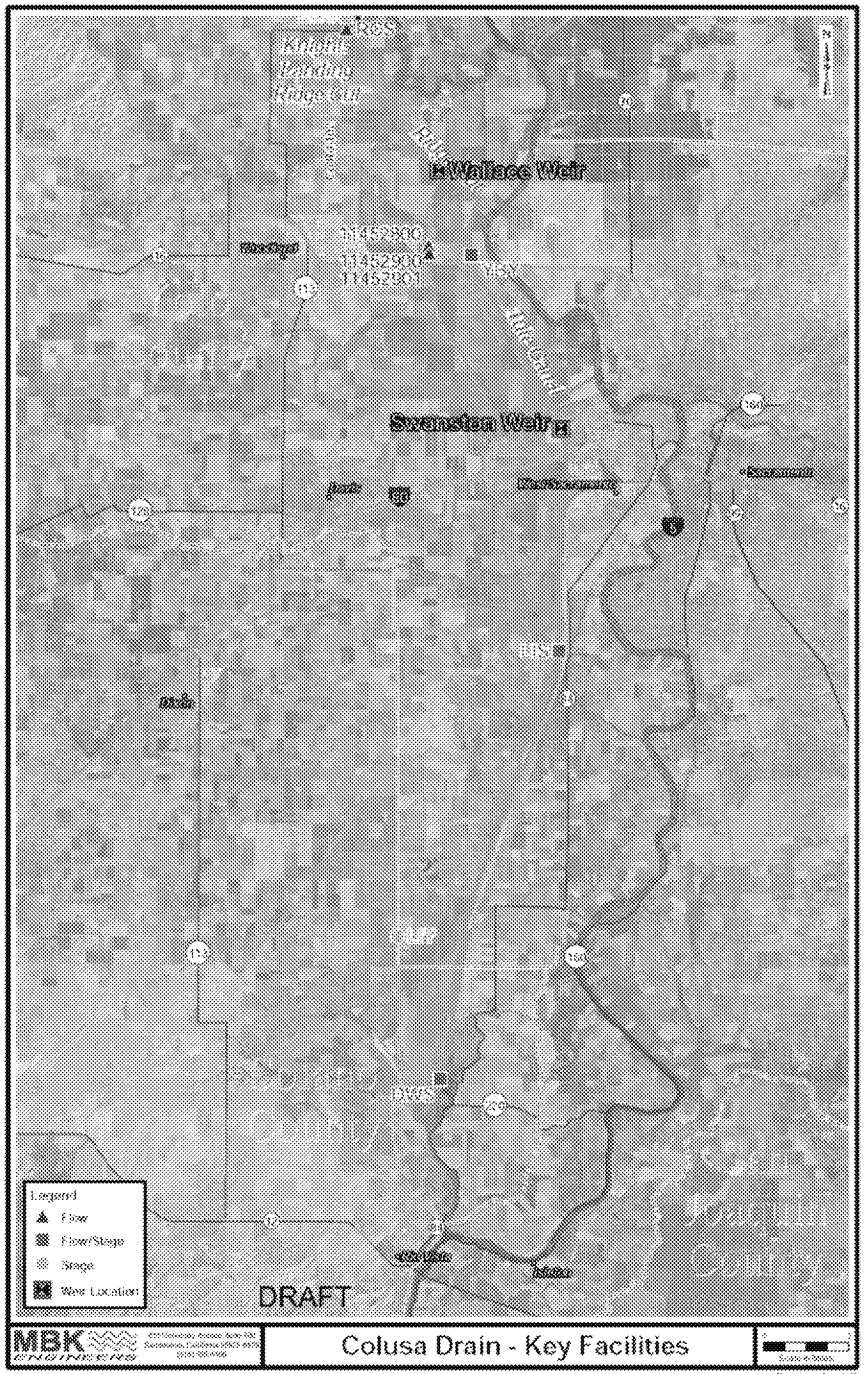

Wallace Weir
Sycamore Weir
DRAFT
Legend
Flow
Flow/Stage
Stage
Weir Location
MBK
Colusa Drain - Key Facilities

Figure 2 of 2

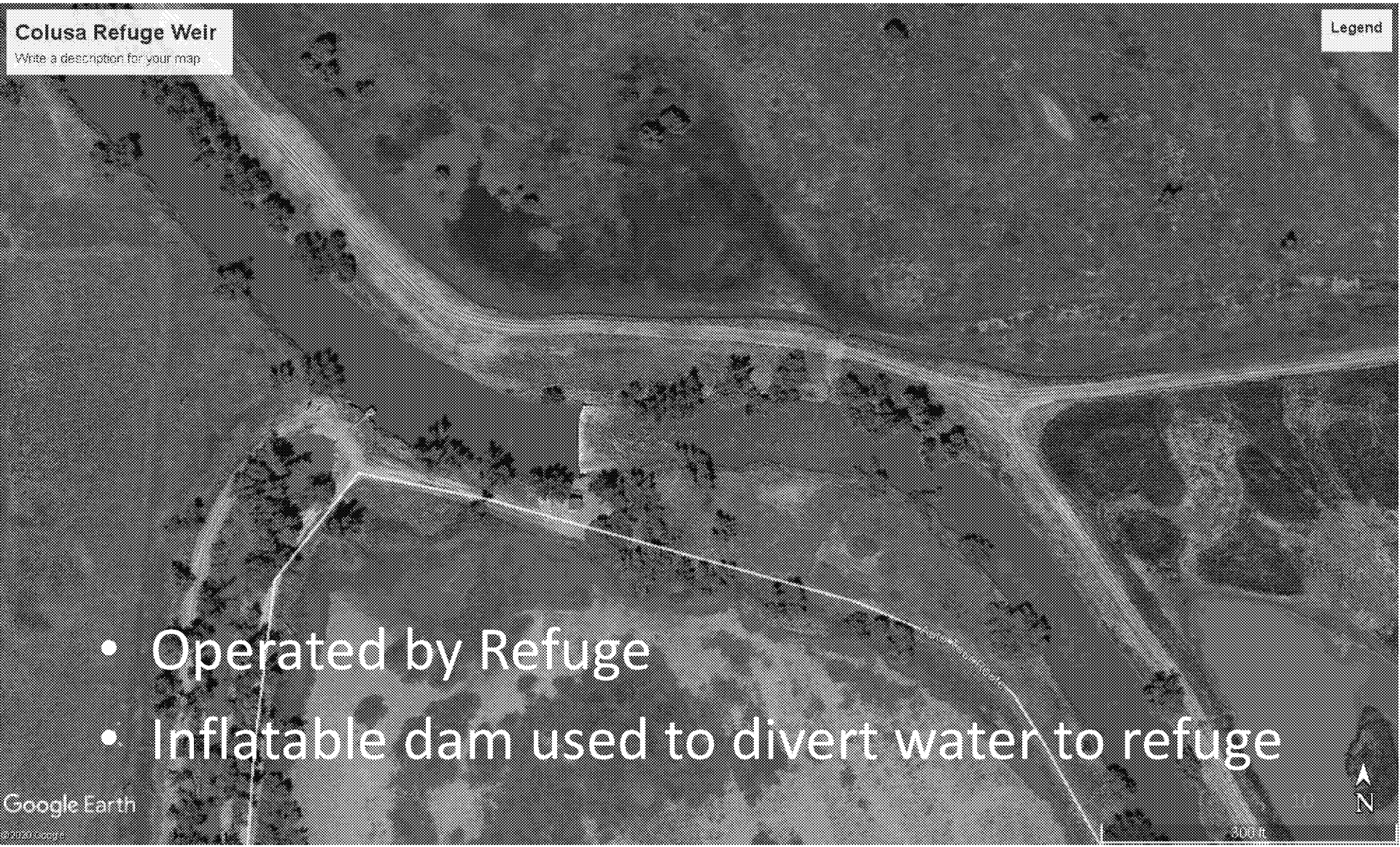
Operational Considerations

Maxwell Dam

- Operated by Maxwell ID
- Potential flooding upstream
- 2016 ND Flow Action - issues draining rice fields

Operational Considerations

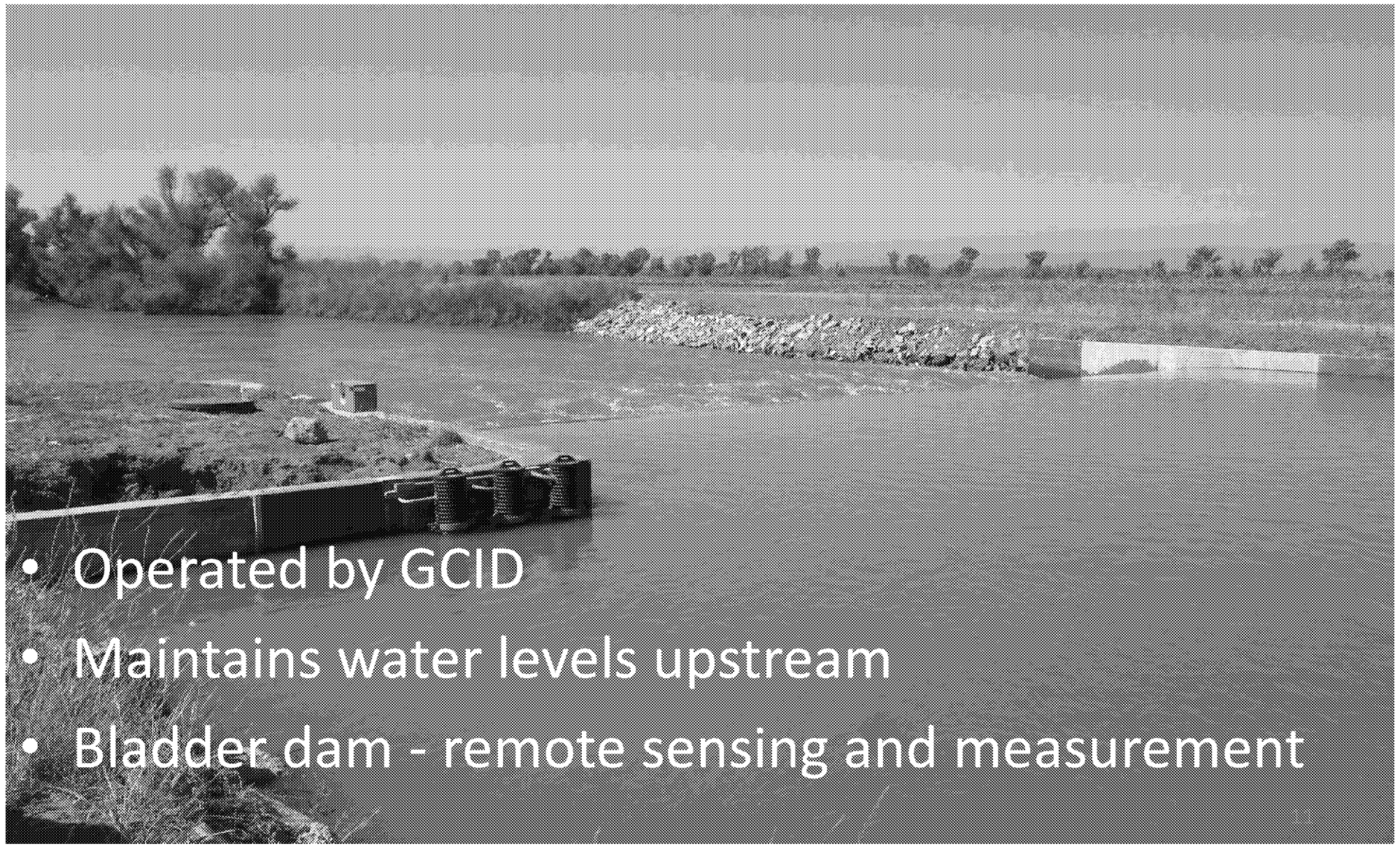
Colusa Refuge Weir



- Operated by Refuge
- Inflatable dam used to divert water to refuge

Operational Considerations

Davis Weir



- Operated by GCID
- Maintains water levels upstream
- Bladder dam - remote sensing and measurement

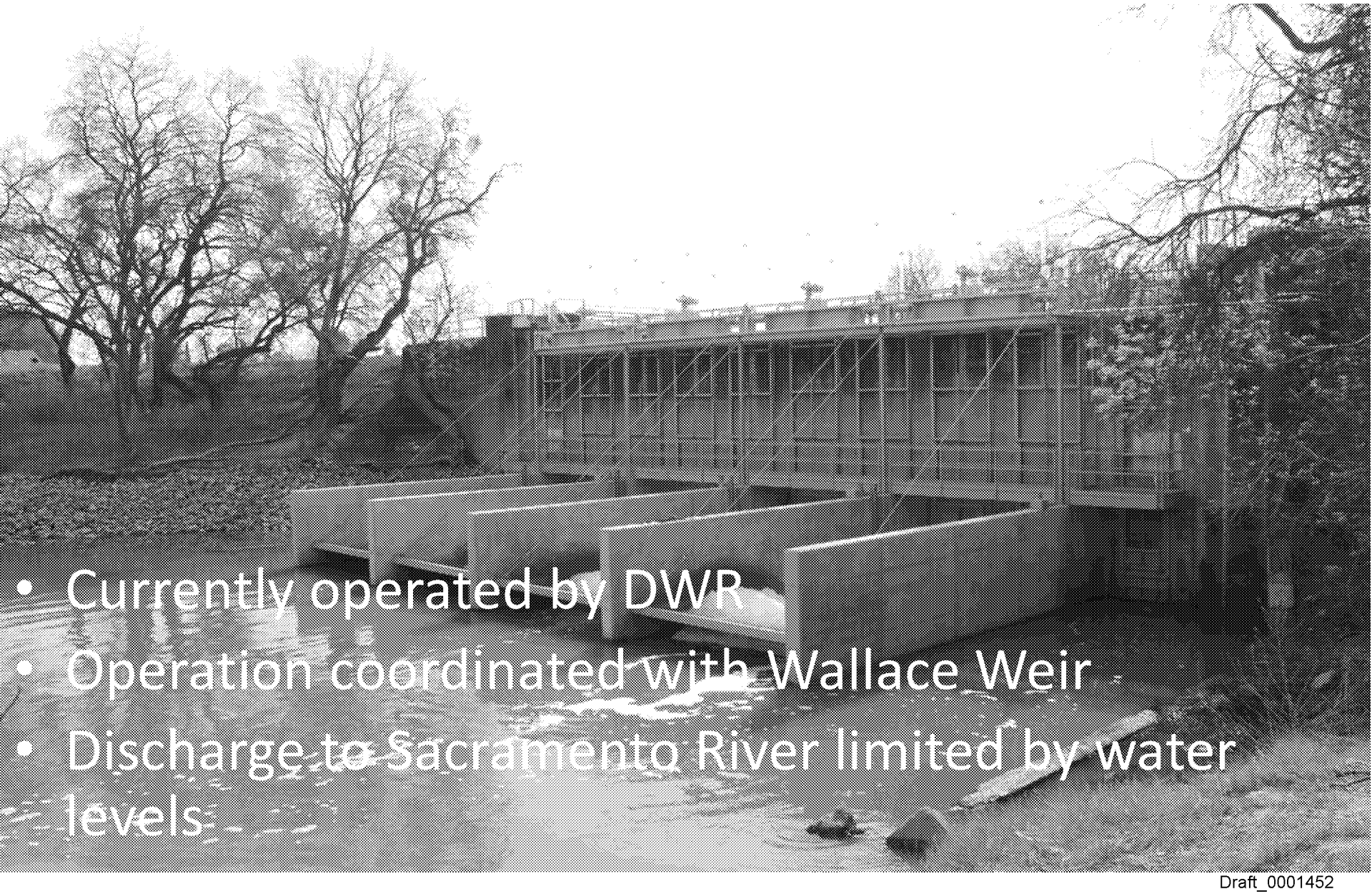
Operational Considerations

Balsdon Weir

- Operation unknown

Operational Considerations

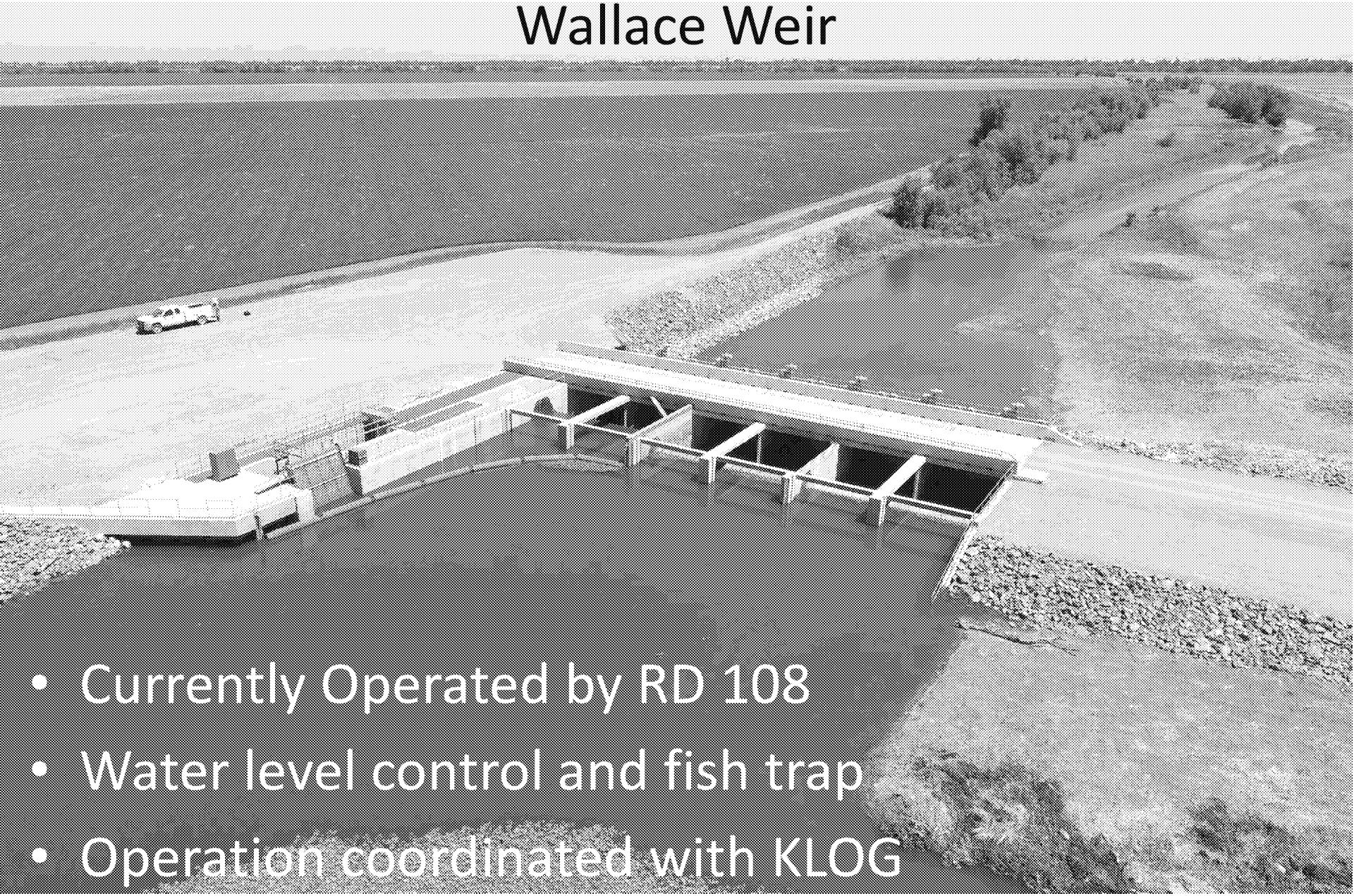
KLOG



- Currently operated by DWR
- Operation coordinated with Wallace Weir
- Discharge to Sacramento River limited by water levels

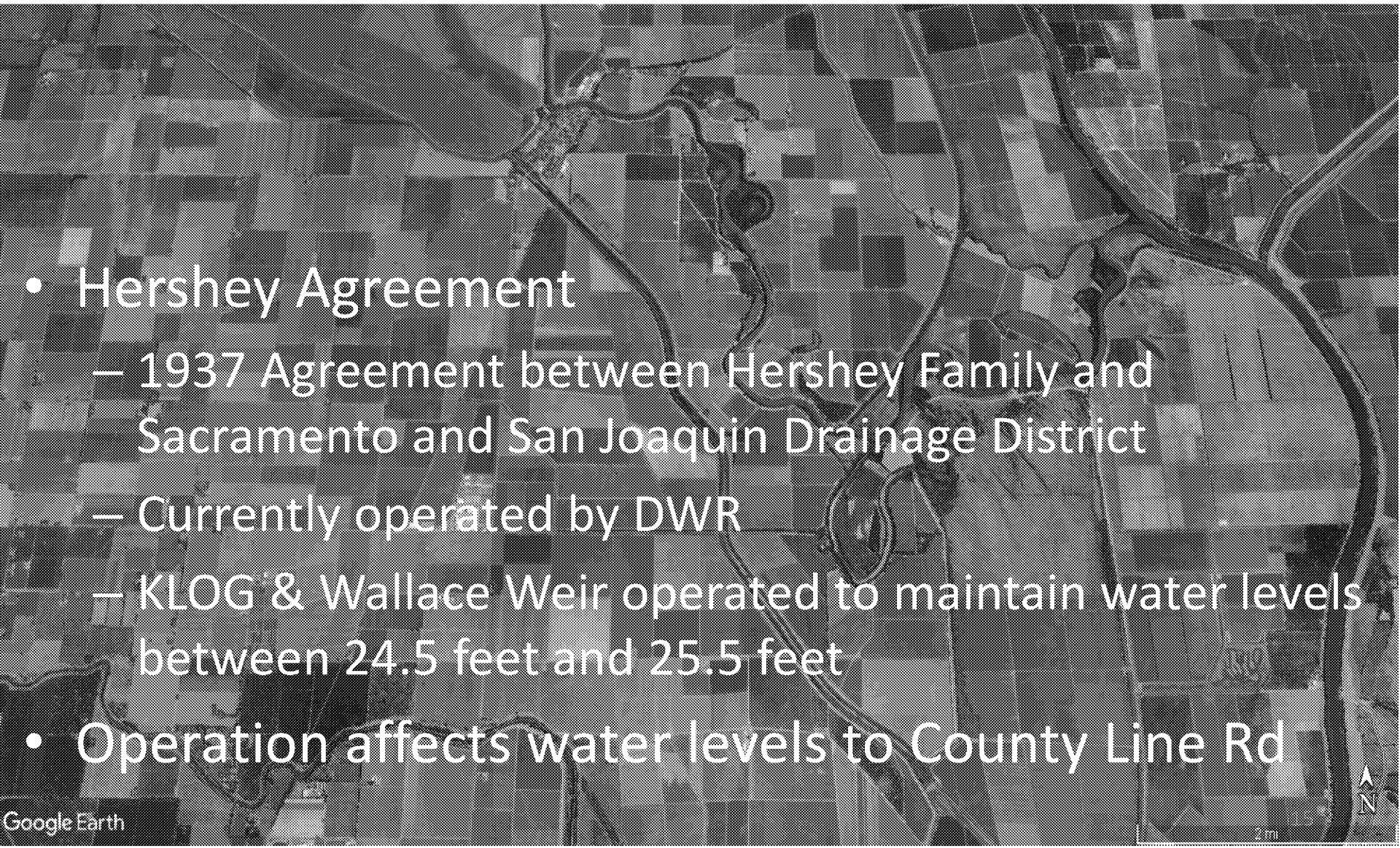
Operational Considerations

Wallace Weir



- Currently Operated by RD 108
- Water level control and fish trap
- Operation coordinated with KLOG

Operational Considerations
KLOG and Wallace Weir



- Hershey Agreement
  - 1937 Agreement between Hershey Family and Sacramento and San Joaquin Drainage District
  - Currently operated by DWR
  - KLOG & Wallace Weir operated to maintain water levels between 24.5 feet and 25.5 feet
- Operation affects water levels to County Line Rd

Alternative 5a –Replaces Delevan Canal/ Pipeline with Canal from the T-C Canal to the CBD - $3.5B

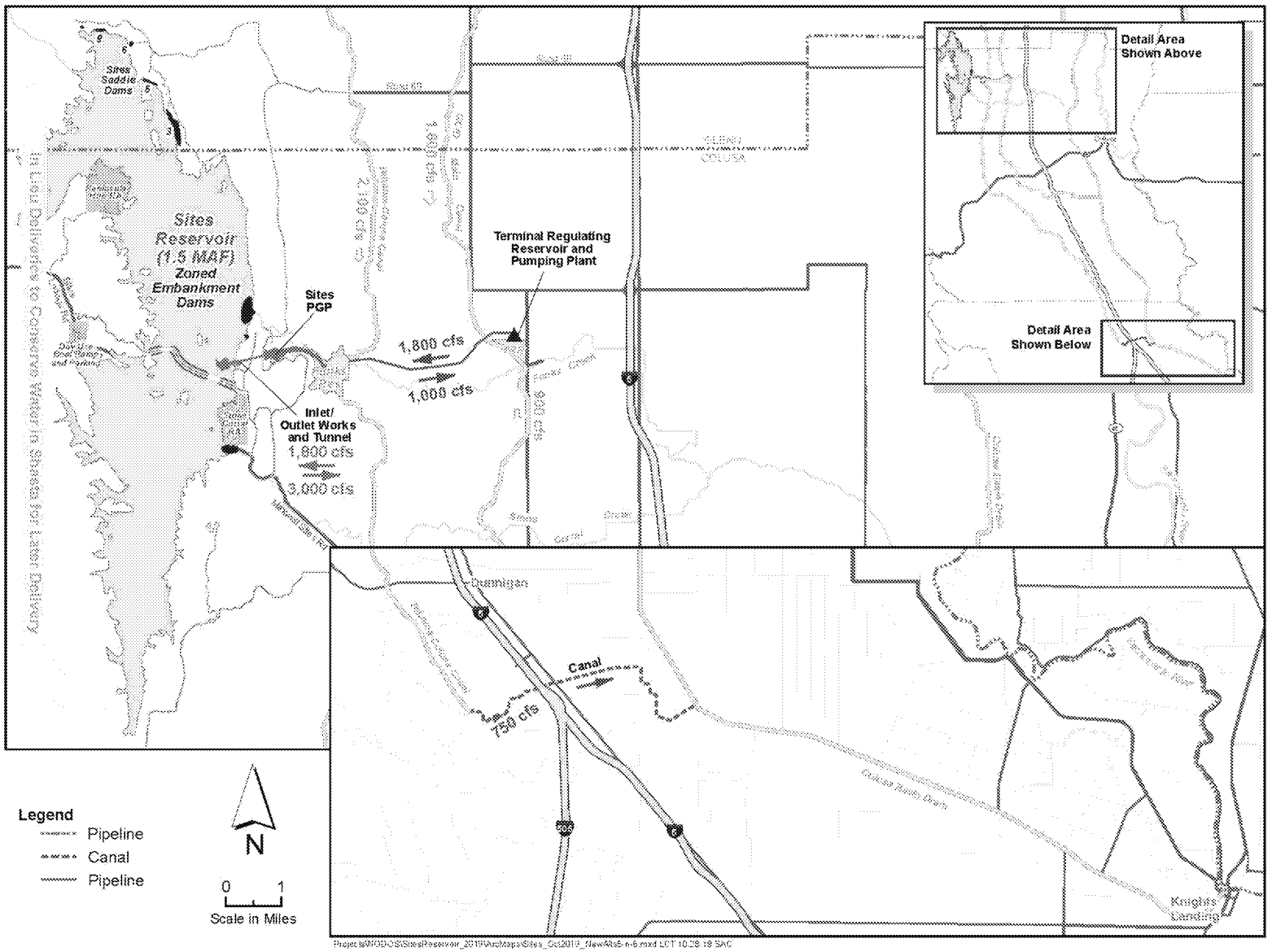
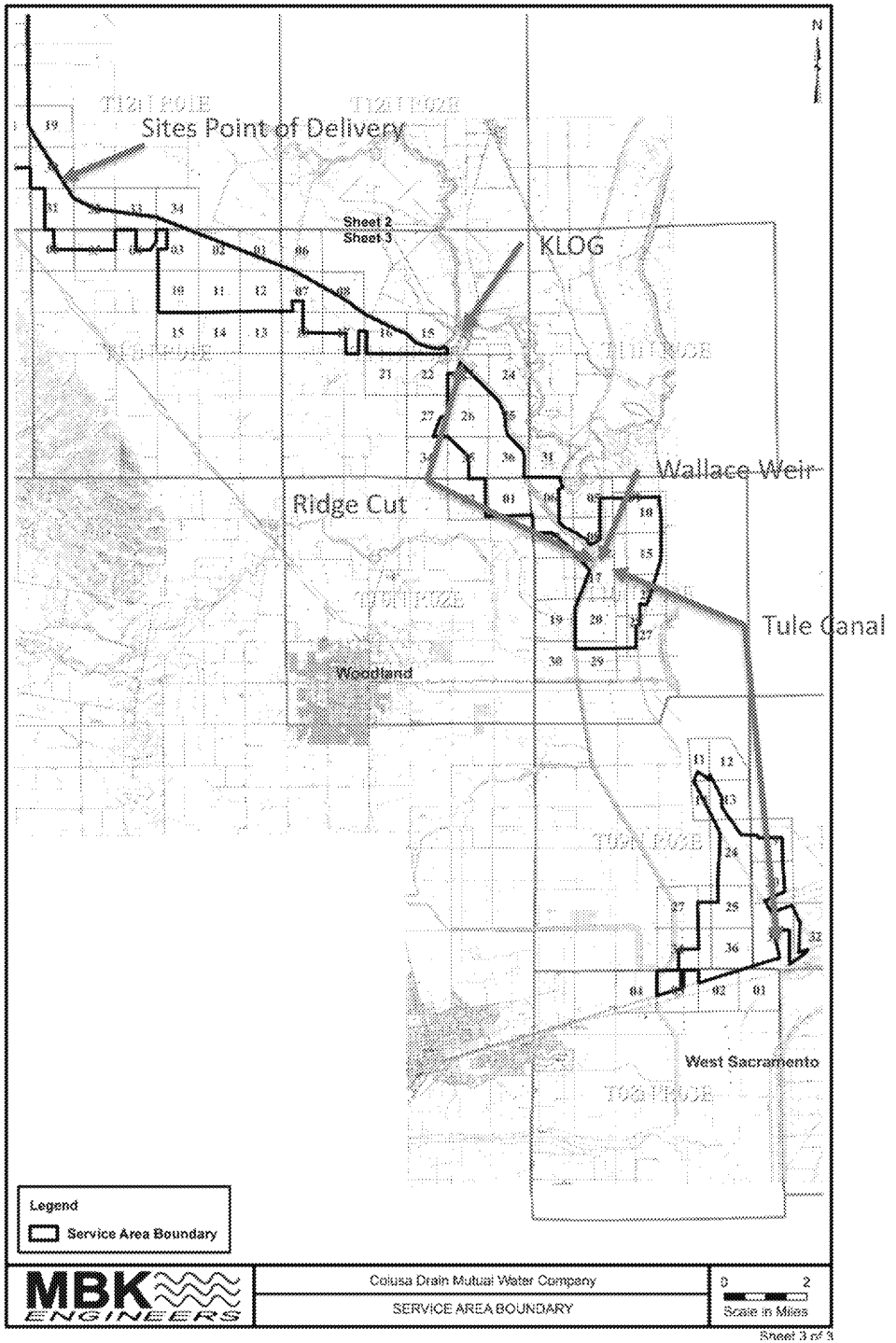


Figure 5a

Operational Considerations

- Colusa Drain MWC
- Water Rights



Operational Considerations

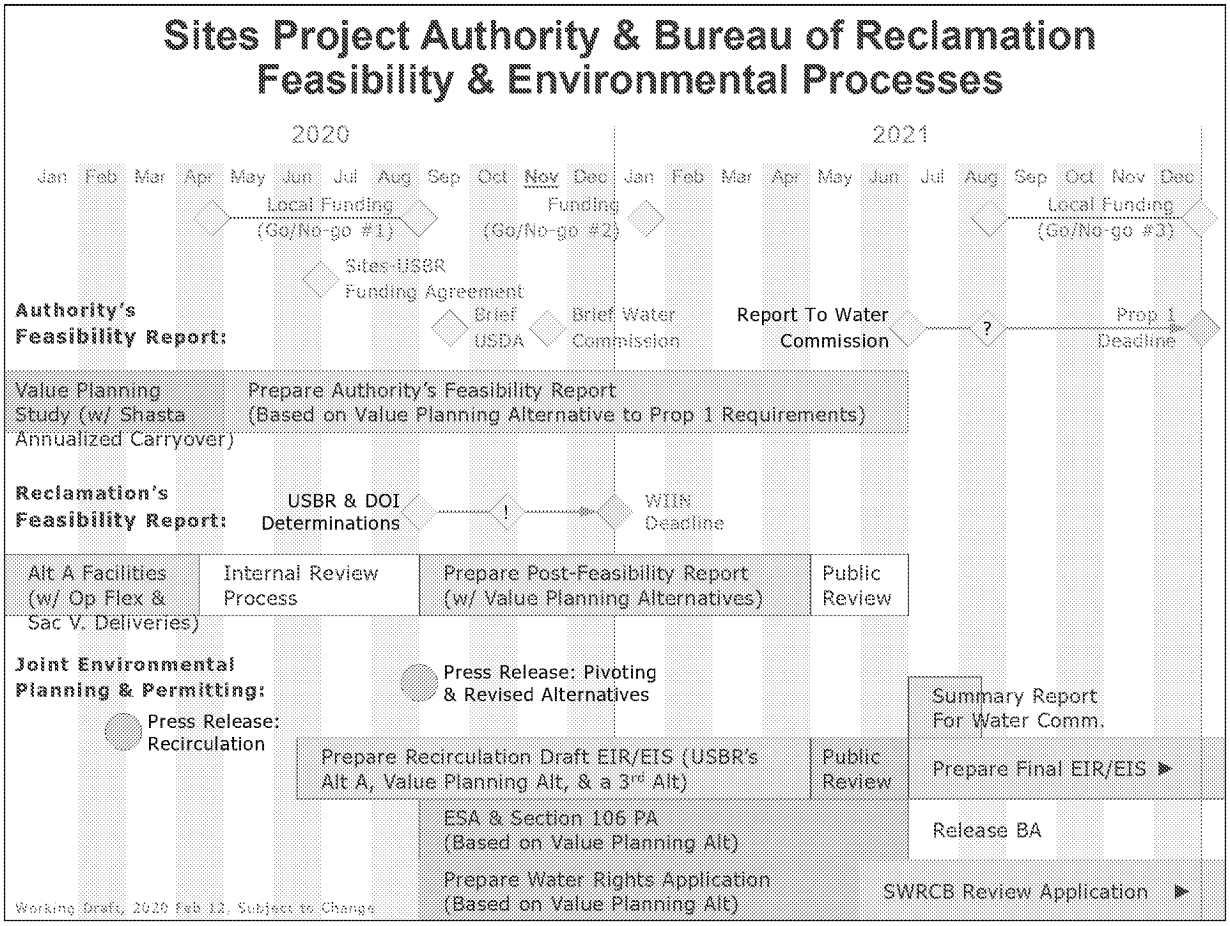
Operational Considerations

- Increased flow = increased water levels
- Potential for seepage and flooding and impacting drainage of fields
  - Upstream of weirs and dams
  - Mostly along western or right bank of Colusa Drain
  - Both sides of Ridge Cut

Questions & Discussion

- Colusa Drain Mutual Water Company
- Water Rights
- Flows
  - Timing
  - Quantity
  - Location
- Water Quality
- Other ???

Sites Project Authority & Bureau of Reclamation Feasibility & Environmental Processes



From: Tull, Robert/SAC [Robert.Tull@jacobs.com]
Sent: 2/14/2020 4:23:56 PM
To: Rob Kunde [rkunde@wrmwsd.com]; Heydinger, Erin [Erin.Heydinger@hdrinc.com]; rcooke1956@gmail.com; Chilmakuri,Chandra Sekhar [cchilmakuri@mwdh2o.com]; ccwd2@frontiernet.net; cwang@mwdh2o.com; druiz@westsidewd.com; jsutton@tccanal.com; RCheng@cvwd.org; tbettner@gcid.net; wvanderwaal@rd108.org; Alicia Forsythe [aforsythe@sitesproject.org]; ckao@valleywater.org; dmarks@scvwa.org; eleitterman@valleywater.org; AFlores@zone7water.com; IReyburn@cvwd.org; RNeudeck@mwdh2o.com; Leaf, Rob/SAC [Rob.Leaf@jacobs.com]; Jim Watson [jwatson@sitesproject.org]; wmercado@zone7water.com
Subject: RE: Sites Reservoir - Operations Work Group Feb 14, 2020 - Agenda and Discussion Materials - CONFIDENTIAL
Attachments: Draft SPA Operations Plan 6_13_16_compiled_optimized.pdf

All,

Attached is the draft Sites Project Operations Plan that was developed in June 2016. The plan was never finalized as it was recognized that additional work would be required, but the draft plan provided the basis for the development of the Sac Valley local preferred alternative D that was included in the public draft EIR/EIS and the CWC WSIP application.

Let me know if you have any questions.

Thanks,
Rob

From: Rob Kunde <rkunde@wrmwsd.com>
Sent: Thursday, February 13, 2020 12:23 PM
To: Heydinger, Erin <Erin.Heydinger@hdrinc.com>; rcooke1956@gmail.com; Chilmakuri,Chandra Sekhar <cchilmakuri@mwdh2o.com>; ccwd2@frontiernet.net; cwang@mwdh2o.com; druiz@westsidewd.com; jsutton@tccanal.com; RCheng@cvwd.org; Tull, Robert/SAC <Robert.Tull@jacobs.com>; tbettner@gcid.net; wvanderwaal@rd108.org; aforsythe@sitesproject.org; ckao@valleywater.org; dmarks@scvwa.org; eleitterman@valleywater.org; AFlores@zone7water.com; IReyburn@cvwd.org; RNeudeck@mwdh2o.com; Leaf, Rob/SAC <Rob.Leaf@jacobs.com>; Jim Watson <jwatson@sitesproject.org>; wmercado@zone7water.com
Subject: [EXTERNAL] Sites Reservoir - Operations Work Group Feb 14, 2020 - Agenda and Discussion Materials - CONFIDENTIAL

Ladies and Gentlemen:

Attached find the Agenda and 2 attachments for discussion on tomorrow's conference call. I recommend you review the appropriate North of Delta or South of Delta attachment prior to the call.

Robert J. Kunde, P.E.

Retired Annuitant

Wheeler Ridge-Maricopa Water Storage District

12109 Highway 166, Bakersfield, CA 93313

cell: 661-345-3719 email: rkunde@wrmwsd.com

From: Heydinger, Erin
Sent: Monday, February 10, 2020 1:44 PM
To: Heydinger, Erin; rcooke1956@gmail.com; cchilmakuri@mwdh2o.com; ccwd2@frontiernet.net; cwang@mwdh2o.com; druiz@westsidewd.com; jsutton@tccanal.com; RCheng@cvwd.org; robert.tull@jacobs.com;

tbettner@gcid.net; wvanderwaal@rd108.org; aforsythe@sitesproject.org; ckao@valleywater.org; dmarks@scvwa.org; eleitterman@valleywater.org; AFlores@zone7water.com; IReyburn@cvwd.org; RNeudeck@mwdh2o.com; Leaf, Rob/SAC; Jim Watson; wmercado@zone7water.com; Rob Kunde
Subject: Sites Ad-Hoc Operations Work Group
When: Friday, February 14, 2020 2:00 PM-4:00 PM.
Where: Webex Conference Call and Screenshare

Hi all,
Below is the call-in and screen share information for the Operations WG. If you are using your computer and dialing in on your phone, please be sure to turn the volume down on your computer and mute your computer microphone to avoid feedback.
Thanks!
Erin
Erin Heydinger, PE, PMP
HDR
2379 Gateway Oaks Dr, #200
Sacramento, CA 95833
D 916.679.8863 M 651.307.9758

hdrinc.com/follow-us

-- Do not delete or change any of the following text. --

When it's time, join your Webex meeting here.

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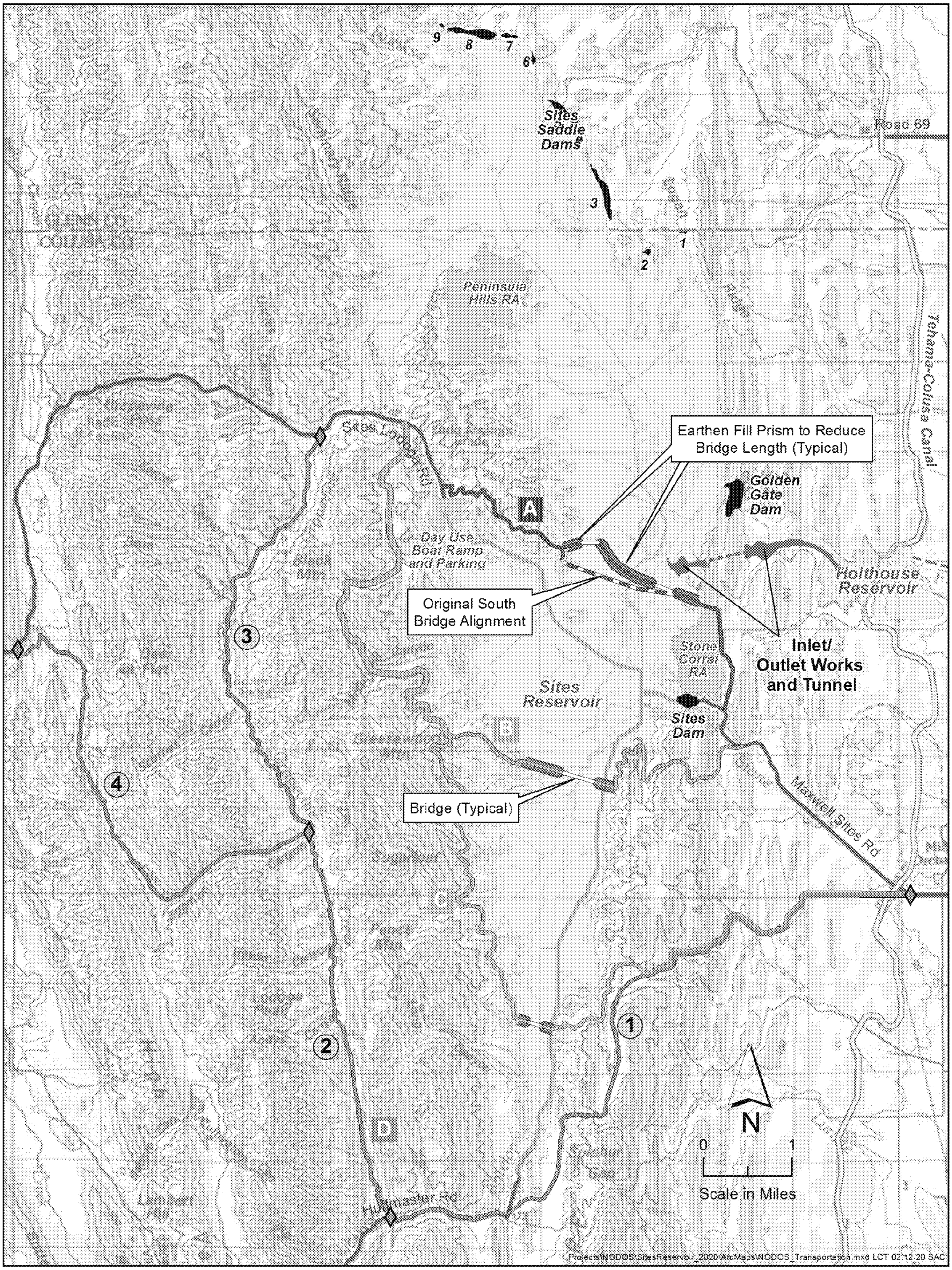

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Appendix F: Engineering Facilities

F.1 Roads and Bridge

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 F-1.

Table F-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..

F.2 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.

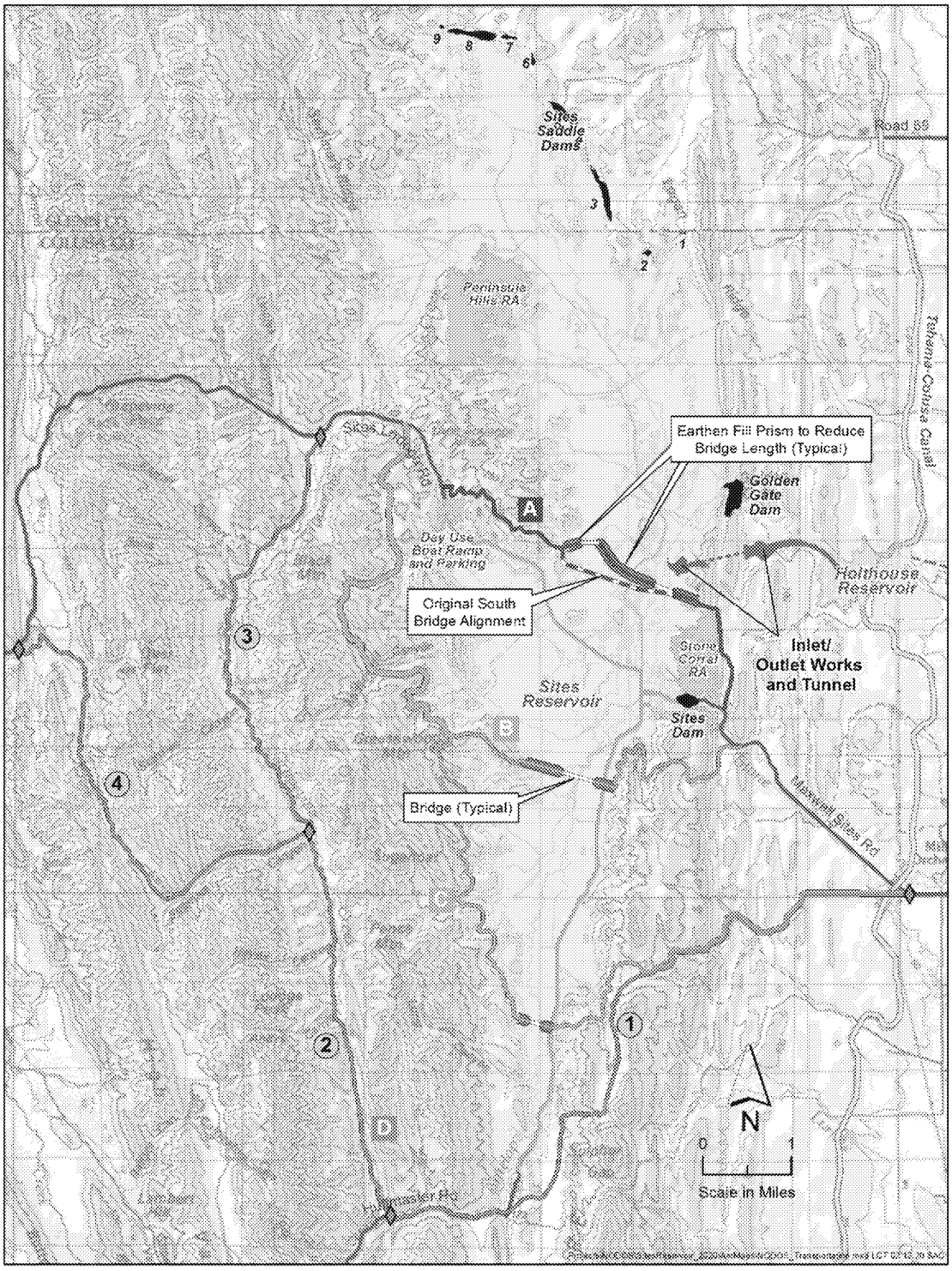

Figure F-1. Public Transportation Route Alternatives

Table F-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 = Roadway Hinge Point Elevation		Road	Reservoir Crossing			Tunnel	Phase 1 Total	Phase 2 (to 1.8 MAF)	Total Phase 1 & 2	Total Blue Alternative
					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
1.8	520	530		$45	1500	$46	$105	$0	$196	NA	$196	$196

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

Table F-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

From: Boling, Robert M. [Robert.Boling@hdrinc.com]
Sent: 2/19/2020 3:18:31 PM
To: Alicia Forsythe [aforsythe@sitesproject.org]; Jim Watson [jwatson@sitesproject.org]
Subject: RE: Sites - Organizational Assessment Table Format
Attachments: 20200210_Service Area D-E-F_Org Assessment SummaryJJS_lwh.docx

Here is the info for the env table. I am also working on putting together a table for all of the recommendations that we can use as a tracking tool. I will take a stab at populating the entire table and send it to everyone to provide comments to but that will take place after this set of board meetings.

From: Alicia Forsythe [mailto:aforsythe@sitesproject.org]
Sent: Tuesday, February 18, 2020 9:32 AM
To: Boling, Robert M. <Robert.Boling@hdrinc.com>; Jim Watson <jwatson@sitesproject.org>
Subject: Fwd: Sites - Organizational Assessment Table Format

Here's what I have started for the organizational assessment.

Ali

———————
Alicia Forsythe | Environmental Planning and Permitting Manager | Sites Reservoir Project | 916.880.0676 | aforsythe@sitesproject.org | www.SitesProject.org

From: Alicia Forsythe <aforsythe@sitesproject.org>
Sent: Monday, February 10, 2020 3:49 PM
To: John Spranza (john.spranza@hdrinc.com); Laurie Warner Herson; Heydinger, Erin
Subject: Sites - Organizational Assessment Table Format

Hi all – Attached is a table format that I was thinking of using for the response to the organizational assessment. You'll see the table at the front end and then text below.

A few things –
1. Can you help me fill in some of the boxes? Would it help for me to schedule a quick discussion and go thru the table, discuss approach, and then we assign out who will fill in what box? Some of this isn't clearly Planning or Permitting or Operations, but a mix of all three.
2. I am undecided if we need the text below to add more than can fit in the table. Let's talk. I stopped filling out the text as I was feeling like it was redundant.

Take a quick look and let me know if we should schedule some time to talk this through.

I am hoping to have a draft to share with Gary at lunch on February 19 (a week from Wednesday).

Ali

Alicia Forsythe | Environmental Planning and Permitting Manager | Sites Reservoir Project | 916.880.0676 | aforsythe@sitesproject.org | www.SitesProject.org

Response to Organization Assessment for
Service Area D (Operations), E (Environmental Planning) and F (Environmental Permitting) –

February 10, 2020

Action #	Summary of Action	Activities Completed To Date	On-going and Suggested Future Activities to Address Recommendation	Priority (High, Medium, Low)	Target Completion Date
1.1	Prepare an analysis of the major regulatory decisions being made regarding flow in the Sacramento River and Delta and determine flow-related permitting strategy with identification of risks	Have we done anything on this previously? Maybe cumulative section in EIS/EIR Permitting strategy memo was prepared by ICF in May 2019 and updated through CDFW meetings in fall/winter 2019. A revised version that will include RC on LTO BiOp is pending a Rob Leaf update on CalSim modeling of that as new baseline.	Staff will review prior related materials and prepare the analysis identified.	High	May 2020

Action #	Summary of Action	Activities Completed To Date	On-going and Suggested Future Activities to Address Recommendation	Priority (High, Medium, Low)	Target Completion Date
1.2	Prepare an analysis of the major comments received on the draft EIR/S. Identify approach to addressing those comments and working with specific commenters.	[redacted] On March 29, 2019, Jacobs provided memo including Draft EIR/EIS Comments Matrix, Master Response Topics, Key Comment Letter Summaries, and draft Initial Responses On April 12, 2019 strategy meetings were initiated with ICF, Reclamation and Authority to address overall approach as well as specific topics. Based on these strategy sessions, an outline for the Final EIR/EIS was prepared and an approach for responding to comments, including master responses to comments was identified and forwarded to both CEQA (Authority) and NEPA (Reclamation) legal counsel. On June 5, 2019 – ICF provided master response annotated outlines and commenced preparing responses. At the same time, the Authority EPP began meeting with key commenters, (e.g., CDFW, NRDC, Humboldt County, etc.) to clarify issues of concern.	[redacted] Depending on the outcome of the Value Planning process, the work that has been done to date in responding to comments will be utilized in either the completion of a Final EIR/EIS or in preparing a Recirculated Draft EIR/EIS. Assuming recirculation of the Draft EIR/EIS is the preferred approach to address VP alternatives, ICF is in the process of preparing a strategy/work plan to be completed in April 2020. The Authority EPP will also continue outreach to Draft EIR/EIS commenters and Agencies.	High	[redacted] Completed under original work plan, to be updated April 2020

Action #	Summary of Action	Activities Completed To Date	On-going and Suggested Future Activities to Address Recommendation	Priority (High, Medium, Low)	Target Completion Date
1.3	Identify legal requirements of the environmental laws that Sites will be required to comply with.	~~Forward to the remaining list that is in the Draft EIR/S~~ Preliminary list of permit requirements and other approvals were included ~~Completed~~ in the Draft EIR/EIS released in August 2017.	Update with new regulations during Phase 2 work in 2020	Medium	Dec 2020
1.4	Establish a permitting flow chart with realistic timelines.	In 2019, the Environmental Planning and Permitting team developed and maintained an MS Project schedule.	• Environmental Planning and Permitting team along with the Operations and Engineering teams is currently developing a detailed project schedule focusing on activities thru the end of 2021. • Develop planning / permitting flow chart and add in key dates from schedule effort. • Present summary schedule and flow chart to Res Com and Board and then track progress monthly thereafter.	High	• April 2020 Res Com and Board meetings – Detailed and summary schedule completed along with flow chart • On-going – Track and report on progress

Action #	Summary of Action	Activities Completed To Date	On-going and Suggested Future Activities to Address Recommendation	Priority (High, Medium, Low)	Target Completion Date
1.5	Prepare analysis of the draft EIR/S for use by all of the permitting agencies to issue permits upon the finalization of the EIR/S. Identify schedule for document completion.	[redacted] A preliminary list of permit requirements and other approvals were included in the Draft EIR/EIS released in August 2017. To the extent possible, the Draft EIR/EIS addressed environmental topics related to future permits.	• Analysis – As the team works to develop a revised project description and revise the Draft EIR/EIS, the permitting agency comments will be reviewed in response to Action 1.2 and a regulatory agency technical team will be formed in response to Action 2.4. These two efforts will collectively address the analysis request in this action. • Schedule – See Action 1.4 for schedule development.	Addressed thru other Action Items	--
2.1	Develop an interest, science based permitting strategy.	[redacted] Permitting strategy memo for operations and construction of the project was prepared by ICF in May 2019 and updated by the team through CDFW meetings in fall/winter 2019. A revised operations version of the strategy will include RC on LTO BiOp is pending a Rob Leaf update on CalSim modeling of that as new baseline.	Jacobs is updating CalSim code that will be used to formulate an updated operation permitting strategy for value planning alternative. No need to update construction as current strategy is being successfully implemented with agencies.	High	Sept 1 2020

Action #	Summary of Action	Activities Completed To Date	On-going and Suggested Future Activities to Address Recommendation	Priority (High, Medium, Low)	Target Completion Date
2.2	Determine when appropriate for project staff and governance members to be involved in the permitting process and at what level.	--	This is addressed on a case-by-case, situation-by-situation basis.	No Action	--
2.3	Determine if overall project provides a "net environmental benefit" beyond cold water pool in Shasta. If yes, then work to get agency and NGO buy in.			High	December 2020

Action #	Summary of Action	Activities Completed To Date	On-going and Suggested Future Activities to Address Recommendation	Priority (High, Medium, Low)	Target Completion Date
2.4	Establish a regulatory agency technical advisory committee at the staff level that meets regularly.	Ad-hoc Environmental Workgroup meets regularly to discuss permitting issues. Starting in July 2019 an executive committee for permitting (Fritz Durst, Thad Bettner, Doug Headrick, Ali Forsythe and Jim Watson) met monthly with CDFW executives to discuss state permitting items and concerns. Starting in July 2019 an Integration team (John Spranza), Sites EPP and ICF key staff met regularly with CDFW and USFWS counterparts to discuss permitting items and concerns. [redacted]	A regulatory agency technical team will be established in spring / early summer 2020 as environmental planning and permitting activities are restarted.	High	June 2020

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Action #	Summary of Action	Activities Completed To Date	On-going and Suggested Future Activities to Address Recommendation	Priority (High, Medium, Low)	Target Completion Date
3.1	Quantify and get agreement from the state and feds as to what the benefits are to an integrated operation with the SWP and CVP.		• Development of a revised operational scenario is scheduled to be completed in ___. • Modeling and analysis to quantify benefits of the revised operational scenario is scheduled to be completed in -------. • With the above information, Sites staff can engage in meaningful discussions with the agency staff as to the benefits of an integrated operation with the SWP and CVP.	High	
9.1	Prepare a Board briefing on the comparative costs of mitigation from comparable projects to help determine a level of reasonableness.	Mitigation cost technical memorandum was prepared by CH2M Hill in 2016 for the proposed project. Additional mitigation cost reviews were prepared in October of 2019 and February 2020 for the Value Planning Process.	Mitigation planning and a class 4 cost estimate are scoped to occur in Phase 2 (late 2020/early 2021) and will use the preferred Value Planning Alternative.	Low	Late 2020

Commented [SJ1]: This should be moderate or high.

Action #	Summary of Action	Activities Completed To Date	On-going and Suggested Future Activities to Address Recommendation	Priority (High, Medium, Low)	Target Completion Date
14.1	Concerns with the structure and information flow from the CDFW discussions.		• Hold more frequent Environmental and Permitting Work Group meetings to provide updates on the CDFW efforts. • Continue to provide updates at the Operations Work Group meetings on the CDFW efforts.	High	
15.1	Prepare a discussion paper on what lessons have been learned by other similar projects that can potentially be adopted for use by the Sites Project.			Medium	

Notes:

1. ANY NOTES HERE

NOTE – I STARTED FILLING IN THIS SECTION BELOW, BUT AM NOT SURE THAT IT ADDS A TON OF VALUE. LETS TALK TO SEE IF THE TABLE ABOVE IS ENOUGH.

Action 1.1, High Priority, May 2020 Target Completion Date

Action 1.1 – Prepare an analysis of the major regulatory decisions being made regarding flow setting in the Sacramento River and the Sacramento/San Joaquin Delta and show how the Sites Reservoir inflows and outflows fit into that decision-making process. Include in the analysis how Sites and Water Fix are connected (or not) as well as how the SWRCB flow setting for the Sacramento and San Joaquin Rivers fits (or not) with Sites. It is critical to understand when it makes the most sense to seek Sites permits that relate to flow setting. If there is a desire to proceed with major uncertainties exist, then provide the risk assessment that addresses that.

- **Activities Completed To Date:** John, have we done anything on this previously? Maybe cumulative section in EIR/S?
-
- **On-going and Suggested Future Activities to Address Recommendation:** Staff will review prior related materials and prepare the analysis identified.
- **Status:** On-going

Action 1.2, High Priority, XXX Target Completion Date

Action 1.2 – Prepare an analysis of the major comments received on the draft EIR/S and lay out how the project team intends to address those comments. Also, lay out a strategy on how the Sites team will approach the commenters who have made major comments that have the potential to stop or delay the project (both governmental and non-governmental entities).

- **Activities Completed To Date:** [redacted]
- **On-going and Suggested Future Activities to Address Recommendation:** [redacted]
- **Status:** XX

Action 1.3, XXX Priority, XXX Target Completion Date

Action 1.3 – Lay out the legal requirements of the environmental laws that this project is required to meet (i.e., the requirements of the state and federal Endangered Species Acts to meet the hierarchical test of: 1) avoid impacts, 2) then minimize, 3) then mitigate; the federal Clean Water Act to identify the least environmentally damaging alternative; then state and federal Historic Preservation Acts, etc.).

- **Activities Completed To Date:** XX
- **On-going and Suggested Future Activities to Address Recommendation:** XX
- **Status:** XX

Action 1.4, High Priority, April 2020 Target Completion Date

Action 1.4 – Establish a flow chart that shows how this project will be permitted and realistic timelines to secure permits based on real world experiences.

- **Activities Completed To Date:** In early 2019, the Environmental Planning and Permitting team developed a MS Project schedule for the planning and key permitting efforts. This schedule was periodically updated through 2019.

- **On-going and Suggested Future Activities to Address Recommendation:** • Environmental Planning and Permitting team along with the Operations and Engineering teams is currently developing a detailed project schedule focusing on activities thru the end of 2021. This schedule is now in a Primavera format, which allows for more detailed tracking of critical path items and schedule float and also allows for cost weighting.
- **Status:** XX

Action 1.5, XXX Priority, XXX Target Completion Date

Action 1.5 – Prepare an analysis of the existing draft EIR/S and confirm that the document can be used by all of the permitting agencies to issue permits upon the finalization of the EIR/S. Lay out the schedule to complete a revised draft EIR/S.

- **Activities Completed To Date:** XX
- **On-going and Suggested Future Activities to Address Recommendation:** XX
- **Status:** XX

Action 2.1, XXX Priority, XXX Target Completion Date

Action 2.1 – Develop a permitting strategy as part of a Strategic Plan that instructs staff and the governance members on the philosophy behind permitting with the goal of moving permitting agencies and non-governmental groups (NGOs) from an attitude of "No!" to "How can we make the Sites Reservoir Project work?" Need a strategy based on interest-based discussions as opposed to positional based or simply consensus philosophy. Need to approach permitting agencies and NGOs with well thought out proposals that are based by science that can withstand anticipated challenges.

- **Activities Completed To Date:** XX
- **On-going and Suggested Future Activities to Address Recommendation:** XX
- **Status:** XX

Action 2.2, XXX Priority, XXX Target Completion Date

Action 2.2 – Provide a risk analysis that discusses when it is appropriate for the project staff and governance members to be involved in the permitting process and at what level. For example, when would it be appropriate for governance members to seek permitting decisions through what could be perceived as a political level rather than through the normal technical staff.

- **Activities Completed To Date:** XX
- **On-going and Suggested Future Activities to Address Recommendation:** XX
- **Status:** XX

Action 2.3, XXX Priority, XXX Target Completion Date

Action 2.3 – Decide if there is enough information from draft environmental documents to define project scenarios that could be used to make the case that the overall project provides a "net environmental benefit" (i.e., focus beyond cold water pool in Shasta to how the storage could allow the 21 project investors to provide a new environmental benefits compared to their current operations). If yes, then do so and get permitting agency and environmental NGO buy in.

- **Activities Completed To Date:** XX

- **On-going and Suggested Future Activities to Address Recommendation:** XX
- **Status:** XX

Action 2.4, XXX Priority, XXX Target Completion Date

Action 2.4 – Establish a regulatory agency technical advisory committee at the staff level (i.e., with the regulatory staff who will review the next Draft EIR/S and ultimately issue permits) who will meet regularly (suggest monthly) with project staff to identify a project that is going to be permittable and to guide the project's environmental review documents and findings.

- **Activities Completed To Date:** XX
- **On-going and Suggested Future Activities to Address Recommendation:** XX
- **Status:** XX

Action 3.1, XXX Priority, XXX Target Completion Date

Action 3.1 – Quantify and get agreement from the state and feds as to what the benefits are to an integrated operation with the SWP and CVP.

- **Activities Completed To Date:** XX
- **On-going and Suggested Future Activities to Address Recommendation:** XX
- **Status:** XX

Action 9.1, Low Priority, XXX Target Completion Date

Action 9.1 – Prepare a Board briefing on the comparative costs of mitigation from comparable projects to help determine a level of reasonableness.

- **Activities Completed To Date:** JOHN – Can you add here what we have done both in the feasibility study and in the value planning effort??
- **On-going and Suggested Future Activities to Address Recommendation:** John – what can we say here about what we are doing now for Value Planning Effort? Next steps for that? In addition, once alternatives are selected for the Recirculated EIR/EIS effort, an additional analysis would be completed to ensure that mitigation obligations are comparable to comparable project impacts and a briefing / presentation summarizing the findings of this analysis will be presented to the Board. The analysis and presentation are expected to be completed late 2020.
- **Status:** XX

Action 14.1, XXX Priority, XXX Target Completion Date

Action 14.1 – There is some anxiety with the discussions and project description changes being agreed in smaller meetings with the CDFW that are not being fully relayed to the rest of the critical decision makers. Address this issue head on with all of the players involved in the CDFW discussions with the other governance members to understand concerns and provide clarity and acceptance that the process continues with the same players.

- **Activities Completed To Date:** XX
- **On-going and Suggested Future Activities to Address Recommendation:** XX
- **Status:** XX

Action 15.1, XXX Priority, XXX Target Completion Date

Action 15.1 – Prepare a discussion paper on what lessons have been learned by other similar projects that have succeeded and can potentially be adopted for use by the Sites Project. (Limit this to environmental planning, permitting, and operations for the purpose of this effort)

- **Activities Completed To Date:** XX
- **On-going and Suggested Future Activities to Address Recommendation:** XX
- **Status:** XX

From: Heydinger, Erin [Erin.Heydinger@hdrinc.com]
Sent: 2/26/2020 9:05:54 AM
To: Spranza, John [John.Spranza@hdrinc.com]; Alicia Forsythe [aforsythe@sitesproject.org]
Subject: RE: Ops Topics

I could go either way on this. Tull will add to the memo, and I think with his help we could develop a graphic or something similar that would outline the overall Shasta exchanges concept, what types of parameters affect exchanges, etc. Something like that would probably work for the April package. That said, it might still be helpful to sit down with Thad and talk about the overall strategy and his vision for how we move forward in discussions with Reclamation.

Ali – what do you think?

Erin Heydinger PE, PMP
D 916.679.8863 M 651.307.9758

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From: Spranza, John <John.Spranza@hdrinc.com>
Sent: Wednesday, February 26, 2020 8:57 AM
To: Heydinger, Erin <Erin.Heydinger@hdrinc.com>; Alicia Forsythe <aforsythe@sitesproject.org>
Subject: RE: Ops Topics

Hi,
As I missed part of the exchange conversation in yesterday's meeting I wanted to check and see if Tull is planning on putting a whitepaper (or equivalent) together for his results prior to me sending an email out requesting the meeting discussed below.
Thanks.

John Spranza

D 916.679.8858 M 818.640.2487

From: Heydinger, Erin
Sent: Wednesday, February 19, 2020 10:47 AM
To: Spranza, John <John.Spranza@hdrinc.com>; Alicia Forsythe <aforsythe@sitesproject.org>
Subject: RE: Ops Topics

This is still outstanding. We did talk to Tull about adding a couple of paragraphs to the front of his Shasta Exchanges memo on the overall principles/concepts, but I think this meeting is still needed.

Thanks!

Erin Heydinger PE, PMP
D 916.679.8863 M 651.307.9758

hdrinc.com/follow-us

From: Spranza, John <John.Spranza@hdrinc.com>
Sent: Wednesday, February 19, 2020 10:24 AM
To: Heydinger, Erin <Erin.Heydinger@hdrinc.com>; Alicia Forsythe <aforsythe@sitesproject.org>
Subject: RE: Ops Topics

Erin,
I had an action item to have you and I meet with Tull and Thad to get a handle on the Shasta exchange and produce a whitepaper on the exchange. Is that covered below or is it still outstanding? I was going to put an email together today but wanted to make sure it had not already been addressed before I did that.

John Spranza

D 916.679.8858 M 818.640.2487

From: Heydinger, Erin
Sent: Tuesday, February 18, 2020 10:37 AM
To: Alicia Forsythe <aforsythe@sitesproject.org>
Cc: Spranza, John <John.Spranza@hdrinc.com>
Subject: Ops Topics

Hi Ali,

Here's what I had in my notes for discussion topics with Rob. The first item highlighted in yellow we didn't talk about – we talked about getting together with Thad and working through it, but I am wondering if we also ask Tull to add to his draft memo more information on the principles of how the exchange works. We got a partial answer to the second highlighted item on the WG call Friday. Not sure we need to dive in to it today, and maybe we can cover it in our two Ops Plan meetings.

1. Schedule two meetings to work on Ops Plan and document relevant modeling assumptions
2. Schedule recurring (weekly or bi-weekly) meetings?
3. Stony Creek memo update with unconstrainted diversion criteria and more explanation on capacity issues
4. Schedule – 5 months for full modeling suite
5. Schedule on Value Planning – results needed by end of week, document development can come over next couple of weeks
6. Shasta Exchanges – ask Rob to add more detail on the overall principle to memo?
7. Discuss how the model treats CVP/SWP water – heard on Friday it is treated as project water. How does this impact the timing of releases from a modeling perspective? Do they also assume water moves during the transfer window?
8. Revised TO reviewed by Jacobs yet? Need to get reviews done more quickly for next TO.

One other item I wanted to follow up on with you was whether we ask Donna to give her COA 101 presentation to the team? I can ask her for some dates if we think it would be helpful.

Thanks!
Erin

Erin Heydinger, PE, PMP
Asst. Project Manager
Water/Wastewater

HDR
2379 Gateway Oaks Dr, #200
Sacramento, CA 95833
D 916.679.8863 M 651.307.9758

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From: William Vanderwaal [wvanderwaal@rd108.org]
Sent: 2/28/2020 11:35:35 AM
To: Frederiksen, Lee E. [Lee.Frederiksen@hdrinc.com]; Alicia Forsythe [aforsythe@sitesproject.org]; Rob Kunde [rkunde@wrmwsd.com]
Subject: CBDD documents
Attachments: MBK memo on Wallace Weir and CBD ops.pdf; 14-1036_KLOG_Historic_Flow_Analysis_012015.pdf; 16-1002_Wallace_Weir_Flood_Impact_Assessment_2016_0525.pdf; 16-1002_Wallace_Weir_WSE_Changes_2016-0711.pdf

All,
Here are some of the documents done for the design of KLOG and Wallace Weir.

Cheers
Bill V

William R Vanderwaal, PE*
Deputy Manager – Reclamation District #108
Manager – Dunnigan Water District
Cell Phone – (530) 812-6276
(*CA & WA)

MBK ENGINEERS

Water Resources • Flood Control • Water Rights

MEMORANDUM

DATE: December 27, 2004

TO: File

FROM: Gary Kienlen

SUBJECT: Operation of the Knights Landing Outfall Gates and Knights Landing Ridge Cut

The Knights Landing Outfall Gates (Outfall Gates) were originally constructed as part Reclamation District 108's (R.D. 108) Sacramento River levee project. The Knights Landing Ridge Cut (Ridge Cut) and the Colusa Drain were originally constructed in order to alleviate a drainage problem in the Lower Colusa Basin resulting from return flows from expanding irrigation from the Sacramento River. Together the Outfall Gates and a structure at the lower end of the Ridge Cut, known as the Wallace Weir, serve to control water levels in the lower end of the Colusa Drain and the Ridge Cut during the irrigation season.

The Outfall Gates and the Wallace Weir have the ability to back water up approximately 22 miles to near the town of College City. In doing so, these facilities allow for irrigation of approximately 8,600 acres within the Colusa Drain Mutual Water Company as well as many other acres of agricultural lands, wetlands and habitat. The purpose of this memorandum is to briefly describe the operation of these structures.

<u>Knights Landing Outfall Gates</u>

The Outfall Gates are located at the terminus of the Colusa Drain approximately 0.3 miles northwest of the town of Knights Landing at Sacramento River Mile 34.15; also referred to as the Colusa Basin Drain, Colusa Basin Drainage Canal or RD 2047 Drain. This is the approximate location where the Lower Sycamore Slough joined the Sacramento River. Historically high flows from the Sacramento River would back up into Lower Sycamore Slough and similar channels. R.D.108 was formed in 1870 and immediately began construction of a levee from Knights Landing to Upper Sycamore Slough. The levee, approximately 40 miles in length, was completed in the spring of 1871 and closed or dammed a number of sloughs which provided openings in the natural river bank. Wooden headgates were constructed at Lower Sycamore Slough near Knights Landing which prevented high flows from entering the slough while allowing water to be released to the river at lower flows. Originally constructed in the 1920's, the modern Outfall Gates were rebuilt by the Department of Water Resources (DWR) in 1985. As currently configured the Outfall Gate structure consists of eight 66-inch automated gates and two 48-inch hand-operated gates. Flap gates are installed on the downstream end of the structure in order to block flow from the Sacramento River into the Colusa Drain at times when the water levels in the River are higher than that in the drain. The Outfall Gates are operated and maintained by DWR's Sacramento Maintenance Yard.

The automated gates are controlled by computers based on the water levels in the Colusa Drain and the Sacramento River. The algorithm used to raise and lower these gates limits their operation to one minute per hour. The automated gates are used to maintain the upstream water levels at times when the water surface elevation in the Sacramento River is lower than in the Colusa Drain. The hand-operated gates are used during flood conditions.

DWR began measuring the flow through the Outfall gates in the early 1940's. After the reconstruction of the Outfall Gates in 1985 developed a computer program to calculate the flow through the gates based on the water surface elevations measured at DWR's Colusa Drain at Knights Landing and Sacramento River at Knights Landing gages. All data required to calculate flows through the Outfall Gates can be accessed remotely by DWR. DWR's Sutter Maintenance Yard maintains the facilities to record and calculate the flow through the Outfall Gates.

DWR attempts to operate the Outflow Gates to maintain a water level of not less than 24.5 feet United States Engineering Datum (USED, also known as U.S. Army Corp of Engineers Datum) to facilitate irrigation in the Lower Colusa Drain and Ridge Cut. DWR also is mandated to keep the water level in the Colusa Drain below 25.5 feet USED. Water levels higher than 25.5 feet USED result in flooding of agricultural lands along the west side of the Colusa Drain.

Knights Landing Ridge Cut

The Knights Landing Ridge Drainage District was formed on April 30, 1913 under a special act of the legislature. The purpose of the District was to develop a plan to provide drainage for water that ponded between the back levees of Reclamation Districts 108, 479 and 787 and high ground to the west and south, the Knights Landing Ridge. The Knights Landing Ridge consists of a broad strip of elevated land built up by overflow from Cache Creek. This ridge separates the Colusa Basin from the Yolo Basin. The Ridge Cut was constructed by dredging through the Knights Landing Ridge for a distance of approximately seven miles. As constructed the Ridge Cut is 400 feet wide at its lower end with a maximum flow depth of about 20 feet. The design capacity was estimated to be about 20,000 cfs with water surface elevations

at 39 feet USED at Knights Landing and 34.5 feet USED at the Yolo Bypass. The current capacity of the Ridge Cut is unknown.

Construction of the Ridge Cut was completed prior to September 1915. The initial plans for the Ridge Cut included a structure at the Colusa Drain to control the flow to the south. This structure was never constructed. Water ceases to flow into the Ridge Cut when the water surface falls below about 21 feet USED. Elevations lower than about 23 feet cause problems for irrigators that pump water from the lower Colusa Drain.

As stated above DWR operates the Outfall gates to maintain water levels in the Colusa Drain and the Ridge Cut between 24.5 feet USED and 25.5 feet USED during the irrigation season. When the Ridge Cut was constructed material from the dredging was used to form embankments or small levees on the east and west sides of the cut. The east levee was connected to the west levee of the Yolo Bypass. At this point low dike was constructed and a plug was constructed in the west borrow pit. Leveling pipes equipped with 42-inch Calco gates were installed in the plug to control flows to the Wallace Ditch for irrigation purposes. The easements for the construction of the west levee of the Yolo Bypass and its connection to the eastern embankment of the Ridge cut are contained in an Option and Agreement between the Hershey et. al. and the Sacramento and San Joaquin Drainage District dated July 17, 1937. According to the easement agreement, the dike and plugs at the lower end of the Ridge Cut were to be constructed to maintain water levels at no greater than 25.5 feet USED. The plug in the western borrow channel of the Ridge cut is referred to locally as the Wallace Weir. A similar structure is also installed in the eastern borrow channel at the head of an irrigation ditch leading due east from the Ridge Cut.

The easement Agreement states that once the dike was constructed by the Sacramento and San Joaquin Drainage District it was up to Hershey to maintain. Historically, the dike has removed during the winter months to alleviate flooding problems along the Ridge Cut and Lower Colusa Drain. In recent years the dike at end of the Ridge Cut has remained in place. As identified above, the current capacity of the Ridge Cut is unknown. Growth of vegetation and lack of maintenance within the Ridge Cut and the borrow channels have resulted in more frequent and longer duration of flooding of the lands along western bank of the Ridge Cut and right or south bank of the Lower Colusa Drain.

/ KLRC MEMO DRAFT.DOC

DRAFT TECHNICAL MEMORANDUM

Date:	January 20, 2015
To:	Barry O' Regan, KSN, Inc.
From:	Chris Campbell, MS; Sridhar Ponangi, PE; Chris Bowles PhD, PE
Project:	14-1036 – Knights Landing Outfall Gates Fish Exclusion Project
Subject:	Historic Flow Analysis

The purpose of this Technical Memorandum (TM) is to review historic flows though Knights Landing Outfall Gates (KLOG) and characterize the existing operation during significant floods. This analysis is important for understanding the potential operational affects of the proposed Alaskan Weir during flood stages and informing the flood impact analysis.

KNIGHTS LANDING OUTFALL GATES OPERATION

Flow through KLOG is controlled by eight 66-inch and two 42-inch screw operated slide gates on the Colusa Basin Drain (Colusa Drain) side, and by eight 66-inch and two 42-inch combination flap and slide gates on the Sacramento River side. The configuration provides for control of flows in either direction and allows automatic outflows from Colusa Drain at lower stages in the Sacramento River (see Figure 1).

The operation of the gates is primarily to protect the lower Colusa Basin from backwater of the Sacramento River during floods and to help control water levels in Colusa Drain for irrigation and drainage. The riverside slide gates remain in the closed position year round with the flap gates active (Russell Eckman, Superintendent, Sacramento Maintenance Yard, pers. comm., January 2015). The flap gates discharge water if the Colusa Drain stage is higher than the Sacramento River stage and prevent reverse flow when the Sacramento River stage is higher. The amount of discharge through the gates depends on the number of gates open and the height of gate openings. The riverside slide gates are opened (raised) only for maintenance. Screw operated gates at the upstream end are operated to maintain required pool elevation, currently at 25.5 ft USED (23.73 ft, NAVD88), during irrigation season based on local interests.

In 2012, DWR rehabilitated the KLOG structure to replace the gate flaps, seals, and assemblies. Additionally, outdated motor controllers and nonfunctional water level sensors were replaced. The new control system and other existing water level sensors along the Sacramento River provide greater flexibility in the operation of the gates to protect Colusa Basin Drain from the backwater effects of the

Sacramento River and maintain the required pool elevation on the Colusa Drain side for irrigation. The rehabilitation project has no impact to the operations of the structure.

HISTORIC FLOW ANALYSIS

An analysis of the KLOG historic flow record[1], available from Water Data Library gauge Colusa Basin Drain at Knight's Landing (A02945), was undertaken to characterize the existing operation of KLOG during significant floods. In addition, flow and stage data from the following gauges (see Figure 1) was obtained and evaluated as a part of the analysis:

- Gauged stage (A02200) Sacramento River at Knights Landing
- Gauged stage (A02495) Colusa Drain at Knights Landing
- Gauged and estimated[2] flow (A02939) Ridge Cut Slough @ Knights Landing

Figures 2, 3, 4 and 5 show the flow and stage data for four historic flood events (1986, 1997, 2006, 2011) when the stage in Sacramento River near Knights Landing exceeded 37.0 ft USED (35.7 ft NAVD88). This monitor stage is defined as the water level corresponding to "flood" or "high water period" flows (USACE, 1957). The figures confirm that the DWR calculated flow data is consistent with the operations of KLOG whereby a positive head difference between the Colusa Drain and Sacramento River results in flow through the structure and a negative head prevents any flow through the structure due to the sealed flap gates.

During these flood events, the stage in the Sacramento River was consistently higher than Colusa Drain at the peak of the flood wave, resulting in no flow through the KLOG structure. However, at far ends of the rising and/or falling limbs, there are instances where Colusa Drain water levels are higher than the stage in Sacramento River resulting in flow (up to 1,370 cfs during the 4 historic floods) through the KLOG structure. The maximum flow through KLOG based on historic record is 2,220 cfs.

Table 1 summarizes the period and duration of flood wave and gate operation for the historic flood events. Also summarized is the period and duration when flow occurs through KLOG structure during the rising and falling limbs of the flood events, and the maximum daily flows during such periods.

[1] Flow calculations at KLOG are based on flow conditions caused by the gate and flap gate settings of each gate relative to the head difference of the stage of the gauge on Colusa Basin Drain (upstream of the gates) and that of the Sacramento River at Knights Landing gauge (downstream of the gates) (Huckabay, 2012).
[2] Flows for Ridge Cut Slough prior to gauge installation (Dec 2006) estimated by cbec (unpublished).

Table 1. Flows and Gate Operations during historic flood events

Flood Event	Period	Number of days	Date of flood peak	Maximum Daily Flow, cfs	Gate Operation[3]
1986 Flood					
Flood wave[1]	Feb 12, 1986 – May 02, 1986	80	Feb 20, 1986		data not available
Flow [2] during rising limb	Feb 12, 1986 - Feb 13, 1986	2		519	
Flow[2] during falling limb	April 4, 1986 - May 02, 1986	29		774	
1997 Flood					
Flood wave[1]	Dec 04, 1997 – Mar 16, 1997	103	Jan 03, 1997		data not available
Flow[2] during rising limb	Dec 06, 1997 - Dec 07, 1996	2		147	
Flow[2] during falling limb	None	0		0	
2006 Flood					
Flood wave[1]	Dec 17, 2005 – Feb 24, 2006	70	Jan 02, 2006		7 – 66" gates open approximately 1.25 ft on Dec 17 and 18; 7 – 66" gates opened approx. 4.5 ft on Dec 19; 7 - 66" gates fully open starting Dec 20, 2005 through June 19;
Flow[2] during rising limb	Dec 17, 2005 – Dec 20, 2005	4		1,370	
Flow[2] during falling limb	none	0		0	
2011 Flood					
Flood wave[1]	Mar 14, 2011 – May 04, 2011	52	Mar 26, 2011		All gates closed on Mar 14 and 15; On Mar 16, 6 – 66-inch gates

					open approximately 0.5 foot; On Mar 17, 5 – 66-inch gates open approximately 5.25 ft and 1 - 66-inch gate open 4.8 ft; On Mar 18, 4- 66" gates open approximately 5.25 ft and 2 - 66" gate open 2 ft; Mar 19 to Apr 27, 4 - 66" gates mostly open and 1 - 66" gate slightly open 0.25 feet; Apr 28 – May 04, open gates transition to fully closed
Flow[2] during rising limb	Mar 14, 2011 – Mar 15, 2011	2		0.9	
Flow[2] during falling limb	none	0		0	

Notes:
[1] Flood wave refers to stage in Sacramento River as recorded at Sacramento River at Knights Landing (A0220) gauge
[2] Historic flow record, available from Water Data Library gauge Colusa Basin Drain at Knight's Landing (A02945)
[3] Gate opening data from DWR's North Region Office

PRELIMINARY ASSESSMENT OF POTENTIAL IMPACTS DUE TO INSTALLATION OF ALASKAN WEIR

When the stage in Sacramento River is higher than the stage in Colusa Drain, which is typical of four historic observations (see Figures 2, 3, 4, and 5), there is no flow through the KLOG. Therefore, the proposed Alaskan Weir would have an insignificant impact on flow and stage in the Sacramento River and the Yolo Bypass.

However, when flow passes through KLOG, the weir could result in additional head loss given that it is located in the turbulent zone of KLOG, which provides an opportunity for small additional flow into the Yolo Bypass through Knights Landing Ridge Cut (KLRC). Although, a significant portion of the leading and trailing stages in the Sacramento River typically result in zero flow through the KLOG, there are instances occurring 1 -3 weeks prior to and following the flood peaks where flow passes through KLOG (see Table 1).

Hydraulic Model

To inform the preliminary hydraulic assessment, cbec truncated the CVFED RAS model down to the limits of the KLOG channel (between the Ridge Cut Slough and the Sacramento River), using observed water level data and gate operations to verify the performance of the gates in the CVFED RAS model. Two periods, January 30, 2010 - February 20, 2010 and January 08, 2011 - January 14, 2011, when the gate operations were fairly constant (six 66-inch gates fully open) were modeled.

In addition, the following changes were made to the CVFED RAS model to improve model performance:

- KLOG gates were represented as culverts instead of rectangular gates to enable the flap gate option that would prevent reverse flow when stage in the Sacramento River is higher than stage in Colusa Drain.
- Inverts for gate openings were modified based on spring line elevation (NRS, 2014) and diameter of the gate opening. The invert for 66-inch gates was set at 16.75 ft-NAVD88 and the invert for 42-inch gates was set at 17.75 ft-NAVD88.
- To account for the head loss through flap gates, given that HEC-RAS cannot account for this loss directly, the entrance loss coefficients and culvert lengths were adjusted so modeled flows were similar to DWR's published flows. Figure 5 shows the DWR published flows and the modeled flows in 2011. Figure 6 shows the same comparison for the modeled period in 2010.
- The proposed Alaskan weir was incorporated into the model by cbec to account for head loss, and to assess the potential flow reduction through KLOG. The reduction in flow through KLOG indicates additional flux into the Yolo Bypass.

In HEC-RAS, the Alaskan Weir pickets (typically 1-inch in diameter) and openings (1.625-inch wide) were represented as multiple culvert openings through an embankment. The top of the weir was set to 25 ft-NAVD88 based on the preliminary design configurations provided by KSN, Inc. Due to memory and processing limitations of the HEC-RAS software, roughly 80% of the weir openings were included in the model while the remaining flow area was blocked off. This represents a conservative configuration whereby the head loss and the additional flow to Yolo Bypass are slightly over estimated.

Results

Table 2 shows the preliminary results of estimated additional flows to Yolo Bypass via KLRC due to the proposed Alaskan Weir during the two periods modeled.

Table 2. Preliminary hydraulic model assessment of flow diversion to RCS due to fish exclusion weir

Date	Average Daily Flow through KLOG, cfs	Estimated additional daily flows to KLRC, cfs	Percentage of flow diversion due to the weir	Gate Operation
30 Jan, 2010	686	3.4	0.5%	6 gates (66-inch) fully open
31 Jan, 2010	1,277	3.9	0.3%	6 gates (66-inch) fully open
01 Feb, 2010	1,473	5.8	0.4%	6 gates (66-inch) fully open
02 Feb, 2010	1,560	10.1	0.6%	6 gates (66-inch) fully open
03 Feb, 2010	1,612	23.3	1.4%	6 gates (66-inch) fully open
04 Feb, 2010	1,621	34.6	2.1%	6 gates (66-inch) fully open
05 Feb, 2010	1,658	43.3	2.6%	6 gates (66-inch) fully open
06 Feb, 2010	1,097	3.1	0.3%	6 gates (66-inch) fully open
07 Feb, 2010	492	0.5	0.1%	6 gates (66-inch) fully open
08 Feb, 2010	374	2.0	0.5%	6 gates (66-inch) fully open
09 Feb, 2010	381	2.4	0.6%	6 gates (66-inch) fully open
10 Feb, 2010	544	3.1	0.6%	6 gates (66-inch) fully open
11 Feb, 2010	713	3.4	0.5%	6 gates (66-inch) fully open
12 Feb, 2010	1,022	6.6	0.6%	6 gates (66-inch) fully open
13 Feb, 2010	1,205	13.3	1.1%	6 gates (66-inch) fully open
14 Feb, 2010	1,266	28.4	2.2%	6 gates (66-inch) fully open
15 Feb, 2010	1,299	35.7	2.8%	6 gates (66-inch) fully open
16 Feb, 2010	1,306	35.6	2.7%	6 gates (66-inch) fully open
17 Feb, 2010	1,290	37.8	2.9%	6 gates (66-inch) fully open
18 Feb, 2010	1,219	38.6	3.2%	6 gates (66-inch) fully open
19 Feb, 2010	1,086	37.3	3.4%	6 gates (66-inch) fully open
20 Feb, 2010	981	37.4	3.8%	6 gates (66-inch) fully open
08 Jan, 2011	280	6.2	2.2%	6 gates (66-inch) fully open
09 Jan, 2011	477	7.5	1.6%	6 gates (66-inch) fully open
10 Jan, 2011	512	10.6	2.1%	6 gates (66-inch) fully open
11 Jan, 2011	578	12.3	2.1%	6 gates (66-inch) fully open
12 Jan, 2011	655	16.4	2.5%	6 gates (66-inch) fully open
13 Jan, 2011	657	15.2	2.3%	6 gates (66-inch) fully open
14 Jan 2011	586	14.3	2.4%	6 gates (66-inch) fully open

Results of the preliminary hydraulic assessment indicate that the additional flow to KLRC, due to the Alaskan Weir, is a small portion (< 5 percent) of flow through the KLOG. The head loss through the weir is 0.30 ft under maximum flow of 1,658 cfs through the KLOG on Feb 5, 2010 which appears reasonable given the conservative nature of the weir configuration as discussed before.

Using a conservative value of 5 percent, the estimated maximum daily flow diverted to Yolo Bypass during the four floods is as follows:

- 1986 flood: 38.7 cfs (5 percent of 774 cfs)
- 1997 flood: 8 cfs (5 percent of 147 cfs)
- 2006 flood: 69 cfs (5 percent of 1370 cfs)
- 2011 flood: 0.05 cfs (5 percent of 0.90 cfs)

The cumulative volume of additional flow to Yolo Bypass during the period of flood wave relative to the cumulative volume to Yolo Bypass over the Fremont Weir (CDEC station: FRE) is summarized below:

- 1986 flood: Fremont Weir flow data not available for comparison
- 1997 flood (Dec 04, 1997 – Mar 16, 1997): 16.3 ac-ft vs. 7,821,312 ac-ft (< 0.01 %)
- 2006 flood (Dec 17, 2005 – Feb 24, 2006): 334 ac-ft vs. 4,369,488 ac-ft (< 0.01 %)
- 2011 flood (Mar 14, 2011 – May 04, 2011): 0.10 ac-ft vs. 2,383,868 ac-ft (< 0.01 %)

Based on this assessment, the volume of flow diverted to Yolo Bypass is insignificant and should not affect peak stages during a flood.

However, the flow diversion estimates are preliminary and would depend on stage in Colusa Drain, stage in the Sacramento River and gate operations. Hydraulic model analysis of the 100-year flood would provide an accurate assessment of any potential impacts to flow and stage in Sacramento River and Yolo Bypass. To perform such an analysis, the following approach is proposed:

- CVFED Combined RAS model (includes Upper and Lower) will be used to simulate 100-year recurrence interval event. We will verify that the KLOG in the CVFED RAS model reflects the historic gate operation and modify as necessary. According to DWR, 1997 flood flows and stages represent 100-year flood hydrology in the Sacramento Basin. CVFPO 100-year flood hydrology will be obtained or compiled to inform the hydraulic model.
- We will verify that KLOG gauge flows simulated in the RAS model reasonably match observed operations.
- Additional head loss factor will be accounted for on the river side to reflect the Alaskan Weir under project conditions.
- Results from the 100-year flood model under existing and project conditions will be compared to check that the hydraulic impacts due to the proposed Alaskan Weir are insignificant for the duration of the 100-year flood, whereby small head losses result in slightly more water moving into the Yolo Bypass on the leading and trailing limbs of the flood wave. Comparisons will be made at key index points within the system.

REFERENCES

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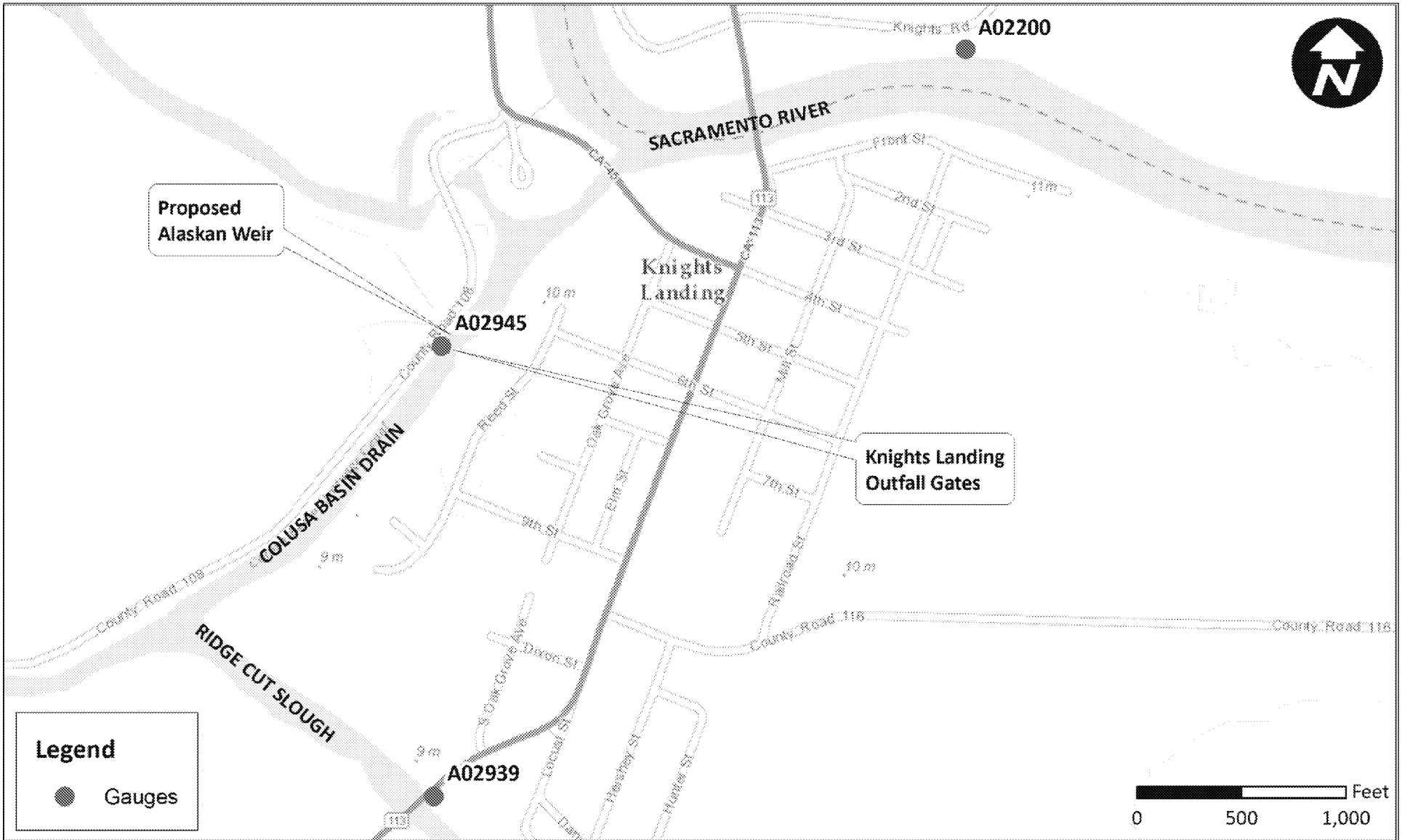
Huckabay, Pat. 2012. Metadata on A02945 – Colusa Basin Drain at Knights Landing gauge. Water Data Library, California Department of Water Resources. May 23, 2012.

USACE. 1957. Unit No. 162 – Knights Landing Outfall Gates. Supplement to Standard Operations and Maintenance Manual. Sacramento River Flood Control Project. Prepared by U.S. Army Corps of Engineers, Sacramento District. August 1957.

Natural Resource Scientists (NRS). 2014. "Knights Landing Outfall Gates" power point presentation. Dated November 6, 2014.



Notes:

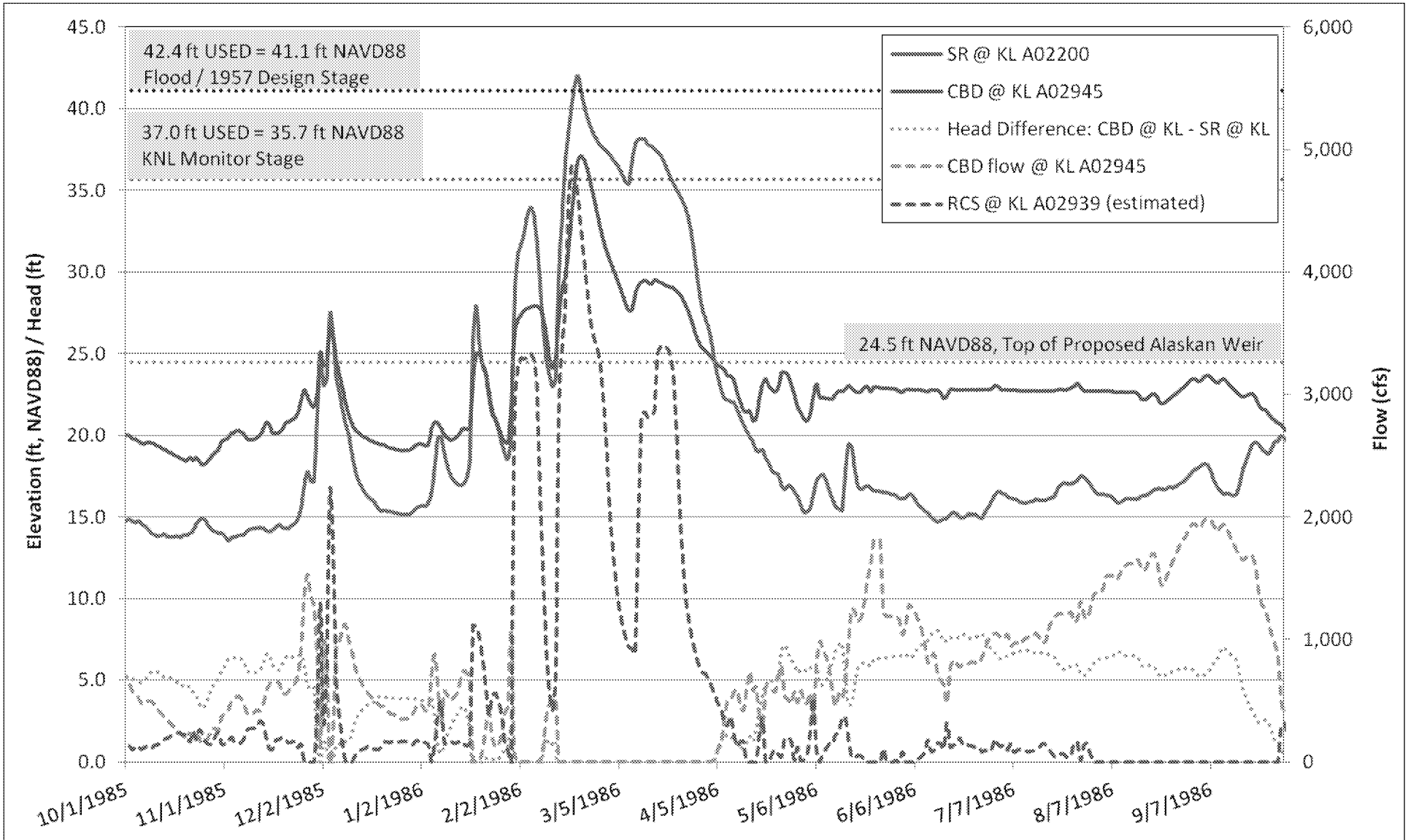
cbec

Knights Landing Outfall Gates Fish Exclusion Project

Location of Gauges

Project No. 14-1036 | Created By: SP | **Figure 1**

C:\Work\Projects\14-1036_KLOG\Reporting\TM_1\Fig_1_gage_locs.docx
1/20/2015



Notes:

Knights Landing Outfall Gates Fish Exclusion Project

KLOG flow and stage data – water year 1986

Project No. 14-1036	Created By: SP	**Figure 2**

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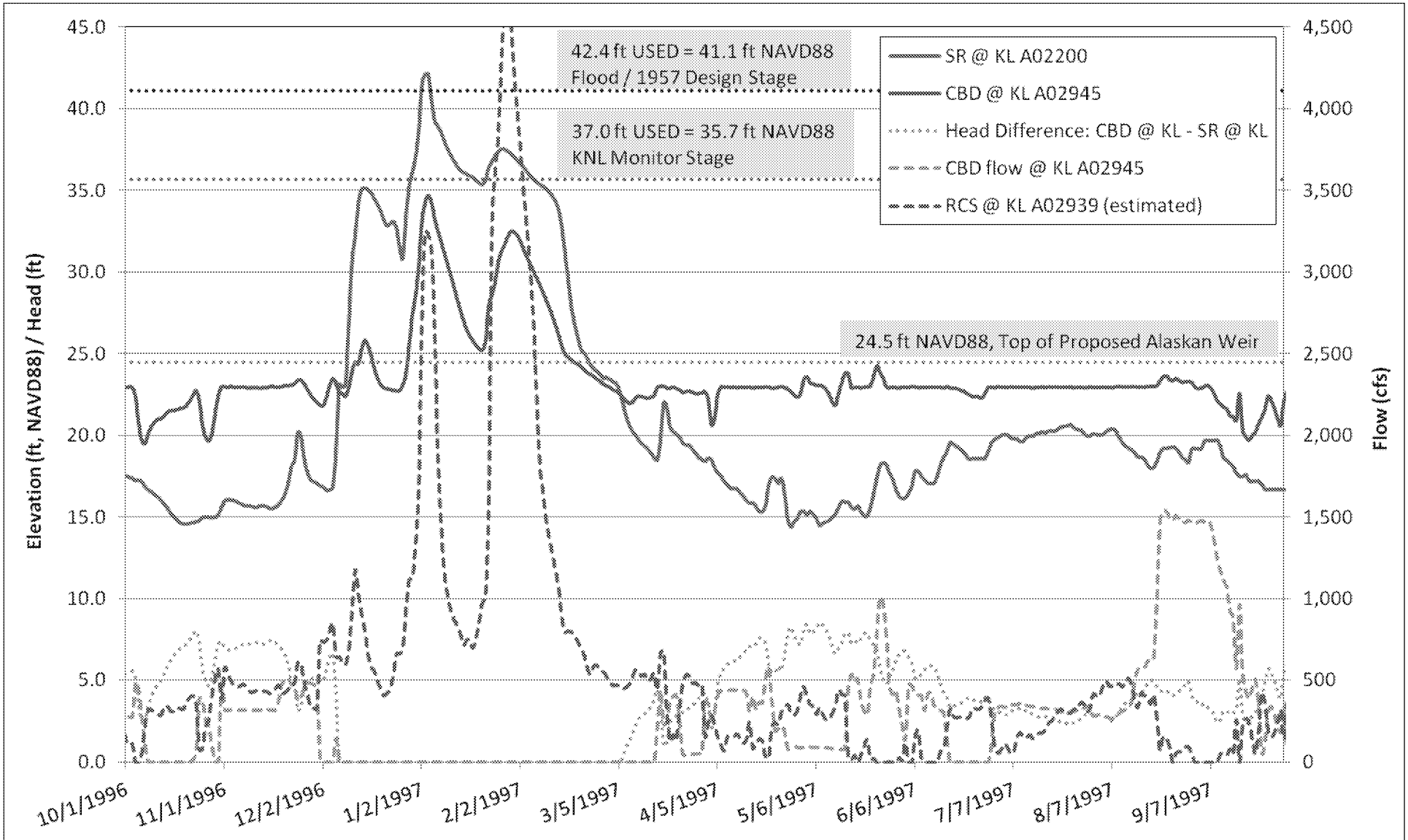
1/20/2015



Notes:

Knights Landing Outfall Gates Fish Exclusion Project

KLOG flow and stage data – water year 1997

Project No. 14-1036	Created By: SP	**Figure 3**

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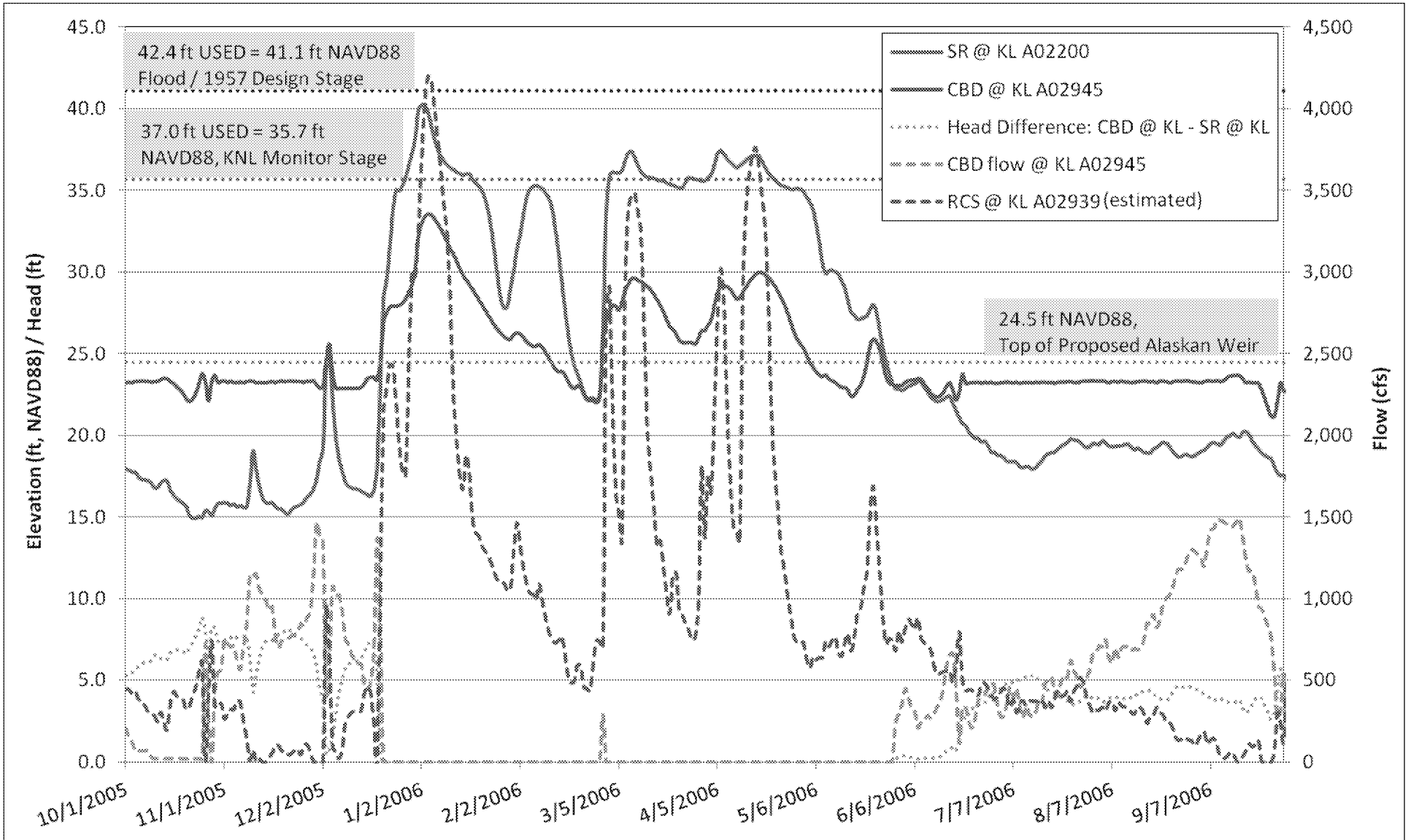
1/20/2015



Notes:

Knights Landing Outfall Gates Fish Exclusion Project

KLOG flow and stage data – water year 2006

Project No. 14-1036	Created By: SP	**Figure 4**

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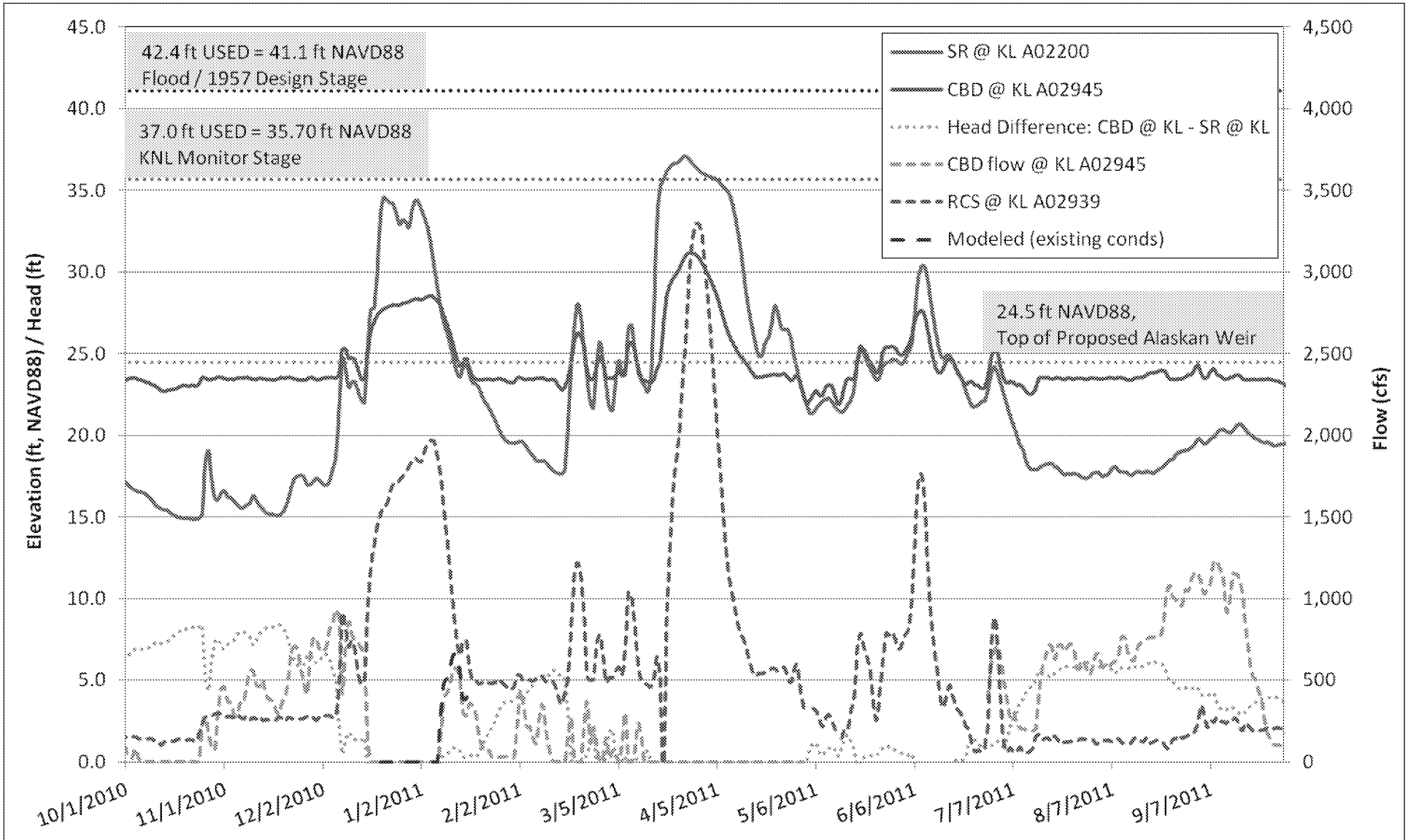
1/20/2015



Notes:

Knights Landing Outfall Gates Fish Exclusion Project

KLOG flow and stage data – water year 2011

Project No. 14-1036 | Created By: SP | **Figure 5**

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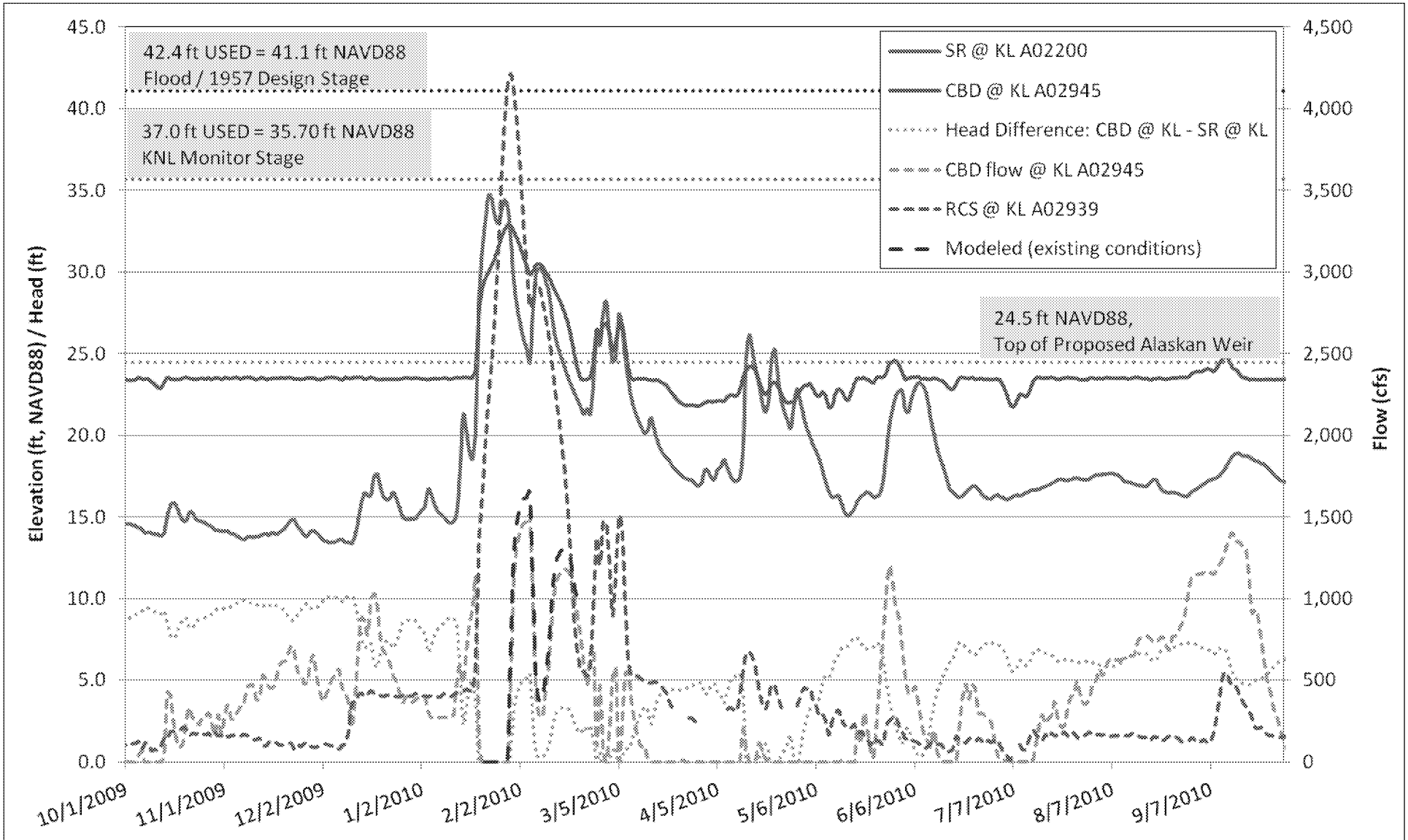
1/20/2015



Notes:

Knights Landing Outfall Gates Fish Exclusion Project

KLOG flow and stage data – water year 2010

Project No. 14-1036	Created By: SP	**Figure 6**

C:\Work\Projects\14-1036_KLOG\Reporting\TM_1\Fig_6_wy20110.docx
1/20/2015

TECHNICAL MEMORANDUM

Date:	April 21, 2016
To:	Barry O'Regan (KSN)
From:	Sridhar Ponangi, Chris Campbell
Project:	16-1002 – Wallace Weir Fish Rescue Facility
Subject:	DRAFT Flood Impact Assessment

1 INTRODUCTION

This Technical Memorandum (TM) describes the modeling approach and results of the flood impacts assessment conducted to support the US Army Corps of Engineers (USACE) 408 Certification, the Yolo County Flood Hazard Development Permit, and the Central Valley Flood Protection Board (CVFPB) Encroachment Permit for the proposed Wallace Weir Fish Rescue Facility (Project). The Project includes replacement of the existing weir structure at the terminus of Knights Landing Ridge Cut (KLRC) at the Yolo Bypass with operable gates, fish barriers, and a fish collection facility. Based on the results of the hydraulic analysis, it can be concluded that the project will not increase water surface elevations of the design flood event by more than 0.10 feet along KLRC.

2 MODEL DEVELOPMENT

A key component of this assessment was the use of a hydraulic model to evaluate the potential impacts to water levels during the design flood due to the construction of the Project. A one-dimensional (1D) hydraulic model of KLRC was developed in HEC-RAS 4.1. to perform the assessment. Key elements of the hydraulic model development are discussed below. All elevations in this TM are referenced to the North American Vertical Datum of 1988 (NAVD88) in feet.

2.1 GEOMETRY

The hydraulic model prepared to support the flood assessment included the KLRC below County Road 16 bridge and portions of Yolo Bypass, which were derived from the Central Valley Floodplain Evaluation and Delineation (CVFED) HEC-RAS model (Figure 1). The KLRC reach extends from RM 7.13 (just upstream of Hwy 113 bridge crossing) to RM 0.570 while the Yolo Bypass reach extends from RM 54.261 (3,900 feet north of Wallace Weir) to RM 52.059 (8,700 feet south of Wallace Weir). The KLRC reach in

the CVFED model terminates just upstream of the existing Wallace weir and did not include the structure. The KLRC reach was therefore extended approximately 800 feet downstream to capture the existing weir and the proposed relocation of Wallace Weir. The KLRC was extended using cross sections prepared by cbec for the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (DWR, in draft) and supplemented with recent survey data collected by DWR North Region Office (NRO) in October 2015 (Figure 1). The extended KLRC reach is connected to the Yolo Bypass cross sections using lateral weirs on the east side (river left) such that flow in excess of channel/weir capacity flows across the agricultural fields. An inline weir was added to the CVFED model (Figure 2(a)) to represent the current Wallace Weir configuration typical of winter conditions when the gates on the 28-foot rectangular opening are fully open and the earthen berm is partially degraded in preparation for the flood season (pers. comm. with John Brennan, Knaggs Ranch, LLC, on February 4, 2016).

The Project conditions geometry (Figures 2(b)(c)) was based on preliminary design drawings prepared by KSN (dated February 2016) and reflects the following design features:

- Two 33.5-foot gate openings with inverts set at 20.83 feet, and one 33.5-foot gate opening with invert set at 16.5 feet; separated by 2-foot thick walls (see Figure 2 (b))
- Gate crest elevation was assumed to be at the proposed upstream road deck elevation of 26.2 feet per preliminary design drawings.
- Six 16-foot wide fish barriers (pickets) separated by 1.5-foot thick walls. Four bays have invert elevations set at 17.7 feet (assuming 6-inch protrusion when the screens are in down position during flood conditions) and two have invert elevations set at 15.7 feet (see Figure 2(c)). The fish barriers are approximately 16-foot wide and maintain a height of 18-inches above the downstream water surface when in the raised position.
- Proposed hardened road crossing with an upstream crest set at 28.2 feet with a 1-foot thick road deck.
- Proposed access road / field berm north of Wallace Weir set to 27.8 feet.
- Channel transition from the downstream end of the fish barrier sill 100 feet wide to the existing channel geometry 200 feet downstream and 30 feet wide.

2.2 ROUGHNESS

The cross sections added to the RAS model to extend KLRC channel in the vicinity of the existing Wallace Weir assumed roughness values consistent with the CVFED cross sections for the KLRC, i.e. 0.035 for the low flow channels and 0.047 for overbank areas. Under project conditions, a roughness value of 0.015 was assumed for cross-sections that represented the gate and fish barrier structure while the remaining cross sections had roughness values similar to the existing conditions.

2.3 BOUNDARY CONDITIONS

Based on DWR communication with US Army Corps of Engineers (USACE) (Meegan G. Nagy, SPK on November 2, 2015), 1957 design flows and stages prepared for the Sacramento River Flood Control

Project were adopted for the flood impact assessment. The 1957 design profiles assume 20,000 cfs along KLRC and 343,000 cfs along the Yolo Bypass between Fremont Weir and KLRC (Figure 1).

The downstream end of the RAS model is 8,700 feet south of Wallace Weir. An interpolated stage of 35.5 feet USED (or 34.25 feet NAVD88) was used assuming a USED to NAVD88 adjustment of -1.25 feet per DWR (see Appendix A).

At the request of upstream landowners, two additional flows were simulated in the model: 4,000 cfs and 10,000 cfs in KLRC. The 4,000 cfs event represents an observed flow condition on 1/3/2006 as derived from TUFLOW model outputs for the Yolo Bypass from the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project. The 10,000 cfs event represents a hypothetical flow condition outside of the range of measured flows on KLRC. Both flow profiles assumed 203,000 cfs in the Yolo Bypass between Fremont Weir and KLRC and a downstream boundary condition of 32.5 feet NAVD88 as derived from the TUFLOW model on 1/3/2006.

The model was simulated as an unsteady model by incorporating the flows and stages as constant time series. During a typical flood season, the operable gates and picket barriers will be in the raised position to facilitate fish rescue operations, which require varied operations of the operable gates to force water (by gravity) into the fish rescue facility intake. The operable gates are designed to pass 4,000 cfs from KLRC during Fremont Weir non-overtopping conditions. When KLRC flows are greater than 3,800 cfs, all three operable gates are in a lowered positioned. If Fremont Weir is forecasted to overtop, all operable gates and pickets will be in the lowered position. An unsteady approach was used over a steady state approach because of steady state convergence issues with flow over the RAS lateral weirs on the left bank of KLRC between station 0.810 and 0.570. It should be noted that the maximum water surface elevations WSEs occurred during the initial time steps ("warm up period") leading up to the model reaching its stable condition. Therefore, the existing and project WSEs at the end of the simulation period (when flows and WSEs are stable) were compared to evaluate hydraulic impacts, if any, of the proposed project.

3 RESULTS

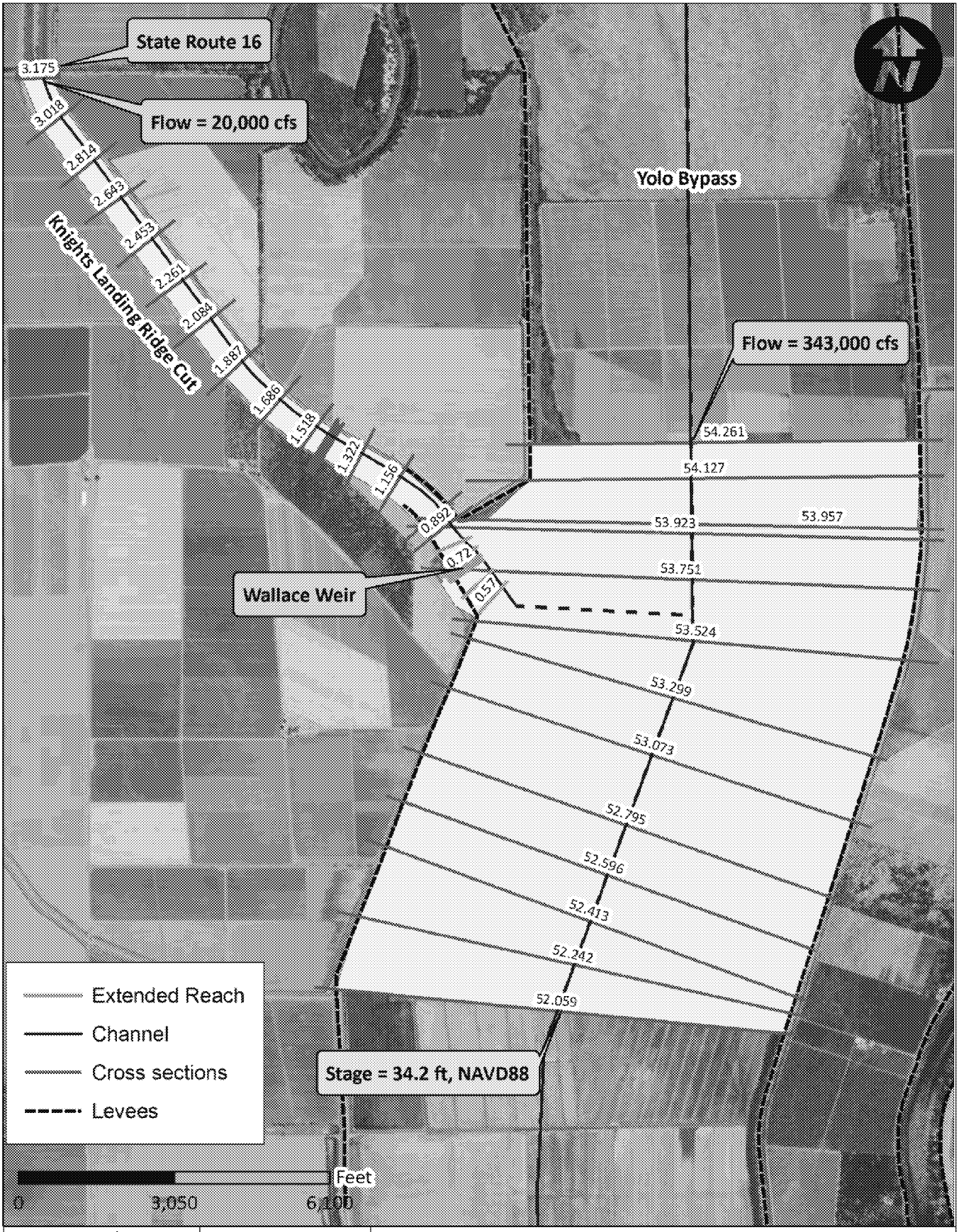
The results of the hydraulic analysis show no rise in water surface elevations under the 1957 design flood conditions and for the 4,000 cfs and 10,000 cfs conditions in the confined reach of KLRC above station 0.810. Table 1 presents the stage at key locations along KLRC. There is less than 0.05 foot rise in water surface elevations just upstream of the weir for the 1957 event and less than 0.01 foot rise for 4,000 cfs and 10,000 cfs. Under existing conditions, the velocity of flow over the berms ranged between 0.5 and 1.0 foot per second, while under project conditions, the velocity ranges between 0.5 and 1.8 feet per second. Detailed tabular results of the HEC-RAS analysis are presented in Appendix B. Based on the results of the hydraulic analysis, it can be concluded that the project will not increase water surface elevations of the design flood event by more than 0.10 feet and so does not have a flood conveyance impact along KLRC.

Sensitivity testing was also conducted to evaluate the impact on stages in KLRC when all gates are closed either due to debris blockage at the gates or pickets or gate malfunction. For simplicity, both of these conditions were represented keeping all three gates fully raised. The results of this testing show that the project will not increase water surface elevations of the design flood event by more than 0.10 feet and so does not have a flood conveyance impact along KLRC upstream of Wallace Weir.

Table 1. Results of the Proposed Wallace Weir Fish Rescue Facility Flood Impact Assessment

Location	Existing WSE (existing gates open)	Project WSE (with all gates open)	Project WSE (with all gates closed)
4,000 cfs			
Downstream of Hwy 113 (Station 7.13)	34.21	34.22	34.22
Downstream of SR 16 (Station 3.175)	33.32	33.32	33.32
Station 0.892	33.19	33.20	33.20
Station 0.810	33.19	33.20	33.20
Station 0.753	33.19	33.20	33.20
Station 0.726	33.19	33.20	33.20
Upstream of Wallace Weir (Station 0.720)	33.19	33.20	33.20
Downstream of Wallace Weir (Station 0.646)	33.18	33.18	33.18
KLRC confluence with Yolo Bypass (Station 0.570)	33.16	33.16	33.16
10,000 cfs			
Downstream of Hwy 113 (Station 7.13)	36.47	36.47	36.47
Downstream of SR 16 (Station 3.175)	33.93	33.93	33.93
Station 0.892	33.24	33.24	33.24
Station 0.810	33.24	33.24	33.24
Station 0.753	33.24	33.25	33.25
Station 0.726	33.25	33.26	33.26
Upstream of Wallace Weir (Station 0.720)	33.25	33.27	33.27
Downstream of Wallace Weir (Station 0.646)	33.23	33.22	33.22
KLRC confluence with Yolo Bypass (Station 0.570)	33.20	33.20	33.20
20,000 cfs			

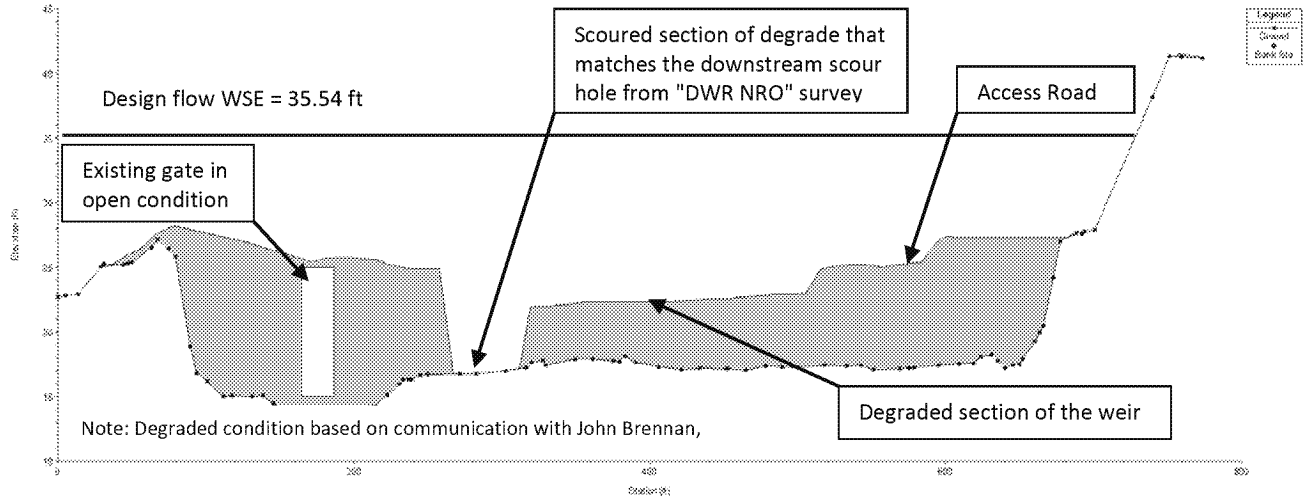
Downstream of Hwy 113 (Station 7.13)	40.77	40.77	40.77
Downstream of SR 16 (Station 3.175)	37.00	37.00	37.00
Station 0.892	35.50	35.50	35.50
Station 0.810	35.50	35.51	35.51
Station 0.753	35.51	35.53	35.53
Station 0.726	35.53	35.56	35.56
Upstream of Wallace Weir (Station 0.720)	35.54	35.57	35.58
Downstream of Wallace Weir (Station 0.646)	35.5	35.49	35.49
KLRC confluence with Yolo Bypass (Station 0.570)	35.43	35.43	35.43



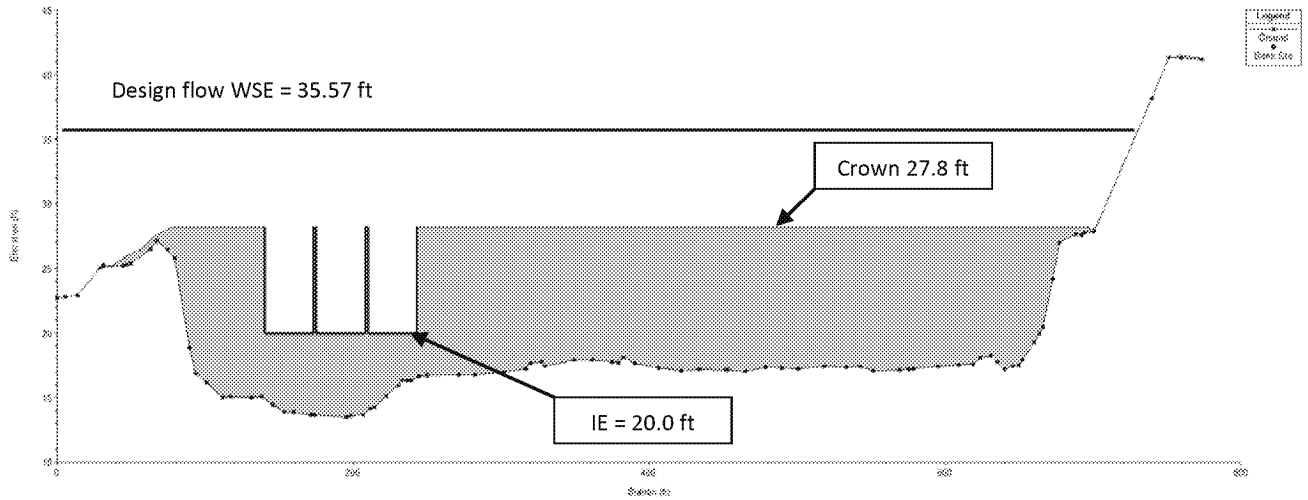
Notes: Source data: CVFED model, cbec prepared cross sections and DWR NRO survey	cbec	*Wallace Weir Fish Rescue Facility* **Model extents**		
		Project No. 16-1002	Created By: SP	**Figure 1**

Fig_1_Model_Domain.docx
4/21/2016

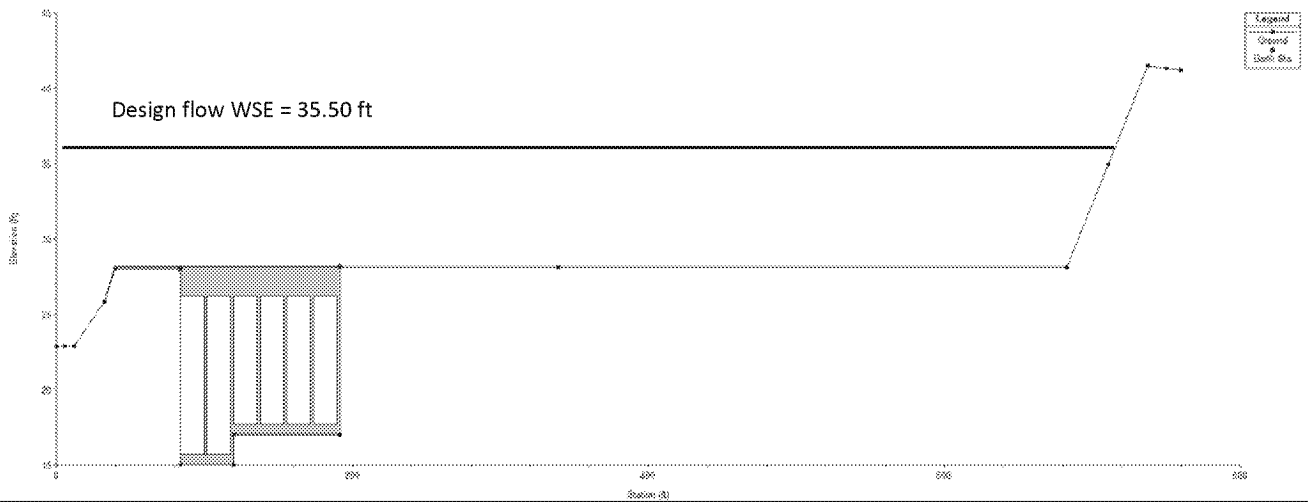
(a) Existing Wallace Weir (Inline Structure 0.712)



(b) Proposed Wallace Weir Gates (Inline Structure 0.712) Upstream Face at Obermeyer Weirs



(c) Proposed Fish Barrier Structure (Inline Structure 0.707) Downstream Face at Fish Barrier Pickets



Notes: Left to Right looking downstream	cbec	*Wallace Weir Fish Rescue Facility* **Modeled Wallace Weir Configurations**		
		Project No. 16-1002	Created By: SP	**Figure 2**

Fig_2_Weir_Configs.docx
4/21/2016

APPENDIX A

USED to NAVD88 Datum Conversion

Datum Conversion from U.S.E.D. to NAVD88 at Fremont Weir

The purpose of this document is to describe the estimated conversion of elevations relative to the United States Engineering Datum (U.S.E.D) to the North American Vertical Datum of 1988 (NAVD88). It is important to understand that this conversion is only an estimate and is valid only at a specific location and time which will be described in more detail below.

In order to explain how this conversion was determined, it helps to understand the basis for each of these vertical datums. The U.S.E.D. datum is a tidal datum and is based on mean lowerlow water. Each river system has its own reference point for a basis of measurement, in the case of the Sacramento River the reference point is a tidal station at the Golden Gate. So the zero value for U.S.E.D. along the Sacramento River will not be the same as that of the Klamath River, for example. And as with any tidal datum, it is based on a series of measurements that occurred over a 19 year period known as the National Tidal Datum Epoch. Because of changes in sea level, it is possible for the same point to have a different basis (zero value) depending which epoch is used. Unfortunately, I have not been able to find documentation describing the epoch used as reference for the Fremont Gage or Fremont Weir but I am sure it is not the current epoch of 1983-2001.

The NAVD88 datum is an orthometric vertical reference datum. It uses a single point, called Father Point/Rimouski near the mouth of the St. Lawrence River in Quebec as reference. And although this point is a tidal benchmark, because of variations in tides from north to south and from the east coast to west coast, it is not actually mean sea level for all of North America.

Regardless of the datum, nearly all monuments (physical markers) are subject to some degree of movement. The changes may be localized due to settling, erosion or ground swell, or they may be large scale due to plate tectonics or subsidence. In the case of the Fremont Weir, it is logical to assume the crest was built reasonably close to a constant elevation. But as we look at it today, there are variations along the crest of at least several tenths indicating it has had some localized change. Also, recent extensometer readings in the Yolo Bypass show there may be a significant level of subsidence occurring in the area. All of these factors affect the level of accuracy for the existing monuments as well as the conversion.

At the Fremont Weir, the methodology used to determine the conversion from U.S.E.D. to NAVD88 was based on field observations using known historical elevations. The control point used for determining the NAVD88 elevation was SM NO 15 (PID AI5070). Using Real-Time-Kinematic (RTK) GPS surveying, control points were established near the western portion of the Fremont Weir. Since the primary purpose of the survey at that time was to measure the crest of the weir on the west side and be consistent with previous measurements collected by others on the east side of the weir, the control point elevations were checked and verified against the

previous measurements. Using these control points and an active trackingrobotic total station, a measurement was taken at the staff gage onNovember 14th, 2012. At that time, the staff gage at posted elevation 40.00 was measured and the NAVD88 elevation was determined to be 38.75 feet. From that information the conversion is computed to be:

U.S.E.D – 1.25 ft= NAVD88

This conversion was used to check the elevation of the weir crest and the result appears to be correct.

Because of the variables listed above, it is possible for someone to compute a slightly different conversion. Also, if it has not already been done, it would be advisable to verify that the staff gage at the weir is on the same datum as the Sacramento River at Fremont Weir station (http://cdec4gov.water.ca.gov/cgi-progs/stationInfo?station_id=FRE).

If you have questions regarding this information please contact Jim West (jwest@water.ca.gov /530-529-7317) or Seth Lawrence (Seth.Lawrence@water.ca.gov /530-528-7449).

Jim West
L.S. 7660

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

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 AI5070
 AI5070                         *CURRENT SURVEY CONTROL
 AI5070  ______________________________________________________________________
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 AI5070* NAD 83(2011) EPOCH   -  2010.00
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 AI5070
 AI5070  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
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 AI5070            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
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 AI5070
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 AI5070.Significant digits in the geoid height do not necessarily reflect accuracy.
 AI5070.GEOID12B height accuracy estimate available here.
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AI5070.See file dsdata.txt to determine how the superseded data were derived.
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AI5070  HISTORY     - Date     Condition        Report By
AI5070  HISTORY     - 1999     MONUMENTED       CA-113
AI5070  HISTORY     - 20020826 GOOD             FRAME
AI5070  HISTORY     - 20041005 GOOD             CADT
AI5070  HISTORY     - 20080101 GOOD             FRAME
AI5070
AI5070                           STATION DESCRIPTION
AI5070
AI5070'DESCRIBED BY YOLO COUNTY CALIFORNIA 1999
AI5070'THE STATION IS LOCATED ABOUT 9 MI (14.5 KM) NORTHEAST OF WOODLAND,
AI5070'ABOUT 7 MI (11.3 KM) SOUTH OF KNIGHTS LANDING AND ALONG THE EAST SIDE
AI5070'OF THE YOLO BYPASS.  TO REACH THE STATION FROM THE INTERSECTION OF
AI5070'INTERSTATE HIGHWAY 5 AND COUNTY ROAD E8, ROAD 102, ABOUT 2 MI (3.2 KM)
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AI5070'EAST OF WOODLAND, GO EAST ON HIGHWAY 5 FOR ABOUT 5 MI (8.0 KM) TO THE
AI5070'ROAD 22 OFF-RAMP.TAKE THE OFF-RAMP EAST AND THEN SOUTH FOR 0.2 MI (0.3
AI5070'KM) TO A T-INTERSECTION, ROAD 118.  TURN LEFT AND GO EAST FOR 0.5 MI
AI5070'(0.8 KM) TO A T-INTERSECTION, OLD RIVER ROAD. TURN LEFT AND GO
AI5070'NORTHWEST ON OLD RIVER ROAD, PASSING UNDER HIGHWAY 5, FOR 0.2 MI (0.3
AI5070'KM) TO A SIDE ROAD RIGHT, ROAD 117.  TURN RIGHT AND GO NORTHERLY ON
AI5070'ROAD 117 FOLLOWING THE WEST BANK OF THE SACRAMENTO RIVER, FOR ABOUT 6
AI5070'MI (9.7 KM) TO A SIDE ROAD LEFT, ROAD 16.  TURN LEFT AND GO WEST ON
AI5070'ROAD 16 FOR 2.05 MI (3.30 KM) TO THE BASE OF A LEVEE AND A FORK IN THE
AI5070'ROAD.  TAKE THE LEFT FORK AND GO SOUTHWEST FOR 0.05 MI (0.08 KM) TO
AI5070'THE TOP OF THE LEVEE AND A GATE. CONTINUE SOUTH ALONG THE LEVEE ROAD
AI5070'THROUGH THE GATE FOR 1.2 MI (1.9 KM) TO A DIRT SIDE ROAD LEFT AND AN
AI5070'ABANDONED TWO STORY CONCRETE PUMPING PLANT.  TURN LEFT AND GO EAST ON
AI5070'THE DIRT ROAD TO THE BASE OF THE LEVEE AND THE STATION ON THE RIGHT.
AI5070'THE STATION IS A YOLO COUNTY SURVEYOR DISK SET INSIDE A WELL CASING
AI5070'WITH THE WORD GROUND ON THE TOP OF THE WELL MONUMENT COVER.  IT IS
AI5070'ABOUT 30 M (98.4 FT) EAST OF THE CENTERLINE OF THE LEVEE ROAD, 15.2 M
AI5070'(49.9 FT) NORTHEAST OF THE NORTHEAST CORNER OF THE CONCRETE BUILDING,
AI5070'13.4 M (44.0 FT) NORTH OF THE NORTHWEST CORNER OF A 3 M (9.8 FT) BY 3
AI5070'M (9.8 FT) CORRUGATED METAL BUILDING AT THE HEAD OF AN IRRIGATION
AI5070'CANAL, 7.2 M (23.6 FT) EAST OF THE CENTERLINE OF THE DIRT ROAD, SET
AI5070'ABOUT MIDWAY BETWEEM TWO 0.1 M (0.3 FT) IRON PIPES WHICH PROJECT ABOUT
AI5070'1.2 M (3.9 FT) AND INSIDE THE WELL MONUMENT.
AI5070
AI5070                          STATION RECOVERY (2002)
AI5070
AI5070'RECOVERY NOTE BY FRAME SURVEYING AND MAPPING 2002 (JHF)
AI5070'RECOVERED AS DESCRIBED.
AI5070
AI5070                          STATION RECOVERY (2004)
AI5070
AI5070'RECOVERY NOTE BY CALTRANS 2004 (RLM)
AI5070'THE STATION WAS RECOVERED AS DESCRIBED. THIS STATION WAS OCCUPIED AS
AI5070'PART OF A  CALTRANS NORTH REGION OFFICE OF SURVEYORS GPS HEIGHT
AI5070'MODERNIZATION PROJECT.
AI5070
AI5070                          STATION RECOVERY (2008)
AI5070
AI5070'RECOVERY NOTE BY FRAME SURVEYING AND MAPPING 2008 (JHF)
AI5070'RECOVERED AS DESCRIBED.

*** retrieval complete.
Elapsed Time = 00:00:07
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APPENDIX B

RAS Model Results

HEC-RAS River: KNI_18020109 Reach: R1 Profile: 26DEC2005 0100

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
R1	3.199	26DEC2005 0100	Unsteady_Exst_v2	20000.00	18.40	37.85		37.98	0.000142	3.44	7103.61	519.59	0.14
R1	3.199	26DEC2005 0100	Unsteady_PROj_v2	20000.00	18.40	37.85		37.99	0.000142	3.44	7104.50	519.61	0.14
R1	3.199	26DEC2005 0100	PRJv2_GATESCLOSE	20000.00	18.40	37.85		37.99	0.000142	3.44	7104.50	519.61	0.14
R1	3.198	26DEC2005 0100	Unsteady_Exst_v2	20000.00	18.40	37.85		37.98	0.000142	3.45	7102.74	519.57	0.14
R1	3.198	26DEC2005 0100	Unsteady_PROj_v2	20000.00	18.40	37.85		37.99	0.000142	3.45	7103.62	519.59	0.14
R1	3.198	26DEC2005 0100	PRJv2_GATESCLOSE	20000.00	18.40	37.85		37.99	0.000142	3.45	7103.62	519.59	0.14
R1	3.197			Lat Struct									
R1	3.196			Lat Struct									
R1	3.193	26DEC2005 0100	Unsteady_Exst_v2	20000.00	17.74	37.86	26.41	37.98	0.000131	3.29	7513.23	550.83	0.14
R1	3.193	26DEC2005 0100	Unsteady_PROj_v2	20000.00	17.74	37.86	26.41	37.98	0.000131	3.29	7514.16	550.86	0.14
R1	3.193	26DEC2005 0100	PRJv2_GATESCLOSE	20000.00	17.74	37.86	26.41	37.98	0.000131	3.29	7514.16	550.86	0.14
R1	3.190			Bridge									
R1	3.186	26DEC2005 0100	Unsteady_Exst_v2	20000.00	15.14	36.99		37.12	0.000132	3.38	7381.05	539.43	0.14
R1	3.186	26DEC2005 0100	Unsteady_PROj_v2	20000.00	15.14	36.99		37.12	0.000132	3.38	7381.98	539.45	0.14
R1	3.186	26DEC2005 0100	PRJv2_GATESCLOSE	20000.00	15.14	36.99		37.12	0.000132	3.38	7381.98	539.45	0.14
R1	3.185			Lat Struct									
R1	3.184			Lat Struct									
R1	3.175	26DEC2005 0100	Unsteady_Exst_v2	20000.01	13.30	37.00		37.11	0.000094	3.00	7959.06	534.06	0.12
R1	3.175	26DEC2005 0100	Unsteady_PROj_v2	20000.00	13.30	37.00		37.11	0.000094	3.00	7959.97	534.07	0.12
R1	3.175	26DEC2005 0100	PRJv2_GATESCLOSE	20000.00	13.30	37.00		37.11	0.000094	3.00	7959.98	534.07	0.12
R1	3.018	26DEC2005 0100	Unsteady_Exst_v2	19999.99	15.25	36.90		37.02	0.000110	3.09	7895.07	541.49	0.13
R1	3.018	26DEC2005 0100	Unsteady_PROj_v2	20000.00	15.25	36.91		37.02	0.000110	3.09	7896.02	541.50	0.13
R1	3.018	26DEC2005 0100	PRJv2_GATESCLOSE	20000.00	15.25	36.91		37.02	0.000110	3.09	7896.02	541.50	0.13
R1	3.017			Lat Struct									
R1	2.814	26DEC2005 0100	Unsteady_Exst_v2	20000.00	14.68	36.82		36.91	0.000085	2.82	8502.12	537.69	0.11
R1	2.814	26DEC2005 0100	Unsteady_PROj_v2	20000.00	14.68	36.82		36.91	0.000085	2.82	8503.08	537.70	0.11
R1	2.814	26DEC2005 0100	PRJv2_GATESCLOSE	20000.00	14.68	36.82		36.91	0.000085	2.82	8503.08	537.70	0.11
R1	2.812			Lat Struct									
R1	2.643	26DEC2005 0100	Unsteady_Exst_v2	20000.00	14.72	36.72		36.83	0.000106	3.01	7718.52	529.51	0.12
R1	2.643	26DEC2005 0100	Unsteady_PROj_v2	20000.00	14.72	36.72		36.83	0.000105	3.01	7719.48	529.53	0.12
R1	2.643	26DEC2005 0100	PRJv2_GATESCLOSE	20000.02	14.72	36.72		36.83	0.000105	3.01	7719.48	529.53	0.12
R1	2.641			Lat Struct									
R1	2.453	26DEC2005 0100	Unsteady_Exst_v2	19999.99	15.35	36.61		36.72	0.000104	3.00	7854.77	545.21	0.12
R1	2.453	26DEC2005 0100	Unsteady_PROj_v2	19999.98	15.35	36.61		36.72	0.000104	3.00	7855.78	545.22	0.12
R1	2.453	26DEC2005 0100	PRJv2_GATESCLOSE	20000.01	15.35	36.61		36.72	0.000104	3.00	7855.78	545.22	0.12
R1	2.452			Lat Struct									
R1	2.261	26DEC2005 0100	Unsteady_Exst_v2	20000.00	14.73	36.50		36.61	0.000107	2.99	7724.07	542.48	0.12
R1	2.261	26DEC2005 0100	Unsteady_PROj_v2	20000.01	14.73	36.51		36.62	0.000107	2.99	7725.10	542.49	0.12
R1	2.261	26DEC2005 0100	PRJv2_GATESCLOSE	19999.99	14.73	36.51		36.62	0.000107	2.99	7725.10	542.49	0.12
R1	2.259			Lat Struct									
R1	2.084	26DEC2005 0100	Unsteady_Exst_v2	20000.00	13.74	36.39		36.51	0.000118	3.23	7415.26	522.71	0.13
R1	2.084	26DEC2005 0100	Unsteady_PROj_v2	20000.00	13.74	36.39		36.51	0.000118	3.23	7416.28	522.72	0.13
R1	2.084	26DEC2005 0100	PRJv2_GATESCLOSE	20000.01	13.74	36.39		36.51	0.000118	3.23	7416.28	522.72	0.13
R1	2.082			Lat Struct									
R1	1.887	26DEC2005 0100	Unsteady_Exst_v2	20000.02	13.88	36.25		36.38	0.000126	3.31	7225.76	511.38	0.13
R1	1.887	26DEC2005 0100	Unsteady_PROj_v2	20000.00	13.88	36.26		36.38	0.000126	3.31	7226.78	511.39	0.13
R1	1.887	26DEC2005 0100	PRJv2_GATESCLOSE	20000.00	13.88	36.26		36.38	0.000126	3.31	7226.78	511.39	0.13
R1	1.886			Lat Struct									
R1	1.885			Lat Struct									
R1	1.686	26DEC2005 0100	Unsteady_Exst_v2	19999.99	12.11	36.11		36.24	0.000133	3.49	7021.24	502.84	0.14
R1	1.686	26DEC2005 0100	Unsteady_PROj_v2	20000.01	12.11	36.11		36.25	0.000133	3.49	7022.28	502.85	0.14
R1	1.686	26DEC2005 0100	PRJv2_GATESCLOSE	20000.00	12.11	36.11		36.25	0.000133	3.49	7022.28	502.85	0.14
R1	1.684			Lat Struct									
R1	1.518	26DEC2005 0100	Unsteady_Exst_v2	20000.01	12.87	35.98		36.12	0.000140	3.60	7091.29	529.24	0.14
R1	1.518	26DEC2005 0100	Unsteady_PROj_v2	19999.99	12.87	35.99		36.13	0.000140	3.60	7092.42	529.24	0.14
R1	1.518	26DEC2005 0100	PRJv2_GATESCLOSE	19999.98	12.87	35.99		36.13	0.000140	3.60	7092.42	529.24	0.14
R1	1.466	26DEC2005 0100	Unsteady_Exst_v2	20000.00	13.04	35.94		36.08	0.000145	3.59	7046.50	532.80	0.14
R1	1.466	26DEC2005 0100	Unsteady_PROj_v2	20000.00	13.04	35.94		36.09	0.000145	3.59	7047.64	532.81	0.14
R1	1.466	26DEC2005 0100	PRJv2_GATESCLOSE	19999.99	13.04	35.94		36.09	0.000145	3.59	7047.64	532.81	0.14
R1	1.459	26DEC2005 0100	Unsteady_Exst_v2	20000.00	13.44	35.93		36.08	0.000149	3.65	7053.92	534.17	0.15
R1	1.459	26DEC2005 0100	Unsteady_PROj_v2	19999.99	13.44	35.94		36.08	0.000149	3.65	7055.06	534.18	0.15

HEC-RAS River: KNI_18020109 Reach: R1 Profile: 26DEC2005 0100 (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
R1	1.459	26DEC2005 0100	PRJv2_GATESCLOSE	19999.99	13.44	35.94		36.08	0.000149	3.65	7055.07	534.18	0.15
R1	1.455			Culvert									
R1	1.451	26DEC2005 0100	Unstdy_Exst_v2	20000.00	12.01	35.84		36.00	0.000155	3.79	6736.86	523.77	0.15
R1	1.451	26DEC2005 0100	Unstdy_PROj_v2	19999.99	12.01	35.84		36.00	0.000155	3.79	6738.00	523.81	0.15
R1	1.451	26DEC2005 0100	PRJv2_GATESCLOSE	19999.99	12.01	35.84		36.00	0.000155	3.79	6738.00	523.81	0.15
R1	1.450			Lat Struct									
R1	1.449			Lat Struct									
R1	1.438	26DEC2005 0100	Unstdy_Exst_v2	20000.00	11.95	35.85		35.99	0.000134	3.49	7025.81	530.40	0.14
R1	1.438	26DEC2005 0100	Unstdy_PROj_v2	20000.00	11.95	35.85		35.99	0.000133	3.49	7026.96	530.41	0.14
R1	1.438	26DEC2005 0100	PRJv2_GATESCLOSE	19999.99	11.95	35.85		35.99	0.000133	3.49	7026.96	530.41	0.14
R1	1.322	26DEC2005 0100	Unstdy_Exst_v2	19999.99	12.52	35.78		35.90	0.000129	3.26	7339.26	557.59	0.14
R1	1.322	26DEC2005 0100	Unstdy_PROj_v2	20000.02	12.52	35.78		35.91	0.000129	3.26	7340.49	557.60	0.14
R1	1.322	26DEC2005 0100	PRJv2_GATESCLOSE	20000.01	12.52	35.78		35.91	0.000129	3.26	7340.49	557.60	0.14
R1	1.156	26DEC2005 0100	Unstdy_Exst_v2	20000.00	12.71	35.67		35.79	0.000125	3.18	7421.96	561.21	0.13
R1	1.156	26DEC2005 0100	Unstdy_PROj_v2	20000.01	12.71	35.67		35.79	0.000125	3.18	7423.22	561.22	0.13
R1	1.156	26DEC2005 0100	PRJv2_GATESCLOSE	19999.98	12.71	35.67		35.79	0.000125	3.18	7423.22	561.22	0.13
R1	1.155			Lat Struct									
R1	1.154			Lat Struct									
R1	0.962	26DEC2005 0100	Unstdy_Exst_v2	20000.00	12.62	35.54		35.66	0.000132	3.27	7418.10	560.67	0.14
R1	0.962	26DEC2005 0100	Unstdy_PROj_v2	19999.99	12.62	35.54		35.67	0.000132	3.27	7419.41	560.68	0.14
R1	0.962	26DEC2005 0100	PRJv2_GATESCLOSE	20000.00	12.62	35.54		35.67	0.000132	3.27	7419.41	560.68	0.14
R1	0.892	26DEC2005 0100	Unstdy_Exst_v2	20000.00	12.62	35.50		35.62	0.000133	3.28	7393.50	560.48	0.14
R1	0.892	26DEC2005 0100	Unstdy_PROj_v2	20000.00	12.62	35.50		35.62	0.000133	3.28	7394.89	560.49	0.14
R1	0.892	26DEC2005 0100	PRJv2_GATESCLOSE	20000.01	12.62	35.50		35.62	0.000133	3.28	7394.88	560.49	0.14
R1	0.891			Lat Struct									
R1	0.89			Lat Struct									
R1	0.810	26DEC2005 0100	Unstdy_Exst_v2	18001.92	16.29	35.50		35.58	0.000110	2.62	8106.20	646.50	0.12
R1	0.810	26DEC2005 0100	Unstdy_PROj_v2	18005.14	16.29	35.51		35.59	0.000110	2.62	8107.45	646.51	0.12
R1	0.810	26DEC2005 0100	PRJv2_GATESCLOSE	18000.31	16.29	35.51		35.59	0.000110	2.62	8107.53	646.51	0.12
R1	0.809			Lat Struct									
R1	0.808			Lat Struct									
R1	0.753	26DEC2005 0100	Unstdy_Exst_v2	16110.54	16.29	35.51		35.57	0.000083	2.27	8107.93	646.51	0.10
R1	0.753	26DEC2005 0100	Unstdy_PROj_v2	14651.39	16.29	35.53		35.59	0.000068	2.06	8125.11	646.59	0.09
R1	0.753	26DEC2005 0100	PRJv2_GATESCLOSE	14591.15	16.29	35.53		35.59	0.000068	2.05	8125.70	646.59	0.09
R1	0.726	26DEC2005 0100	Unstdy_Exst_v2	14576.27	16.80	35.53		35.57	0.000058	2.02	9148.81	657.34	0.09
R1	0.726	26DEC2005 0100	Unstdy_PROj_v2	12280.97	16.80	35.56		35.59	0.000041	1.70	9171.16	657.45	0.07
R1	0.726	26DEC2005 0100	PRJv2_GATESCLOSE	12210.25	16.80	35.56		35.59	0.000041	1.69	9171.72	657.46	0.07
R1	0.720	26DEC2005 0100	Unstdy_Exst_v2	14025.83	13.49	35.54	22.00	35.57	0.000027	1.54	11547.71	662.19	0.06
R1	0.720	26DEC2005 0100	Unstdy_PROj_v2	11672.64	13.49	35.57	21.68	35.59	0.000019	1.27	11539.18	653.21	0.05
R1	0.720	26DEC2005 0100	PRJv2_GATESCLOSE	11599.75	13.49	35.58	21.66	35.59	0.000018	1.27	11539.66	653.21	0.05
R1	0.712			Inl Struct									
R1	0.709	26DEC2005 0100	Unstdy_Exst_v2	14025.83	13.84	35.50		35.53	0.000053	2.01	9547.17	669.64	0.08
R1	0.709	26DEC2005 0100	Unstdy_PROj_v2	11672.64	20.00	35.48		35.57	0.000026	2.77	5379.71	622.56	0.12
R1	0.709	26DEC2005 0100	PRJv2_GATESCLOSE	11599.75	20.00	35.48		35.56	0.000026	2.76	5379.38	622.56	0.12
R1	0.7089			Lat Struct									
R1	0.7088			Lat Struct									
R1	0.707	26DEC2005 0100	Unstdy_PROj_v2	11672.64	15.00	35.49	23.47	35.57	0.000020	2.86	5780.07	622.57	0.11
R1	0.707	26DEC2005 0100	PRJv2_GATESCLOSE	11599.75	15.00	35.49	23.44	35.56	0.000020	2.85	5779.69	622.57	0.11
R1	0.703	26DEC2005 0100	Unstdy_Exst_v2	13907.64	13.84	35.50		35.53	0.000052	1.99	9546.77	669.64	0.08
R1	0.697	26DEC2005 0100	Unstdy_PROj_v2	11672.64	15.00	35.49		35.52	0.000036	1.64	9172.56	633.35	0.07
R1	0.697	26DEC2005 0100	PRJv2_GATESCLOSE	11599.75	15.00	35.49		35.52	0.000035	1.63	9172.48	633.35	0.07
R1	0.646	26DEC2005 0100	Unstdy_Exst_v2	13021.42	15.93	35.50		35.52	0.000043	1.63	10037.40	716.53	0.07
R1	0.646	26DEC2005 0100	Unstdy_PROj_v2	11398.34	15.93	35.49		35.51	0.000033	1.43	10035.10	716.51	0.06
R1	0.646	26DEC2005 0100	PRJv2_GATESCLOSE	11341.08	15.93	35.49		35.51	0.000033	1.42	10035.02	716.51	0.06
R1	0.570	26DEC2005 0100	Unstdy_Exst_v2	17800.64	15.39	35.43		35.48	0.000073	2.30	10733.29	758.07	0.10
R1	0.570	26DEC2005 0100	Unstdy_PROj_v2	16657.35	15.39	35.43		35.47	0.000064	2.15	10733.29	758.07	0.09
R1	0.570	26DEC2005 0100	PRJv2_GATESCLOSE	16616.67	15.39	35.43		35.47	0.000063	2.14	10733.29	758.07	0.09

TECHNICAL MEMORANDUM

Date:	July 11, 2016
To:	Barry O'Regan (KSN)
From:	Chris Campbell
Project:	16-1002 – Wallace Weir Fish Rescue Facility
Subject:	Potential Water Surface Elevation Changes

The following is summary of potential water surface elevation (WSE) changes in the Colusa Basin Drain (CDB) near State Route 113 (SR 113) for a range of flows due to the proposed Wallace Weir Fish Rescue Facility (Project). The potential WSE changes were assessed by using a HEC-RAS hydraulic model (not described here) to compute the difference in the water surface profiles between existing and project conditions along Knights Landing Ridge Cut (KLRC) from the Tule Canal upstream to its connection with the CBD near SR 113.

FREMONT WEIR NON-OVERTOPPING CONDITIONS

For KLRC flows ranging from 50 to 4,000 cfs for Fremont Weir non-overtopping conditions, Table 1 shows the changes in upstream WSEs based on proposed gate operations required for submergence of the fish facility intake and diffusers. These results generally show that for KLRC flows below 800 cfs, the WSEs in the CBD near SR 113 are below 25.5 ft USED during which the Knights Landing Outfall Gates (KLOG) gates have historically remained open because Sacramento River WSEs are lower than CBD WSEs. As such, any increase in WSEs in CBD below a stage of 25.5 ft can be mitigated by shunting additional flows through KLOG to the Sacramento River. However, CDB WSEs above 25.5 ft result in potential flooding of agricultural lands along the west side of the CBD when flows in KLRC are above 800 cfs (which occurs 25% of the time). For CBD WSEs above 25.5 ft, the KLOG gates have historically been closed in the winter because the Sacramento River WSEs are typically higher than CBD WSEs. As such, there is no ability to convey water to the Sacramento River, and the CBD WSEs rise up to 0.36 ft at 800 cfs and 0.08 ft at 4,000 cfs (see Table 1). This may cause potential nuisance flooding to fields along the south end of the CBD during the winter season during Fremont Weir non-overtopping conditions. To minimize the potential for nuisance flooding, the head drop across the fish facility entrance gate can be reduced from its optimal range of 1.0 to 1.5 ft to the minimum NMFS criteria of 0.5 ft. For KLRC flows in the range of 800 to 3000 cfs, the minimum drop across the entrance gate reduces the CDB WSE increases from up to 0.37 ft down to below 0.13 ft (see [ ] values in Table 1]. For the highest flows above 3000 cfs, which occur only 1% of the time between October through May for Fremont Weir non-

overtopping conditions, minimizing the drop across entrance gate has no effect on CDB WSEs because all three of the operable gates on Wallace Weir are already fully lowered.

Overall, the proposed operation of Wallace Weir will result in ±0.1 ft increase in WSEs on the CBD near SR 113 for Fremont Weir non-overtopping conditions 15% of the time from October through May. As shown by Figure 1, and depending on the water year, this can range from 1 to 7 months cumulatively within an 8 month operational period. Furthermore, the WSE changes in the CDB near 113 will quickly diminish in the upstream direction.

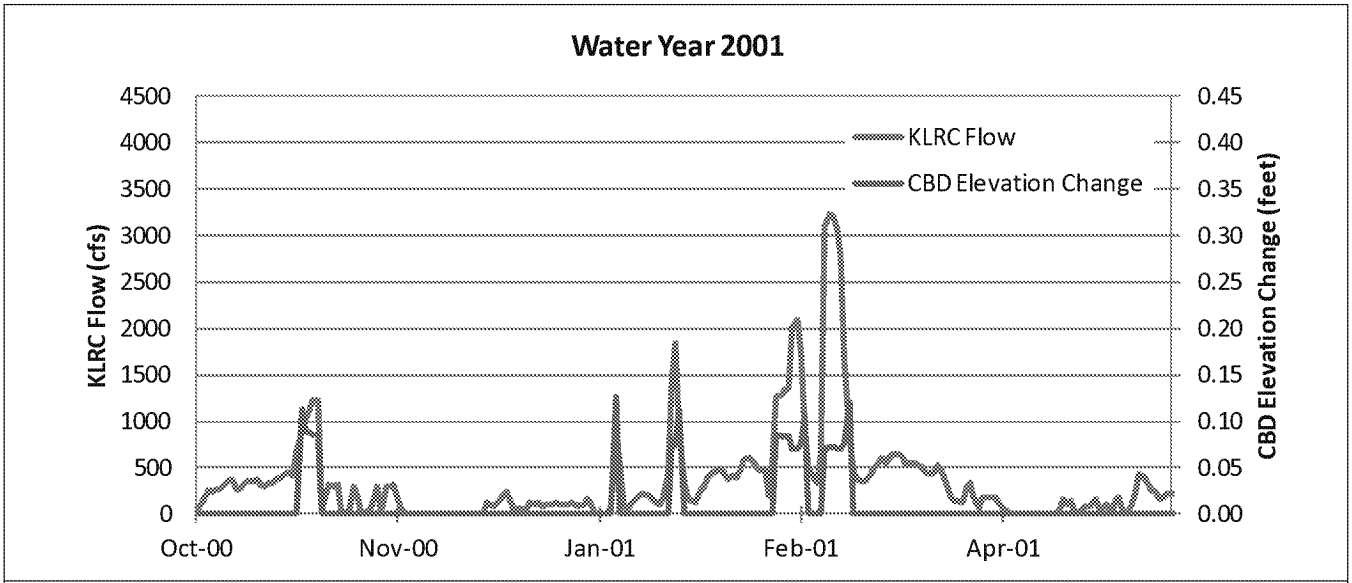
Table 1. Changes in upstream Colusa Basin Drain water surface elevation near SR 113.

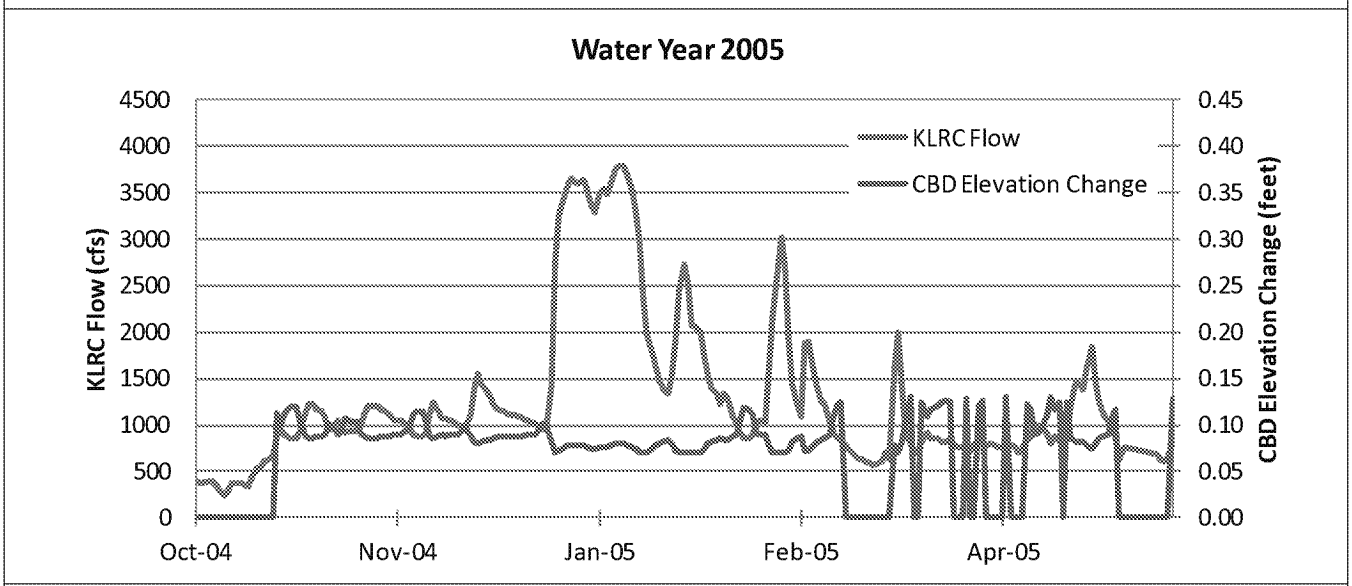
Profile	KLRC Flow (cfs)	Existing WSE (USED, ft)	Project WSE (USED, ft) [per 0.5 ft gate drop]	Difference in WSE (ft) [per 0.5 ft gate drop]	Maximum additional capacity through KLOG (cfs)
1	50	20.81	20.95	0.14	180[1]
2	100	21.26	21.43	0.17	190[1]
3	200	22.04	22.24	0.20	230[1]
4	300	22.72	22.98	0.25	280[1]
5	400	23.3	23.67	0.36	380[1]
6	500	23.83	24.16	0.32	350[1]
7	600	24.33	24.62	0.29	340[1]
8	700	24.78	25.24	0.46	490[1]
9	800	25.24	25.61 [25.37]	0.37 [0.13]	0[2]
10	900	25.67	25.96 [25.78]	0.29 [0.11]	0[2]
11	1000	26.03	26.25 [26.12]	0.22 [0.09]	0[2]
12	2000	28.27	28.47 [28.34]	0.20 [0.07]	0[2]
13	3000	29.75	29.91 [29.82]	0.16 [0.07]	0[2]
14	3800	30.76	30.86 [30.84]	0.10 [0.08]	0[2]
15	4000	30.97	31.05 [31.05]	0.08 [0.08]	0[2]

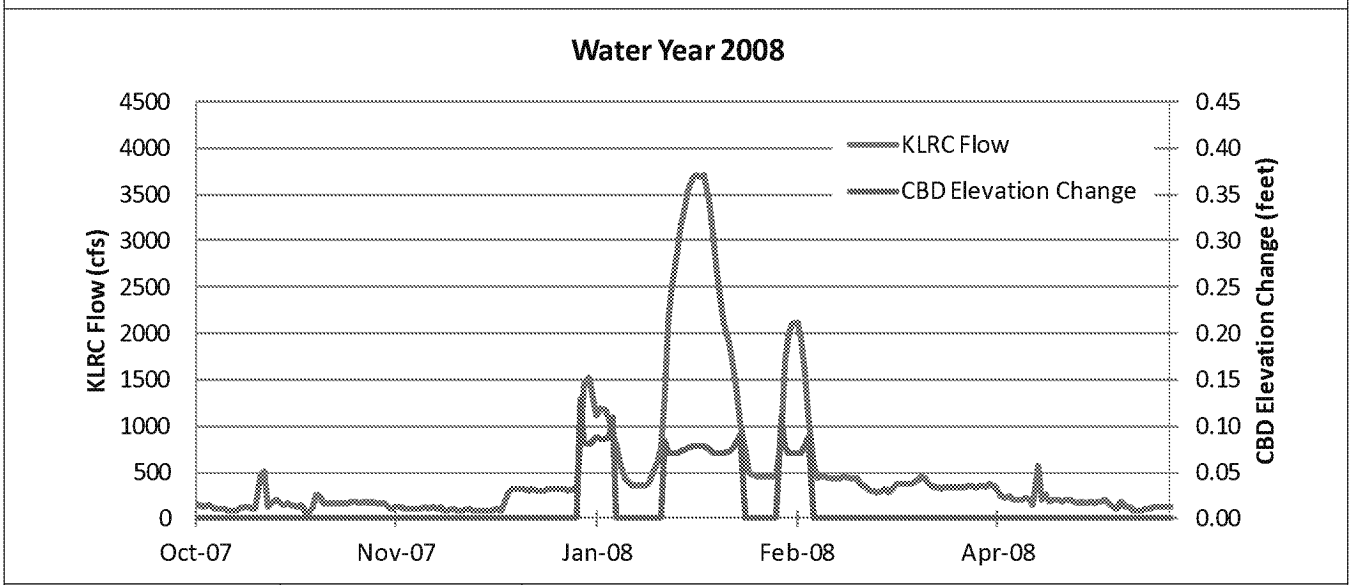
Notes:
[1] Based on historical correlation between KLOG flow and Sacramento River water levels
[2] KLOG gates typically closed

FREMONT WEIR OVERTOPPING CONDITIONS

For KLRC flood flows of 4,000, 10,000, and 20,000 cfs and concurrent with Fremont Weir overtopping, the HEC-RAS model was used to assess WSE changes in the Yolo Bypass and along KLRC. During overtopping conditions, the Yolo Bypass flood waters create a significant backwater effect that submerges Wallace Weir with up to 5, 6, and 9 feet of water at 4,000, 10,000, and 20,000 cfs, respectively. As such, there is a very localized increase in WSEs up to 0.1 ft in the immediate vicinity of Wallace Weir within the Yolo Bypass, but within KLRC up to SR 113, there are no changes to the water surface profiles when Fremont Weir is overtopping.







Notes:

Wallace Weir Fish Rescue Facility

WSE changes at State Route 113 bridge

Project No. 16-1002	Created By: CRC	**Figure 1**

Fig1_CBD_WSE_Changes.docx
7/11/2016