

July 2, 2021

DELIVERY VIA ELECTRONIC FILING

David E. Capka, P.E.
Office of Energy Projects
Director, Division of Dam Safety and Inspections (D2SI)
Federal Energy Regulatory Commission
888 First Street, N.E., Routing Code: PJ-13
Washington, D.C. 20426

RE: FERC Nos. P-14803-001 and P-2082-063; NATDAM-OR00559, CA00323, CA00234, CA00325; Letter Report, Independent Board of Consultants Meeting No. 3.

Dear Director Capka:

The Klamath River Renewal Corporation (Renewal Corporation) accepts all of the recommendations of the Lower Klamath Project Independent Board of Consultants (BOC) and proposes the following plan and schedule to implement such recommendations. The BOC's recommendations are set forth in its *Letter Report: Board of Consultants Mtg. No. 3* (Report No. 3), attached hereto at Exhibit A.

Formal Meeting No. 3

Formal Meeting No. 3 was called for the purpose of concluding the BOC's review of the construction potential failure modes analysis final draft report (CPFMA Report) prepared on behalf of the Renewal Corporation in support of its License Surrender Application.¹ Formal Meeting No. 3 was convened on June 2, 2021, adjourned, then reconvened on June 4, 2021, during which time the BOC provided its preliminary conclusions and recommendations with respect to the CPFMA Report. On June 14, 2021, the BOC provided the Renewal Corporation and PacifiCorp with a draft report. On June 16, 2021 the Renewal Corporation and PacifiCorp provided the BOC with comments on the draft CPFMA Report. On June 18, 2021 the BOC provided the Renewal Corporation and PacifiCorp with Report No.3.

¹ *Amended Application for Surrender of License for Major Project and Removal of Project Works*, FERC Nos. 14803-001, 2082-063.

Report No. 3

Report No. 3 contains seven recommendations (Report No. 3 at page 18-19). The Renewal Corporation respectfully requests FERC's review and approval of the following plan and schedule to comply with the BOC's recommendations.

Recommendation Number 1:

The BOC recommends formalizing a process whereby CPFMs and associated risk reduction measures are proactively considered in advance of, and during, the work. This could be an agenda item in monthly progress meetings, and could also be addressed in special task start-up meetings for various critical activities. This may look different and be independent of the Risk Register. The main thing is to facilitate timely awareness and discussion among stakeholders, including, but not limited to, subcontractors, inspectors, crafts persons, and engineers.

Response to Recommendation Number 1:

The Renewal Corporation will identify dates for incorporating the CPFMs and associated risk reduction measures into the construction schedule. Not less than sixty (60) days in advance of the commencement of construction activities, the Renewal Corporation will convene a working group comprised of the Renewal Corporation's Owner's Representative (McMillen Jacobs), the Renewal Corporation's Contractor (Kiewit), and the Renewal Corporation's Consultant (Kleinschmidt) to review the relevant CPFMs and associated risk reduction measures. The Renewal Corporation will prepare a record (separate from the Risk Register) containing the CPFMs as a risk management measure to support the final construction planning work activities and implementation activities during construction.

The Renewal Corporation will incorporate a status review of the CPFMs into the monthly construction progress meeting as well as into specific construction work task coordination meetings and workplan preparation. During construction, the Renewal Corporation will monitor status updates of the CPFMs provided during the weekly site-specific construction meetings and coordinate work activities as necessary to implement risk reduction measures. The Renewal Corporation will implement any further guidance provided by this working group. The Renewal Corporation will file an updated Construction Management Plan with FERC on or before December 31, 2021 to incorporate the risk reduction measures proposed in this response to this recommendation.

Recommendation Number 2:

The BOC concurs with using a careful approach to advancing the diversion adit through Copco 1 dam, including use of probe holes. Challenges will be the embedded railroad track steel and the potential cold joints shown on drawings near the upstream face. The BOC recommends that subcontractor crafts persons and others working at the adit heading be made acutely aware of conditions, implications of conditions, and associated risks that could be encountered.

Response to Recommendation Number 2:

The Renewal Corporation will prepare site specific risk reduction measures for the Copco No. 1 adit work activities. These measures will outline the construction work activities, implications, and associated risks and include a job hazard analysis to be completed before the work is initiated. Similarly, the Temporary Emergency Action Plan (TEAP) will be updated to include site-specific provision for the Copco No. 1 adit construction, including monitoring provisions, rapid evacuation measures and protocols, and notification protocols. The Renewal Corporation will provide training to all subcontractors, stakeholders, and personnel associated with the construction and operation of the Copco No. 1 adit. The training will include specific construction work activities, roles and responsibilities, risks and hazards, site access, TEAP, and the site-specific safety plan. The Renewal Corporation will file an updated Construction Management Plan and the TEAP with FERC on or before December 31, 2021 to incorporate the risk reduction measures proposed in this response to this recommendation.

Recommendation Number 3:

The BOC concurs with Kiewit's approach to implement best practice measures to properly manage precipitation runoff from gullies and upslope areas above waste fill placements to mitigate erosion potential. The BOC recommends that these measures be configured to permanently protect these areas from erosion and gullyng.

Response to Recommendation Number 3:

The Final Design includes measures to control erosion and gullyng of upslope areas above waste fill placements during construction and post-construction. These measures are incorporated into the construction documents as required under the Oregon and California National Pollution Discharge Elimination System (NPDES) stormwater permits. These permits will provide all necessary protection measures under their respective Storm Water Prevention and Protection Plan (SWPPP) requirements. The Final Design includes SWPPP Best Management Practices (BMPs) to provide long-term protection of the fill area. At the completion of construction, the Renewal Corporation will inspect the site for compliance with the SWPPPs and make corrective actions as site conditions dictate. The Renewal Corporation will monitor the site until site stability is achieved, as evidenced by the States of California and Oregon issuing their NPDES termination of coverage. The Renewal Corporation will file an updated Construction Management Plan with FERC on or before December 31, 2021 to incorporate the risk reduction measures proposed in this response to this recommendation.

Recommendation Number 4:

The BOC concurs with Kiewit's approach to make additional investigations to determine subsurface conditions at the toe of the proposed J. C. Boyle scour hole fill. The main concern of the BOC is to identify any potential loose/soft layers/deposits which could represent a potential failure plane affecting the global slope stability of the fill. The BOC recommends the findings of the investigations be considered in calculations of the stability of the slope as appropriate, and reconfiguration of the fill be made as needed to maintain permanent stability. Conditions of saturation of the fill during rainy season should be considered in analysis.

Response to Recommendation Number 4:

The Renewal Corporation will conduct site investigations of the existing scour hole in the drawdown year, immediately following shutdown of the power generation flowline and overflow spillway. The site investigation will include completing borings along the toe of the existing scour hole slope to characterize the subsurface geotechnical conditions. The site borings will provide the Renewal Corporation with a better understanding of the subsurface conditions upon which the scour hole fill will be founded.

The Renewal Corporation will use this geotechnical information to update the design, if required, and to accommodate specific site conditions, including removal of unsuitable material, modification to the toe foundation design, and potential refinement in the material placement plan included in the Final Design. The Renewal Corporation will consider and address any soft layers or deposits revealed by this analysis that could impact the long-term stability of the scour hole fill. The Renewal Corporation will provide the BOC with a summary of the findings of these investigations and analyses on or before June 30 of the drawdown year. The Renewal Corporation will consider these findings in the calculations of slopes and the implementation of permanent slope stability measures proposed in the Reservoir Drawdown and Diversion Plan. The Renewal Corporation will file an updated Construction Management Plan with FERC on or before December 31, 2021 to incorporate the risk reduction measures proposed in this response to this recommendation.

Recommendation Number 5:

Some of the CPFMs involve debris blockage of the conduits (J. C. Boyle), adit (Copco No. 1) and diversion tunnel (Iron Gate) intakes during the initial reservoir drawdown and subsequent dam removal activities. The BOC recommends that one or more practical debris removal contingency plans be developed, including necessary tools and material for rapid deployment. These contingency plans should include various scenarios involving different reservoir pool levels and access conditions.

Response to Recommendation Number 5:

The Renewal Corporation will prepare the recommended contingency plans addressing the potential failure modes, including blockage of conduits, tunnels, and adits during the initial drawdown and subsequent dam removal activities. The Renewal Corporation's contingency plans will include rapid deployment of equipment and resources to remove debris accumulation from the conduits to maintain unrestricted flow conditions at the dam conduits, tunnels, and adits. The contingency plans will identify multiple scenarios specific to each dam in sufficient detail to support a rapid deployment of equipment and resources, if necessary. These measures may include, but are not limited to, methods for rapidly clearing debris and material from the low-level outlets, excavation of controlled sections with the dam embankment to release water while preventing embankment failure, or installation of bypass flow facilities. The Renewal Corporation will prepare the contingency plans in advance of the construction work. The Renewal Corporation will update the contingency plans as required during construction to incorporate site specific information or observations. The Renewal Corporation will file an

updated Construction Management Plan with FERC on or before December 31, 2021 to incorporate the risk reduction measures proposed in this response to this recommendation.

Recommendation Number 6:

The BOC recommends that flow conditions through the Iron Gate diversion tunnel be closely monitored during the initial drawdown and subsequent conveyance of flows through the project during dam removal. Measured reservoir levels and tunnel flows at the downstream USGS gage should be compared to conditions predicted by the CFD models to make the necessary modifications to the dam removal schedule and sequence if necessary to maintain the required freeboard levels.

The BOC further recommends that, until the tunnel performance, including gate opening and measured flows are confirmed, the spillway and dam crest should remain intact and at their current level of service. If there were any performance concerns, delays in dam crest degradation would need to be further considered. A milestone activity should be included in the construction schedule for the Iron Gate Dam removal. This milestone activity would mark the evaluation and verification of the diversion tunnel flow capacity and be shown as a predecessor for dam crest degradation activities.

Response to Recommendation Number 6:

The Renewal Corporation will develop a milestone activity to be included in the construction schedule designed specifically to provide flow monitoring from the Iron Gate tunnel. The Renewal Corporation will monitor flow conditions through the Iron Gate tunnel, daily, from initial drawdown and until the Iron Gate tunnel is decommissioned. Flow monitoring shall occur at downstream United States Geological Survey gauge (No. 11516530, river mile 189.73). The Renewal Corporation will use flow monitoring data to confirm that the hydraulic capacity of the outlet tunnel matches or exceeds the capacity predicted in the Computation Fluid Dynamics (CFD) modeling, and to confirm that the hydraulic operating conditions (in terms of flow characteristics, air flow, and hydraulic jump conditions) are consistent with the CFD modeling results. Early in the drawdown period, the Renewal Corporation will confirm the maximum hydraulic capacity along with flow capacity at intermediate reservoir levels. The Renewal Corporation will also use the flow monitoring data to confirm that the drawdown schedule matches the proposed duration and timing of drawdown proposed in the Final Design.

In evaluating the flow conditions through the Iron Gate diversion tunnel, the Renewal Corporation will compare data derived from the daily monitoring of flow conditions through the Iron Gate tunnel to the Renewal Corporation's hydraulic models to ascertain if required freeboard levels are being maintained. The Renewal Corporation will compare the outlet tunnel capacity at the maximum and intermediate reservoir levels against the drawdown schedule to confirm the operating flow conditions and durations. If required freeboard levels are not being maintained, the Renewal Corporation shall take such further actions as may be required to restore and maintain required freeboard levels. These measures may include, but are not limited to, modifying the gate operating position, improving air supply facilities (if determined to be

insufficient), incorporating additional bypass flow facilities, or controlling inflows to the reservoir through coordination with the United States Bureau of Reclamation (USBR).

The Renewal Corporation will establish March 30 of the drawdown year as a milestone for providing the BOC with confirmation that the Iron Gate tunnel performance during the initial drawdown effort is sufficient for implementation of final reservoir drawdown. The Renewal Corporation will provide the BOC with such confirmation on or before this date. If the Renewal Corporation is unable to confirm that the Iron Gate tunnel performance is sufficient for implementation of the final reservoir drawdown, measures for modifying the tunnel or drawdown schedule will be developed to achieve acceptable reservoir drawdown conditions while maintaining safe operating conditions in the tunnel.

The Renewal Corporation will file an updated Construction Management Plan with FERC on or before December 31, 2021 to incorporate the risk reduction measures proposed in this response to this recommendation.

Recommendation 7.

The two most critical issues associated with the removal of the Iron Gate Dam are:

- *The operation of the diversions tunnel concrete bulkhead gate, and*
- *The conditions of the unlined tunnel with its ability to withstand high velocity flow during the initial reservoir drawdown and provide the required conveyance to safely pass subsequent floods during the dam removal.*

The technical justification for eliminating the complete lining of the unlined tunnel section is based primarily on the:

- *Results of CFD modeling of the diversion tunnel flows,*
- *Assessment of the geologic conditions off the unlined tunnel section, and*
- *Results of the recent tunnel survey and data acquisition and processing.*

The BOC understands from discussions with Kiewit that the unlined reach of the diversion tunnel will undergo further inspections during the pre-drawdown works to make the necessary improvements to achieve its safe operation.

The BOC understands that the results of the CFD modeling of these two Category I CPFMs are currently under review by Dr. Henry Falvey. The BOC recommends that these two CPFMs, and any other CPFMs associated with the CFD modeling, be reviewed and modifications to their risk reduction opportunities be updated, as necessary.

Response to Recommendation 7.

The Renewal Corporation will convene a team comprised of representatives from Kiewit, Knight-Piesold, and the Owner's Representative to review Dr. Henry T. Falvey's comments, determine what modifications to the design and/or risk management are warranted, then incorporate these recommended modifications into the Final Design and the construction

workplans. The risk register will be updated to reflect the modifications and associated risk management measures identified for implementation.

Final CPFMA Report and BOC Monitoring of Critical Milestones

The Renewal Corporation directed Kleinschmidt to address the BOC's comments on the CPFMA Report in a final CPFMA Report to be filed with FERC and the BOC. The final CPFMA Report will be filed with FERC and the BOC on or before July 16, 2021.

Report No. 3 states that "[t]he BOC considers it to be appropriate to have the BOC members present on site to observe critical milestones, such as the adit penetration of Copco No. 1, the foundation conditions at the toe of the J. C. Boyle scour hole, improvements to the Iron Gate tunnel, the implementation of restoration measures following dam removal, or other important milestones and/or activities. This is intended to inform the BOC of the key milestones to assist in formulating the final report summarizing the work." (Report No. 3 at p 21.) The Renewal Corporation welcomes this involvement of the BOC, as directed by the Commission.

On behalf of the Renewal Corporation, I extend my thanks and appreciation for the hard work and diligence of the BOC. This project has benefitted from the BOC's expertise and recommendations and the Renewal Corporation looks forward to continuing to work with the BOC in connection with the implementation of our project.

Sincerely,

s/ Mark Bransom

Mark Bransom,
Chief Executive Officer
Klamath River Renewal Corporation

Enclosures

cc: Douglas Johnson, (D2SI) Portland Regional Engineer
Dustin Till (PacifiCorp)
Service List (FERC No. 2082-063 and 14803-001)

Exhibit A

Letter Report; Board of Consultants Formal Meeting No. 3
Lower Klamath Project (FERC Nos. P-2082-063, P-14803-001)
Klamath River Renewal Corporation

BOARD OF CONSULTANTS

Lower Klamath Project

Mr. Mark Bransom
Klamath River Renewal Corporation
2001 Addison Street, Suite 317
Berkeley, CA 94704

Date: June 18, 2021

**Re: Letter Report; Board of Consultants Formal Meeting No. 3
Lower Klamath Project (FERC Nos. P-2082-063, P-14803-001)
Klamath River Renewal Corporation**

Dear Mr. Bransom,

The Independent Board of Consultants for the review of the Lower Klamath Project respectively submits the following Formal Meeting No. 3 Report.

INTRODUCTION

The Lower Klamath Project Independent Board of Consultants (BOC) convened Formal Meeting No. 3 via video conference on June 2 and 4, 2021. The purpose of the Formal Meeting was to discuss the BOC's final review comments and obtain any further recommendations with respect to the final draft of the *Construction Potential Failure Mode Analysis (CPFMA) Report* dated May 2021. The CPFMA for the removal of four dams and the restoration of the Lower Klamath River was prepared in support of the *Amended Application for Surrender of License for Major Project and Removal of Project Works*, FERC Nos. P-2082-063 and P-14803-001 ("Amended Surrender Application").

The Federal Energy Regulatory Commission (FERC) advised the Klamath River Renewal Corporation (Renewal Corporation) that FERC staff would not attend this formal meeting. Therefore, consistent with the FERC's May 22, 2018 directive, this formal meeting was not publicly noticed and participation was limited to the attendee's identified in Attachment B.

The BOC Formal Meeting was conducted in accordance with the FERC's Formal Meeting Protocol, and addressed the requirements of their May 22, 2018 letter.

The Formal Meeting agenda and attendee list are provided as Attachments A and B, respectively. The Formal Meeting minutes are presented as Attachment C. Discussions of design and construction related-activities prior to the June 2, 2021 formal meeting were as follows:

- During the informal meetings conducted on October 9, 2020 and November 20, 2020, the Renewal Corporation provided the BOC with an update on the 90% design specifications, focusing on changes since the 60% design.
- On December 11 and 14, 2020, Kleinschmidt facilitated the CPFMA workshop based on the 90% design.

Workshop participants included members of the:

- BOC
- Renewal Corporation
- McMillen Jacobs (Owner's Representative)
- Kleinschmidt (Facilitator)
- Kiewit (Contractor)
- Knight-Piesold (Design Lead, Contractor's Engineer)
- PacifiCorp (Licensee)
- FERC staff, and
- California Department of Safety of Dams (DSOD) staff

The CPFMA Core Team was comprised of:

- One member from the BOC: Jim Borg
 - One member from McMillen Jacobs: Mort McMillen
 - One member from Kiewit: Erik Esparza
 - One member from Knight-Piesold: Norm Bishop
 - Two members from Kleinschmidt: Steve Spicer (Facilitator), and Kim Hansen
- The CPFMA Core Team was assisted by technical staff which provided supporting information and analyses during the session. These other participants were allowed to add to the discussion, but without voting on CPFMA evaluation and categorization. On April 21, 2021 the Core Team independently reviewed the draft CPFMA Report and provided review comments for incorporation into the final draft report. The final draft CPFMA Report was provided to the BOC on May 11, 2021. On May 27, 2021 an informal meeting was held via video conferencing to address the BOC's request to provide further clarification of the following issues:
 - The geologic condition of the unlined section of the Iron Gate diversion tunnel and the justification for eliminating the complete lining of the unlined tunnel section.

- Downpull forces on the bottom of the Iron Gate concrete upper bulkhead during its raising.
- Energy dissipation in the Iron Gate diversion tunnel and protection to the proposed tunnel lining extension from high velocity flows during reservoir drawdown.
- Foundation conditions and fill placement in the scour hole at the end of the J. C. Boyle power canal.

This letter report presents the BOC's Findings, Conclusions and Recommendations following the review of the information provided to the BOC during and following our CPFMA informal meetings of December 11 and 14, 2020. This report incorporates our review of the documents, materials and correspondence provided by the Renewal Corporation and their Project team regarding the ongoing studies for the proposed dam removal and river channel restoration associated with the Project.

REVIEW DOCUMENTS

In advance of the BOC Formal Meeting, the Renewal Corporation provided the BOC and the FERC with the following documents:

- Final Draft Construction PFMA and Appendices, dated May 2021 (CEII)
- Final Draft Construction PFMA Report Response to Comments, dated April 21, 2021 (CEII)
- Revised PFM IRG-01 (Sediment/Debris in Low-Level Outlet Gate Guides prevents full opening of Bulkhead Gate)
- Supporting Technical Information:
 - 90% Design Report (CEII)
 - Final Design (CEII)
 - Copco No. 1 Dam – Upstream Geophysical Survey (Attachment O to the Existing Conditions Assessment Report (CEII)
 - Additional Reference Material (CEII)
 - Stanford Copco No. 1, As Constructed Report
 - Reservoir Rim Stability Report (Attachment K to the Existing Conditions Assessment Report) (CEII)
 - Existing Conditions Assessment Report (CEII)
 - Draft Construction PFMA Report (CEII)
 - Iron Gate Diversion Tunnel Gate, Memorandum dated December 10, 2020 (CEII)
 - Iron Gate Diversion Tunnel Outlet Gate – Hoist Lifting Force Requirements, Memorandum dated December 10, 2020 (CEII)
 - Iron Gate Tunnel Modeling – Updated with 2021 Survey Results, Memorandum dated May 6, 2021 (CEII)

At the request of the BOC, on June 1, 2021 the Renewal Corporation provided the BOC and the FERC with an updated Formal Meeting No. 3 data package including the following documents:

- Iron Gate Low-Level Outlet Survey Data Acquisition and Processing, Yurok Tribe, External Technical Memo dated December 11, 2020 (CEII).
- Klamath River Renewal Project, Geotechnical Data Report, Revision E with Updated Appendix H Figures, December 16, 2020 (CEII).
- Klamath River Renewal Project, Draft Responses to BOC Review Comments on the CPFMA Report and Supporting Information, May 27, 2021(CEII)

UNDERSTANDING OF THE ASSIGNMENT

In accordance with the FERC's May 2018 directive and Section 14.3.7 of the 2017 FERC's *2017 Energy Guidelines for the Evaluation of Hydropower Projects*, the BOC conducted an evaluation of the CPFMA final draft report to better understand potential failure modes and corresponding risk mitigations, as well as public safety aspects, associated with the construction-related activities of the Renewal Corporation's Definite Decommissioning Plan.

It is the BOC's understanding that the May 22, 2018 FERC Directive states that at the end of the Formal Meeting "the BOC shall verbally present its conclusions, recommendations and answers to the questions posed." The BOC verbally presented its initial conclusions on June 2, 2021 and its initial recommendations on June 4, 2021. The following sections present the BOC's Findings, Conclusions and Recommendations resulting from our review of Renewal Corporation's "Construction Failure Mode Analysis Report, Revision D".

FINDINGS

This section presents the findings of the BOC regarding the final draft of the "Construction Potential Failure Modes Analysis, Revision D" dated May, 2021. The findings for the CPFMs related to construction-related activities associated with the removal of each of the four dams is presented in this section.

Construction-related Activities Associated with the Reservoir Drawdown and Facilities Removals

The report provides an overview of the sequence of the construction-related activities associated with the pre-drawdown, staged drawdown and demolition of the works for each of the four dams. These activities are presented to allow the evaluation of the site conditions and activities which could cause potential failure modes to occur.

The BOC finds that the CPFMA Report reasonably describes the construction-related activities associated with the reservoir drawdown and facility removal. While Section 3.0 presents an overview of the staged activities associated with the pre-drawdown, drawdown demolition and removal works, the BOC understands from discussions with the Kiewit team that they realize that the activities may need to be modified based on actual field conditions experienced or exposed during project implementation. The BOC considers the activities presented are reasonably sufficient to evaluate construction-related CPFMs.

Construction Potential Failure Mode Identification

Potential failure modes for each of the four CPFM categories are identified and defined in accordance with Chapter 14 of the FERC's *Engineering Guidelines for the Evaluation of Hydropower Projects*.

The BOC finds that the methodology and available information used to identify potential failure modes is in accordance with Chapter 14 of the FERC Guidelines (Rev 1, July 1, 2005) and was sufficient for conducting the CPFMA.

Development of Construction Potential Failure Modes

The CPFMs for each of the four dams were developed by a Core Team comprised of representatives from the BOC, FERC, Renewal Corporation, PacifiCorp (Licensee), McMillen Jacobs (Owner's Representative), Kleinschmidt (Facilitator), Kiewit (Contractor), and Knight-Piesold (Design Engineer).

The Core Team identified, developed and assigned categories for several candidate CPFMs associated with the construction-related activities of each dam. Each of the CPFMs assigned a category based on an evaluation of their:

- Path to Failure (initiation and development),
- Consequences (of failure related to project to removal or downstream impacts to schedule or public safety),
- Positive and Adverse Factors,
- Categorization and Rationale,
- Surveillance and Monitoring Considerations, and
- Risk Reduction Opportunities

The BOC finds that the Core Team consisted of individuals with the appropriate technical expertise and qualifications to participate in the CPFMA, but also possessed an intimate knowledge of the project conditions through years of inspections and analyses related to its implementation. The BOC commends the involvement of the construction contractor in the CPFMA process.

Summary and Conclusions of CPFMs

The CPFMA assigned the following categories to each of the four dams:

| Dam | Total CPFMs | Category I | Category II | Category III | Category IV | Withdrawn | IV – Not Developed |
|-------------|-------------|------------|-------------|--------------|-------------|-----------|--------------------|
| J. C. Boyle | 8 | 0 | 5 | 1 | 2 | 5 | 3 |
| Copco No. 1 | 6 | 0 | 6 | 0 | 0 | 3 | 0 |
| Copco No. 2 | 2 | 0 | 1 | 0 | 1 | 4 | 0 |
| Iron Gate | 12 | 2 | 7 | 1 | 2 | 9 | 0 |
| All Dams | 1 | 0 | 0 | 1 | 0 | 0 | 2 |
| Total | 29 | 2 | 19 | 3 | 5 | 21 | 5 |

The BOC finds that the Core Team has done a thorough evaluation of the CPFMs associated with the construction-related activities. The BOC concurs with the Core Team in their categorization of each of the CPFMs, although the BOC had the following questions which were thoroughly discussed during the review:

- Functioning of the Iron Gate diversion tunnel during initial reservoir drawdown and construction site protection during the period of dam removal (Category I), and
- Toe failure of the scour hole at the end of the J. C. Boyle Power Canal (Category III).

The BOC concurs with the contractor's approach to conduct additional field investigations as necessary to further assess the Iron Gate diversion tunnel conditions

in the pre-drawdown year as well as foundation conditions in the J.C. Boyle scour hole prior to material placement.

Considerations for Surveillance and Monitoring

The Core Team identified surveillance and monitoring considerations to observe possible changes to site conditions which could impact relevant CPFMs and resulting removal operations and public safety. In summary, the considerations included:

- Construction progress delays
- Observation, forecasting and coordination with the United States Bureau of Reclamation (USBR) regarding the operation of upstream project facilities
- Stability of reservoir rim, embankment and material placement slopes
- Materials investigations and testing
- Unanticipated movement and settlement of debris and sediment

The BOC finds that surveillance and monitoring of site conditions and facilities will need to persist and likely evolve throughout the removal of the dams to achieve project and public safety. The BOC understands from discussions with CPFMA participants that the contractor is fully aware of the more critical areas and risk reduction opportunities identified during the CPFMA and is committed to a program of continual surveillance, monitoring, and potential reactions throughout project implementation.

Opportunities for Risk Reduction

The CPFMs identified a number of risk reduction opportunities related to the construction-related activities for each of the four dams. The number of risk reductions for each of the dams (in parenthesis) are as follows:

- J. C. Boyle (6)
- Copco No. 1 (4)
- Copco No. 2 (1)
- Iron Gate (15)

The CPFMA Core Team compiled a detailed list of risk reduction opportunities for the contractor's consideration during the removal of the dams. The BOC understands from discussions with CPFMA participants that the contractor recognizes that opportunities for reducing risks will go beyond those identified during the CPFMA, including currently unforeseen conditions should they arise.

Supporting Materials

Many of the CPFMs were supported with sketches to assist with their development and categorization. In addition, an appendix with 100% design drawings were provided, along with project data sheets. These sketches were included in the materials provided

to the BOC and the FERC in preparation for the CPFMA workshop, as distributed on December 9, 2020.

The BOC compliments the Renewal Corporation, the Kiewit Technical Teams and Kleinschmidt for providing excellent supporting resources in preparation for the CPFMA. The team's timely response to BOC questions was also appreciated. The BOC considers that the timely presentation of detailed information was essential for the successful completion of the CPFMA.

CONCLUSIONS

This section presents the conclusions of the BOC regarding the final draft of the "Construction Potential Failure Modes Analysis, Revision D" dated May, 2021. The findings for the CPFMs related to construction-related activities associated with the removal of each of the four dams is presented in this section.

J. C. Boyle Dam

The Core Team assigned no Category I CPFMs at J. C. Boyle Dam. The Category II/III CPFMs for the J. C. Boyle Dam can be summarized as follows:

- Overtopping during delays in construction due to fires. (Category II).

A forest fire occurs which impedes and limits contractor access to the site, resulting in a delay in embankment removal. With the partial removal of the embankment and limited access, inflows exceed the discharge capacity of the culverts and spillway, and the embankment is overtopped and breached. The consequences of this CPM include a delay in the schedule and downstream flooding and sediment and potential damage.

The surveillance and monitoring considerations include an evaluation of the existing upstream cofferdam and a risk reduction opportunity involving observation of sediment head cutting at the entrance to the approach to the diversion channel.

The BOC concludes that the surveillance and monitoring considerations and risk reduction measures (along with the Fire Management Plan) for this CPM are reasonable.

- Overtopping due to flood exceeding 1% chance flood (Category II).

A flood in excess of the 1% event occurs, resulting in the overtopping and breaching of the partially excavated embankment. The resulting uncontrolled release of the reservoir causes downstream flooding and delays to the dam removal activities.

Surveillance and monitoring considerations include maintaining communication with the USBR regarding the operation of upstream facilities to alert the contractor of river inflows warranting emergency measures. Risk reduction opportunities include reviewing the dambreak analysis for the high hazard dam to indicate incremental flows and inundated areas resulting from the failure of the dam.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities (along with the Flood Management Plan) for this CPFM are reasonable.

- Upstream slope failure & overtopping during drawdown (Category II).

The dissipation of pore pressures and the phreatic surface within the upstream slope of the embankment lags behind the reservoir drawdown rate and causes the upstream slope to become unstable and slough into the reservoir. As a result, the embankment is overtopped and breached, causing impacts to the dam removal activities.

Surveillance and monitoring considerations focus on visually monitoring cracking or sloughing of the embankment and risk reduction opportunities involve verifying embankment material properties to confirm, or update, slope stability analyses.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for this CPFM are reasonable.

- Clogging of low-level culverts resulting in overtopping (Category II).

Sediment, debris and cofferdam and/or embankment material are mobilized during the removal of the embankment and clog or block the low-level conduits, reducing their discharge capacity. As a result, the partially removed embankment is overtopped and breached, causing impacts to the dam removal activities.

Surveillance and monitoring considerations focus primarily on visually monitoring debris buildup which could clog the opening of the conduits. The risk reduction opportunity involves having equipment available and means identified for mechanically removing debris impeding flow from entering the conduits.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for this CPFM are reasonable.

- Instability of embankment due to earthquake during drawdown (Category II).

An earthquake of sufficient magnitude occurs during reservoir drawdown causing the instability and failure of the embankment and the release of a flood wave. This CPFM impacts dam removal activities.

Surveillance and monitoring considerations include monitoring United States Geologic Survey (USGS) alerts and performing post-earthquake inspections. The risk reduction opportunity involves maintaining existing, or flatten, upstream slopes during the excavation of the embankment dam.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunity for this CPFM are reasonable.

- Toe failure of the scour hole at the end of the power canal (Category III).

Demolition waste previously placed in the scour hole at the power canal emergency spillway is open-graded and porous. River flows scour the unclassified alluvial material beneath the waste material, causing it to slough into the river and form a temporary dam. Breaching of the dam releases a floodwave which endangers downstream recreationalists.

Risk reduction opportunities include placing dam demolition debris at an alternative site and placing engineered backfill in the scour hole, and performing field and geotechnical investigations to determine subsurface conditions at the toe.

The BOC concludes that these risk reduction measures for this CPFM are reasonable assuming adequate slope stability exists for any adverse conditions encountered during the toe subsurface investigations (e.g., soft or loose foundation layers), as verified by slope stability analysis of the design condition of embankment saturation during the rainy season.

Copco No. 1 Dam

The Core Team assigned no Category I CPFMs at Copco No. 1 Dam. The Category II CPFMs for the Copco No. 1 Dam are all primarily related to the uncertainties related to the construction of, and conveyance of flow through, the drainage adit.

- Overtopping due to delay in the adit construction (Category II).

Delay in the construction of the adit beyond the end of September causes damage to the working platform from flow over the spillway. The consequence identified with this CPFM is damage to the adit working platform, resulting in Copco No. 1 construction schedule delays and increase in construction costs.

Risk reduction opportunities include considering access to the working platform to the left side of the river and considering methods to accelerate adit construction.

The BOC concludes that the risk reduction opportunities for the CPFM are reasonable.

- Premature draining of the reservoir (Category II).

The premature failure of the upstream remnant concrete of the adit wall and drawdown of the reservoir affects the Copco No. 2 work area. The consequences related to this CPFM are impacts to the Copco No. 1 and Copco No. 2 removal schedules and costs.

The surveillance and monitoring considerations and risk reduction opportunities include extensive studies to probe and map rail reinforcement and joint locations throughout the advancement of the adit construction.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities to be taken by the adit subcontractor to address this CPFM are reasonable.

- Reservoir rim instability due to rapid drawdown (Category II).

The drainage of the critical reservoir rim areas lags behind the reservoir drawdown, resulting in slope failures. The primary concern associated with this CPFM involves public safety. The instability of critical reservoir rim areas would wash away sections of roads and also result in the loss of reservoir shoreline property.

Developing and implementing a drone and LIDAR plan to monitor the behavior of locations identified as “at risk” and restricting access to the more vulnerable areas are included in the surveillance and monitoring considerations and risk reduction opportunities for this CPFM.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for this CPFM are reasonable.

- Construction of the adit opens lift joints (Category II).

The drill and blast construction of the adit open cold lift joints causing the instability and failure of the dam. The consequences associated with the uncontrolled failure to Copco No. 1 dam from the unanticipated opening of the lift joints during the adit construction include not only a delay in the Copco No. 2 dam removal but potentially result in its domino collapse/failure and uncontrolled release, resulting in the potential for loss of workers’ lives and the

downstream Daggett Bridge. The BOC recognizes that the failure of Copco No. 1 dam during adit construction, while unlikely, could be catastrophic.

This CPFM does not specify risk reduction opportunities. The surveillance and monitoring considerations proposed include investigating the reinforcement and joint locations and monitoring leakage through the open joints during the advancement of adit construction to address this CPFM.

The BOC concludes that the surveillance and monitoring considerations for this CPFM are reasonable.

- Instability due to vibration in low-level outlet steel pipe downstream of adit (Category II).

Flow in the adit steel pipe extension induces vibration which damage welded joints, wash out the working platform supporting materials, and cause the pipe to fail. The consequences related to this CPFM include delays and increased costs associated with the removals of both Copco No. 1 and 2 dams.

CFD modeling was used to estimate the flow diversion characteristics and air supply requirements within the adit during the removal of Copco No. 1. The risk reduction opportunities include using a conservative design to achieve sufficient air entrainment to reduce the potential for flow instabilities and vibrations and a robust pipe design and well drained fill confinement.

The BOC concludes that the risk reduction measures for this CPFM are reasonable.

- Plugging or partial blocking of the adit (Category II).

The plugging or partial blocking of the entrance to the adit from debris reduces drawdown rates. The primary consequence related to this CPFM is a delay in the Copco No. 1 removal and increase in cost. The removal of debris from the adit entrance would be difficult.

Risk reduction opportunities include excavating a debris trap upstream of the adit entrance to collect submerged debris. The slope of the adit was selected to enhance debris transport and reduce the potential for blockage. Finally, the adit subcontractor has experience using a blasting plan to free debris lodged in the adit entrance.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for the CPFM are reasonable.

Copco No. 2 Dam

The Core Team assigned no Category I CPFMs at Copco 2 Dam. The Category II CPFM for the Copco No. 2 Dam is associated with the delay in access to the site.

- Dam removal delayed due to site access issue (Category II).

Rock falls or road failures prevent access to the Copco No. 2 site, resulting in construction delays and a potential increase in removal costs.

The surveillance and monitoring consideration involves visual monitoring the road cut slopes for signs of rock falls and slope instabilities. The risk reduction opportunities include considering an alternate Copco No. 2 access route on the left side of the river.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for this CPFM are reasonable.

Iron Gate Dam

The Core Team assigned two Category I, eight Category II and one Category III CPFMs for the Iron Gate Dam. The two Category I CPFMs are related to the operation of the existing low-level outlet works during the opening of the concrete bulkhead and condition of the unlined tunnel during the initial reservoir drawdown and providing adequate flow diversion during dam removal.

- Sediment/Debris blocks low-level outlet gate guides and prevents full opening of bulkhead gate (Category II).

The blockage of the outlet gate guides prevents the bulkhead gate from opening fully. This results in a prolonged operation of the tunnel in a dangerous state with no means of moving the gate or clearing the guides. The consequence of this CPFM would be an indeterminate delay in the removal of Iron Gate Dam and potentially increasing removal costs.

Risk reduction opportunities include the inspection of the guides and removal of debris and full gate movement tests under balance head to address any difficulties anticipated during final gate opening. In addition, the hoist operation and gate stems during the raising of the gate will be closely monitored.

The BOC concludes that the risk reduction measures for this CPFM are reasonable.

- Overtopping due to blocked discharge (Category II).

The diversion tunnel is the only means for conveying flows through the Iron Gate project during the critical stages of its removal. The consequences of sediment

or debris blocking the tunnel go beyond delaying the dam's removal, but also cause premature failure with the uncontrolled release of the reservoir and the potential for loss of downstream property and life.

The CPFM risk reduction opportunities propose the development of a Debris Management Plan, plans for materials available for emergency spillways through the embankment at intermediate levels of removal, and construction, and construction of a protected channel on the downstream face of the dam to be used should overtopping occur. Closely monitoring the movement of debris and sediment toward the tunnel intake. The observation of reservoir and gate shaft water levels and river flows to detect whether debris blockage is reducing tunnel discharge is also proposed.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for this CPFM are reasonable.

- Slope instability of upstream embankment slope due to fast drawdown (Category II).

The dissipation of pore pressures and the phreatic surface within the upstream slope of the embankment lags behind the reservoir drawdown rate and causes the upstream slope to become unstable and slough into the reservoir. As a result, the dam is overtopped and breached, and the resulting floodwave causes downstream property damage and loss of life.

Regularly monitoring the embankment's upstream slope during reservoir drawdown and maintaining upstream excavation slopes flatter than the original slopes have been identified as risk reduction opportunities.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for this CPFM are reasonable.

- Overtopping due to delays (Category II).

Any delay in the removal of the embankment beyond the end of September increases the risk of overtopping, breach in the embankment and floodwave, resulting in damage to downstream property and loss of life.

Monitoring actual versus scheduled production, delays due to external events, and the capacity of the diversion tunnel, along with preparing for emergency measures to safely pass flows over or through the embankment have been identified as risk reduction opportunities.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for this CPFM are reasonable.

- Overtopping due to collapse of diversion tunnel lining upstream of gate (Category II).

The upstream diversion tunnel lining is designed to withstand internal pressures. Blockage of the intake structure dewater the tunnel resulting in the collapse of the concrete lining restricting flows around the lowered embankment, causing it to overtop, breach and release a downstream floodwave. The consequence of this CPFM is the potential for downstream property damage and loss of life.

Monitoring the potential for debris blockage of the intake and loss of tunnel conveyance, and the development of a Debris Management Plan, are identified as risk reduction opportunities.

BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for this CPFM are reasonable.

- Overtopping due to failure of diversion tunnel intake trash rack (Category II).

The blockage of the tunnel intake with debris causes the failure of trashrack sections. These sections travel downstream and lodge in the tunnel or gate slots and reduce the discharge capacity of the tunnel. The loss of tunnel discharge capacity results in the overtopping and breach of the embankment and release of floodwave potentially causing downstream property damage and loss of life.

Monitoring the water levels in the reservoir and gate shaft to detect any decrease in tunnel discharge and evaluating the trashrack structural and hydraulic capacity are identified as risk reduction opportunities.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities, (along with the development of a Debris Management Plan) for this CPFM are reasonable.

- Overtopping due to blocked outlet diversion tunnel outlet (rock slope failure) Category II)

The blockage of the tunnel outlet due to a rock slope failure reduces the discharge capacity of the tunnel. The loss of tunnel discharge capacity results in the overtopping and breach of the partially excavated embankment and release of floodwave potentially causing downstream property damage and loss of life.

Visually monitoring the slope above the outlet for signs of unravelling and maintaining construction access roads to remove rock material blocking the outlet are identified as risk reduction opportunities.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for this CPFM are reasonable.

- Slope instability at reservoir rim due to fast drawdown (Category II).

The drainage of the critical reservoir rim areas lags behind the reservoir drawdown, resulting in slope failures. The consequence of this CPFM is damage to property and roads in these more vulnerable areas.

Developing and implementing a warning plan and drone monitoring the locations identified as “at risk” during the initial reservoir drawdown are identified as risk reduction opportunities.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for this CPFM are reasonable.

- Overtopping due to flood exceeding diversion design flood (1%) occurs (Category I).

When the reservoir is drawn down below the service spillway crest and powerhouse intake structure the removal of the embankment relies solely on the diversion tunnel to control reservoir levels. A flood exceeding 1% occurs which overtops the three-foot freeboard, causing the lowered embankment to breach. The resulting floodwave causes downstream property damage and loss of life.

Surveillance and monitoring considerations include maintaining communication with the USBR to alert the contractor of river inflows to initiate emergency measures. Risk reduction opportunities include developing a design of an emergency spillway notch and armored channel on the downstream slope to prevent the premature embankment breach. The development of an emergency flood management plan and temporary emergency action plan (TEAP) are also proposed to reduce the risks of damage to downstream property and loss of lives.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities, (along with the development of Emergency Flood Management and Temporary Emergency Action Plans) for this CPFM are reasonable.

- Gate wedged in place before opening completely (Category I).

During the initial opening of the low-level outlet gate (upper concrete bulkhead) the air supply vent pipe becomes damaged and is unable to provide air to cushion the pressure fluctuations from the unsteady flow between the gate and steel bulkhead discharge ring, causing the gate to become wedged in the gate

slots preventing it to open. The primary consequence of this CPFMA is that the tunnel discharge capacity is insufficient to maintain the schedule for the removal of the embankment.

No specific surveillance and monitoring considerations are identified for this CPFMA, although similar CPFMs indicate that monitoring reservoir and gate shaft water levels and discharges recorded at the downstream USGS gage are proposed. Risk reduction opportunities include fully cycling the gate under balanced head in preparation for the initial opening and considering an alternative air supply method are indicated.

Discussion with Kiewit subsequent to the CPFMA indicated that consideration of an alternate air supply method using a vertical shaft driven downstream of the steel bulkhead ring would need to penetrate through the embankment material, and prove to be infeasible. Consequently, a well anchored and robust designed air pipe vent system will be developed to provide adequate air supply.

The BOC concludes that the surveillance and monitoring considerations and risk reduction opportunities for this CPFMA are reasonable.

- Rockfall blocks section of unlined tunnel (Category I).

During the operation of the diversion tunnel, highly turbulent flow creates a rockfall in the unlined tunnel reach which blocks and reduces the tunnel's discharge capacity. The loss of tunnel discharge capacity results in the overtopping and breach of the partially excavated embankment and release of floodwave causing downstream property damage and loss of life.

The risk reduction opportunity indicates that the unlined tunnel reach has been inspected and areas of weakness are being evaluated for improvements.

The BOC concludes that the risk reduction opportunity for this CPFMA (along with the development of Emergency Flood Management and Temporary Emergency Action Plans) for this CPFMA are reasonable.

RECOMMENDATIONS

The BOC presents the following recommendations resulting from the review of the final draft of the "Construction Potential Failure Modes Analysis, Revision D" dated May, 2021.

Recommendation No. 1

The BOC recommends formalizing a process whereby CPFMs and associated risk reduction measures are proactively considered in advance of and during the work. This

could be an agenda item in monthly progress meetings, and could also be addressed in special task start-up meetings for various critical activities. This may look different and be independent of the Risk Register. The main thing is to facilitate timely awareness and discussion among stakeholders, including, but not limited to subcontractors, inspectors, crafts persons, and engineers.

Recommendation No. 2

The BOC concurs with using a careful approach to advancing the diversion adit through Copco 1 dam, including use of probe holes. Challenges will be the embedded railroad track steel and the potential cold joints shown on drawings near the upstream face. The BOC recommends that subcontractor crafts persons and others working at the adit heading be made acutely aware of conditions, implications of conditions, and associated risks that could be encountered.

Recommendation No. 3

The BOC concurs with Kiewit's approach to implement best practice measures to properly manage precipitation runoff from gullies and upslope areas above waste fill placements to mitigate erosion potential. The BOC recommends that these measures be configured to permanently protect these areas from erosion and gullying.

Recommendation No. 4

The BOC concurs with Kiewit's approach to make additional investigations to determine subsurface conditions at the toe of the proposed J. C. Boyle scour hole fill. The main concern of the BOC is to identify any potential loose/soft layers/deposits which could represent a potential failure plane affecting the global slope stability of the fill. The BOC recommends the findings of the investigations be considered in calculations of the stability of the slope as appropriate, and reconfiguration of the fill be made as needed to maintain permanent stability. Conditions of saturation of the fill during rainy season should be considered in analysis.

Recommendation No. 5

Some of the CPFMs involve debris blockage of the conduits (J. C. Boyle), adit (Copco No. 1) and diversion tunnel (Iron Gate) intakes during the initial reservoir drawdown and subsequent dam removal activities. The BOC recommends that one or more practical debris removal contingency plans be developed, including necessary tools and material for rapid deployment. These contingency plans should include various scenarios involving different reservoir pool levels and access conditions.

Recommendation No. 6

The BOC recommends that flow conditions through the Iron Gate diversion tunnel be closely monitored during the initial drawdown and subsequent conveyance of flows

through the project during dam removal. Measured reservoir levels and tunnel flows at the downstream USGS gage should be compared to conditions predicted by the CFD models to make the necessary modifications to the dam removal schedule and sequence if necessary to maintain the required freeboard levels.

The BOC further recommends that, until the tunnel performance, including gate opening and measured flows are confirmed, the spillway and dam crest should remain intact and at their current level of service. If there were any performance concerns, delays in dam crest degradation would need to be further considered. A milestone activity should be included in the construction schedule for the Iron Gate Dam removal. This milestone activity would mark the evaluation and verification of the diversion tunnel flow capacity and be shown as a predecessor for dam crest degradation activities.

Recommendation No. 7

The two most critical issues associated with the removal of the Iron Gate Dam are:

- The operation of the diversion tunnel concrete bulkhead gate, and
- The condition of the unlined tunnel with its ability to withstand high velocity flow during initial reservoir drawdown and provide the required conveyance to safely pass subsequent floods during the dam's removal.

The technical justification for eliminating that complete lining of the unlined tunnel section is based primarily on the:

- Results of CFD modeling of the diversion tunnel flows,
- Assessment of the geologic condition of the unlined tunnel section, and
- Results of the recent tunnel survey and data acquisition and processing.

The BOC understands from discussions with Kiewit that the unlined reach of the diversion tunnel will undergo further inspections during the pre-drawdown works to make the necessary improvements to achieve its safe operation.

The BOC understands that the results of the CFD modeling of these two Category I CPFMs are currently under review by Dr. Henry Falvey. The BOC recommends that these two CPFMs, and any other CPFMs associated with the CFD modeling, be reviewed and modifications to their risk reduction opportunities be updated as necessary.

NEXT MEETING

At this time the BOC understands that no further meetings are likely to occur in regards to the Construction Potential Failure Mode Analysis Report. However, in accordance with the FERC May 22, 2018 Directive it is the BOC's understanding that it is the FERCs intent that the BOC involvement is to remain in effect through the approved

dam removal process. In this light, The BOC considers it to be appropriate to have the BOC members present on site to observe critical milestones, such as the adit penetration of Copco No. 1, the foundation conditions at the toe of the J. C. Boyle scour hole, improvements to the Iron Gate tunnel, the implementation of restoration measures following dam removal, or other important milestones and/or activities. This is intended to inform the BOC of the key milestones to assist in formulating the final report summarizing the work.

CLOSURE

A CPFMA has been conducted to consider the candidate CPFMs for the removal of the four lower Klamath river dams and their resulting consequences to project schedule and public safety. Paths to failure, positive and adverse factors, and surveillance and monitoring considerations have been identified to develop risk reduction measures. The BOC opines that the CPFMA was performed by qualified individuals including those intimately familiar with the current conditions and designs for the projects. In addition, the Renewal Corporation and Kiewit have assembled an experienced and technically competent team of planners, designers and contractors capable of achieving a safe and efficient removal of the projects.

However, the BOC has noted that while the CPFMs impact on project removal schedule and project safety have been discussed, the resulting increase in costs should also be considered.

Based on our review of the information provided at this stage in the Project, the BOC respectfully submits Letter Report No. 3 providing our findings, conclusions and recommendations regarding the final draft of the Construction Potential Failure Mode Analysis Report in support of the Renewal Corporation's license surrender application for the Lower Klamath Project.

Yours sincerely,



James E. Borg



Craig Findlay



Dan Hertel

ATTACHMENT A

LOWER KLAMATH PROJECT

FERC Board of Consultants: P-2082, P-14803 NATDAM-OR00559, CA00323, CA00234, CA00325

Formal Meeting No. 3 Agenda

Wednesday, June 2, 2021

Zoom Meeting Information

[Zoom Link](#)

Dial-In: 1 669 900 6833

Meeting ID: 844 0370 7479

Passcode: 975106

Attendees:

- CPFMA Core Team Members:
 - BOC: James Borg
 - McMillen Jacobs: Mort McMillen
 - Kiewit: Erik Esparza
 - Knight-Piesold: Norm Bishop
 - Kleinschmidt: Kim Hansen, Steve Spicer
- Other Attendees, as Requested:
 - BOC: Craig Findlay, Dan Hertel
 - Renewal Corporation: Laura Hazlett, Olivia Mahony, Mark Quehrn
 - PacifiCorp: Dustin Till, Peter Martins, Mike Ledesma
- FERC: Not Attending
- On-Record/Publicly Noticed: No

| Start (Times in PDT) | Duration | Topic | Leader(s) |
|----------------------------|----------|---|------------------------------------|
| 11:00 AM | 20 min | Call to Order: <ul style="list-style-type: none">• Participant Role Call• Understanding of the Assignment• Responsibility of Meeting Minutes• Adoption of BOC Procedures | Jim Borg |
| 11:20 AM | 10 min | Review Agenda: <ul style="list-style-type: none">• Additions/Deletions• Questions? | Jim Borg |
| 11:30 AM | 90 min | Review and Discussion of Construction Potential Failure Mode Analysis (CPFMA) Workshop Report and Supplemental Information | CPFMA Core Team, BOC Members |

| | | | |
|---------|--------|---|--------------|
| 1:00 PM | 20 min | Break | Participants |
| 1:20 PM | 30 min | Preliminary Conclusions, Recommendations, and Answers to Questions Posed <ul style="list-style-type: none"> • Conclusions • Recommendations • Response to Questions Posed | Jim Borg |
| 1:50 PM | 10 min | Assignments/Responsibilities: <ul style="list-style-type: none"> • BOC/KRRC Responsibilities • BOC Draft Report • Renewal Corporation Draft Report Review • BOC Final Report: June 16, 2021 | Jim Borg |
| 2:00 PM | TBD | Other Business and Further Discussion, As Needed | Participants |

ATTACHMENT B

LOWER KLAMATH PROJECT

FERC Board of Consultants: P-2082, P-14803 NATDAM-OR00559, CA00323, CA00234, CA00325

Formal Meeting No. 3

Meeting Participants

Formal Meeting #3 Participants – June 2, 2021

Core Team Members:

| Name | Affiliation |
|---------------|----------------------|
| Jim Borg | Board of Consultants |
| Mort McMillen | McMillen Jacobs |
| Erik Esparza | Kiewit |
| Norm Bishop | Knight-Piesold |
| Kim Hansen | Kleinschmidt |
| Steve Spicer | Kleinschmidt |

Other Attendees, as Requested:

| Name | Affiliation |
|-----------------|----------------------|
| Craig Findlay | Board of Consultants |
| Dan Hertel | Board of Consultants |
| Laura Hazlett | Renewal Corporation |
| Olivia Mahony | Renewal Corporation |
| Mark Quehrn | Perkins Coie |
| Dustin Till | PacifiCorp |
| Demian Ebert | PacifiCorp |
| Mike Ledesma | PacifiCorp |
| Charles Sensiba | Troutman Sanders |

Formal Meeting #3 Read-Out Participants – June 4, 2021

| Name | Affiliation |
|-----------------|----------------------|
| Jim Borg | Board of Consultants |
| Craig Findlay | Board of Consultants |
| Dan Hertel | Board of Consultants |
| Laura Hazlett | Renewal Corporation |
| Olivia Mahony | Renewal Corporation |
| Mort McMillen | McMillen Jacobs |
| Mark Quehrn | Perkins Coie |
| Dustin Till | PacifiCorp |
| Demian Ebert | PacifiCorp |
| Mike Ledesma | PacifiCorp |
| Charles Sensiba | Troutman Sanders |

ATTACHMENT C-1

LOWER KLAMATH PROJECT

FERC Board of Consultants: P-2082, P-14803 NATDAM-OR00559, CA00323, CA00234, CA00325

Formal Meeting No. 3

June 2, 2021

Meeting Minutes

Call to Order

The meeting was called to order at 11:00 a.m. PT. The list of meeting attendees was provided on the agenda.

The attendee included on the agenda who did not participate was:

- PacifiCorp: Peter Martins

Attendees who were not included on the agenda and did participate were:

- PacifiCorp: Demian Ebert, Charles Sensiba (Troutman Sanders)

It was noted that the Federal Energy Regulatory Commission (FERC) would not attend the meeting.

Understanding of Assignment

Jim Borg requested that Mark Quehrn (Perkins Coie) read the FERC May 22, 2018 Directive, outlining FERC's expectations of the Board. Mr. Quehrn then read the FERC expectations related to the assignment. There was no further discussion.

Mr. Quehrn noted the progress of the Board on the tasks outlined in the FERC Directive and offered appreciation for their work.

Adoption of Board of Consultants Procedures

Mr. Borg stated that the Board concurred with Mr. Quehrn's reading and assessment, and then presented the procedures for formal meetings as set forth in KLAMATH RENEWAL CORPORATION, LOWER KLAMATH PROJECT, PROCEDURES FOR BOARD OF CONSULTANTS, Section C FORMAL MEETINGS, Independent Board of Consultants Procedures, FERC Nos. P-2082, P-14803, NATDAM-OR00559, CA00323, CA00234, CA00325; Letter from Mark Bransom to David E. Capka, August 28, 2018.

Review of the Agenda

Mr. Borg presented the meeting agenda, as distributed on May 19, 2021, to the Board and meeting participants, and asked for any revisions to or questions about the agenda. There were no requested changes or further discussion.

Review and Discussion of Construction Potential Failure Mode Analysis (CPFMA) Workshop Report and Supplemental Information

Mr. Borg reviewed that the Board participated in the informal CPFMA workshop based on 30% design in December 2019, and held informal meetings in October 2020 and November 2020 to receive design updates. The formal CPFMA Workshop based on 90% design was held in December 2020. The Board and Core Team members then reviewed and provided comments on the Kleinschmidt draft CPFMA Report (February 2021). The Board and Core Team also separately discussed IRG-01 during a meeting in April 2021. These comments and discussion were addressed in the Kleinschmidt final draft CPFMA Report (Rev D, May 2021). The Board then requested further information from the design contractors related to the PFMs, which was discussed during a technical call with the design contractors and then provided to the Board in May 2021.

Noting the Board and Core Team members have had numerous opportunities to review and discuss the information and material, the Board recommended to focus the meeting on the findings and conclusions of the Kleinschmidt final draft CPFMA Report (Rev D, May 2021). There were no objections to this approach or requests for further discussion or clarifications of the material.

Mr. Borg then presented the findings and conclusions of each of the PFMs in the Kleinschmidt final draft CPFMA report (Rev D, May 2021). There was further discussion related to the Iron Gate Dam PFMs, specifically related to the initial gate operations and the flow conditions in the tunnel.

There was discussion about ongoing inspections and monitoring of differing site conditions through project implementation. Erik Esparza (Kiewit) concurred that Kiewit will perform further testing and robust inspections at each dam site prior to drawdown to confirm any differing conditions.

Dan Hertel asked about the design criteria and resistance testing of the Iron Gate tunnel ventilation system. Norman Bishop (Knight-Piesold) responded that individual bolts will be tested based on design criteria. He further explained the structural frames will be designed to the American Institute of Steel Construction Code. Knight-Piesold expects to perform more calculations at the time of a License Surrender Order. Mr. Bishop stated that the criteria and calculations will be included in the Basis of Design Report.

Mr. Borg stated the Board's understanding that Dr. Henry T. Falvey (Henry T. Falvey and Associates, Inc.) is performing an external expert review of the Iron Gate tunnel computational fluid dynamics (CFD) modeling. Mr. Borg requested the Board be provided with Dr. Falvey's findings upon receipt.

Mr. Borg then noted that many consequences in the CPFMA report result in impacts to project cost and schedule, rather than concerns of public safety. Laura Hazlett (Renewal Corporation) stated that the Renewal Corporation continues to update its risk register regularly and at key project milestones. It was noted that the project team will be updating the risk register based on the Board's Formal Meeting #3 conclusions and recommendations.

In conclusion, Mr. Borg stated that the Board concludes the risk mitigation measures of the PFMs are reasonable, understanding that more testing and inspections will be performed during the pre-drawdown period and project implementation and design changes will be made, as appropriate. He further stated that the Board opines the CPFMA was performed by qualified individuals including those intimately familiar with the project and design, and that the Renewal Corporation and Kiewit have assembled a competent team capable of achieving safe and efficient facilities removal.

Preliminary Conclusions, Recommendations, and Answers to Questions Posed

Mr. Borg stated that this meeting effectively served as the Board's read out of preliminary conclusions and answers to questions posted, but that the Board's recommendations were not sufficiently developed to present during the current meeting session and that the Board would reconvene the Formal Meeting #3 on Friday, June 4 to review the recommendations and answers to questions posed. It was decided the meeting would be held at 9:00 a.m. PT.

Mr. Hertel and Craig Findlay confirmed the Board has discussed the material and information with one another and the recommendations will reflect discussion of the Board.

Assignments/Responsibilities

Mr. Borg then reviewed the assignments and responsibilities:

- Board: Complete the read out of preliminary recommendations during the Friday, June 4 read-out meeting.
- Report Timing:
 - It was anticipated the Board would send its draft final report to the Renewal Corporation and PacifiCorp on Monday, June 14; the Renewal Corporation and PacifiCorp would offer any comments for consideration by Wednesday, June 16; and the Board would send the final report on Friday, June 18 for the Renewal Corporation's filing at FERC.
 - It was decided this schedule would be confirmed during the June 4 read-out meeting.

Other Business and Further Discussion, As Needed

Mr. Borg asked whether Mort McMillen's (McMillen Jacobs) comments on the draft CPFMA Report (February 2021) had been addressed to his satisfaction. Mr. McMillen confirmed.

Ms. Hazlett offered appreciation on behalf of the Renewal Corporation for the Board's time and attention to these matters and the project.

Adjournment

Upon motion duly made by Mr. Findlay, seconded by Mr. Hertel, and unanimously carried, the Formal Meeting #3 was adjourned at 12:20 p.m. PT.

ATTACHMENT C-2

LOWER KLAMATH PROJECT

FERC Board of Consultants: P-2082, P-14803 NATDAM-OR00559, CA00323, CA00234, CA00325

Formal Meeting No. 3

June 4, 2021

Meeting Minutes

Call to Order and Introduction

The meeting was called to order at 9:00 a.m. PT on June 4. Attendees included:

- Board of Consultants: Jim Borg, Dan Hertel, Craig Findlay
- Renewal Corporation: Laura Hazlett, Olivia Mahony, Mort McMillen (McMillen Jacobs), Mark Quehrn (Perkins Coie)
- PacifiCorp: Dustin Till, Demian Ebert, Mike Ledesma, Charles Sensiba (Troutman Sanders)

Review of the Agenda

Jim Borg stated the purpose of the meeting was to reconvene the June 2 Formal Meeting #3 and provide a read-out of the Board's recommendations on the construction Potential Failure Modes Analysis (CPFMA) and Kleinschmidt final draft CPFMA report (Rev D, May 2021). A separate agenda for the meeting was not distributed.

Preliminary Conclusions, Recommendations, and Answers to Questions Posed

Mr. Borg presented the Board's six recommendations regarding the CPFMA analysis and Kleinschmidt final draft CPFMA Report (Rev D, May 2021). There was no further discussion.

Other Business and Further Discussion, As Needed

Mr. Borg then sought input about next steps and FERC's expectations of the Board's tasks as outlined in the FERC May 22, 2018 Directive. Mark Quehrn (Perkins Coie) referred to the FERC 2018 Directive, noting the Board has accomplished many of the tasks outlined by FERC. Given the Board's progress on the tasks outlined in the FERC 2018 Directive, it was decided that the Renewal Corporation, in consultation with the Board and PacifiCorp, would submit a letter to FERC requesting further guidance as to the remaining tasks of the Board through project implementation.

Laura Hazlett (Renewal Corporation) offered appreciation for the Board's ongoing detailed review of the project materials, noting the project has benefitted from the Board's recommendations.

Assignments/Responsibilities

Olivia Mahony (Renewal Corporation) then presented the proposed final report schedule the Board discussed during the June 2 Formal Meeting:

- Board to provide a draft report to Renewal Corporation and PacifiCorp: June 14

- Renewal Corporation and PacifiCorp provide any comments to the Board on the draft report: June 16
- Board submits its final report for the Renewal Corporation's filing at FERC: June 18
- Renewal Corporation and PacifiCorp submit the Board's final report and the Renewal Corporation responses to FERC within two weeks, per the FERC 2018 Directive: June 2

This schedule was confirmed by the Board.

Adjournment

There being no further items or discussion, the meeting was adjourned at 9:20 a.m. PT.

CERTIFICATE OF SERVICE

I hereby certify that, on this 2nd day of July 2021, I have served the public filing of **Letter Report, Independent Board of Consultants Meeting No. 3** regarding FERC Project Nos. P-14803-001 and P-2082-063 via email containing a link thereto, or via U.S.P.S. if no email address was available, upon each person designated on the official service list compiled by the Secretary in these proceedings.

/s/ Ivy Carr

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