

Appendix I

NMFS Determination on April 27, 2012



**UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration**

NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

April 27, 2012

Mr. Don Glaser
Regional Director
Mid-Pacific Region
U.S. Bureau of Reclamation
2800 Cottage Way, MP-3700
Sacramento, California 95825-1898

Mr. Mark Cowin
Director
California Department of Water Resources
P.O. Box 942836, Room 1115-1
Sacramento, California 94236-0001

Dear Mr. Glaser and Mr. Cowin:

On January 12, 2012, Plaintiffs, Plaintiff-Intervenor, and Federal Defendants to the Consolidated Salmonid Cases (Case 1:09-cv-01053-LJO –DLB) signed and filed with the Federal court a joint stipulation (Document 659-2) that included Central Valley Project and State Water Project operations for April and May 2012. On March 16, 2012, NOAA's National Marine Fisheries Service (NMFS) transmitted to the U.S. Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR) the real-time operations technical memorandum (tech memo) required as part of the joint stipulation (Paragraph 2.a.v).

Following a meeting of the Delta Conditions Team (DCT) on April 23, 2012, Tom Boardman (a member of the DCT) sent to the Delta Operations for Salmonids and Sturgeon (DOSS) technical team a proposal from the Public Water Agencies (PWA, attachment 1 to the enclosed DOSS advice) for consideration. During the DOSS call on April 24, 2012, the DOSS discussed the PWA proposal, in addition to a similar proposal from Reclamation. Reclamation offered an alternate proposal to continue the combined exports of 1,500 cfs through Thursday, April 26, 2012, then increase exports to 100% of Vernalis flow through the rest of the period on April 30, 2012.

The DOSS advice (see enclosure) to the Water Operations Management Team (WOMT) and NMFS are to: (1) continue to operate per the OMR technical memorandum, *i.e.*, continue to hold combined exports at 1,500 cfs through the current experimental period which ends on April 30; (2) refer the PWA's questions and concerns to Kevin Clark (DWR), the lead investigator of the



stipulation study, for his review first; and (3) target an OMR treatment level of -5,000 cfs (or as negative an OMR level as is feasible given all other regulatory constraints, including D-1641) for the May 1-May 15 experimental period. DOSS did not advise seeking a variance to the D-1641 1:1 Vernalis flow:export requirement.

NMFS accepts the DOSS advice and determines that combined 1,500 cfs exports through the end of the period on April 30, 2012, is consistent with the intent and objective of OMR flow management, as provided in the tech memo. The tech memo provides the DOSS with the flexibility to switch the order of the experimental OMR targets, that is, "DOSS may adjust the ordering of OMR flow management targets opportunistically during April and May 2012" (tech memo page 8). NMFS determines that since the OMR flow through April 30, 2012, and switching OMR experimental flows in May, is consistent with the joint stipulation and associated tech memo, that it will avoid jeopardizing the continued existence of Central Valley steelhead.

NMFS also agrees with the DOSS advice that the principal investigator should respond to the technical questions from the PWA regarding the sentinel steelhead stipulation study. NMFS understands that Reclamation and DWR will not be requesting from the State Water Resources Control Board a variance of the export limit under Decision-1641, and supports that decision.

The sentinel steelhead study is the first of its kind, that is, to study the fine scale movements of acoustically-tagged steelhead within and throughout the Delta, and to utilize some of the data to inform in-season management and water operations. Considering the results from the first sentinel release group at the experimental OMR flow of -3,500 cfs (in actuality, OMR values were closer to the -2,000 to -2,500 cfs range), we would expect more acoustic tags to pass the Railroad Cut receivers, and also earlier in the experimental period, with the increased level of exports beginning May 1.

In an effort to continually review the scientific foundation of this action, I am directing my staff to reconvene the group that developed the sentinel study and the tech memo (the planning committee), to re-evaluate the trigger and action response from the tech memo based on the new information received from the first experimental period. In anticipation of the potential observed detection of a high frequency of sentinel steelhead at the Railroad Cut receivers during the experimental period in the first half of May, NMFS is willing to consider possible adjustment to either the trigger or the action response.

NMFS appreciates the continued coordination of the parties towards the implementation of the joint stipulation and the technical memorandum.

Sincerely,



Rodney R. McInnis
Regional Administrator

Enclosure

**DOSS Advice for operations for the remainder of the April 15-April 30, 2012, time period,
and for the May 1-May 15, 2012, time period**

**Old and Middle River Flow Management per the 2012 Joint Stipulation, in lieu of Action
IV.2.1 of the NMFS Biological Opinion for the Long-Term Operations of the Central
Valley Project and State Water Project (NMFS Opinion)**

Summary of Advice from the Delta Operations for Salmonids and Sturgeon (DOSS) group:

Background:

On Friday, April 20, 2012, NMFS was notified that the exposure trigger at the Railroad Cut receivers (9 fish for the April 15-30 experimental period) was exceeded. NMFS, in turn, notified the Water Operations Management Team (WOMT) that the projects should, within 48 hours, adjust operations to target an Old and Middle River (OMR) flow of -1,250 cfs, or, if targeting that OMR would require combined exports to drop below 1,500 cfs, reduce exports to the minimum health and safety level of 1,500 cfs. The projects have been operating with combined exports at 1,500 cfs since Sunday, April 22, 2012.

The Public Water Agencies submitted some concerns and questions (Attachment 1) to NMFS on April 24, 2012, prior to the Delta Operations for Salmonids and Sturgeon (DOSS) technical team call, and recommended that operations be adjusted to target an OMR flow of no more negative than -2,500 cfs for the rest of April. The recommended operations would represent a change in operations from the required operations for the remainder of the current experimental period of April 15-30.

The concerns and recommendation were discussed by DOSS, along with some alternate recommendations offered by DOSS representatives. In addition, the U.S. Bureau of Reclamation offered an alternate proposal to continue at combined exports of 1,500 cfs through Thursday, April 26, 2012, and then increase exports to 100% of Vernalis flow through the remainder of the experimental period (through April 30). Other DOSS representatives proposed holding OMR at -1,250 cfs or holding combined exports to 1500 cfs combined exports (whichever option allows greater exports) through April 30, per the OMR Technical Memorandum¹.

DOSS advice for Tuesday 4/24/12:

DOSS advice re: operations per the stipulation -- remainder of April 15-April 30 time period
DOSS advises that the projects continue to operate per the OMR technical memorandum, *i.e.* continue to hold combined exports at 1,500 cfs through the current experimental period which ends on April 30. DOSS also advises that the questions and concerns submitted by the public water agencies be reviewed first by Kevin Clark (California Department of Water Resources), the lead investigator of the stipulation study.

¹ Available at http://swr.nmfs.noaa.gov/ocap/2012_stipulation.htm

Rationale for Advice for remainder of April 15-30, 2012, time period:

While there were no objections to this DOSS advice, the discussion included diverse perspectives on the recent tag detections at Railroad Cut and the significance for managing outmigration conditions for Central Valley steelhead. Notwithstanding, the following points brought up on DOSS indicates that the existing protections should continue:

1. Sentinel steelhead continue to pass the Railroad Cut receivers (Attachment 2);
2. Wild steelhead continue to be salvaged and lost at the fish facilities on a regular basis (<ftp://ftp.dfg.ca.gov/salvage/DOSS%20Salvage%20Tables/>); and
3. An increase in wild steelhead being observed at Mossdale this past week compared to previous years.

DOSS advice re: operations per the stipulation -- initial OMR treatment level for May 1-May 15 time period:

DOSS advises that the initial OMR treatment level for the May 1-May 15 experimental period target an OMR treatment level of -5,000 cfs, or as negative an OMR level as is feasible given all other regulatory constraints, including D-1641. DOSS did not advise seeking a variance to the D-1641 1:1 Vernalis flow:export requirement.

Rationale for Advice for May 1-May 15, 2012, time period:

The current trend in OMR levels for the April 15-30 time period will result in an effective OMR treatment level more positive than the target treatment level of -3,500 cfs, likely in the -2,000 to -2,500 cfs range. Rather than implement the -1,250 cfs OMR treatment level indicated for May 1-May 15 in the OMR Technical Memorandum, another quite positive OMR treatment level, DOSS advises targeting a more negative OMR treatment level. One of the concerns about waiting until the second half of May to implement a more negative OMR treatment level is that some parties are concerned that smelt protections could restrict exports and limit the feasibility of a more negative OMR treatment level. Recent increases in water temperature in the Delta have also raised concerns about the suitability of water conditions in the second half of May. Shifting the more negative OMR treatment level to the first half of May increases the likelihood of having at least two different OMR treatment levels. Note that DOSS provided this advice with an expectation (based on WOMT and other discussions last week) that an intermediate initial OMR treatment level would likely be implemented during the second half of May.

DOSS advice re: operations per Action IV.2.3:

The older juvenile loss density for April 20, 2012 was reported to be 3.1 fish/TAF, which exceeds the first stage trigger of 2.5 fish/TAF under Action IV.2.3. DOSS advises that, under IV.2.3, the projects would be required to operate to an OMR level of no more negative than -3,500 cfs for at least five days².

² At the WOMT meeting on the afternoon of April 24, 2012, it was clarified that the first day of the five-day action response was Monday, April 23, 2012, the day NMFS was notified that the loss density trigger had been exceeded.

ATTACHMENT 1

Concerns, questions, and recommendation submitted
April 24, 2012, by public water agencies for consideration
by DOSS



Barbara Byrne <barbara.byrne@noaa.gov>

For DOSS: Contractor letter to DOSS

1 message

Barbara Byrne <barbara.byrne@noaa.gov>

Tue, Apr 24, 2012 at 8:57 AM

To: Garwin.Yip@noaa.gov, Alice Low <ALOW@dfg.ca.gov>, "Anderson, Craig" <Craig_Anderson@fws.gov>, Andy Chu <andychu@water.ca.gov>, Angela Llaban <allaban@water.ca.gov>, Anne Snider <asnider@waterboards.ca.gov>, Aondrea Bartoo <aondrea_bartoo@fws.gov>, Barbara Byrne <barbara.byrne@noaa.gov>, Barbara Rocco <barbara.rocco@noaa.gov>, Barbara Rocco <barocco@sbcglobal.net>, Bob Fujimura <bfujimura@dfg.ca.gov>, Bruce Herbold <Herbold.Bruce@epa.gov>, Brycen Swart <brycen.swart@noaa.gov>, Chad Dibble <CDIBBLE@dfg.ca.gov>, Cynthia LeDoux-Bloom <cledoux@water.ca.gov>, Dan Yamanaka <dany@water.ca.gov>, Edmund Yu <eyu@water.ca.gov>, "Ford, Mike" <jmford@water.ca.gov>, Jason Roberts <JDROBERTS@dfg.ca.gov>, Jeff Stuart <j.stuart@noaa.gov>, Jim Gleim <jamesg@water.ca.gov>, Joe Johnson <jrjohnson@dfg.ca.gov>, John Hannon <JHannon@usbr.gov>, Jon R Burau <jrburau@usgs.gov>, Joshua A Israel <JAIsrael@usbr.gov>, Kevin Reece <creece@water.ca.gov>, "Kiteck, Elizabeth" <EKiteck@usbr.gov>, "Kyler, Kari" <KKyler@waterboards.ca.gov>, "Oppenheim, Bruce" <Bruce.Oppenheim@noaa.gov>, Pat Brandes <Pat_Brandes@fws.gov>, Paul Fujitani <PFujitani@usbr.gov>, "Pettit, Tracy" <pettit@water.ca.gov>, Rachel Johnson <rbarnettjohnson@usbr.gov>, Robert Vincik <rvincik@dfg.ca.gov>, Roger Guinee <roger_guinee@fws.gov>, Russell Yaworsky <rpyaworsky@usbr.gov>, Scott Cantrell <SCANTREL@dfg.ca.gov>, Thomas Morstein-Marx <TMorsteinMarx@usbr.gov>, "Washburn, Thuy" <TWashburn@usbr.gov>

FYI, information from DCT members below:

----- Forwarded message -----

From: **Ford, John M (Mike)** <jmford@water.ca.gov>

Date: Tue, Apr 24, 2012 at 8:53 AM

Subject: RE: Contractor letter to DOSS

To: Tom Boardman <tboardman@apex.net>

Cc: Barbara Byrne <barbara.byrne@noaa.gov>, bruce <bruce.oppenheim@noaa.gov>

Tom,

Yes, I will make sure its sent out and discussed

From: Tom Boardman [mailto:tboardman@apex.net]

Sent: Tuesday, April 24, 2012 8:42 AM

To: Ford, John M (Mike)

Subject: Contractor letter to DOSS

Hi Mike,

Below is a letter that the water contractors would like to submit to the DOSS group for discussion at their meeting this morning. Could you make sure the group receives it?

Thanks

Tom

To the DOSS group:

In response to the discussions that occurred yesterday on the DCT team's conference call, public water agencies south of the Delta have the following concerns and recommendations related to the current management action that began April 22 intended to protect endangered steelhead trout. The listed concerns apply equally to export and flow-related decisions made during May under the Stipulation.

1. Concerns & Questions

- a. Were the Stipulation acoustic tagged hatchery steelhead sufficiently acclimated to behave normally? The Stipulation results appear to be inconsistent with the preliminary 6-Year Study results in that a higher percentage of the Stipulation fish have been detected in the interior delta.
- b. Were the Stipulation fish released at Buckley Cove too close to Turner Cut and Railroad Cut to produce realistic results? Turner Cut is the first junction into the interior Delta, just three miles downstream of the release point. Railroad Cut receiver is just 5 miles downstream from Turner Cut.
- c. Only 3% of the 6-year study acoustic tagged steelhead have been detected in the vicinity of the intakes. Could that be because the 6-year study fish were released about 10 miles farther upstream than Buckley Cove and had more time to acclimate?
- d. What is the comparison of detection rates of Stipulation fish versus 6-year Study fish at Railroad Cut?
- e. Is the 5% detection criterion at Railroad Cut, which is based on 3% detection at the export facilities, too restrictive considering the winter run Chinook take level is 2% of juvenile Chinook entering the Delta? Given that winter run Chinook have already traveled miles in a riverine and tidal estuarine environment, the detection limit seems questionable.
- f. The Stipulation does not provide that exports may be reduced to serve as an experiment. Particularly in light of the water supply losses incurred, exports should not be reduced to provide more data.
- g. What has been the actual salvage of endangered steelhead at the state and federal facilities? How does the actual salvage differ from the passage detection of the Stipulation fish?

2. Additional information

- a. Determine if the Stipulation fish traveled north or south in Old River using 6-Year Study receiver information and the Stipulation Study receiver inside Clifton Court Forebay.

- b. Estimate effect of predation by using more of the receivers to determine movement patterns.
- c. Develop the Delta Simulation Model-2 and Particle Tracking Model results representing this time period for comparison to actual steelhead detection patterns.
- d. Evaluate real time fish movement using data from all possible monitoring programs. Such basic fish behavioral understanding is essential to fully inform policy makers of the implications of their decisions.

3. Recommendation

- a. Considering our concerns expressed above, with this first Stipulation study, we recommend increasing the allowable OMR for the remainder of April from -1250 cfs to -2,500 cfs, which is approximately 1:1 at Vernalis.

The technical memo driving project operations clearly needs to be modified to reflect what we presently know and don't know regarding the movement of wild steelhead through the estuary. In addition, the data relative to the actual occurrence of wild steelhead at the export facilities does not justify the "default" assumption of the regulatory agencies that the most restrictive approach to project exports is justified given the biological uncertainties and economic certainties for our State.

--

Barb Byrne
Fish Biologist

barbara.byrne@noaa.gov | office: 916-930-5612 | fax: 916-930-3629
NMFS Central Valley Office | 650 Capitol Mall, Suite 5-100 | Sacramento, CA 95814

ATTACHMENT 2

Daily Analysis of Sentinel Steelhead in the
2012 Stipulation Study
Hanson Environmental, Inc.
April 24th, 2012

2012 Stipulation Study

Daily Analysis – April 24th, 2012

Natalie Stauffer, Hanson Environmental, Inc.

On April 24th, 2012, data from the Railroad Cut VEMCO receivers at Old and Middle River was downloaded at approximately 10:00 and analyzed by Hanson Environmental, Inc. Data from 5 receivers was analyzed to determine if any fish released by the 2012 stipulation study's first tagging and release effort were detected. Additionally, data from Site 3C was analyzed for 2 days, as the data downloaded yesterday was not accurate or usable. Five new tags were detected and verified (detected at least twice in a 30 minute interval) since the last data retrieval. Thus, a cumulative total of 42 tags have been detected. All of the receivers were working accurately, as verified by the number of beacon tag hits detected and recorded.

Tag ID	Site 2A	Site 2B	Site 3A	Site 3B	Site 3C	Initial Detection Date
A180-1702-14022/3		X	X	X	X	4/17/2012
A180-1702-17738/9	X	X	X	X	X	4/17/2012
A180-1702-2894/5	X	X	X	X	X	4/17/2012
A180-1702-2902/3	X	X	X	X	X	4/17/2012
A180-1702-3328/9			X	X	X	4/17/2012
A180-1702-2826/7	X	X	X	X	X	4/19/2012
A180-1702-17756/7		X	X	X	X	4/19/2012
A180-1702-19376/7			X	X	X	4/19/2012
A180-1702-2808/9	X	X	X	X	X	4/19/2012
A180-1702-2842/3	X	X	X	X	X	4/19/2012
A180-1702-3484/5	X	X	X	X	X	4/19/2012
A180-1702-14032/3	X	X		X	X	4/19/2012
A180-1702-14042/3	X	X	X	X	X	4/19/2012
A180-1702-14048/9	X	X	X	X	X	4/20/2012
A180-1702-8032/3			X	X	X	4/20/2012
A180-1702-3480/1	X	X	X	X	X	4/21/2012
A180-1702-19370/1	X	X	X	X	X	4/21/2012
A180-1702-8030/1	X	X	X	X	X	4/21/2012
A180-1702-23798/9			X	X	X	4/21/2012
A180-1702-17760/1			X			4/21/2012
A180-1702-14038/9			X	X	X	4/21/2012
A180-1702-23778/9			X	X	X	4/21/2012
A180-1702-3482/3			X	X	X	4/21/2012
A180-1702-8026/7			X	X	X	4/21/2012
A180-1702-14052/3			X	X	X	4/21/2012

A180-1702-2836/7			X	X	X	4/21/2012
A180-1702-3466/7			X	X	X	4/21/2012
A180-1702-2892/3	X	X	X	X	X	4/22/2012
A180-1702-2810/1	X	X	X	X	X	4/22/2012
A180-1702-17754/5				X	X	4/22/2012
A180-1702-23776/7	X	X	X		X	4/22/2012
A180-1702-3496/7	X	X				4/23/2012
A180-1702-2900/1	X	X	X	X	X	4/23/2012
A180-1702-2838/9	X	X				4/23/2012
A180-1702-14024/5			X	X	X	4/23/2012
A180-1702-19404/5			X	X	X	4/23/2012
A180-1702-2906/7				X	X	4/23/2012
A180-1702-19400/1	X	X				4/24/2012
A180-1702-14050/1	X	X	X	X	X	4/24/2012
A180-1702-2898/9			X	X	X	4/24/2012
A180-1702-2904/5			X	X	X	4/24/2012
A180-1702-23794/5			X	X	X	4/24/2012

Note of change from previous report: Tag ID A180-1702-23776/7 was detected, but not verified at Site 3B. It was, however, detected and verified at Site 3C. These changes are reflected in the table above.

Appendix J

NMFS Determination on May 4, 2012



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

MAY - 4 2012

Mr. Donald R. Glaser
Regional Director
Mid-Pacific Region
U.S. Bureau of Reclamation
2800 Cottage Way, MP-3700
Sacramento, California 95825-1898

Mr. Mark W. Cowin
Director
California Department of Water Resources
P.O. Box 942836, Room 1115-1
Sacramento, California 94236-0001

Dear Mr. Glaser and Mr. Cowin:

On January 12, 2012, Plaintiffs, Plaintiff-Intervenor, and Federal Defendants to the Consolidated Salmonid Cases (Case 1:09-cv-01053-LJO –DLB) signed and filed with the Federal court a joint stipulation (Document 659-2) that included Central Valley Project and State Water Project operations for April and May 2012. On March 16, 2012, NOAA's National Marine Fisheries Service (NMFS) transmitted to the U.S. Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR) the real-time operations technical memorandum (tech memo) required as part of the joint stipulation (Paragraph 2.a.v).

Pursuant to my April 27, 2012, letter and NMFS determination, my staff reconvened the OMR tech memo planning committee (planning committee) on May 1, 2012, to re-evaluate the trigger and action response from the tech memo based on the new information received from the first experimental period. Various proposals and suggestions for adjustments were vetted through the planning committee, Delta Conditions Team, Delta Operations for Salmonids and Sturgeon (DOSS) Team, and the Water Operations Management Team (WOMT). Enclosure 1 provides the proposals that the groups discussed. The following provides a general summary.

- April 30th: DCT met and discussed proposals from:
 - Brad Cavallo (Attachment 1 to Enclosure 1)
 - Barb Byrne (Attachment 2 to Enclosure 1)
- May 1st:
 - DOSS met and reviewed four different proposals, but did not provide advice regarding a preferred proposal.



- The tech memo planning committee met in the morning and discussed various options for adjusting the trigger and/or the response. There was no consensus on the best approach.
- WOMT met and discussed the four proposals and directed that a sub-group of WOMT meet the next day to further screen the proposals and advise WOMT.
- May 2nd:
 - A sub-group of WOMT met and screened the options into two proposals to present to the full WOMT group, including the pros and cons of each proposal.
 - WOMT met, discussed the two proposals, and developed a hybrid approach to recommend to NMFS. There was not full agreement regarding the recommended option.

Subsequent to the special WOMT call on May 2, NMFS was apprised of an error in the initial calculation of the Railroad Cut trigger that was presented to WOMT on May 2. Enclosure 2 provides the update assumptions used to calculate the Railroad Cut trigger of 24 sentinel steelhead. The intention of the tech memo is to divide the month of May into two stipulation periods. Therefore, NMFS is providing the adjustment and clarifying that the stipulation periods in May should be May 1-15 and May 16-31¹.

NMFS determines that implementing the following proposal will meet the needs of the stipulation study experimental design, adequately protect steelhead, and minimizes the impact to water supply. As such, NMFS finds that the proposal and adjustments will not jeopardize the continued existence of Central Valley steelhead.

- Railroad Cut trigger of 24 sentinel steelhead.
- Combined export limit of 100% of the 3-day average of Vernalis flows (D-1641 limit) for at least the May 1-5 period, even if the Railroad Cut trigger is met during that time period.
- If the Railroad Cut trigger is met, export reductions shall be initiated² (but no earlier than May 5) to produce a 5-day running average of the tidally filtered OMR flow of -1,250 cfs, or 1,500 cfs combined exports, whichever is greater.
- After 5 days of the most positive OMR (or minimum exports), the Projects can return to the experimental OMR flow, or D-1641, whichever is controlling, for the remainder of the period.

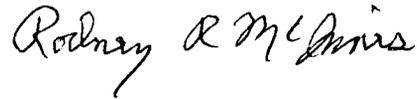
This proposal was selected because had the best real-time adaption of the Railroad Cut trigger while remaining closely tied to the in-depth analysis in the underlying Opinion (*i.e.*, it retained the general calculations of the Railroad Cut trigger while adjusting various assumptions based on the results of the first sentinel steelhead release), created the greatest likelihood of experimental value while still maintaining minimum protections for steelhead, and allowed for increased exports by both lengthening the initial OMR treatment period and shortening the action response time.

¹ The tech memo, page 16, stated the stipulation periods as May 1-14 and May 15-31.

² The tech memo, page 15, provides up to 48 hours to manage exports

NMFS appreciates the continued coordination of the parties towards the implementation of the joint stipulation and the technical memorandum, and especially for developing proposals and providing helpful advice on screening the numerous proposals that were received this period.

Sincerely,

A handwritten signature in cursive script that reads "Rodney R. McInnis".

Rodney R. McInnis
Regional Administrator

Enclosures:

1. Proposals considered for implementation during the current experimental period of May 1-15, 2012
2. Explanation of updates to assumptions used to calculate the Railroad Cut trigger

ENCLOSURE 1

Proposals considered for implementation during
the current experimental period of May 1-15, 2012

Proposals for adjustments to the sentinel steelhead trigger and/or action response for the current experimental period of May 1-15

Proposals discussed during the Delta Conditions Team (DCT) meeting on April 30, 2012, 2:00 p.m.:

1. See attachment 1 for the proposal from Brad Cavallo (Cramer Fish Sciences).
2. Barb Byrne (NMFS) verbally presented a proposal during the DCT call. Attachment 2 is Barb's written proposal that was sent to the planning committee prior to its meeting.

DOSS meeting on May 1, 2012, 9:00 a.m.: In addition to the above, the following proposals were discussed:

3. Implement the March 16, 2012, technical memorandum, with the adjustments provided in the April 27, 2012, NMFS determination.
4. Josh Israel proposed keeping the Railroad Cut trigger calculation the way it was proposed in the tech memo, but if the trigger is met, rather than the action response of changing exports to meet an OMR of -1,250 cfs or 1,500 cfs combined exports through the rest of the experimental period, go to minimum for 5 days, then go back to the initial OMR for the experimental period. This would serve 3 purposes: (1) preserve the integrity of the study, as proposed; (2) minimizes water cost by limiting minimums to 5 days; and (3) maximizes learning opportunity by seeing how fish react to less negative OMR (after the trigger is met), seeing how fish react to 5 days at minimum exports (which is indirectly testing the action response of Action IV.2.3), and finally, seeing how fish respond to OMR returning to the experimental OMR flow.

Proposals discussed at the planning committee meeting on May 1, 2012, 11:00 a.m.: The above proposals were discussed.

Proposals discussed at the WOMT subgroup meeting on May 2, 2012, 9:00 a.m.: The above proposals were discussed. The following proposals were presented to WOMT for its consideration at the special WOMT meeting:

- Option 1: 10 days sustained 1:1 exports:Vernalis flow per D-1641, then transition to 5 days at minimum exports. No sentinel steelhead trigger at Railroad Cut.
 - Experimental value:
 - Better because longer sustained OMR at the same level
 - May not be as good because by day 10, less sentinel fish in the area of the Railroad Cut receivers to track
 - Fish protection potentially higher for wild steelhead if wild steelhead respond to the higher flows at Vernalis at the end of the experimental period
 - Water cost higher because of the expected higher Vernalis flow in the latter 5 days of the experimental period

- Option 2: fish trigger adjusted to 19 sentinel steelhead at Railroad Cut (based on spreadsheet calculation), transition to minimums (most positive OMR or combined exports) for 5 days, then go back up to 1:1 D-1641 export limit
 - Experimental value less because:
 - If hit trigger sooner, less days of not sustained higher OMR
 - If not hit the trigger throughout the experimental period, then can't test fish response from high (more negative) OMR transitioning to low (least negative) OMR
 - Fish protection:
 - Same as option 1 if at the end of the period
 - Potentially less if trigger is met earlier, and if steelhead respond to higher Vernalis flows at the end of the period
 - Water supply consideration:
 - If trigger met around day 5-7, then water supply impact minimized
 - If trigger met around day 10, then water supply impact is the same as option 1

Final proposal from the special WOMT call on March 2, 2012, 12:00 p.m.:

- Railroad Cut trigger of 19 sentinel steelhead (based on a quick calculation during the planning committee meeting), applying the experimental steelhead release and fate from the first experimental period.
- Combined export limit of 100% of the 3-day average of Vernalis flows (D-1641 limit) for at least the May 1-5 period, even if the Railroad Cut trigger is met during that time period.
- If the Railroad Cut trigger is met, export reductions shall be initiated (but no earlier than May 5) to produce a 5-day running average of the tidally filtered OMR flow of -1,250 cfs, or 1,500 cfs combined exports, whichever is greater. Because it was previously agreed that the projects can phase in the operation over 48 hours, this action may look more like 7 days of more negative OMR.
- After 5 days of the most positive OMR (or minimum exports), the Projects can return to the experimental OMR flow for the remainder of the period.



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TECHNICAL MEMORANDUM

TO: Delta Conditions Team and Stipulation Acoustic Tagging Study Leads
 FROM: Brad Cavallo
 DATE: April 30 2012
 SUBJECT: Reevaluation of Railroad Cut Trigger for Stipulation Study

On April 16th one-hundred and sixty-three (163) acoustically tagged steelhead smolts originating from the Mokelumne River Fish Hatchery were released near Buckley Cove on the San Joaquin River (just downstream from Stockton). These fish were released as part of the “sentinel steelhead study” specified in the March 16th NMFS technical memorandum required by the joint stipulation agreement (Document 659-2) for the Consolidated Salmonid Cases (Case 1 :09-cv-01053-LJO -DLB).

As of April 30th, 40 acoustically tagged fish, roughly 25% of the total fish released as part of the “sentinel steelhead study” have reached receiver arrays located at Railroad Cut on Old and Middle River corridors. This rate of detection exceeds by a factor of five the “trigger” defined in the stipulation technical memorandum and occurred despite OMR flows being near -2,500 cfs rather than the -3,500 cfs originally planned for the experiment (Figure 1). Additional releases of sentinel steelhead are planned for May 1st and May 15th and there is concern that these releases will produce similar results; exceeding the stipulation study trigger and forcing an immediate reduction of South Delta exports.

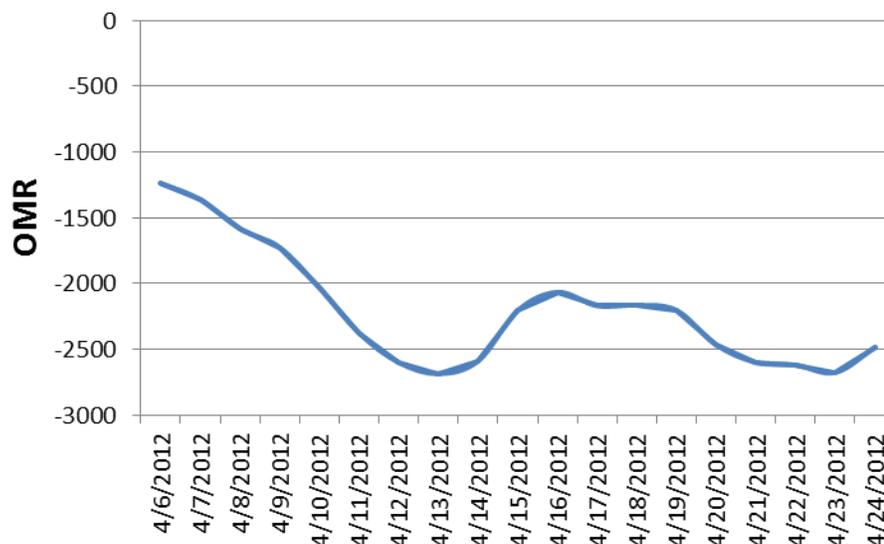


Figure 1. Five-day moving average of OMR conditions during April, 2012.

In light of result from the April 16th release, and in recognition of concerns about forthcoming release, Cramer Fish Sciences staff conducted an analysis of the conditions and factors which could contribute to exceeding the stipulation study trigger.

Specifically, we created a simple simulation model (in Microsoft Excel) which allowed us to evaluate the influence of two key factors: 1) route selection at four junctions to the interior Delta, and 2) survival rate per kilometer (km). The stipulation study trigger calculations applied a survival rate of 0.97/km, thus we explored values between 0.95/km and 0.99/km. For simplicity, and because we currently lack more detailed information, this survival rate was applied to all migration corridors evaluated. For route selection, we used the range of fish entrainment indicated by DSM2 Hydro analysis and PTM analysis (@ 2 days) presented at the February 7th stipulation workshop: Turner Cut: 9% to 15%; Colombia Cut (10% to 20%); Middle River (10% to 20%); Old River (5% to 13%). Lastly, once fish entered one of the interior Delta routes (via any junction) we assumed all fish would continue moving southward and would fail to reach Railroad Cut only due to mortality. In reality, some fraction of fish entering the interior Delta may turn around and return to mainstem San Joaquin River; however the rate at which this occurs is currently unknown.

Results of analyses conducted with our simple simulation model indicate that under a variety survival and routing conditions, a relatively large number of sentinel steelhead smolts can be expected to arrive at the Railroad Cut Receiver Array (Figure 2).

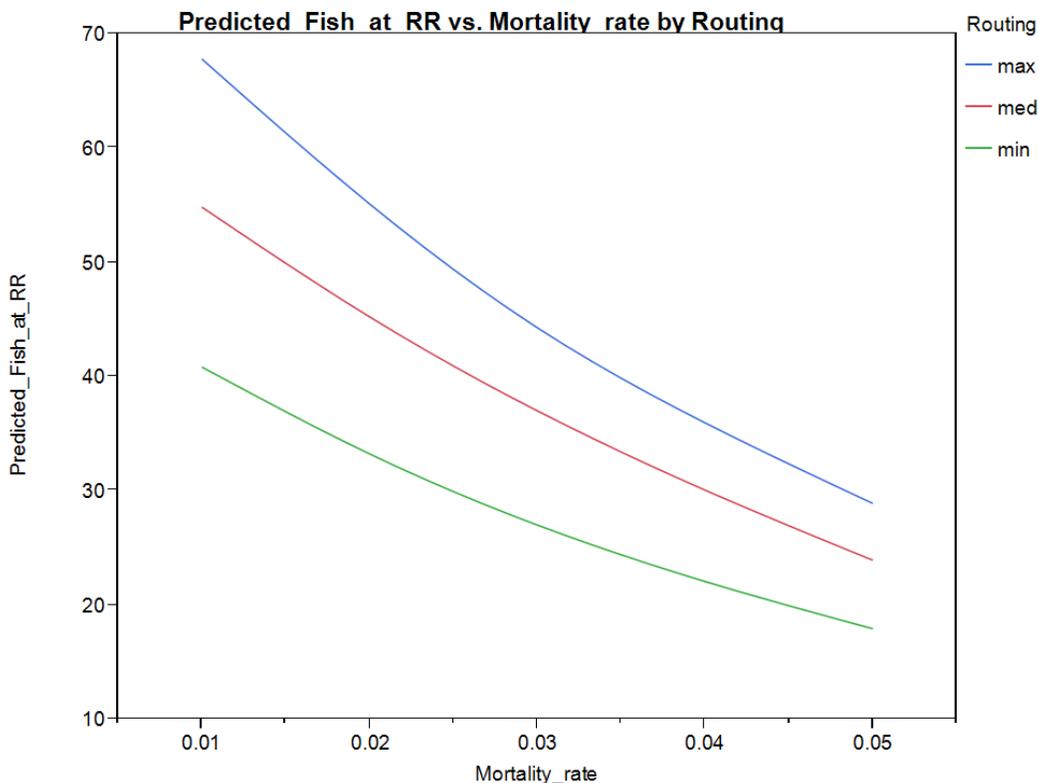


Figure 2. Predicted number of fish arriving at Railroad Cut receiver arrays (y-axis) as a function of mortality rate (x-axis) and three routing levels (legend). Routing levels refer to the minimum, median, and maximum of ranges for each junction as defined in the text.

Indeed, the results suggest that 40 sentinel fish arriving at the Railroad Cut receiver array is a very likely event. To provide a more complete assessment of this probability, and in particular to inform expectations for forthcoming releases of stipulation study sentinel fish, we conducted a bootstrap re-sampling exercise. Using the same model assumptions described previously, we randomly resampled 1,000 times among the range of survival rates and routing probabilities and estimated the fraction of fish which would be expected. The results of this resampling exercise are depicted in Figure 3. The mean response was that 24% of sentinel fish would be expected to arrive at Railroad Cut arrays, with a minimum of 11% and a maximum of 41%.

Collectively, the results of the analyses presented here indicate a relatively large fraction of sentinel steelhead should be expected to arrive at the Railroad Cut receiver array regardless of OMR conditions, and thus, the trigger defined in the stipulation technical memorandum was in error. These results suggest the trigger should be re-evaluated for the remaining two releases of sentinel steelhead smolts.

The bootstrap resampling results may provide basis for establishing a new experimental trigger. OMR flows during the first release of sentinel fish were roughly -2500 and produced results very near the mean response of the resampling simulation. If more negative OMR flows cause more fish to reach Railroad Cut (as has been hypothesized), then OMR flows of -3,800 cfs (for example) would be expected to significantly increase the fraction of sentinel steelhead arriving at Railroad Cut. Though there is no objective definition of “significant” possible in these circumstances, an observation of sentinel fish greater than the 90% percentile from the bootstrap resampling provides a reasonably conservative metric. For example, a revised trigger criteria might state: “If the proportion of sentinel fish arriving at Railroad Cut exceeds 34% (the 90th percentile of observations from simulations studies), then the trigger will have been reached.”

The Delta Conditions Team and stipulation study investigators should discuss these findings and discuss appropriate revisions to the original stipulation study trigger.

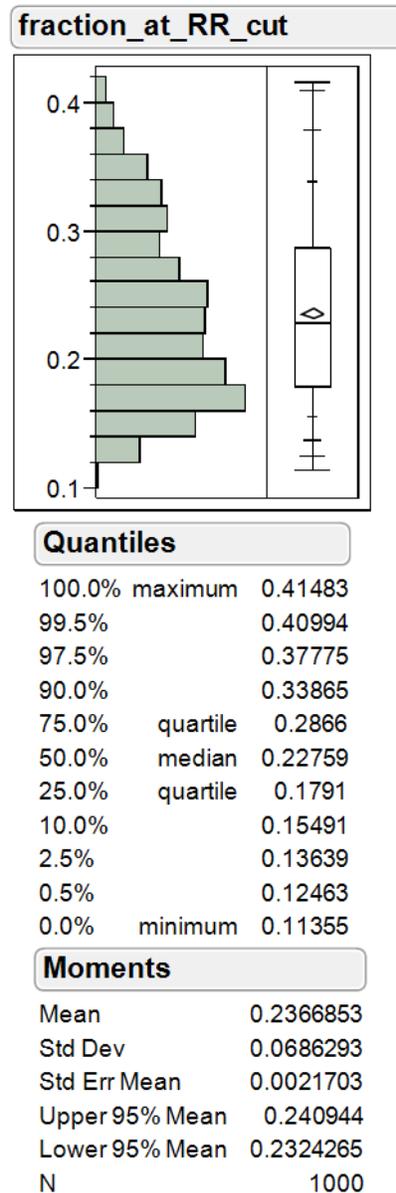


Figure 3. Results from bootstrap resampling exercise of sentinel study routing and survival probabilities.

DRAFT IDEA FOR SENTINEL TRIGGER ADJUSTMENT – Barb Byrne – 5.1.2012

When the OMR technical memo was drafted, limited information was available about steelhead movement through the south Delta and the trigger level and action response were set to levels intended to manage risk for steelhead entering the Delta from above Mossdale or from the Calaveras or Mokelumne rivers. The data from the first release group of sentinel steelhead suggest that entrainment of tagged steelhead into south Delta channels (or predation in south Delta channels, or predation in the mainstem San Joaquin following by movement of predators into south Delta channels) under even fairly positive OMR levels, comparable to the OMR levels that would be expected if implementing Action IV.2.1, is higher than was expected – exceeding the trigger level of 9 fish five-fold even before the end of the experimental period.

It may be appropriate to use the tag detection information from the first experimental period to update the exposure trigger level for subsequent experimental periods. Because conditions during the first experimental period were similar to the conditions expected under Action IV.2.1 implementation, one option is to set the trigger level for subsequent periods to the total number of sentinel tags detected at the Railroad Cut receivers throughout the April 15-30 experimental period (total of 49). This option includes tags detected throughout the experimental period (desirable), but includes over a week at combined exports of 1500 cfs, which would tend to result in more positive OMRs than if exports had continued to track the Vernalis flows as allowed under D-1641 (less desirable).

Another option is to set the trigger level for subsequent periods to the total number of sentinel tags detected at the Railroad Cut receivers throughout the April 15-21 partial experimental period, when exports were restricted (by D-1641) to 100% of Vernalis flows (30, based on the 4/22 early morning download). This option does not include tags detected when exports are less than Vernalis flow (desirable), but also does not include tag detections from more than half of the experimental period (less desirable).

The action response should remain that same, that is, operations will, within 48 hours, target an OMR of -1,250 (or 1500 combined exports) once the exposure trigger level is exceeded.

ENCLOSURE 2

Explanation of updates to assumptions
used to calculate the Railroad Cut trigger

The table below (modeled after Table 4 of the OMR Technical Memorandum) shows the trigger calculation for the May 1-May 15 experimental period, with updated assumptions highlighted in yellow.

ROW ID	VALUE	FORMULA	DESCRIPTION
Calculation of average travel distance between Railroad Cut receivers and the SWP and CVP			
A1	12	Fixed value	Approximate distance (km) from Railroad Cut receiver on Old River to SWP Clifton Court intake
A2	18	Fixed value	Approximate distance (km) from Railroad Cut receiver on Middle River to SWP Clifton Court intake
A3	2	Fixed value	Approximate distance (km) from SWP Clifton Court intake to CVP intake
A4	13.73	$=(A11 * A1) + [A12 * (A1 + A3)]$	Average approximate distance(km) from Railroad Cut receiver on Old River to SWP or CVP intake, weighted according to estimated split of facility entry (value assumed in A13)
A5	19.73	$=(A11 * A2) + [A12 * (A2 + A3)]$	Average approximate distance(km) from Railroad Cut receiver on Middle River to SWP or CVP intake, weighted according to estimated split of facility entry (value assumed in A13)
A6	0.34 ⁱ	Assumption	Of fish passing the Railroad Cut receivers, assumed proportion that are in Old River
A7	17.7	$=(A6 * A4) + [(1 - A6) * (A5)]$	Average approximate distance (km) traveled by all fish reaching the SWP or CVP, weighted by origin (Old River or Middle River) and split of facility entry.
Calculation of exposure trigger			
A8	167 ⁱⁱ	Assumption	Number of Acoustically Tagged Fish in release group. <i>Set to the actual release group size for each treatment period.</i>
A9	2%	Fixed value	Loss at the SWP and CVP not to exceed this value (percent of release group)
A10	3.34	$=A8 * A9$	Loss at the SWP and CVP not to exceed this value (number of fish from release group)
A11	0.13	$=A13$	Of fish that enter the CVP or SWP, assumed proportion that enter the SWP
A12	0.87	$=(1 - A13)$	Of fish that enter the CVP or SWP, assumed proportion that enter the CVP
A13	0.13 ⁱⁱⁱ	Assumption	Of fish that enter the CVP or SWP, assumed proportion that enters the SWP.
A14	4.33	Fixed value	SWP approximate salvage-to-loss factor

ROW ID	VALUE	FORMULA	DESCRIPTION
Calculation of exposure trigger, continued			
A15	0.68	Fixed value	CVP approximate salvage-to-loss factor
A16	0.187617261	=1*[1/(1+A14)]	For each fish entering the SWP, expected SWP salvage
A17	0.595238095	=1*[1/(1+A15)]	For each fish entering the CVP, expected CVP salvage
A18	0.812382739	=1*[A14/(1+A14)]	For each fish entering the SWP, expected SWP loss
A19	0.404761905	=1*[A15/(1+A15)]	For each fish entering the CVP, expected CVP loss
A20	TRUE	Logical formula as used in excel: =IF(A16*A14=A18, TRUE, FALSE)	Check that expected SWP salvage (A16) * SWP approximate salvage-to-loss factor (A14) = expected SWP loss (A18)
A21	TRUE	Logical formula as used in excel: =IF(A17*A15=A19, TRUE, FALSE)	Check that expected CVP salvage (A17) * CVP approximate salvage-to-loss factor (A15) = expected CVP loss (A19)
A22	TRUE	Logical formula as used in excel: =IF(A16+A18=1, TRUE, FALSE)	Check that expected SWP salvage (A16) + expected SWP loss (A18) = 1
A23	TRUE	Logical formula as used in excel: =IF(A17+A19=1, TRUE, FALSE)	Check that expected CVP salvage (A17) + expected CVP loss (A19) = 1
A24	0.459111349	=(A11*A18)+(A12*A19)	Expected loss per fish that enter the SWP or CVP, given the assumed entry proportion to each facility and the loss rate at each facility
A25	7.274923621	=A10/A24	How many fish from the release group may encounter the SWP & CVP without exceeding the loss trigger?
A26	4.36%	=A25/A8	What percent of fish from the release group may encounter the SWP & CVP without exceeding the loss trigger?
A27	0.79	=A11*A25*A18	Expected SWP Loss if A25 fish enter the facilities at the expected ratio
A28	2.55	=A12*A25*A19	Expected CVP Loss if A25 fish enter the facilities at the expected ratio
A29	TRUE	Logical formula as used in excel: =IF(A27+A28=A10, TRUE, FALSE)	Check that SWP loss + CVP Loss add up to loss trigger
A30	0.065^{iv}	Assumption	Assumed mortality rate (per km) between the Railroad Cut receivers and the SWP and CVP.
A31	0.31	=(1-A30)^A7	Survival from the Railroad Cut receivers to the SWP and CVP, based on the average distance in A7.
A32	24	=A25/A31	How many fish from the release group may encounter the Railroad Cut receivers without exceeding the loss trigger?
A33	14.4%	=A32/A8	What percent of fish from the release group encounter the Railroad Cut receivers without exceeding the loss trigger?

ⁱ The "Bi-Weekly Report" from Hanson Environmental, Inc. prepared from data downloaded on April 27, 2012, reported that of the 48 tags detected at the Railroad cut receivers, 44 sentinel tags were detected in Middle River and 29 sentinel tags were detected in Old River. Of the 29 sentinel tags detected in Old River, 25 were also detected in Middle River, leaving just four sentinel tags as having been detected only in Old River. Because a full tag detection history from all Railroad Cut receivers, including time of each detection, is not yet available, NMFS assumed that half of the 25 sentinel tags detected in both channels traveled through Old River (12.5 sentinel tags) and half traveled through Middle River (12.5 sentinel tags). Of fish passing the Railroad Cut receivers, the proportion that is in Old River is estimated as $(4+12.5)/48=0.34$.

ⁱⁱ 167 sentinel steelhead were released from May 1-2, 2012.

ⁱⁱⁱ Based on a preliminary sentinel tag detection analysis (through 4/30) from Josh Israel (Reclamation), of the 15 sentinel tags detected at the receivers just inside the SWP and CVP, 2 sentinel tags were detected at the SWP. Of fish that enter the CVP or SWP, the proportion that enter the SWP is estimated as $2/15=0.1333$.

^{iv} Based on a preliminary sentinel tag detection analysis (through 4/30) from Josh Israel (Reclamation), of the 49 tags that were detected at the RR Cut receivers through April 30, 2012, 15 tags were detected at the receivers just inside the SWP and CVP. This information, per the calculation method shown below, was used to update the south Delta mortality estimate to 6.5% per km.

Updated mortality estimate based on the reported number of tags at Railroad Cut and entering the CVP or SWP.			
ROW ID	VALUE	FORMULA	DESCRIPTION
B1	49	Fixed value	Number of tags detected at Railroad Cut receivers
B2	15	Fixed value	Number of tags detected entering the CVP or SWP
B3	34	B1-B2	Number of tags that "died" between the Railroad Cut receivers and the CWP or SWP
B4	0.69387755	B3/B1	Percent of tags that "died" between the Railroad Cut receivers and the CWP or SWP
B5	17.6708333	A7 (from above table)	Average distance (km) for all fish reaching facilities, weighted by origin (and split of facility entry)
B6	0.9352045	$(B2/B1)^{(1/B5)}$	Migration survival rate (per km)
B7	0.0647955	1-B6	Updated Estimate of Migration Mortality Rate (per km)

Appendix K

NMFS Determination on May 11, 2012



**UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration**

NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

MAY 11 2012

Mr. Donald R. Glaser
Regional Director
Mid-Pacific Region
U.S. Bureau of Reclamation
2800 Cottage Way, MP-3700
Sacramento, California 95825-1898

Mr. Mark W. Cowin
Director
California Department of Water Resources
P.O. Box 942836, Room 1115-1
Sacramento, California 94236-0001

Dear Mr. Glaser and Mr. Cowin:

On January 12, 2012, Plaintiffs, Plaintiff-Intervenor, and Federal Defendants to the Consolidated Salmonid Cases (Case 1:09-cv-01053-LJO –DLB) signed and filed with the Federal court a joint stipulation (Document 659-2) that included Central Valley Project (CVP) and State Water Project (SWP; combined, referred to as the Projects) operations for April and May 2012. On March 16, 2012, NOAA's National Marine Fisheries Service (NMFS) transmitted to the U.S. Bureau of Reclamation and the California Department of Water Resources the real-time operations technical memorandum (tech memo) required as part of the joint stipulation (Paragraph 2.a.v).

The enclosure provides the Delta Operations for Salmonids and Sturgeon group (DOSS) advice¹ to the Water Operations Management Team (WOMT) and NMFS on the third experimental period of May 16-31, as follows:

- Update the assumptions used to calculate the Railroad Cut trigger with the additional tag detection data collected during the first week of the second experimental study period, expected to result in a trigger value in the low 30s (based on a quick calculation during the DOSS call). The final trigger number would be provided to NMFS and included in the NMFS determination.
- Target an Old and Middle River (OMR) flow limit of -5,000 cfs for at least the May 16-20 period, even if the Railroad Cut trigger is met during that time period.

¹ Discussions at DOSS and the resulting advice to WOMT and NMFS were based on the assumption that the San Joaquin Valley Water Year Type Index 60-20-20 was "critical."



- If the number of tag detections at the Railroad Cut receivers meets or exceeds the Railroad Cut trigger, export reductions shall be initiated (but no earlier than May 20) to produce a 5-day running average of the tidally filtered OMR flow of -1,250 cfs, or 1,500 cfs combined exports, whichever is greater. Because it is acknowledged that changes in operations may take 48 hours to implement (possibly longer over a weekend), the initial OMR limit may be in effect as long as 7 days, even if the trigger is exceeded within the first five days.
- After 5 days at the most positive OMR (or minimum exports), the Projects can return to the experimental OMR flow of -5,000 cfs for the remainder of the period.

NMFS accepts the DOSS advice, and determines that implementing the above proposal, with the clarifications provided below, will meet the needs of the stipulation study experimental design, adequately protect steelhead, and minimizes the impact to water supply. As such, NMFS finds that the proposal and adjustments will not jeopardize the continued existence of Central Valley steelhead.

- NMFS' April 27, 2012, determination (http://swr.nmfs.noaa.gov/ocap/doss/Glaser_Cowin%20NMFS_determination_letter.pdf) formalized the switch in experimental OMR flows in May, so that during the May 16-31, 2012, experimental period, the experimental OMR flow should target -1,250 cfs. However, as a result of other regulatory constraints (*i.e.*, D-1641), the Projects were not able to implement the higher (more negative) OMR flows within the allowable range. Despite NMFS' determination acknowledging a switch in experimental OMR flows, NMFS determines that an initial experimental OMR flow of -5,000 cfs during the May 16-31, 2012, period is consistent with the intent of the NMFS' March 16, 2012, technical memorandum (tech memo, http://swr.nmfs.noaa.gov/ocap/2012-03-16_Joint_Stipulation_Tech_Memo.pdf) and supporting stipulation study plan (Attachment 3 to the tech memo), that is, to evaluate potential effects of OMR flows on reach-scale survival, migrate rate, and net migration direction of acoustically tagged juvenile steelhead in the lower San Joaquin River, Turner Cut, Columbia cut, Middle River, and Old River.
- Enclosure 2 provides the updated assumptions used to calculate the initial Railroad Cut trigger of 31 sentinel steelhead. However, since the third experimental period has not started yet, the trigger of 31 sentinel steelhead was based on an assumption that 168 sentinel steelhead will be released, with no mortalities. The following table provides the calculated trigger number based on different release group sizes, in the event the release group is less than 168. Upon confirmation of the final release number, NMFS will notify the Delta Conditions Team, DOSS, WOMT, and the planning committee e-mail list via e-mail of the official Railroad Cut trigger number.

Release Group Size	Railroad Cut Trigger
165-168	31
159-164	30
153-158	29
150-152	28

As with the proposal considered in NMFS' May 4, 2012, determination, the above proposal has the best real-time adaption of the Railroad Cut trigger while remaining closely tied to the in-depth analysis in the underlying biological opinion on the long-term operations of the CVP and SWP (*i.e.*, it retained the general calculations of the Railroad Cut trigger while adjusting various assumptions based on the results of the first sentinel steelhead release), created the greatest likelihood of experimental value while still maintaining minimum protections for steelhead, and allowed for increased exports by both lengthening the initial OMR treatment period and shortening the action response time.

Following the DOSS and WOMT meetings, NMFS was apprised of a change in the San Joaquin Valley Water Year Type Index (SJI) from "critical" to "dry" (http://cdec.water.ca.gov/cgi-progs/iodir_ss/wsi). As provided in the joint stipulation (Paragraph 2.a.v on page 5), "The DOSS will provide its information and advice to the WOMT for its consideration in developing a recommendation to NMFS for actions to protect salmonids and green sturgeon." With this change in SJI, NMFS will discuss with DOSS during its meeting next Tuesday whether any changes to the post response flow level (likely to be May 28-31, 2012) are warranted..

NMFS appreciates the continued coordination of the parties towards the implementation of the joint stipulation and the technical memorandum.

Sincerely,



for Rodney R. McInnis
Regional Administrator

Enclosures:

1. DOSS advice
2. Explanation of updates to assumptions used to calculate the Railroad Cut trigger

DOSS Advice for operations during May 16-31, 2012

Old and Middle River Flow Management per the 2012 Joint Stipulation, in lieu of Action IV.2.1 of the NMFS Biological Opinion for the Long-Term Operations of the Central Valley Project and State Water Project (NMFS Opinion)

Summary of Advice from the Delta Operations for Salmonids and Sturgeon (DOSS) group:

Background:

The Delta Conditions Team (DCT) met on May 7, 2012, and offered the following experimental OMR treatment levels for consideration during the May 16-31, 2012, experimental period:

- Tom Boardman (supported by Terry Erlewine and Paul Hutton): OMR at -5,000 cfs to test the higher (more negative) end of the OMR range; and
- Emily Brown (supported by Doug Obegi): OMR at -1,250 cfs to test the lower (more positive) end of the OMR range. While sentinel steelhead have been exposed to minimum exports/more positive OMR, this exposure has happened as a result of a Railroad Cut trigger, not at the beginning of an experimental period.
- After the DCT call, and prior to DOSS, Brad Cavallo sent an e-mail to the DCT with the proposal for an OMR of -1,250 cfs for the first week and -5,000 cfs for the second week of the experimental period.

DOSS discussed the above proposals, and also variations of them, in consideration of the following:

- Forecasted flows at Vernalis
- Benefits to the experiment from the various initial OMR flows
- Protection of wild steelhead in the San Joaquin River
- Expected water temperatures

DOSS advice for Tuesday 5/8/12:

DOSS advises WOMT and NMFS to consider the following proposal for implementation during the third sentinel steelhead experimental study period of May 16-31, 2012:

- Update the assumptions used to calculate the Railroad Cut trigger with the additional tag detection data collected during the first week of the second experimental study period, expected to result in a trigger value in the low 30s (based on a quick calculation during the DOSS call). The final trigger number would be provided to NMFS and included in the NMFS determination.
- Target an OMR limit of -5,000 cfs for at least the May 16-20 period, even if the Railroad Cut trigger is met during that time period.
- If the number of tag detections at the Railroad Cut receivers meets or exceeds the Railroad Cut trigger, export reductions shall be initiated (but no earlier than May 20) to produce a 5-day running average of the tidally filtered OMR flow of -1,250 cfs, or 1,500 cfs combined exports, whichever is greater. Because it is acknowledged that changes in

operations may take 48 hours to implement (possibly longer over a weekend), the initial OMR limit may be in effect as long as 7 days, even if the trigger is exceeded within the first five days.

- After 5 days at the most positive OMR (or minimum exports), the Projects can return to the experimental OMR flow of -5,000 cfs for the remainder of the period.

Rationale for DOSS advice:

Railroad Cut trigger number:

- DOSS agreed to use the Railroad Cut trigger worksheet from the March 16, 2012, technical memorandum, with updated assumptions.
- Assumptions, including the estimate of south Delta mortality, would be updated based on data from the first and second experimental periods.

Target an OMR limit of -5,000 cfs for at least the May 16-20 period, even if the Railroad Cut trigger is met during that time period.

- DOSS agreed that either extreme of the experimental OMR range (-1,250 cfs, or -5,000 cfs), as opposed to a moderate OMR flow, should be targeted as the initial OMR flow. DOSS agreed to advise the initial OMR of -5,000 cfs because:
 - there is a greater difference between the initial OMR flows in the first and second periods (approximately -2,450 cfs and -2,900 cfs, respectively) and -5,000 cfs than compared to -1,250 cfs; greater differentiation between treatment levels provides greater power to test the effect of OMR on steelhead movement.
- A minimum of 7 days at the initial OMR flow (at least 5 days at the OMR, plus 2 additional days for the Projects to implement an action response, as necessary) provides a reasonable window of time at the experimental OMR level over which to test sentinel steelhead response.

5-day action response at the most positive OMR (or minimum exports), then the Projects can return to the experimental OMR flow of -5,000 cfs for the remainder of the period through May 31, 2012.

- The 5-day duration of the action response will allow testing of the response of sentinel steelhead to a shift to more positive OMR flows. Tag detection data will be reviewed to assess whether or not (1) the more positive OMR flows slow or reverse the migration of the sentinel steelhead towards the export facilities, and (2) whether 5 days is an adequate duration to elicit a response.

Water temperatures: The group noted that the current warm water temperatures are expected get even higher near the end of May. The possibility of temperature-mediated impacts on fish condition (*e.g.*, stress) and mortality of sentinel steelhead in the central delta should be considered during the analysis of the sentinel study data.

The table below (modeled after Table 4 of the OMR Technical Memorandum) shows the trigger calculation for the May 16-May 31 experimental period, with updated assumptions highlighted in yellow.

ROW ID	VALUE	FORMULA	DESCRIPTION
Calculation of average travel distance between Railroad Cut receivers and the SWP and CVP			
A1	12	Fixed value	Approximate distance (km) from Railroad Cut receiver on Old River to SWP Clifton Court intake
A2	18	Fixed value	Approximate distance (km) from Railroad Cut receiver on Middle River to SWP Clifton Court intake
A3	2	Fixed value	Approximate distance (km) from SWP Clifton Court intake to CVP intake
A4	13.74	$=(A11*A1)+[A12*(A1+A3)]$	Average approximate distance(km) from Railroad Cut receiver on Old River to SWP or CVP intake, weighted according to estimated split of facility entry (value assumed in A13)
A5	19.74	$=(A11*A2)+[A12*(A2+A3)]$	Average approximate distance(km) from Railroad Cut receiver on Middle River to SWP or CVP intake, weighted according to estimated split of facility entry (value assumed in A13)
A6	0.25 ⁱ	Assumption	Of fish passing the Railroad Cut receivers, assumed proportion that are in Old River
A7	18.23	$=(A6*A4) + [(1-A6)* (A5)]$	Average approximate distance (km) traveled by all fish reaching the SWP or CVP, weighted by origin (Old River or Middle River) and split of facility entry.
Calculation of exposure trigger			
A8	168 ⁱⁱ	Assumption	Number of Acoustically Tagged Fish in release group. <i>Set to the actual release group size for each treatment period.</i>
A9	2%	Fixed value	Loss at the SWP and CVP not to exceed this value (percent of release group)
A10	3.36	$=A8*A9$	Loss at the SWP and CVP not to exceed this value (number of fish from release group)
A11	0.13	$=A13$	Of fish that enter the CVP or SWP, assumed proportion that enter the SWP
A12	0.87	$=(1-A13)$	Of fish that enter the CVP or SWP, assumed proportion that enter the CVP
A13	0.13 ⁱⁱⁱ	Assumption	Of fish that enter the CVP or SWP, assumed proportion that enters the SWP.
A14	4.33	Fixed value	SWP approximate salvage-to-loss factor

ROW ID	VALUE	FORMULA	DESCRIPTION
Calculation of exposure trigger, continued			
A15	0.68	Fixed value	CVP approximate salvage-to-loss factor
A16	0.187617261	=1*[1/(1+A14)]	For each fish entering the SWP, expected SWP salvage
A17	0.595238095	=1*[1/(1+A15)]	For each fish entering the CVP, expected CVP salvage
A18	0.812382739	=1*[A14/(1+A14)]	For each fish entering the SWP, expected SWP loss
A19	0.404761905	=1*[A15/(1+A15)]	For each fish entering the CVP, expected CVP loss
A20	TRUE	Logical formula as used in excel: =IF(A16*A14=A18, TRUE, FALSE)	Check that expected SWP salvage (A16) * SWP approximate salvage-to-loss factor (A14) = expected SWP loss (A18)
A21	TRUE	Logical formula as used in excel: =IF(A17*A15=A19, TRUE, FALSE)	Check that expected CVP salvage (A17) * CVP approximate salvage-to-loss factor (A15) = expected CVP loss (A19)
A22	TRUE	Logical formula as used in excel: =IF(A16+A18=1, TRUE, FALSE)	Check that expected SWP salvage (A16) + expected SWP loss (A18) = 1
A23	TRUE	Logical formula as used in excel: =IF(A17+A19=1, TRUE, FALSE)	Check that expected CVP salvage (A17) + expected CVP loss (A19) = 1
A24	0.45741293	=(A11*A18)+(A12*A19)	Expected loss per fish that enter the SWP or CVP, given the assumed entry proportion to each facility and the loss rate at each facility
A25	7.34566031	=A10/A24	How many fish from the release group may encounter the SWP & CVP without exceeding the loss trigger?
A26	4.37%	=A25/A8	What percent of fish from the release group may encounter the SWP & CVP without exceeding the loss trigger?
A27	0.77	=A11*A25*A18	Expected SWP Loss if A25 fish enter the facilities at the expected ratio
A28	2.59	=A12*A25*A19	Expected CVP Loss if A25 fish enter the facilities at the expected ratio
A29	TRUE	Logical formula as used in excel: =IF(A27+A28=A10, TRUE, FALSE)	Check that SWP loss + CVP Loss add up to loss trigger
A30	0.077 ^{iv}	Assumption	Assumed mortality rate (per km) between the Railroad Cut receivers and the SWP and CVP.
A31	0.23	=(1-A30)^A7	Survival from the Railroad Cut receivers to the SWP and CVP, based on the average distance in A7.
A32	31	=A25/A31	How many fish from the release group may encounter the Railroad Cut receivers without exceeding the loss trigger?
A33	18.5%	=A32/A8	What percent of fish from the release group encounter the Railroad Cut receivers without exceeding the loss trigger?

ⁱ Because a full tag detection history from all Railroad Cut receivers, including time of each detection, is not yet available, NMFS assumed that half of the sentinel tags detected in both channels traveled through Old River and half traveled through Middle River. Of fish passing the Railroad Cut receivers for each experimental period, the proportion that is in Old River is thus estimated as: (Number of tags detected ONLY at Old River receivers + Half of the tags detected at both Old River and Middle River receivers)/Total number of tags detected at either Old River or Middle River receivers.

	Period 1: 4/15-4/30	Partial Period 2: 5/1-5/7
Number of tags detected ONLY at Old River receivers	3	0
Number of tags detected ONLY at Middle River receivers	18	31
Number of tags detected at BOTH Old River and Middle River receivers	28	14
Total number of tags detected at either Old River or Middle River receivers	49	45
Of fish passing the Railroad Cut receivers for each experimental period, the proportion in Old River	$(3+14)/49=0.3469$	$(0+7)/45=0.1555$
Average of two periods	$(0.3469+0.1555)/2=0.2512$	

ⁱⁱ 168 sentinel steelhead is the expected release group size. If sentinel steelhead die or not recover fully during tagging or holding, this release group size will be adjusted accordingly. The calculated trigger levels at various release group sizes are summarized in Enclosure 3.

ⁱⁱⁱ Of fish that enter the CVP or SWP, the proportion that enter the SWP is estimated as: Number of tags detected at the receivers just inside the SWP/Total number of tags detected at the receivers just inside either the SWP or CVP.

	Period 1: 4/15-4/30	Partial Period 2: 5/1-5/7
Number of tags detected at the receivers just inside the SWP	2	1
Number of tags detected at the receivers just inside the CVP	13	7
Total number of tags detected at the receivers just inside either the SWP or CVP	15	8
Of fish that enter the CVP or SWP, the proportion that enter the SWP	$2/15=0.1333$	$1/8=0.125$
Average of two periods	$(2/15 + 1/8)/2= 0.1292$	

^{iv} Sentinel tag detections at the receivers near Railroad Cut in Old River and Middle River, as well as at the receivers just inside the SWP and CVP, were used to update the estimate of south Delta mortality per the calculation method shown below.

Updated mortality estimate based on the reported number of tags at Railroad Cut and entering the CVP or SWP.				
ROW ID	VALUE for Period 1: 4/15-4/30 (column a)	VALUE for partial Period 2: 5/1-5/7 (column b)	FORMULA	DESCRIPTION
B1	49	45	Fixed value	Number of tags detected at Railroad Cut receivers
B2	15	8	Fixed value	Number of tags detected entering the CVP or SWP
B3	34	37	B1-B2	Number of tags that "died" between the Railroad Cut receivers and the CWP or SWP
B4	0.69387755	.82222222	B3/B1	Percent of tags that "died" between the Railroad Cut receivers and the CWP or SWP
B5	18.2341837	18.2341837	<i>A7 (from above table)</i>	Average distance (km) for all fish reaching facilities, weighted by origin (and split of facility entry)
B6	0.93714208	.90962365	$(B2/B1)^{(1/B5)}$	Migration survival rate (per km)
B7	0.06285792	.09037635	1-B6	Updated Estimate of Migration Mortality Rate (per km)
B8	0.07661714		$(B7a + B7b)/2$	Average of two periods

Appendix L

Water supply impacts of operations under Joint
Stipulation relative to RPA Action IV.2.1

Effects on Exports under the Two Operational Scenarios

Assumption:

When comparing the two operations -

Sign convention: + = increase in exports; - = decrease in exports

Date	San Joaquin at Vernalis (cfs)	Operations Under		Daily Diff (cfs)	Cumulative Diff (taf)
		OMR Tech Memo Combined Exports (cfs)	NMFS BiOp RPA IV.2.1. Combined Exports (cfs)		
1-Apr	1,520	1,913	1,520	393	0.78
2-Apr	1,577	1,812	1,577	235	1.24
3-Apr	1,596	1,788	1,596	192	1.63
4-Apr	1,598	1,817	1,598	219	2.06
5-Apr	1,713	1,814	1,713	101	2.26
6-Apr	1,809	2,004	1,809	195	2.65
7-Apr	2,006	2,011	2,006	5	2.66
8-Apr	2,230	2,806	2,230	576	3.80
9-Apr	2,458	2,812	2,458	355	4.50
10-Apr	2,630	2,818	2,630	187	4.87
11-Apr	2,684	2,626	2,684	-58	4.76
12-Apr	2,599	2,614	2,599	15	4.79
13-Apr	2,607	2,608	2,607	1	4.79
14-Apr	2,803	2,615	2,803	-188	4.42
15-Apr	3,019	3,660	3,019	641	5.69
16-Apr	3,085	3,593	3,085	509	6.70
17-Apr	3,373	3,033	3,033	0	6.70
18-Apr	3,325	3,202	3,202	0	6.70
19-Apr	3,091	3,194	3,194	0	6.70
20-Apr	2,792	2,968	2,968	0	6.70
21-Apr	2,682	2,825	2,825	0	6.70
22-Apr	2,799	1,756	2,799	-1,043	4.63
23-Apr	2,798	1,522	2,798	-1,277	2.10
24-Apr	2,739	1,516	2,739	-1,223	-0.33
25-Apr	2,504	1,519	2,504	-985	-2.28
26-Apr	2,294	1,486	2,294	-808	-3.88
27-Apr	2,293	1,510	2,293	-782	-5.44
28-Apr	2,353	1,514	2,353	-839	-7.10
29-Apr	2,325	1,495	2,325	-831	-8.75
30-Apr	2,325	1,543	2,325	-782	-10.30
1-May	2,399	2,291	2,291	0	-10.30
2-May	2,521	2,321	2,321	0	-10.30
3-May	2,725	2,473	2,473	0	-10.30
4-May	2,973	2,624	2,624	0	-10.30
5-May	3,103	2,973	2,973	0	-10.30
6-May	3,163	3,080	3,080	0	-10.30
7-May	3,200	2,934	2,934	0	-10.30
8-May	3,279	1,511	3,279	-1,767	-13.80
9-May	3,290	1,509	3,290	-1,780	-17.34
10-May	3,211	1,507	3,211	-1,704	-20.72
11-May	3,858	1,514	1,929	-415	-21.54
12-May	4,289	1,512	2,144	-632	-22.79
13-May	4,328	4,115	2,164	1,951	-18.92
14-May	4,381	4,294	2,190	2,104	-14.75
15-May	4,418	4,650	2,209	2,441	-9.91
16-May	3,920	4,994	1,960	3,033	-3.89
17-May	3,135	4,993	1,568	3,426	2.90
18-May	2,750	5,004	1,500	3,504	9.85
19-May	2,565	3,985	1,500	2,485	14.78
20-May	2,500	4,513	1,500	3,013	20.76
21-May	2,413	4,516	1,500	3,016	26.74
22-May	2,460	4,507	1,500	3,007	32.71
23-May	2,413	4,012	1,500	2,512	37.69
24-May	2,460	1,521	1,500	0	37.69
25-May	2,448	1,529	1,500	0	37.69
26-May	2,254	1,509	1,500	0	37.69
27-May	2,180	1,504	1,500	0	37.69
28-May	2,408	1,504	1,500	0	37.69
29-May	2,440	4,850	1,500	3,350	44.33
30-May	2,301	4,831	1,500	3,331	50.94
31-May	2,252	4,575	1,500	3,075	57.04