Eightmile Dam Rebuild and Restoration Project

Background

Eightmile Lake is one of four lakes in the Alpine Lakes Wilderness Area managed by the Icicle and Peshastin Irrigation Districts (IPID) to provide water storage. A small dam, low-level outlet pipe, and a slide gate at the outlet of Eightmile Lake allow for controlled releases of stored water to supplement flows in Icicle Creek, which increase water supply available during low flow periods typically occurring during the late summer months. Icicle Creek, a tributary to the Wenatchee River, provides water for agricultural irrigation, municipal and domestic use, aquatic habitat for wild and hatchery fish, and recreation. Due to the large size of the drainage basin relative to the storage volume in the lake, Eightmile Lake has a high potential for refill, even during dry years. The Eightmile Dam, high in the Alpine Wilderness Area, is a major source of stored water supporting streamflows in Icicle Creek, benefiting these uses.

The existing dam was constructed in the 1920s and consists of a rock masonry and concrete wall structure with an earthen embankment section. The infrastructure is more than 90 years old and requires improvements to operate in a safe, reliable way.

The following are the key concerns for Washington State Department of Ecology (Ecology) Dam Safety Office (DSO) and IPID:

- Limited Spillway Capacity –The spillway overtopped and eroded the earthen embankment portion of the dam more than 25 years ago. This has limited IPID's ability to refill the lake to the historical spillway elevation and increased the potential for additional erosion and failure of the earthen embankment portion of the dam.
- Jack Creek Fire – The August 2017 Jack Creek Fire burned trees and vegetation within the Eightmile Lake watershed down to the shoreline of the lake. This created concerns of increased peak runoff into Eightmile Lake, which combined with debris piling up on the dam, could increase the risk of dam failure.
- Low-Level Outlet Failure – The low-level outlet pipe at the lake is approximately 300 feet long and consists of pipe that varies in size and composition. The oldest section was replaced as part of emergency repairs completed in 2018. The pipe now functions adequately, but still requires replacement for long term operations.

Following the 2017 fire, DSO elevated the hazard classification of the dam from low to high. This hazard classification means that dam failure would threaten human lives and/or cause substantial economic or environmental damage.

Due to these concerns, IPID declared an emergency at Eightmile Dam on March 13, 2018. The dam was repaired in 2018 to temporarily increase safety by widening and hardening the spillway and by replacing a segment of the low-level outlet pipe that had collapsed. While the repairs made it possible to lower the lake and provide additional spill capacity, the infrastructure does not currently meet DSO's requirements for dam safety or IPID's needs. As a result of these ongoing safety concerns, DSO is requiring that the outlet gate be kept open to reduce the volume of water stored and thus reduce risk of failure during the winter and early spring.

Objective

IPID's proposed replacement of the Eightmile Dam has three objectives:

1. Restore the storage capacity of Eightmile Lake so that it meets IPID's irrigation and storage needs.
2. Comply with DSO regulations for a high hazard dam.
3. Provide additional water to enhance Icicle Creek instream flow volumes and potential mitigation of new beneficial uses.

IPID holds a 1926 adjudicated water right to store 25 cfs of water at Eightmile Lake. Downstream public safety is a paramount concern and high priority. Erosion to the earthen embankment portion of the dam structure has reduced the active storage available for release by gravity without pumping or siphoning to less than 1,400 acre feet under current conditions. Rebuilding the dam would restore the storage capacity to meet IPID's irrigation needs and could provide additional water to enhance instream flows.

Eightmile Dam would be one of the first several projects to be implemented under the Icicle Creek Water Resource Management Strategy at the direction of the Icicle Work Group. The multi-stakeholder group is working to identify and evaluate projects that will increase instream flows and improve the management of water in the Icicle Creek Subbasin. The group has adopted Guiding Principles that represent the collective goals established by the group for improving water management in Icicle Creek Subbasin. The proposed Eightmile Dam Rebuild and Restoration project helps meet the Guiding Principles of the Icicle Creek Strategy.

Ecology's Office of Columbia River (OCR) is the lead agency under the State Environmental Policy Act (SEPA) and is leading the development of the Environmental Impact Statement (EIS) for the dam replacement project in accordance with Washington Administrative Code (WAC) 197-11.

There are two spillway design alternatives under consideration in the EIS, and three construction options. The alternatives, along with operational considerations, are described below; alternative details are provided in Tables 1 and 2. Considering stakeholder input and other factors, proposals that extend outside the deeded land area have been eliminated from consideration in the EIS.

Narrow Spillway with Gates (formerly Alternative 1A)

Dam Design

This alternative includes replacement of the existing dam with an earthen embankment and reinforced concrete dam structure equipped with automated control gates over the primary spillway. Three four-foot-high, 20-foot long automatic level control gates would be installed on top of the primary spillway, which would have a hard crest elevation of 4,667.0 feet. The gates would allow IPID to control the water level within the top 4 feet of the lake. When the need for additional water supply is anticipated, IPID would raise the gates in the late spring or early summer to raise the lake to elevation 4,671.0 feet prior to releasing the water in the late summer. The gates would automatically lower if the lake level gets too high to protect the dam and prevent overtopping. For example, if a storm occurs when the gates are up and the lake is full, the gates would automatically lower to pass peak flows generated by the storm. This design would allow for a narrow primary spillway (60 feet wide) and therefore a smaller dam footprint compared to the Wide Spillway Alternative.

During extreme storm events, the lake would continue to rise above the primary spillway. Two 10-foot wide intermediate spillways on either side of the primary spillway would provide 20 feet of additional spillway width at an elevation of 4,671.5 feet. A secondary spillway would be created in a low spot south of the main dam structure by hardening an existing channel. The secondary spillway would

have a crest elevation of 4,673.0 feet. The spillways would provide capacity to pass the design storm event (a storm that has the probability of occurring once in 1,000,000 years) while maintaining the freeboard in the lake required by DSO.

Water would be released from the lake through a new 30-inch diameter low-level outlet pipe/siphon. The low-level outlet pipe/siphon would extend from an inlet submerged in the lake approximately 150 feet west of the new dam structure to an outlet in the Eightmile Creek channel approximately 314 feet downstream of the new dam structure. This would allow the lake to be drawn down to a low water surface elevation of 4,636 feet during drought conditions, which would allow access to stored water without pumping. The low-level outlet pipe would be located entirely within the special warranty deed area. IPID would release water during the late summer to maintain the water supply available for authorized diversions and instream flows in Icicle Creek. Releases through the low-level outlet pipe would be controlled by an automated plug valve at the downstream end of the pipe. IPID would have the ability to adjust the valve remotely to release the flows needed to meet downstream water supply and instream flow needs.

The primary spillway gates and low-level outlet valve at the lake would be powered by batteries charged by a solar panel. Lake levels, gate and valve positions, and other controls would be monitored remotely and the equipment would be operated via radio signal requiring an antenna, both of which would be located at the dam site. The controls and monitoring equipment would be concealed as much as possible to protect the equipment and preserve, to the extent possible, the aesthetic values of the Alpine Lakes Wilderness Area.

Wide Spillway without Gates

Dam Design

This alternative includes replacement of the existing dam with an earthen embankment and reinforced concrete dam with a primary spillway length of 180 feet. The primary spillway would be fixed and completely passive. No gates or automatic equipment would control the spillway or adjust the spillway crest elevation. This would result in a wider spillway and a larger footprint than the Narrow Spillway Alternative because the primary spillway would have 4 fewer feet of vertical spillway capacity. There would be no intermediate spillways. The primary spillway would have a hard spillway crest at an elevation of 4,671.0 feet.

During extreme storm events, the lake would flow over the entire length of the primary spillway. A secondary spillway, the same as the Narrow Spillway Alternative, would be created in a low spot south of the main dam structure by hardening an existing channel. The secondary spillway would have a crest elevation of 4,673.0 feet. The spillways would provide enough capacity to pass the design storm event while maintaining the freeboard in the lake required by DSO.

As with the Narrow Spillway Alternative, water would be released from the lake through a new 30-inch diameter low-level outlet pipe/siphon. The operation and configuration of the low-level outlet pipeline would be essentially the same described for the Narrow Spillway Alternative, with the low-level outlet pipe being located entirely within the special warranty deed area.

Operation

In general, operation of Eightmile Dam would be as follows under either alternative:

- The lake would be allowed to fill annually through mid-July each year.
- IPID would then open the valve on the low-level outlet to start releasing water, as needed to meet downstream needs.
- IPID would close the valve on the low-level outlet at the end of the irrigation season.
- Similar to existing dam conditions, the lake level would typically continue to drop due to seepage through the soils under the dam until early fall storms begin to refill the lake.
- The lake would refill through the winter and spring.

Under either alternative, the drawdown would be limited to an elevation of 4,642 feet during non-drought years and 4,636 feet during declared drought conditions (roughly once every 5 years) and taking into consideration a known natural leak in the lake/dam. The maximum drawdown would release 2,000 acre-feet. IPID would regulate the lake so that the water elevation does not fall below the target elevation as of October 1 of each year, unless releases are needed after October 1 due to drought. The lake would only be lowered to the low water surface elevation in drought years in late-September to early-October.

IPID would limit the release of water for non-district purposes to be consistent with water volumes determined through a decision-making process and resulting tool to be created by the Icicle Work Group and approved by the co-conveners (Ecology and Chelan County). This tool will set the total water quantity to be released each year under the existing water right for non-district purposes and the minimum elevation of the lake. This decision support tool will also direct the instantaneous release amounts and timing of releases. IPID would reserve the right to lower the lake beyond such limits if needed for district purposes but not below 4,642 feet unless a drought is declared by the state.

Under the Narrow Spillway Alternative, the water surface elevation in the lake would typically be held at a maximum elevation 4,667 feet except for a few weeks during the late spring and early summer when IPID would raise the gates over the primary spillway to capture additional runoff and raise the lake to a maximum water elevation of 4,671 feet. IPID would typically raise the gates in May and begin to draw down the lake in July. The gates would be lowered once the lake level is drawn down below the bottom of the gates (4,667 feet). Under the Narrow Spillway Alternative, if the gates are raised and the lake fills, the gates would automatically lower to prevent the lake level from rising above 4,671 feet. During a storm, the gates would lower to provide additional spillway capacity to pass peak storm flows.

Under the Wide Spillway Alternative, the spillway would be passive, meaning that there would be no gate or other adjustable controls. The lake would flow over the primary spillway when the lake fills to an elevation above 4,671 feet.

Construction Methods – Applicable to both Action Alternatives

Construction of the proposed project would require transport of construction equipment and materials into and out of the Alpine Lakes Wilderness Area. Two potential construction methods have been identified for mobilizing equipment and materials to and from the site: 1) Helicopter transport, and 2) Overland vehicle transport. These methods could be used for either alternative. A combination of methods is also possible. Non-motorized wilderness ground transport (i.e., pack

equipment and materials in and out using humans and pack animals, no use of motorized equipment) could be used to supplement either method.

Construction would require substantial earthwork, including excavation and placement of large rock. It is anticipated that completing the work would require heavy construction equipment, such as excavators or other earthmoving equipment. Mobilization of heavy equipment would require a transportation using a heavy-lift helicopter or overland transport. Non-motorized wilderness transport would supplement helicopter or overland vehicle transport for the lighter equipment and materials able to be transported in small quantities.

The construction methods vary considerably in terms of schedule implications, cost, and potential impacts to the construction access route.

No Action Alternative

The No Action Alternative serves as the baseline condition against which the Action Alternatives are compared and is intended to illustrate the most likely scenario if the project is not implemented.

Under the No Action Alternative, the dam would be left as is, with a primary spillway elevation of 4,667 feet, and would continue to operate in its current state and manner. This leaves the dam vulnerable to failure which would threaten human lives downstream, and create economic hardship for the IPID. Should a dam failure occur, residences, public infrastructure and wilderness habitat would be damaged or destroyed. DSO currently requires IPID to leave the low-level outlet gate open during the winter and early spring to reduce the risk of a dam failure. The operation of the dam in this manner is not consistent with DSO regulations, does not meet the DSOs safety requirements for a high hazard dam, and would ultimately result in enforcement action by the DSO. The No Action Alternative does not meet IPID objectives for water storage capacity for operational and irrigation water delivery.

Because of the hazard the dam presents, it is possible that some emergency action would be required in the future to address the dam's deficiencies if none of the action alternatives described herein are implemented. However, it is not possible to predict with certainty what that action would be or what its effects would be. Consequently, for purposes of this analysis, it is assumed that the existing state of the dam and its operation remain unchanged.