

Final Study Plan, Part 1

Klamath Hydroelectric Project Interim Measure 11 Study Activities for 2018

February 20, 2018

Introduction

The Klamath Hydroelectric Settlement Agreement (KHSA; as amended on April 6, 2016) includes Interim Measure 11 (Interim Water Quality Improvements), which is intended to address water quality improvement in the Klamath River during the interim period leading up to potential dam removal. Regarding Interim Measure (IM) 11, the KHSA states “The emphasis of this measure shall be nutrient reduction projects in the watershed to provide water quality improvements in the mainstem Klamath River, while also addressing water quality, algal and public health issues in Project reservoirs and dissolved oxygen in J.C. Boyle Reservoir.” The measure calls for PacifiCorp to spend up to \$250,000 per year¹ for studies or pilot projects in consultation with the Interim Measures Implementation Committee² (IMIC).

This document describes the proposed studies or pilot projects that PacifiCorp will conduct during 2018 to address the IM 11 objectives as described above. These proposed studies or pilot projects will be a continuation of, or build upon, IM 11 studies that have been conducted since 2010. A draft version of this Study Plan was circulated with a request for IMIC comments on January 17, 2018 and was discussed at the January 18, 2018 IMIC meeting. This final Study Plan was created by incorporating comments from the IMIC. This Study Plan is considered to be part one because there are likely to be other efforts undertaken under IM 11 in 2018 that have not yet been identified. Specifically, proposed 2018 Activities described in this Study Plan that are related to IM 11 include:

1. Development of the Priority List of Projects: Phase 3
2. Support for the Upper Klamath Basin Watershed Action Plan Team
3. Continued Evaluation of Intake Barrier System for Water Quality Improvement of Iron Gate Powerhouse Releases

Each of these studies is described below. Costs are still being developed for the various studies and funding requirements for the studies as currently outlined below may be less than the \$250,000 available under IM 11. If this is the case, additional scope and study objectives – or potentially additional studies – may be undertaken in 2018. These future studies would be documented and submitted for IMIC review in a future part (e.g., Part 2) of this study plan.

¹ Per year until the date that the Dam Removal Entity (DRE) accepts a Surrender Order issued by the Federal Energy Regulatory Committee (FERC) regarding the Klamath Hydroelectric Project. The KHSA indicates that up to 25 percent of the funding in this measure for pre-surrender-order acceptance studies and post-surrender-order acceptance implementation may be directed towards in-reservoir water quality improvement measures, including but not limited to J.C. Boyle reservoir.

² The IMIC is comprised of representatives from PacifiCorp and other parties to the KHSA. The purpose of the IMIC is to collaborate with PacifiCorp on ecological and other issues related to the implementation of the Non-Interim Conservation Plan Interim Measures set forth in Appendix D of the KHSA.

1: Development of the Priority List of Projects: Phase 3

Purpose and Objectives

The first activity of the IM 11 activities during 2018 will be Phase 3 of the Development of a Priority List of Projects. The purpose of this effort is to continue to develop and implement the Priority List of Projects (PLP) to be implemented after the Dam Removal Entity's (DRE) acceptance of a surrender order from the Federal Energy Regulatory Commission (FERC; per the KHSA). Following acceptance of the surrender order, PacifiCorp shall provide funding of up to \$5.4 million for implementation of projects (as recommended by the PLP), and an additional amount of up to \$560,000 per year to cover project operation and maintenance expenses related to those projects during the interim period. The PLP is being informed by, among other things, the information gained from the specific studies conducted to-date under IM 11. The KHSA further stipulates that prior to implementation of projects, the PLP will be approved by the Oregon Department of Environmental Quality (ODEQ), the North Coast Regional Water Quality Control Board (Regional Water Board), and the State Water Resources Control Board (State Board).

The development and implementation of the PLP is being accomplished in four phases:

- Phase 1: Define the PLP selection process. Identify project categories that are candidates for the PLP and rank the project categories for further detailed assessment in Phase 2. Phase 1 activities were completed in April 2017 and are discussed in the associated report (see CH2M 2017a).
- Phase 2: Identify and determine the specific PLP. Determine the approach to allocation of funding amounts for the PLP. Define the conceptual governance structure and process anticipated to be necessary to implement the PLP. Per IM 11, obtain final approval of the PLP from ODEQ, the Regional Water Board, and the State Board. The first two steps of Phase 2 activities were completed in November 2017, and results of Phase 2 activities are described in CH2M (2017b). The final Phase 2 report will be completed after reviewing comments from the IMIC that were received in January 2018. Once the report is complete, the ODEQ, the Regional Water Board, and the State Board can proceed with obtaining final approval which is expected to be completed sometime in 2018; a specific schedule has not been developed for final approvals.
- Phase 3: Fully develop the governance process, select a Fiscal Agent, and begin development of a process to allow for project implementation. This Activity 1 of IM 11 during 2018 (as described further below) will complete Phase 3 of the PLP process.
- Phase 4: Implement governance process and projects from the PLP. Phase 4 will not occur until the DRE accepts the FERC surrender order as discussed in the KHSA.

Task and Work Elements

Work on Phase 3 of the PLP will not start until the ODEQ, Regional Water Board, and State Board have approved the final PLP as discussed in the KHSA and the Phase 2 report (CH2M 2017b). Once approvals have been obtained, the following tasks associated with this activity in 2018 will proceed:

- Coordinate with the IMIC to refine the specific scope for Phase 3 of the PLP process if necessary. Additional meetings and outreach may be required to comprehensively identify the scope of work for Phase 3, define responsibilities, and establish schedules.
- If the PLP is approved with no substantive changes, the scope of work for 2018 would include activities to: fully develop the governance structure; obtain IMIC approval of that governance structure; select a Fiscal Agent; develop necessary agreements between key members of the governance structure and the Fiscal Agent; and begin development of a request for specific project proposals.

Schedule and Deliverables

Phase 3 activities are anticipated to begin in 2018; however, work will not start until final approval of the PLP has been obtained. The IMIC meetings and conference calls discussed in the scope of work will occur either within existing IMIC meetings or on a schedule to be determined. The final product of this effort along with the schedule for delivery of that work would be developed following completion of the scope of work as discussed above in consultation with the IMIC. The final deliverables could include: a complete and agreed upon governance structure, designated Fiscal Agent, operating agreements with the Fiscal Agent and the key members of the governance structure, and a draft request for proposals.

2: Support for the Upper Klamath Basin Watershed Action Plan Team

Purpose and Objectives

Several past efforts, including the Upper Klamath Basin Comprehensive Agreement, have identified the need for a plan or strategy to prioritize and implement restoration actions to support water quality improvements, fisheries recovery, and recovery of riparian and riverine process and function in the Upper Klamath Basin. In response, the Upper Klamath Basin Watershed Action Plan Team (Project Team) was recently formed and has begun developing the Upper Klamath Basin Watershed Action Plan (Action Plan). The Project Team currently consists of key members of the Upper Klamath Basin restoration and regulatory community including the Klamath Tribes, Trout Unlimited, The Nature Conservancy, U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program, Klamath Watershed Partnership, ODEQ, and the Regional Water Board.

The Action Plan is being developed by the Project Team, with feedback and buy-in from as many of the agencies and organizations in the Upper Klamath Basin (stakeholders) as possible. The Action Plan will include information about types of restoration projects necessary to address specific impairments to riverine and riparian process and function, reach-scale maps identifying candidate sites for specific restoration projects, and a prioritization framework to assist the Project Team and other implementers in prioritizing areas for restoration work. Finally, the Action Plan will be science-driven, focusing on addressing watershed processes. The Project Team has significant experience incorporating such concepts into restoration planning and implementation.

Because a major goal of the Action Plan will be water quality improvements, namely including projects and actions being furthered under IM 11, the Action Plan is considered a valuable tool for use in advancing the PLP process of IM 11 (as described above). Previously funded work included support for meetings, plan preparation, stakeholder meetings, and outreach. The scope of work for extends support for plan development and meetings to July 2019.

Task and Work Elements

The tasks and work elements associated with this activity (as funded by PacifiCorp) in 2018 will include the following:

- Funding for Project Team activities for Trout Unlimited, The Nature Conservancy, and Klamath Watershed Partnership.
- Monthly Action Plan planning meetings of the Project Team (12 meetings).
- Stakeholder meeting associated with development of a stakeholder outreach strategy (1 meeting).
- Complete development of Action Plan components.

Schedule and Deliverables

The monthly Action Plan planning meetings and stakeholder meeting will be completed on a schedule to be determined by the Project Team. Deliverables will include meeting minutes for the monthly meetings and stakeholder meeting, and a report describing progress made on development of Action Plan components.

3: Continued Evaluation of the Iron Gate Intake Barrier Curtain System for Water Quality Improvement of Powerhouse Releases

Purpose and Objectives

The purpose of Activity 3 is to continue to evaluate the effectiveness of the intake barrier system in Iron Gate reservoir to improve water quality in Iron Gate powerhouse releases to the Klamath River. Work in 2018 will build on previous years of data collection and continue to inform management and operation of the system. For example, in 2011 to 2013, studies were conducted under IM 11 to test the installation of an adjustable barrier or cover on the intake tower trash rack at Iron Gate reservoir. In general, the intake cover showed only limited effectiveness over a short duration (i.e., several hours to a few days) as intake inflow hydraulics adjusted to the presence of the intake (Miao and Deas 2014). In 2014, a pilot test was conducted of a geotextile curtain deployed upstream of the intake as a means of reducing algae entrainment into the intake. Although the curtain was not specifically designed for this purpose³, monitoring results suggest that the curtain had an effect on reducing blue-green algae in releases from the reservoir during the curtain deployment period (Carlson 2014). The existing curtain was installed in 2015.

During 2015-2017, annual studies have been conducted to continue evaluation of the operation of the curtain upstream of the intake as a means of reducing algae entrainment into the intake (Watercourse 2016; PacifiCorp 2017). The concept behind the curtain is to control the depth at which water is withdrawn from the reservoir into the intake, and thereby potentially enhance water quality downstream of Iron Gate dam by reducing the potential entrainment of biomass from blooms of cyanobacteria (blue-green algae) and potential associated algal toxins (i.e., microcystin). These studies have provided valuable insights into the performance of the curtain system under varying conditions. This work has collectively indicated that the curtain functions as it was designed and selectively limits the entrainment of surface water in Iron Gate reservoir. Conditions in 2017 were substantially different than the previous 2 years. These conditions were driven by a relatively warm and calm (low wind) summer, coupled with high levels of cyanobacteria production. These conditions led to modest stratification in the epilimnion that persisted from early in the summer into fall, resulting in compromised dissolved oxygen levels in Iron Gate reservoir and the river downstream of the dam – even with the curtain in a completely rolled up position. Recently, IMIC members have posed questions that are addressed in this task. One of these questions is related to the curtain effectiveness relative to the effects of Iron Gate dam itself in reducing cyanobacteria released to the Klamath River. The other question deals with the adequacy of the existing data to evaluate the effectiveness of the curtain. Both of these questions are addressed in the work to be conducted in 2018.

Task and Work Elements

The tasks and work elements associated with this activity in 2018 will include the following:

- Using the data collected from 2015 through 2017, work will focus on refining the understanding of the factors that affect curtain effectiveness, especially those that differentiate 2017 from previous years.

³ The curtain used for this pilot test was the existing lake divider curtain that was originally deployed in Long Gulch Cove for the cove algae management study (i.e., Activity 5 of the 2013-2014 IM 11 Study Plan). The Long Gulch curtain was redeployed to a position about 180 meters upstream of the Iron Gate intake during August-September 2014, and then subsequently removed from the reservoir.

This includes review of: IM 15 water quality data collected before the curtain was installed; wind speed data and wind-generated mixing statistics; and flow patterns near the curtain from existing acoustic doppler current profile (ADCP) work. This comprehensive review will help address the question about relative curtain effectiveness as it relates to Iron Gate dam itself. It is also possible that this analysis will identify gaps in the existing information or additional focused studies that need to be implemented to address specific questions (for example, focused ADCP data collection).

- The curtain will again be deployed in the summer-fall of 2018 to be operational during the period when blooms of cyanobacteria are most prevalent in Iron Gate reservoir (approximately mid-July through October).
- Field data collection at the curtain in 2018 will focus on collecting information to support the evaluation of curtain effectiveness and improve the understanding of curtain function. This will include detailed vertical profiles immediately before and after curtain deployment; profiles will be repeated a few days after curtain deployment. PacifiCorp will again deploy of data sondes and thermograph arrays upstream and downstream of the curtain to continuously monitor conditions throughout the summer. If the data analysis task discussed above indicates the need for specific data collection efforts in addition to those discussed here, specific study plans will be developed for those investigations.

Schedule and Deliverables

Comprehensive review and analysis of existing data will begin in spring 2018 with a goal of being complete by June 2018. The curtain will be deployed in the summer-fall of 2018. Field data collection will occur to bracket the curtain deployment period per the monitoring plan. Final data analysis and reporting would occur after data collection is complete and likely be completed in 2019.

References

- CH2M. 2017a. Development of a Priority List of Projects: Phase 1 Report. Klamath River Hydroelectric Project Interim Measures Implementation Committee: Interim Measure 11. April 2017. Prepared by CH2M, Portland, Oregon for PacifiCorp, Portland, Oregon.
- CH2M. 2017b. Development of a Priority List of Projects: Phase 2 Draft Report. Klamath River Hydroelectric Project Interim Measures Implementation Committee: Interim Measure 11. November 2017. Prepared by CH2M, Portland, Oregon for PacifiCorp, Portland, Oregon.
- Miao. E. and M. Deas. 2014. Assessment of an Intake Barrier for Water Quality Control at Iron Gate Reservoir – 2013. Final Technical Report. Prepared for PacifiCorp, Portland, Oregon. Prepared by Watercourse Engineering, Inc., Davis, California. April 2014.
- PacifiCorp. 2017. 2016 Evaluation of Intake Barrier Curtain in Iron Gate reservoir to Improve Water Quality in the Klamath River. October.
- Watercourse Engineering Inc. (Watercourse). 2016. Water Quality Effects of an Intake Barrier Curtain to Reduce Algae Concentrations Downstream of Iron Gate Reservoir. Prepared for PacifiCorp. July.