

FINAL State Water Project Incidental Take Permit Risk Assessment for Winter-run and Spring-run Chinook Salmon

Section 1: Overview

Date: 3/15/2022

Life Stages Present:

- Winter-run Chinook salmon (juvenile)
- Spring-run Chinook salmon (juvenile)
- Spring-run Chinook salmon (adult)
- Winter-run Chinook salmon (adult)

Advice to the Water Operations Management Team (WOMT):

No advice is warranted.

For the week beginning March 15, 2022, D-1641 Delta Outflow is controlling exports at the Central Valley Project (CVP) and the State Water Project (SWP). COA 8.4.2 Larval and Juvenile Longfin Smelt Entrainment Protection was triggered on 03/11/2022 and is restricting SWP proportional share of OMR to -1,250 cfs. Combined exports on 3/15/2022 are 3,300 cfs resulting in an Old and Middle River Index (OMRI) of -2,800 cfs and 12.9% of inflow diverted (14-day average). These projected OMRI values are more positive than what would be required if the SWP Incidental Take Permit Conditions of Approval (COA) thresholds were to be exceeded. The Delta Cross Channel (DCC) gates remain closed for seasonal requirement consistent with D-1641 and the CVP Proposed Action. The SWP is exporting this week and no outages are planned.

The distribution of the juvenile natural origin winter-run (WR) Chinook salmon population estimated to be in the Delta in conjunction with flows forecasted at Freeport, CVP and SWP exports, and OMR flows, result in an overall risk of entrainment into the central and south Delta from the Sacramento River consistent with the previous week and estimated to remain medium. Based on monitoring data, hydrological conditions, and seasonal timing, the Salmon Monitoring Team (SaMT) estimates an overall medium risk of entrainment into the interior Delta from the Sacramento River for young-of-year spring-run (SR) Chinook salmon which is consistent with the previous week.

SaMT considers the overall entrainment risk of WR into the salvage facilities to remain low this week. SaMT does not anticipate COA 8.6.3 (Mid and Late Season Natural WR Chinook Salmon Daily Loss Threshold) to be triggered. OMRI values are more positive than what is required if a COA threshold is exceeded; therefore, if COA 8.6.3 was exceeded there would be no action taken to restrict OMR further. SaMT considers the potential for SR entrainment into the export facilities to be low this week due to no salvage of SR reported for WY 2022 and projected OMRI values.

Risk Assessment:

Red Bluff Diversion Dam (RBDD) continues to observe winter-run Chinook salmon, indicating ongoing downstream passage at these locations, yet minimal to no catch has been observed at the downstream monitoring locations closer to the Delta. Due to the winter-run Chinook salmon observation on 3/9/2022, the fish distribution list has been updated from 0-15% last week to 1-15% of winter-run yet to enter the Delta. **

COA 8.6.4 (Daily SR Hatchery Surrogate Loss Threshold) is now in effect. The first hatchery surrogate release of fall-run Chinook salmon (FR) from Coleman National Fish Hatchery occurred on 3/15/2022. This release totaled 2,865,384 FR of which 719,838 FR are marked with an adipose fin clip and CWT. The second hatchery surrogate release of FR from Coleman National Fish Hatchery is anticipated to occur on 3/18/22. SaMT does not anticipate the potential for salvage for either of these release groups to occur this week.

Table 1: Current Fish Distribution

Location	Yet to Enter Delta	In the Delta	Exited the Delta
Young-of-year winter-run Chinook salmon*	Current 1-15%** Last week 0-15%	Current 80-89% Last Week 80-90%	Current 5-10% Last Week 5-10%
Young-of-year spring-run Chinook salmon	Current 15-30% Last week 20-35%	Current 70-85% Last Week 65-80%	Current 0% Last Week 0%
Hatchery origin winter-run Chinook salmon	Current 90-95% Last week 94-98%	Current 5-9% Last Week 2-6%	Current 0-1% Last Week 0%

*Due to very low numbers of WR being seen in real-time monitoring, this distribution is based mostly on historical timing.

** Due to recently distributed RBDD estimated passage on 3/9/2022, totaling 36 winter-run Chinook salmon caught in the RSTs, SaMT changed the winter-run distribution from 0-15% (estimated on 3/8/22) of winter-run to 1-15% (estimated on 3/15/22).

Risk Assessment:

Section 1-A: Sacramento River and Confluence

Assessment of risk of entrainment into the central Delta for WR and SR in the Sacramento River: (8.1.5.1 C ii, iii, iv and 8.1.5.1 B iii)

- Exposure Risk:
 - WR: High
 - SR: High
- Routing Risk:
 - WR: Low
 - SR: Low
- Overall Entrainment Risk:
 - WR: Medium
 - SR: Medium
- Change in risk of entrainment into the central Delta (increased/decreased risk compared to last week):
 - WR: Similar to the previous week

- Routing Risk and Exposure Risk remain similar to the previous week. The STARS model predicts routing probability into Georgiana Slough and Sutter and Steamboat sloughs to be similar to last week. Freeport flows are also similar to last week and the majority of WR are estimated to have reached the Delta. Therefore, overall risk of entrainment of WR into the central Delta remains consistent with the previous week and is considered medium.
 - SR: Similar to the previous week
 - Routing Risk and Exposure Risk remain similar to the previous week. The majority of SR are estimated to be in the Delta and Freeport flows remain similar to last week. Therefore, the overall entrainment into the central Delta remains consistent with the previous week and is considered medium.

Section 1-B: Facilities Risk

Central Valley Project/State Water Project (CVP/SWP) facilities entrainment risk for WR and SR in the central Delta over the next week (8.1.5.1 D iii, iv, v)

- Exposure Risk:
 - WR: Low
 - SR: Low
- Reporting OMR/Export Risk:
 - Baseline OMR (-2,800 cfs)
 - WR: Low
 - SR: Low
 - Scenario 1 OMR: (-500 cfs)
 - WR: Low
 - SR: Low
 - Scenario 2 OMR: (-3,000 cfs)
 - WR: Low
 - SR: Low
- Overall Entrainment Risk:
 - WR: Low
 - SR: Low
- Change in risk of entrainment into the facilities (increased/decreased risk compared to last week):
 - WR: Consistent with the previous week
 - Reporting OMR/Export Risk and Exposure Risk remain similar to the previous week due to exports being restricted. No WR were caught in salvage during the previous week. Therefore, the overall entrainment risk into the facilities remains consistent with the previous week and is considered low.
 - SR: Consistent with the previous week
 - Reporting OMR/Export Risk and Exposure Risk remains similar to the previous week. OMRI values are more positive than expected at this time because of Delta Outflow requirements. No SR have been caught in salvage for WY 2022. Therefore, the overall entrainment risk remains consistent with the previous week and is considered low.

Section 1-C: Annual Loss Threshold Risk

- Annual loss threshold risk and Alternative Actions (8.1.5.1. E I, ii, iii and 8.1.5.1 F I, ii)

- Loss at the SWP and CVP facilities compared to the estimated remaining population in the Delta and upstream of the Delta: Salvage of California Endangered Species Act (CESA)-listed Chinook salmon has not occurred over the past week.
 - Define risk of hitting a threshold, 50%, or 75%, or 100%, and likelihood of exceeding a threshold:
 - Natural origin WR: 1,462.94 [1.17% of the 125,038 natural-origin WR Juvenile Production Estimate (JPE)]
 - Current Annual Loss: 20.56
 - 50% Threshold based on natural WR JPE: 731.47
 - Risk of exceeding threshold: Low
 - 75% Threshold based on natural WR JPE: 1,097.21
 - Risk of exceeding threshold: Low
 - 100% Threshold based on natural WR JPE: 1,462.94
 - Risk of exceeding threshold: Low
 - Hatchery WR: 181.85 [0.12% of the 151,544 Livingston Stone National Fish Hatchery (LSNFH) hatchery release JPE]
 - Current Annual Loss: 0
 - 50% Threshold based on hatchery WR JPE: 90.93
 - Risk of exceeding threshold: Low
 - 75% Threshold based on hatchery WR JPE: 136.39
 - Risk of exceeding threshold: Low
 - 100% Threshold based on hatchery WR JPE: 181.85
 - Risk of exceeding threshold: Low

Section 1-D: Daily Loss Threshold Risk

- Daily loss threshold risk and Alternative Actions
 - Loss at the SWP and CVP facilities compared to estimated remaining population in Delta and upstream of the Delta:
 - Daily loss thresholds and subsequent loss and associated operations:
 - COA 8.6.3: Mid and Late Season Natural WR Chinook Salmon Daily Loss Threshold
 - January 1 - January 31: $0.0000635 * 125,038 = 7.94$
 - February 1 - February 28: $0.0000991 * 125,038 = 12.39$
 - March 1 – March 31: $0.000146 * 125,038 = 18.26$
 - April 1 – April 30: $0.0000507 * 125,038 = 6.34$
 - May 1 – May 31: $0.000077 * 125,038 = 9.63$
 - Highest daily loss: 3.52
 - Risk of exceeding threshold: Low
 - COA 8.6.4 Daily SR Hatchery Surrogate Loss Threshold
 - Hatchery Origin Young-of-Year SR Surrogates [0.25% of total in-river fall-run releases for each release group from Coleman National Fish Hatchery (CNFH)]:
 - Group 1 Loss Threshold: 1,799.6
 - Highest Daily Loss: 0
 - Risk of exceeding threshold: Low

Section 2: Basis for Advice

The 2020 [Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin Delta 2081-2019-066-00](#) (SWP ITP) states that advice to Water Operations Management Team (WOMT) shall be consistent with the Project Description, COA in the ITP, and the applicable ESA authorizations. This week's advice is based on the following COAs which are currently applicable:

List relevant COA number and title based on species/life stage, time of year, etc.:

8.1.4 Collaborative Approach to Real-time Risk Assessment. Beginning no later than October 1 through the end of OMR Management (see Condition of Approval 8.8) the Smelt and Salmon Monitoring Teams shall meet weekly, or more often as required, to consider survey data, salvage data, and other pertinent biotic and abiotic factors and prepare risk assessments as described in Conditions of Approval 8.1.1, 8.1.2, 8.1.5.1 and 8.1.5.2.

The Smelt and Salmon Monitoring Teams shall prepare operations advice for the WOMT as required by Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, 8.7, and 8.8, including advice on operations. The Smelt and Salmon Monitoring Teams shall each prepare risk assessments and operations advice. Within each team, staff jointly develop the risk assessment and supporting documentation to accompany operations advice (see Conditions of Approval 8.1.5.1 and 8.1.5.2). DWR and CDFW Smelt and Salmon Monitoring Team staff may conclude different operations advice is warranted, in which case the difference shall be noted and elevated as described in this Condition of Approval.

The Smelt and Salmon Monitoring Teams shall communicate their advice to WOMT. The WOMT shall then confer and attempt to reach a resolution and agreed-upon Project operations. If a resolution is reached, Permittee shall operate consistent with the decision regarding Project operations from WOMT. If the WOMT does not reach a resolution, the CDFW Director may require Permittee to implement an operational recommendation provided by CDFW. CDFW will provide its operational decision to Permittee in writing. Permittee shall implement the operational decision required by CDFW. Permittee shall ensure that its proportional share (see Condition of Approval 8.10) of the OMR flow requirement as a part of the operational decision is satisfied.

8.1.5 Real-time Risk Assessments. The Smelt and Salmon Monitoring Teams (Conditions of Approval 8.1.1 and 8.1.2) shall prepare weekly risk assessments, or more often as required, and operations advice (as required by Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, and 8.7) during their discussions and analyses. The Smelt and Salmon Monitoring Teams shall provide the risk assessments and pertinent supporting information to the WOMT (Condition of Approval 8.1.3) within one business day of each meeting.

8.3.2 Salmonid Presence. After January 1 each year, if Conditions of Approval 8.3.1 or 8.3.3 have not already been triggered, the OMR Management season shall begin when the Salmon Monitoring Team first estimates that 5% of the CHNWR or CHNSR population is in the Delta whichever is sooner. Upon initiation of the OMR Management season, Permittee shall reduce exports to achieve, and shall maintain a 14-day average OMR index no more negative than -5,000 cfs, until the OMR Management season ends (see Condition of Approval 8.8). In the event that a salmon daily or single-year loss threshold is exceeded (Conditions of Approval 8.6.1, 8.6.2, 8.6.3, or 8.6.4) prior to the start of OMR Management season the requirements in those Conditions shall control operations.

8.6.1 Winter-run Single-year Loss Threshold. In each year, Permittee shall, in coordination with Reclamation, operate the Project to avoid exceeding the following single-year loss thresholds:

- *Natural WR (loss = 1.17% of natural WR JPE)*
- *Hatchery WR (loss = 0.12% of hatchery WR JPE)*

The loss threshold and loss tracking for hatchery WR does not include releases into Battle Creek.

Loss of WR at the CVP and SWP salvage facilities shall be calculated based on LAD criteria for run assignment.

Annual loss of natural and hatchery WR at the CVP and SWP salvage facilities shall be counted cumulatively beginning November 1 each calendar year through June 30 the following calendar year.

WR shall be identified based on the Delta Model LAD criteria. Loss shall be calculated for the South Delta Export Facilities using the 2018 CDFW loss equation (Attachment 6).

During the water year, if cumulative loss of natural or hatchery WR exceeds 50% of the annual loss threshold, Permittee shall restrict south Delta exports to maintain a 14-day average OMR index no more negative than -3,500 cfs through the end of OMR Management (see Condition of Approval 8.8). After 14 days of operations to maintain an OMR index no more negative than -3,500 cfs, Permittee may convene the Salmon Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.1) and determine whether the risk of entrainment and loss of natural and hatchery WR is no longer present. Risks shall be measured against the potential to exceed the next single-year loss threshold. The results of this risk assessment and associated OMR advice shall be provided to WOMT according to Condition of Approval 8.1.3 and the decision-making process shall follow the process described in Condition of Approval 8.1.4.

The -3,500 cfs OMR flow operational criteria, adjusted and informed by this risk assessment, shall remain in effect until the end of OMR Management (Condition of Approval 8.8).

During the water year, if cumulative loss of natural or hatchery WR at the CVP and SWP salvage facilities exceeds 75% of the single-year loss threshold, Permittee shall restrict OMR to a 14-day moving average OMR flow index that is no more negative than -2,500 cfs through the end of OMR Management (Condition of Approval 8.7). After 14 days Permittee may convene the Salmon Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.1) and determine whether the risk of entrainment and take of natural and hatchery WR is no longer present. The results of this risk assessment and associated OMR advice shall be provided to WOMT according to Condition of Approval 8.1.3 and the decision-making process shall follow the process described in Condition of Approval 8.1.4.

The -2,500 cfs OMR flow operational criteria adjusted and informed by this risk assessment shall remain in effect until the end of OMR Management (Condition of Approval 8.8).

During the water year, if natural or hatchery WR cumulative loss at the CVP and SWP salvage facilities exceeds the single-year loss threshold, Permittee shall immediately convene the Salmon Monitoring Team to review recent fish distribution information and operations and provide advice regarding future planned Project operations to minimize subsequent loss during that year. The Salmon Monitoring Team shall report the results of this review and advice to the WOMT (see Condition of Approval 8.1.3). Operational decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment).

If the single-year loss threshold is exceeded, Permittee and Reclamation shall also convene an independent panel to review Project operations and the single-year loss threshold prior to November 1, as described in Condition of Approval 8.2. The purpose of the independent panel is to review the actions and decisions contributing to the loss trajectory that lead to an exceedance of the single-year loss threshold, and make

recommendations on modifications to Project implementation, or additional actions to be conducted to stay within the single-year loss threshold in subsequent years.

Permittee shall, in coordination with Reclamation, continue monitoring and reporting salvage at the CVP and SWP salvage facilities. Permittee and Reclamation shall continue the release and monitoring of yearling Coleman National Fish Hatchery (NFH) late fall-run and yearling SR surrogates. The Salmon Monitoring Team shall use reported real-time salvage counts along with qualitative and quantitative tools to inform risk assessments (see Condition of Approval 8.1.5.1). 8.3.2 Salmonid Presence. After January 1 each year, if Conditions of Approval 8.3.1 or 8.3.3 have not already been triggered, the OMR Management season shall begin when the Salmon Monitoring Team first estimates that 5% of the CHNWR or CHNSR population is in the Delta whichever is sooner. Upon initiation of the OMR Management season, Permittee shall reduce exports to achieve, and shall maintain a 14-day average OMR index no more negative than -5,000 cfs, until the OMR Management season ends (see Condition of Approval 8.8). In the event that a salmon daily or single-year loss threshold is exceeded (Conditions of Approval 8.6.1, 8.6.2, 8.6.3, or 8.6.4) prior to the start of OMR Management season the requirements in those Conditions shall control operations.

8.6.3 Mid- and Late-season Natural Winter-run Chinook Salmon Daily Loss Threshold. To minimize entrainment, salvage, and take of natural CHNWR during the peak and end of their migration through the Delta. Permittee shall restrict south Delta exports for five days to achieve a five-day average OMR index no more negative than - 3,500 cfs when daily loss of natural older juveniles at the SWP and CVP salvage facilities exceeds the following thresholds based on the JPE reported in January of the same calendar year:

- January 1 – January 31: 0.00635 % of the CHNWR JPE*
- February 1 – February 28: 0.00991 % of the CHNWR JPE*
- March 1 – March 31: 0.0146 % of the CHNWR JPE*
- April 1 – April 30: 0.00507 % of the CHNWR JPE*
- May 1 – May 31: 0.0077 % of the CHNWR JPE*

8.6.4 Daily Spring-run Chinook Salmon Hatchery Surrogate Loss Threshold. To minimize entrainment of emigrating natural juvenile CHNSR from the Sacramento River and tributaries, including the Feather and Yuba rivers into the channels of the central Delta, south Delta, CCF, and the Banks Pumping Plant, Permittee shall restrict exports based on the presence of hatchery produced CHNSR surrogate groups at the CVP and SWP salvage facilities. CHNSR surrogate groups shall consist of all in-river fall- and spring-run surrogate release groups of Chinook salmon from the Coleman National Fish Hatchery, Feather River Hatchery, and the Nimbus Fish Hatchery.

Each water year between February 1 and June 30 Permittee shall reduce south Delta exports for five consecutive days to achieve a five-day average OMR index no more negative than -3,500 cfs when:

- Feather River Hatchery coded wire tagged (CWT) CHNSR surrogates (includes both spring- and fall-run hatchery release groups) cumulative loss at the at the CVP and SWP salvage facilities is greater than 0.25% for each release group, OR*

- *Coleman National Fish Hatchery and Nimbus Fish Hatchery CWT fall-run release groups cumulative loss at the at the CVP and SWP salvage facilities is greater than 0.25% of the total in-river releases for each release group.*

This Condition of Approval may be modified through the process described in Condition of Approval 8.6.6 and an amendment to this ITP.

8.7 OMR Flexibility During Delta Excess Conditions. Permittee may increase exports to capture peak flows in the Delta during storm-related events (hereafter OMR flex) when:

- *The Delta is in excess conditions, AND*
- *QWEST is greater than 0, AND*
- *A measurable precipitation event has occurred in the Central Valley, AND*
- *Permittee, in coordination with Reclamation, determines that Delta outflow index indicates a higher level of outflow available for diversion due to peak storm flows, AND*
- *None of the following Conditions of Approval are controlling Project operations: 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, and 8.6.4, AND*
- *Risk assessments conducted by the Salmon and Smelt Monitoring Teams (Conditions of Approval 8.1.5.1 and 8.1.5.2) Indicate that an OMR more negative than -5,000 cfs is not likely to trigger an additional real-time OMR restriction (Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, and 8.6.4), AND*
- *Cumulative salvage at the CVP and SWP facilities of yearling Coleman NFH late fall-run Chinook salmon (as yearling CHNSR surrogates) is less than 0.5% within any of the release groups, AND*
- *Risk assessments conducted by the Salmon and Smelt Monitoring Teams determines that no changes in spawning, rearing, foraging, sheltering, or migration behavior as a result of OMR Flex operations beyond those anticipated to occur through operations described in Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, and 8.6.4 are likely to occur.*

If none of the restrictions listed above apply, Permittee may increase south Delta exports but shall manage Project operations to achieve a five-day average OMR index no more negative than -6,250 cfs. The decision to operate under this Condition of Approval shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment), and SWP OMR flex is subject to approval by CDFW.

If, during OMR flex operations, any of the following conditions occurs, Permittee shall reduce south Delta exports to achieve a 14-day average OMR index no more negative than -5,000 cfs, unless a further reduction in exports is required by another Condition of Approval. The more positive OMR index shall be achieved within 48 hours of the occurrence of the condition, and the 14-day moving average shall apply from that point forward.

- *Risk assessments conducted by the Salmon and Smelt Monitoring Teams (Conditions of Approval 8.1.5.1 and 8.5.1.2) indicate that an OMR more negative than -5,000 cfs is likely to trigger an additional real-time OMR restriction (Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, and 8.6.4), OR*

- *Cumulative salvage at the CVP and SWP facilities of yearling Coleman NFH late fall-run Chinook salmon (as yearling CHNSR surrogates) exceeds 0.5% within any of the release groups, OR*
- *A risk assessment conducted by the Salmon or Smelt Monitoring Teams identifies changes in spawning, rearing, foraging, sheltering, or migration behavior as a result of OMR Flex operations beyond those anticipated to occur through operations described in Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1,8.5.2, 8.6.1, 8.6.2, 8.6.3, and 8.6.4, OR*
- *Operational restrictions described in Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, and 8.17 are required.*

Section 3: Hydrology and Operations

Assessment of hydrologic, operational, and meteorological information. 8.1.5.1 A

Section 3-A: Water Operations, Water Operations Outlook, and Projected Conditions C 8.1.5.1 A. i, iii, iii:

- Antecedent Actions:
- Water Temperature:
 - Mossdale (MSD): <https://cdec.water.ca.gov/dynamicapp/QueryDaily?s=MSD>
 - Number of days threshold exceeded: Not applicable until June.
 - Prisoners Point (PPT): <https://cdec.water.ca.gov/dynamicapp/QueryDaily?s=PPT&end=2021-01-20>
 - Number of days threshold exceeded: Not applicable until June.
- Tidal Cycle: (*Spring/Neap. Note if tidal cycle has potential to affect south Delta hydrology or X2*)
 - Mild spring tide for the beginning of the week and then move into a neap tide later in the week.
- Turbidity: Not discussed
- Salinity (X2): 78.2 km on 3/15/2022
- Hydraulic Footprint (*Provide brief description of hydrologic footprint and summary of relevant DSM2 results*): DSM2 results were discussed during SaMT and a model interpretation is provided this week.
 - North Delta into Interior and Central Delta
Channels 49 (San Joaquin River at Sherman Island) and (Sacramento River at Sherman Island)
 - The overall trend over the forecast period is a decrease in velocity over the forecasted period. Fish that are moving will experience a slower travel rate over the forecast period. Changes to modeled velocity conditions would not likely be detected and it's unlikely that listed salmonids would experience changes to rearing, foraging, migrating, and/or sheltering.
 - San Joaquin River and Central Delta into South Delta
Channel 6 (San Joaquin River at Head of Old River) and 21 (San Joaquin River upstream of Turner Cut)
 - The largest daily difference in velocity for these two channels is 0.01 ft/second. The overall trend over the forecast period is a decrease in velocity over the forecasted period. Fish that are moving will experience a slower travel rate over the forecast period. Changes to modeled velocity conditions would not likely be detected and it's unlikely that listed salmonids would experience changes to rearing, foraging, migrating, and/or sheltering.
 - South Delta into facilities
Channels 148 (Middle River) and 94 (Old River)
 - In the first half of the forecast period there is a model difference between baseline and -1,700 cfs and -1,000 cfs. However, that difference is still minimal at 0.14 ft/second. In the second half of the forecast period there is minimal difference in velocity between the scenarios. If the facilities operate to baseline or -1,700 cfs, fish that are moving would experience a slower travel rate over the first half of the forecast period. Changes to modeled velocity conditions would not likely be detected and it is unlikely that listed salmonids would experience changes to rearing, foraging, migrating, and/or sheltering.
- Outages:
 - SWP: None projected
 - CVP: None projected.
- Exports – range: 3/15/2022 – 3/21/2022

- SWP: 0 to 1,500 cfs
- CVP: 800 to 2,700 cfs
- Meteorological Forecast: *“Valley rain and mountain snow showers today then mild and dry through Friday. Valley and foothill thunderstorms possible late morning and afternoon. Another chance for higher amounts of widespread Valley rain and mountain snow this weekend.”*
https://www.wrh.noaa.gov/total_forecast/getprod.php?new&prod=XXXAFDSTO&wfo=sto
- Storm Event Projection:
 - A storm system will be moving over the region on Saturday. This one will be much colder than the current one. Snow levels look to start out around 5500 feet and lower Saturday night into Sunday down to around 3000 to 3500 feet. The valley could get between a quarter of an inch to a half an inch of rain with the foothills and mountains between a half an inch to an inch of rain.
- DCC Gates position: Closed on 11/30/2021 per D-1641 seasonal closure.
- Sacramento River flow at Freeport: <https://cdec.water.ca.gov/dynamicapp/QueryDaily?s=FPT>
- San Joaquin River flow at Vernalis:
 - https://cdec.water.ca.gov/jspplot/jspPlotServlet.jsp?sensor_no=1689&end=&geom=&interval=&cookies=
 - https://cdec.water.ca.gov/guidance_plots/VNS_gp.html
- QWEST: 2,000 cfs
 - QWEST will decrease to -400 or -500 within the next two days then become more positive again towards the end of the week.

Table 2: Comparison of USGS Tidally Filtered OMR and OMR Index data.

Date	Averaging Period	USGS gauges (cfs)	Index (cfs)
3/12/2022	Daily	-1,400	-500
3/12/2022	5-day	-1,300	-800
3/12/2022	14-day	-1,400	-800
3/14/2022	Daily	Not Applicable	-1,000
3/14/2022	5-day	Not Applicable	-700
3/14/2022	14-day	Not Applicable	-800

Section 4: Distribution and Biology

8.1.5.1.B Assessment of biological information for WR and SR.

Section 4-A: WR Population Status 8.1.5.1.B i

- Adult escapement estimate:
 - Estimated spawning escapement for WR adults contributing to brood year (BY) 2021 is 10,269.
- Redd distribution and fry emergence timing:
 - WR fry presence is drawing to a close for BY 2021. Estimated juvenile WR passage at RBDD for 3/11/2022 is 572,188 fish, which represents 99.3% of historical passage.
- Juvenile production:
 - https://www.fws.gov/redbluff/rbdd_biweekly_final.html
- Livingston Stone National Fish Hatchery releases:
 - See Table 4
- Distribution of natural WR:
 - See Table 1
- Distribution of Livingston Stone National Fish Hatchery Sacramento River WR and Battle Creek WR:
 - A release of 123,975 BY 2021 winter-run Chinook salmon occurred on 2/9/2022 and a release of 396,310 BY 2021 winter-run Chinook salmon occurred on 3/2/2022 in the Sacramento River at Caldwell Park Boat Ramp. A subset of 569 total fish were acoustically tagged and many of them have been detected at Butte City Bridge and downstream of the confluence at Tower Bridge in the Sacramento River. A few of these acoustic tagged fish have been acoustically detected past Georgiana Slough and 1 has been detected passing Benicia Bridge.
https://oceanview.pfeg.noaa.gov/CalFishTrack/pageLSWR_2022.html

Section 4-B: SR Population Status 8.1.5.1.B ii

- Adult escapement estimate: Not available.
- Redd distribution and fry emergence timing:
 - Juvenile SR fry are present and migrating downstream to rear.
 - Total SR juvenile passage for BY 2021 is 111,027 fish as of 3/11/2022 at RBDD.
- Hatchery release (in-river and downstream):
 - See Table 4
- Distribution of natural SR:
 - See Table 1.
- Distribution of Feather River Fish Hatchery SR:
 - Releases have not occurred.

Section 4-C: Additional Data Sources to Assess Sensitivity to Entrainment into the Central and South Delta

8.1.5.1.C & D

- Acoustic telemetry: *Summary of acoustic telemetry tracking*
 - <https://oceanview.pfeg.noaa.gov/CalFishTrack/>
- Trawls:
 - Sacramento Trawl:
https://www.fws.gov/lodi/juvenile_fish_monitoring_program/djfmp/?dir=Sacramento%20trawls%20CHN-POD%20species%202012-Present
 - Mossdale Trawl:
https://www.fws.gov/lodi/juvenile_fish_monitoring_program/djfmp/?dir=Mossdale%20trawls%20CHN-POD%20species%202012-Present

- Chipps Island Trawl: https://www.fws.gov/lodi/juvenile_fish_monitoring_program/djfm/?dir=Beach%20seines%20CHN-POD%20species%202012-Present
- Rotary Screw Traps:
 - Knights Landing, Tisdale and Lower Sacramento Rotary Screw Trap Data: <https://www.calfish.org/ProgramsData/ConservationandManagement/CentralValleyMonitoring/SacramentoValleyTributaryMonitoring/MiddleSacramentoRiverSalmonandSteelheadMonitoring.aspx>
 - Redd Bluff Diversion Dam Rotary Screw Trap Data: https://www.fws.gov/redbluff/RBDD%20JSM%20Biweekly/2021/rbdd_ismp_2021.html
 - Feather River Rotary Screw Trap Data for Butte Creek: <https://www.calfish.org/ProgramsData/ConservationandManagement/CentralValleyMonitoring/SacramentoValleyTributaryMonitoring/ButteCreek.aspx>
- Seines:
 - Sacramento River Beach Seines: https://www.fws.gov/lodi/juvenile_fish_monitoring_program/djfm/?dir=Beach%20seines%20CHN-POD%20species%202012-Present
- Carcass Survey Data:
 - Lower American River Carcass Survey Data: <https://www.calfish.org/ProgramsData/ConservationandManagement/CentralValleyMonitoring/SacramentoValleyTributaryMonitoring/MiddleSacramentoRiverSalmonandSteelheadMonitoring.aspx>
- Additional hatchery release notifications: *List all relevant hatchery release notifications.*
 - See Table 4 Hatchery Release Data WY 2022
- New monitoring (as required by Condition of Approval 7.5.1, 7.5.2, and 7.5.3): *Upstream monitoring results during transfer window, additional rotary screw trap monitoring updates, additional acoustic tag study results, genetic identification results, trap capture efficiency trial results, and pathology results if available and relevant.*
 - None
- Anticipated emigration to continue into the Delta: http://www.cbr.washington.edu/sacramento/data/query_hrt.html and http://www.cbr.washington.edu/sacramento/data/query_salvage_hrt.html
- Routing and Survival Analysis:
 - Delta STARS Model: <https://oceanview.pfeg.noaa.gov/shiny/FED/CalFishTrack/>

<u>Date:</u> (3/15/2022)	<u>DCC</u>	<u>Georgiana Slough</u>	<u>Sacramento River</u>	<u>Sutter and Steamboat Slough</u>
Proportion of Entrainment	0	0.30	0.45	0.25
Survival	NA	0.17	0.50	0.37

- Tillotson entrainment model or other entrainment models as they become available: The entrainment tool estimates a median loss of 0 WR Chinook salmon and a maximum loss of 193 WR Chinook salmon during this week (SacPas last updated on 3/15/2022). <http://www.cbr.washington.edu/sacramento/lossandsalvage/>
- Salvage trends in relation to OMRI: *Provide overview of salvage data and insert salvage table as attachment at end of document:* <https://apps.wildlife.ca.gov/Salvage>

Table 3. Relevant Water Year 2022 Criteria and Status for Listed Chinook Salmon under the SWP Long-Term Incidental Take Permit.

<u>Action</u>	<u>Timeframe</u>	<u>Current Action Status</u>	<u>Threshold(s)</u>	<u>Current Relevant Data</u>	<u>Weekly Trend</u>	<u>Last Updated</u>	<u>Comments</u>
Onset of OMR Mgmt. Salmonid Presence (8.3.2)	Jan. 1 - Jun. 30 <i>(when ≥ 5% of winter-run or spring-run are in the Delta)</i>	In effect	5% of the winter-run or spring-run population are present in the Delta	Winter-run = 80-89% estimated in the Delta; Spring-run = 70-85% estimated in the Delta	Possible increase in presence of WR and SR	3/15/22	Based on 3/15/22 SaMT discussion
Winter-run yearly loss (8.6.1)	Nov. 1 - Jun. 30	In effect WY 2022 loss = 1462.94	Natural CHNWR (loss = 1.17% of JPE) 50% of 1.17% of JPE = 731.47 Hatchery CHNWR (loss = 0.12% of JPE) 50% of 0.12% of JPE = 90.93	Current yearly WR loss (natural LAD) = 20.56 Current yearly WR loss (hatchery) = 0	Possible salvage of both natural and hatchery WR	3/15/22	Based on salvage data from 3/15/22
Winter-run discrete daily loss (8.6.2)	Nov. 1 - Dec. 31	Not in effect	11/1-11/30: loss of 6/day unclipped older juv. Chinook salmon 12/1-12/31: loss of 26/day unclipped older juv. Chinook salmon	NA	NA	1/17/22	NA

<p>Mid- and Late-season Natural WR Daily Loss Threshold defined as natural origin juvenile Chinook salmon (8.6.3)</p>	<p>Jan 1 – May 31</p>	<p>In effect</p>	<p>January 1 – 31: 0.00635% of the CHNWR JPE</p> <p>February 1 – 28: 0.00991% of the CHNWR JPE</p> <p>March 1 – 31: 0.0146% of the CHNWR JPE</p> <p>April 1 – 30: 0.00507% of the CHNWR JPE</p> <p>May 1 – 31: 0.0077% of the CHNWR JPE</p>	<p>January 1 – 31: 0.000635 * 125,038 = 7.94</p> <p>February 1 – 29: 0.0000991 * 125,038 = 12.39</p> <p><u>March 1 – 31:</u> <u>0.000146 *</u> <u>125,038 = 18.26</u></p> <p>April 1 – 30: 0.0000507 * 125,038 = 6.34</p> <p>May 1 – 31: 0.000077 * 125,038 = 9.63</p>	<p>Possible additional salvage of older juvenile Chinook salmon</p>	<p>3/15/22</p>	<p>Based on salvage data from 3/15/22</p>
<p>Spring-run surrogate protection (8.6.4)</p>	<p>Feb. 1 - Jun. 30</p>	<p>In effect</p>	<p>Coleman National Fish Hatchery (CNFH) Group 1: 0.25% of total in-river CWT fall-run release (total of 7 CWT #s)</p>	<p>CNFH Group 1: 0.0025 * 719,838 = 1,799.6</p>	<p>CNFH Group 1 release occurred on 3/15/2022</p>	<p>3/15/21</p>	<p>NA</p>

Table 4. Hatchery salmon release data for Brood Year 2021 and Water Year 2022.

Release Date	Hatchery	Race	CWT	Marked Release Number	Total Release	Percent Marked	Release Location	Mark	Agency	Release Type
11/8/2021	CNFH	Late Fall	05 64 65	78,056	78,056	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
11/8/2021	CNFH	Late Fall	05 64 66	82,154	82,154	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
11/8/2021	CNFH	Late Fall	05 64 73	75,923	75,923	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/7/2021	SCARF	Spring	06-80-02	3,476	3,476	100%	San Joaquin at Highway 140	CWT, Ad-Clip and PIT	CDFW	SJRRP
12/7/2021	SCARF	Spring	06-19-67	236	236	100%	San Joaquin at Highway 140	CWT, Ad-Clip and PIT	CDFW	SJRRP
12/7/2021	SCARF	Spring	06-18-10	61	61	100%	San Joaquin at Highway 140	CWT and Ad-Clip	CDFW	SJRRP
12/11/2021	CNFH	Late Fall	05 64 67	44,503	44,503	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/11/2021	CNFH	Late Fall	05 64 69	75,848	75,848	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/11/2021	CNFH	Late Fall	05 64 75	64,458	64,458	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/11/2021	CNHF	Late Fall	05 64 72	75,798	75,798	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/11/2021	CNFH	Late Fall	05 64 74	72,120	72,120	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/11/2021	CNFH	Late Fall	05 64 76	69,274	69,274	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/11/2021	CNFH	Late Fall	05 64 77	73,907	73,907	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/11/2021	CNFH	Late Fall	05 64 78	78,103	78,103	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
*12/15/2021	CNFH	Late Fall	05 64 68	84,343	84,343	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Experimental
12/17/2021	CNFH	Fall	NA	0	615,426	0%	Sacramento River at Balls Ferry Boat Ramp	No Mark	USFWS	Experimental
*12/22/2021	CNFH	Late Fall	05 64 70	82,626	82,626	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Experimental
12/30/2021	CNFH	Fall	NA	0	635,998	0%	Sacramento River at Balls Ferry Boat Ramp	No Mark	USFWS	Experimental
*1/6/2022	CNFH	Late Fall	05 64 71	77,325	77,325	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Experimental
1/11/2022	CNFH	Fall	NA	0	607,605	0%	Sacramento River at Balls Ferry Boat Ramp	No Mark	USFWS	Experimental
2/2/2022-2/3/2022	CNFH	Winter	05 65 96	200	200	100%	Sacramento River at Sycamore Grove Boat Launch	CWT, Ad-Clip, and left-pelvic	USFWS	Experimental (Jumpstart)
2/9/2022	LSNFH	Winter	05 58 58	75,078	75,078	100%	Sacramento River at Caldwell Park Boat Ramp	CWT and Ad-Clip	USFWS	Production
2/9/2022	LSNFH	Winter	05 65 10	48,897	48,897	100%	Sacramento River at Caldwell Park Boat Ramp	CWT and Ad-Clip	USFWS	Production
2/14/2022	SCARF	Spring	06 15 55	57,478	57,478	100%	San Joaquin River at Highway 140	CWT and Ad-Clip	CDFW	SJRRP

2/23/2022-2/24/2022	CNFH	Winter	05 65 96	200	200	100%	Sacramento River at Sycamore Grove Boat Launch	CWT, Ad-Clip, and left-pelvic	USFWS	Experimental (Jumpstart)
3/2/2022	LSNFH	Winter	05 61 77	31,099	31,099	100%	Sacramento River at Caldwell Park Boat Ramp	CWT and Ad-Clip	USFWS	Production
3/2/2022	LSNFH	Winter	05 61 78	42,996	42,996	100%	Sacramento River at Caldwell Park Boat Ramp	CWT and Ad-Clip	USFWS	Production
3/2/2022	LSNFH	Winter	05 61 79	47,780	47,780	100%	Sacramento River at Caldwell Park Boat Ramp	CWT and Ad-Clip	USFWS	Production
3/2/2022	LSNFH	Winter	05 65 07	48,138	48,138	100%	Sacramento River at Caldwell Park Boat Ramp	CWT and Ad-Clip	USFWS	Production
3/2/2022	LSNFH	Winter	05 65 08	47,247	47,247	100%	Sacramento River at Caldwell Park Boat Ramp	CWT and Ad-Clip	USFWS	Production
3/2/2022	LSNFH	Winter	05 65 09	47,656	47,656	100%	Sacramento River at Caldwell Park Boat Ramp	CWT and Ad-Clip	USFWS	Production
3/2/2022	LSNFH	Winter	05 65 11	47,532	47,532	100%	Sacramento River at Caldwell Park Boat Ramp	CWT and Ad-Clip	USFWS	Production
3/2/2022	LSNFH	Winter	05 65 12	46,553	46,553	100%	Sacramento River at Caldwell Park Boat Ramp	CWT and Ad-Clip	USFWS	Production
3/2/2022	LSNFH	Winter	05 65 13	37,309	37,309	100%	Sacramento River at Caldwell Park Boat Ramp	CWT and Ad-Clip	USFWS	Production
3/15/2022	CNFH	Fall	05 65 99	102,861	407,249	25%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
3/15/2022	CNFH	Fall	05 66 01	101,412	402,453	25%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
3/15/2022	CNFH	Fall	05 66 02	106,433	424,193	25%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
3/15/2022	CNFH	Fall	05 66 03	84,458	335,925	25%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
3/15/2022	CNFH	Fall	05 66 04	121,538	486,152	25%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
3/15/2022	CNFH	Fall	05 66 05	105,540	421,213	25%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
3/15/2022	CNFH	Fall	05 66 06	97,596	388,199	25%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
3/16/2022 – 3/17/2022	CNFH	Winter	05 65 96	51,376	51,376	100%	North Fork Battle Creek, Manton, CA	CWT, Ad-Clip and left pelvic	USFWS	Jumpstart
3/16/2022 – 3/17/2022	CNFH	Winter	05 65 97	8,661	8,661	100%	North Fork Battle Creek, Manton, CA	CWT, Ad-Clip and left pelvic	USFWS	Jumpstart
3/16/2022 – 3/17/2022	CNFH	Winter	05 65 91	43,852	43,852	100%	North Fork Battle Creek, Manton, CA	CWT, Ad-Clip and left pelvic	USFWS	Jumpstart
3/16/2022 – 3/17/2022	CNFH	Winter	05 65 98	10,568	10,568	100%	North Fork Battle Creek, Manton, CA	CWT, Ad-Clip and left pelvic	USFWS	Jumpstart
3/16/2022 – 3/17/2022	CNFH	Winter	05 65 32	22,501	22,501	100%	North Fork Battle Creek, Manton, CA	CWT, Ad-Clip and left pelvic	USFWS	Jumpstart

*These releases are hatchery yearling spring-run Chinook salmon surrogates that are tracked for COA 8.7 OMR Flexibility During Delta Excess Conditions.

Table 5. Hatchery steelhead release data for Brood Year 2021 and Water Year 2022.

Release Date	Hatchery	CWT	Marked Release Number	Total Release	Percent Marked	Release Location	Mark	Agency	Release Type
12/11/2021	CNFH	N/A	610,911	610,911	100%	Battle Creek at CNFH	Ad-Clip	USFWS	Production
1/31/2022-2/4/2022	NIM	N/A	424,000	424,000	100%	Lower American River at Sunrise Boat Ramp	Ad-Clip	CDFW	Production
1/31/2022-2/1/2022	MOK	06-15-29	57,065	57,065	100%	Mokelumne River at Feist Ranch	CWT and Ad-Clip	CDFW	Production
2/4/2022-2/11/2022	FRH	N/A	495,000	495,000	100%	Boyd's Pump	Ad-Clip	CDFW	Production
2/28/2022	MOK	N/A	60,000	60,000	100%	Mokelumne River at Feist Ranch	Ad-Clip	CDFW	Production

Table 6. COA 8.6.4 Young-of-Year Spring-run Chinook Salmon Hatchery Surrogate Summary Table, WY 2022.

Hatchery	Release Group	Date	Race	Total Fish Released	CWT Fish	Tag Codes	Loss Threshold
Coleman National Fish Hatchery	Group 1	3/15/2022	Fall	2,865,384	719,939	05 65 99	1,799.6
						05 66 01	
						05 66 02	
						05 66 03	
						05 66 04	
						05 66 05	
						05 66 06	
Feather River Fish Hatchery	NA	NA	NA	NA	NA	NA	NA
Nimbus Fish Hatchery	NA	NA	NA	NA	NA	NA	NA