BUREAU OF RECLAMATION

Leavenworth National Fish Hatchery Surface Water Intake Fish Screens and Fish Passage Project Draft Environmental Impact Statement

U.S. Department of the Interior
Bureau of Reclamation
Columbia-Pacific Northwest Regional Office
1150 N. Curtis Road
Boise, ID 83706

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Mission Statements

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Leavenworth National Fish Hatchery Surface Water Intake Fish Screens and Fish Passage Project Draft Environmental Impact Statement

Proposed action:	Reclamation proposes to rehabilitate the Leavenworth National Fish Hatchery surface water intake and delivery system on Icicle Creek by constructing new headworks and a creek-width roughened channel and replacing and lining the surface water conveyance pipeline to the Hatchery.
Lead agency:	Bureau of Reclamation, Columbia-Pacific Northwest Region 9
Responsible official:	Regional Director, Bureau of Reclamation, Columbia-Pacific Northwest Region 9
Cooperating agencies:	U.S. Fish and Wildlife Service U.S. Army Corps of Engineers
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Acronyms and Abbreviations

	Full Phrase
APE	Area of Potential Effects
BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIPP	cure-in-place pipe
COIC	Cascade Orchard Irrigation Company
CUA	contractor use area
CWA	Clean Water Act
DAHP	Washington State Department of Archaeology and Historic Preservation
dB	decibels
dBA	decibels A-weighted
EA	Environmental Assessment
Ecology	Washington Department of Ecology
EDNA	environmental designation for noise abatement
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FPRP	ESA Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic
FPRP III	Programmatic Endangered Species Act Section 7(a)(2) Biological Opinion and the Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Seattle District Corps of Engineers Permitting of Fish Passage and Restoration Action in Washington State
GIS	Geographic Information System
HPA	Hydraulic Project Approval
IO&MA	Intake Operations and Maintenance Area
ITA	Indian Trust Assets
JARPA	Joint Aquatic Resource Permit Application

Leq	equivalent sound level
LNFH, Hatchery	Leavenworth National Fish Hatchery
LOS	Level of Service
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
NTU	nephelometric turbidity unit
O&M	operations and maintenance
OHWM	ordinary high water mark
pH	Potential of hydrogen
PISMA	Pipeline Intake and Sediment Management Area
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RM	river mile
ROW	right-of-way
SWISP	Surface Water Intake Fish Screens and Fish Passage
TCP	Traditional Cultural Property
THPO	Tribal Historic Preservation Officer
TMDL	total maximum daily load
USACE	U.S. Department of the Army, Corps of Engineers
USC	United States Code
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
USGS	U.S. Department of the Interior, Geological Survey
VE	Value Engineering
VPM	virtual public meeting
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WUA	weighted usable area

Executive Summary

ES.1 Introduction

The United States (U.S.) Department of the Interior (DOI), Bureau of Reclamation (Reclamation) has prepared this Environmental Impact Statement (EIS) for the Leavenworth National Fish Hatchery (hereafter, LNFH or Hatchery) Surface Water Intake Fish Screens and Fish Passage (SWISP) Project (**Map 1-1** in **Appendix A**). In this EIS, Reclamation evaluated the impacts of the SWISP Project on the natural and human environment. Reclamation is proposing to rehabilitate, replace, and modernize the LNFH surface water intake and delivery system on Icicle Creek near Leavenworth, Washington by constructing new headworks and a creek-width roughened channel, and replacing and lining the surface water conveyance pipeline to the LNFH. Additional details and description of the proposed action can be found in **Chapter 2**, Proposed Action and Alternatives.

As the lead federal agency, Reclamation has prepared the Draft EIS, in cooperation with the U.S. Army Corps of Engineers (USACE) and U.S. Fish and Wildlife Service (USFWS), and with the participation of Chelan County, the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation Fisheries), the Confederated Tribes of the Colville Reservation (Fish and Wildlife Department), National Marine Fisheries Service (NMFS), Washington State Department of Archaeology and Historic Preservation (Washington DAHP), Washington Department of Ecology (Ecology), Washington Department of Fish and Wildlife (WDFW), and the Washington Department of Natural Resources (WDNR).

Chapter 1 of this EIS presents the purpose of and need for action. **Chapter 2** provides a description of each alternative considered for analysis and identifies Reclamation's preferred alternative. **Chapter 3** presents the affected environment and the potential and anticipated impacts on the human and natural environment that could occur from implementing the alternatives. **Chapter 4** summarizes the coordination and consultation with agencies, Tribes, stakeholders, and the public, during preparation of the Draft EIS.

ES.2 Purpose of and Need for Action

The **need** for Reclamation's proposed action is to comply with the NMFS 2017 Biological Opinion (NMFS 2017a) and current screening and fish passage criteria for anadromous fish passage facilities, improve employee safety when operating and maintaining the intake and delivery structures, and increase reliability and longevity of the water delivery system.

The **purpose** of the SWISP Project is to minimize take of ESA-listed fish species, provide fish passage that complies with current regulatory criteria, and ensure safe, efficient, and reliable delivery of LNFH's full surface water rights from Icicle Creek.

ES.3 Decisions to be Made

This EIS supports federal decisions related to the SWISP Project. It provides necessary information for approving, modifying, or denying the proposal. Based on the analysis in this EIS, Reclamation will make the following decisions:

- Whether or not to rehabilitate, replace, and modernize the LNFH surface water intake facilities on Icicle Creek
- Whether or not to rehabilitate, replace, and modernize the 1.1-mile surface water conveyance pipeline from the intake facilities on Icicle Creek to the LNFH fish production facilities

The USFWS will also be signing the Record of Decision for the SWISP Project EIS under Executive Order (EO) 13807: *Establishing Discipline and Accountability in the Environmental Review and Permitting process for Infrastructure Projects* (also referred to as One Federal Decision). The USFWS decision will be whether the USFWS will support the construction of and then operate the proposed facilities once constructed. Additional federal decisions will be made as part of permitting and consultation processes, including those under the Clean Water Act (CWA) and Section 7 of the Endangered Species Act (ESA).

Additional state jurisdiction decisions would be made as discussed under *Permitting* in **Section 2.4.2**.

ES.4 Project Alternatives

This Draft EIS assesses the potential environmental impacts of the four alternatives under consideration: The No Action Alternative (see **Map 2-1** and **Map 2-2** in **Appendix A**) and three action alternatives: Alternatives B, the Proposed Action (see **Map 2-4** and **Map 2-5** in **Appendix A**), Alternative C (see **Map 2-6** and **Map 2-7** in **Appendix A**), and Alternative D (see **Map 2-4** and **Map 2-5** in **Appendix A**).

The SWISP Project consists of six components:

1. Intake
2. Fish Passage
3. Sediment Management
4. Conveyance Pipeline
5. Temporary Hatchery Water Supply
6. Access and Staging

The different ways these components can be implemented are called Project **elements**. Alternatives development involved identifying the different elements available for each component. For example, to address the temporary Hatchery water supply needed during construction (a component), Reclamation assessed a gravity-fed surface water bypass at the existing intake facilities, pumping from additional groundwater wells, or pumping surface water from the spillway pool (elements) to meet this need.

The SWISP Project alternatives development process involved external cooperating and participating agency collaboration, public involvement, and internal engineering and conceptual design analysis (Reclamation 2020a). Reclamation coordinated with cooperating and participating agencies and the public to define a comprehensive suite of Project elements and screened each element to determine which would be carried forward for combination into complete alternatives and detailed analysis in the Draft EIS. Screening criteria were used to evaluate each element's ability to satisfy the purpose of and need for action, its technological and economic practicability and feasibility, and its ability and likelihood to comply with applicable legal requirements, including specifically the CWA and Section 7 of the ESA. The screening process is further detailed in the SWISP Project Alternatives Compilation Report (Reclamation 2020c).

ES.4.1 No Action Alternative

The No Action Alternative is continuation of current O&M of the existing LNFH surface water intake and delivery system on Icicle Creek. The existing intake and delivery system, constructed in 1939 and 1940, would remain in its current degraded condition. Under the No Action Alternative, all existing features listed below would remain in place and would not be modified, improved, or rehabilitated.

- Low-head diversion dam
- Intake channel
- Intake trashrack structure
- Access road
- Fish ladder/Sediment sluice
- Gatehouse
- Outlet channel
- Conveyance pipeline
- Sand settling basin
- Inside and outside screen chambers

The diversion dam would continue to divert water from Icicle Creek to the intake channel, through an unscreened diversion. The intake trashrack structure at the entrance to the concrete intake channel would remain in operation and would continue to prevent debris from entering the concrete intake channel. The existing sediment sluice would remain in place, requiring accumulated sediment to be removed from the intake channel. The gatehouse would remain in place and the outlet channel would continue to direct bypassed water and sluice material (sediment) from the gatehouse back to Icicle Creek. The aging 31- to 33-inch diameter buried concrete pipeline would continue to convey water up to 42 cfs from the gatehouse to the Hatchery. No sections would be lined or replaced and introduced sediment would continue to be transported to the Hatchery.

ES.4.2 Action Alternatives

The action alternatives components are summarized below in **Table ES-1**, Action Alternatives Analyzed in this EIS. Processes common to each action alternative are described following the table.

Table ES-1. Action Alternatives Analyzed in this EIS

Alternative	Intake and Fish Passage	Sediment Management	Conveyance Pipeline	Temporary Hatchery Water Supply	Access and Staging
B – Proposed Action	Construct the headworks and roughened channel, incorporating the existing low-head diversion dam and intake channel and portion of the fish ladder/sediment sluice; remove unincorporated portion (**Map 2-3** in **Appendix A**). Install NMFS-compliant self-cleaning, cylindrical, screens at the diversion headworks. Construct a low-flow boulder weir fishway and roughened channel to provide NMFS-compliant fish passage. Remove the intake trashrack structure and place a new pipeline in the intake channel to connect the headworks to the conveyance pipeline. Fill the intake channel to cover the pipeline and create the intake operations and maintenance area (IO&MA). Construction of Phase I components would occur up to 24 hours per day, and up	Multiple elements to manage sediment accumulated at the intake would include a ramp on the upstream side of the roughened channel to help mobilize sediment over the feature; a vertical access pipe behind the screens to facilitate flushing sediment with a submerged hose and nozzle using screened water; and a series of pipes, valves and outlet channel at the pipeline intake and sediment management area (PISMA) to flush sediment through the intake pipeline back to Icicle Creek. The PISMA would be placed at the former gatehouse location.	Replace the conveyance pipeline using cut and cover trenching on USFWS property (2,180 feet) and rehabilitate the pipeline by lining with cure-in-place pipe (CIPP) on private parcels (4,000 feet; **Maps 2-4** and **2-5** in **Appendix A**). Construct several temporary access point contractor use areas (CUAs) to provide ingress and egress for pipe lining on private lands. Replace the current control valve system at the sand settling basin on USFWS property with a new control valve vault to allow safe pipe filling operations. Decommission the existing pipeline and abandon this segment in place once control valve connections are made. All rehabilitation, replacement, and modernization of the LNFH intake and delivery facilities would conclude at the control valve system; the sand settling basin and inside and outside screen	Maintain a 40 cfs water supply to LNFH during Phase I construction via a gravity-fed bypass pipeline connected to the existing conveyance pipeline approximately 200-300 feet below the intake construction area and through pumping from the spillway pool as needed. Maintain a 20 cfs water supply to LNFH during Phase II construction between April 17 to May 20, when pipeline replacement, lining with CIPP, and pipeline interconnections are underway. This would occur through pumping from the spillway pool adjacent to LNFH as needed.	Locate staging and storage sites for construction equipment and materials, and construction staff administration and vehicle parking, at various locations on LNFH grounds. Trucks hauling construction equipment and containing construction materials would turn around approximately 1.25 miles above the intake access road, at the Forest Service and Alpine Lakes Wilderness Area kiosks on Icicle Creek Road. Construction access to the conveyance pipeline would use existing roads, temporary access routes, and the pipeline right-of-way (ROW).

Alternative	Intake and Fish Passage	Sediment Management	Conveyance Pipeline	Temporary Hatchery Water Supply	Access and Staging
B – Proposed Action (*continued*)	to 7 days per week during an in-water work window from July 1 to November 15.	(*see above*)	chambers would remain unaltered.	(*see above*)	(*see above*)
C	Same as Alternative B	Same as Alternative B	Same as Alternative B except Reclamation would line the upper segment (520 feet) of the conveyance pipeline on USFWS property with CIPP instead of replacing it. As a result, the mature trees in the Icicle Creek riparian zone along this segment would not be removed. The length of the conveyance pipeline, from the PISMA to CUA 5 (4,520 feet) would therefore be lined with CIPP (**Map 2-6** in **Appendix A**).	Same as Alternative B	Same as Alternative B
D	Same as Alternative B except construction of Phase I components would be limited to workday hours of 7:00 a.m. to 10:00 p.m., 5 days per week, up to 6 days a week, during an in-water work window from July 1 to October 31.	Same as Alternative B	Same as Alternative B	Same as Alternative B with the addition of maintaining a 40 cfs water supply to LNFH over an 8-month period from November 1, 2022 to June 30, 2023 during Phase I construction via two high-capacity pumps operating at the spillway pool 24 hours per day, 7 days per week. An operational third pump would be on site as a backup.	Same as Alternative B

Under each of the action alternatives, construction of the SWISP Project would occur in three phases. Phase I would include construction of the intake access road and rehabilitation of the intake structures and facilities and would include work within the ordinary high water mark of Icicle Creek. Phase I construction under Alternatives B and C would occur up to 24 hours per day, and up to 7 days per week during the in-water work window from July 1 to November 15. Construction would likely occur over two seasons within the in-water work window. Phase I construction under Alternative D would occur between the hours of 7:00 a.m. and 10:00 p.m., 5 days per week, and up to 6 days per week, during the in-water work window from July 1 to October 31. Construction would likely occur over four seasons within the in-water work window.

Phase II for all action alternatives does not include in-water work and would include replacement and lining of the conveyance pipeline. Phase II construction would occur between the hours of 7:00 a.m. and 10:00 p.m., 5 days per week, and up to 6 days per week. The majority of Phase II pipeline lining and some pipeline replacement construction would occur for 4 to 5 weeks between April and May. Phase II pipeline replacement on the lowest segment of pipeline on USFWS Hatchery property would occur year-round where practicable. Construction would likely occur over three construction seasons (2022, 2023, and 2024). There would likely be temporal overlap between parts of Phase I and Phase II construction particularly during the replacement of the lowest segment of pipeline on USFWS Hatchery property. Under Alternatives B and D, 2,180 feet of pipeline would be replaced on USFWS property on the uppermost and lowest segments of pipeline; the remaining 4,000 feet of pipeline would be lined with cure in place pipeline (CIPP). Under Alternative C, 1,660 feet of pipeline would be replaced on USFWS property on the lowest segment of pipeline only; the remaining 4,520 feet of pipeline would be lined with CIPP, including the uppermost segment on USFWS property.

Phase III for all action alternatives would include revegetation of upland and riparian areas that are proposed to be disturbed during earlier phases of construction. Phase III revegetation would occur as soon as practicable after Phase I and Phase II construction activities are complete.

Reclamation would implement Best Management Practices (BMPs) to protect water quality and other resources and promote soil conservation during Project construction and operations and maintenance (O&M). The comprehensive list of BMPs is included in **Appendix B**.

Several federal and state regulatory permit approvals would be required before construction begins. Reclamation would use the Washington State Joint Aquatic Resources Permit Application form to apply for applicable permits, including CWA Section 404 Nationwide Permits from the USACE, CWA Section 401 Water Quality Certification from Ecology, and Hydraulic Project Approval from the WDFW. Because the action alternatives include use of Icicle Creek Road on National Forest system lands, Reclamation would also secure the required road use approval from the Forest Service, most likely under a special use permit.

O&M activities would occur as needed by USFWS staff. Hatchery O&M is subject to both the NPDES permit from EPA and O&M consultations under the ESA Section 7 with NMFS and USFWS (USFWS 2011; NMFS 2017a). Extraordinary maintenance would continue to be handled on a case-by-case basis as determined to be necessary by the Hatchery.

ES.4.3 Alternative Elements Considered but Eliminated

Federal agencies are required to explore and evaluate all reasonable alternatives and to discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Through the alternatives screening process, Reclamation, with input from the USFWS as a cooperating agency, eliminated several stand-alone alternatives and alternative elements because they did not meet the purpose of and need for action, or because they would not meet the technical, socioeconomic, or regulatory screening criteria as outlined in the Alternatives Compilation Report (Reclamation 2020c).

ES.5 Summary of Environmental Consequences

The purpose of the environmental consequences analysis is to describe the anticipated environmental and socioeconomic impacts that would result from each alternative, including the No Action Alternative. **Chapter 3**, Affected Environment and Environmental Consequences, presents the anticipated and potential impacts on the human and natural environment that could occur from implementing the alternatives. Key findings of the impact analysis of the action alternatives are summarized in **Table ES-2**, Summary of Environmental Consequences from Action Alternatives, below.

Under the No Action Alternative, the LNFH would continue current O&M of the LNFH surface water intake and delivery system on Icicle Creek, which were constructed in 1939 and 1940. Routine maintenance would not comprehensively address the continued deterioration of the existing intake and delivery system which cause O&M problems for the Hatchery. The requirements of the NMFS 2017 Biological Opinion (NMFS 2017a) and current screening and fish passage criteria for anadromous fish passage facilities would not be met. The existing low-head diversion dam would continue to impede fish passage, and ESA-listed fish would continue to become entrained[1] in the unscreened intake. Existing safety issues would continue during snow and ice conditions, especially during frazil ice events.

ES.6 Preferred Alternative

In accordance with the NEPA implementing regulations (40 CFR 1502.14[d] and 43 CFR 46.425(a)), Reclamation has identified Alternative C as the preferred alternative. In addition, as One Federal Decision agencies under EO 13807, and in accordance with requirements therein, the USFWS and USACE have concurred with Reclamation's selection of Alternative C as the preferred alternative.

While Reclamation has identified a preferred alternative in this Draft EIS, actual selection of an alternative for implementation will not occur until the Record of Decision. The decision on the alternative to implement will consider public comments and the full analysis in the Final EIS.

[1] Entrainment means the entrapment of fish into a watercourse diversion that has no screen or into high velocity water along the face of an improperly designed screen (Washington Area Code 220-660-030).

Table ES-2. Summary of Environmental Consequences from Action Alternatives

Resource Topic	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Air Quality and Climate	Construction would generate temporary and localized fugitive dust, greenhouse gas emissions, and other air pollutants, which would be minimized using standard dust control and other BMPs. Contribution to global greenhouse gas emissions are expected to be well below 25,000 metric tons of carbon dioxide equivalents per year, which is the greenhouse gas reporting requirement threshold under 40 CFR 98. The types of emissions from O&M would be similar but reduced compared with Alternative A because less maintenance would be needed.	Impacts from construction would be similar to Alternative B, but emissions would be slightly reduced because there would be less construction activity associated with the shorter length of conveyance pipeline being replaced. Contribution to global greenhouse gas emissions would be well below the greenhouse gas reporting requirement threshold under 40 CFR 98 of 25,000 metric tons of carbon dioxide equivalents per year. Emissions associated with O&M of the LNFH would be the same as described under Alternative B.	Impacts from construction would be similar to Alternative B, but emissions would be greater because of the increased Phase I construction timeline and the need for additional pumping for the temporary Hatchery water supply. Contribution to global greenhouse gas emissions would be well below the greenhouse gas reporting requirement threshold under 40 CFR 98 of 25,000 metric tons of carbon dioxide equivalents per year. Emissions associated with O&M of the LNFH would be the same as described under Alternative B.
Geology and Soils	Construction would result in localized effects from ground disturbance and movement of geologic materials. BMPs to minimize surface disturbance, control erosion, and reclaim temporarily disturbed areas would reduce impacts. Permanent facilities would result in the irretrievable commitment of soil resources in limited areas.	Impacts would be similar to Alternative B, but slightly reduced because there would be less construction activity associated with the shorter length of conveyance pipeline being replaced.	Impacts would be the same as described under Alternative B.

Resource Topic	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Water Resources	Intake rehabilitation would greatly reduce sediment diversion, allowing it to remain in the creek and contribute to stream conditions. Surface disturbances from construction within the 100-year floodplain would occur. Surface disturbances and equipment use in and adjacent to Icicle Creek could result in contaminants (e.g., soil, lubricants, fuel, etc.) entering the creek and affecting water quality. There would be two weeks of cofferdam use during November, a month when prolonged precipitation or rain-on-snow events could overtop, dislodge, or destroy the cofferdam. Cofferdam failure during high flows could release tons of sediment or rock into Icicle Creek. Shade-producing trees would be removed, allowing an increase in water temperature and a lowering of dissolved oxygen. BMPs and permit conditions would reduce impacts.	Impacts would be similar to Alternative B, but slightly reduced because less conveyance pipeline would be replaced and fewer shade-producing trees would be removed. As a result, effects from increased water temperature and lowered dissolved oxygen would be reduced.	Impacts would be similar to those described under Alternative B, except Alternative D would involve additional seasons of cofferdam use (four construction seasons instead of two). This would increase surface disturbances and equipment use in and adjacent to Icicle Creek that could result in contaminants (e.g., soil, lubricants, fuel, etc.) entering the creek and affecting water quality. Additionally, cofferdam use would end on October 31 each year, avoiding cofferdam use during November when prolonged precipitation or rain-on-snow events could overtop, dislodge, or destroy the cofferdam.

Resource Topic	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Biological Resources	Alternative B would comply with current NMFS fish screening and passage criteria for anadromous salmonids and would reduce take of ESA-listed fish compared with current conditions. Construction would temporarily affect ESA-listed fish, critical habitat, and EFH, but BMPs (**Appendix B**) and conservation measures developed during ESA Section 7 consultation with the USFWS, and in the NMFS 2017 FPRP III programmatic biological opinion (NMFS 2017b), would reduce effects. Fish passage and aquatic habitat quantity, quality, and connectivity would be improved post-Project implementation. Effects on vegetation would be minor and effects on terrestrial wildlife species would be minor or negligible.	Alternative C would comply with current NMFS fish screening and passage criteria for anadromous salmonids and would reduce take of ESA-listed fish compared with current conditions. Impacts on fish and aquatic habitat and vegetation would be similar to Alternative B, but slightly reduced because less conveyance pipeline would be replaced and fewer shade-producing trees would be removed. Effects on terrestrial wildlife species would be the same as described under Alternative B.	Alternative D would comply with current NMFS fish screening and passage criteria for anadromous salmonids and would reduce take of ESA-listed fish compared with current conditions. The types of impacts on fish and aquatic habitat would be similar to Alternative B, but the time frame over which they occur would differ. This may increase impacts to fish and aquatic habitat because, although the daily and seasonal timeframe would be shorter, the total time needed to complete the Project would be longer. There would also be additional impacts from Phase I construction temporary Hatchery water supply pumping for a longer time period, inundation of the partially constructed intake headworks after cofferdam removal, and remobilization/demobilization efforts before and after each additional in water work window. The fish species affected may differ relative to Alternative B due to the 2-week shorter in-water work window and the workday hours of 7:00 a.m. and 10:00 p.m. Effects on vegetation and terrestrial wildlife species would be the same as described under Alternative B.

Resource Topic	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Cultural Resources	There would be no adverse effect on historic properties, archaeological sites eligible for listing in the NRHP, or Native American TCPs per the *no adverse effect* determination by the State Historic Preservation Officer on March 12, 2020. Professional archaeological monitoring would occur and an inadvertent discovery plan would be followed.	Impacts would be the same as described under Alternative B.	Impacts would be the same as described under Alternative B.
Land Use, Utilities, and Service Systems	Existing intake facilities and the conveyance pipeline would be modified, replaced, rehabilitated, and new intake elements would be constructed. Effects on land use would be unchanged. There would be no change in the current land uses, zoning, landownership, or entitlements. Relocation of at least one power pole and minor upgrades to the overhead electrical infrastructure could result in a temporary lapse in electrical supply to area users.	Impacts would be the same as described under Alternative B.	Impacts would be the same as described under Alternative B.

Resource Topic	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Transportation and Traffic	Heavy vehicle traffic using Icicle Road and Icicle Creek Road and the turnaround at the Forest Service and Alpine Lakes Wilderness kiosk would temporarily reduce the Level of Service (LOS) in these areas. Prohibiting parking at the turnaround would reduce access. Impacts could be greatest during weekends and in summer when traffic volumes and demands for access are highest. Traffic control BMPs would reduce effects.	Temporary reductions in LOS would be less than those described under Alternative B because there would be fewer heavy equipment vehicle trips accessing the intake construction area. Impacts on access would be the same as described under Alternative B.	Temporary reductions in LOS would be similar to those described under Alternative B during daytime hours. Overall daily impacts to traffic and transportation would be reduced under Alternative D as compared with Alternative B, as construction activities after 10:00 p.m. would not occur. However, these impacts would be experienced over a total of four construction seasons under Alternative D, instead of two seasons under Alternative B.
Noise and Vibration	Equipment and vehicle use associated with construction would raise ambient noise levels for sensitive receptors and increase vibration. Expected loudest noise levels would be generated by a pneumatic tool (Phase I construction) and hot air blower (Phase II construction). Increases in ambient noise levels could occur for up to 24 hours per day, and up to 7 days per week during construction.	Impacts would be similar to those described under Alternative B. However, under Alternative C, starting at the PISMA, the conveyance pipeline would be lined with CIPP to the USFWS parcel boundary, which could result in a slight increase in the duration of noise from use of the hot air blower. Additionally, Alternative C would require fewer truck trips to access the intake construction area, resulting in less construction noise for sensitive receptors along Icicle Road/Icicle Creek Road.	There would be no Phase I construction work from 10:00 p.m. to 7:00 a.m. under Alternative D, which would reduce daily noise impacts as compared with Alternative B. However, the overall duration of Phase I construction noise impacts would be experienced over four years under Alternative D, as compared to two under Alternative B. Additionally, the two diesel pumps associated with the temporary Hatchery water supply for Phase I construction would operate 24 hours per day and 7 days per week for a period of 8 months, as opposed to approximately 10 days under Alternative B.

Resource Topic	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Recreation	Temporary impacts to recreational conditions and access would occur during construction, which may temporarily depress recreational visitation rates by approximately 8 percent. Long-term benefits to recreational fishing would result from enhanced fish passage and aquatic ecosystem productivity.	Impacts on recreational opportunities, conditions, and access would be similar to those described under Alternative B, but impact intensity would be reduced because there would be less excavation of the conveyance pipeline and associated truck traffic and delays.	There would be less of a decline in annual recreation visits at the Snow Lake Trailhead (6 percent) as compared to Alternative B due to a shorter in-water work window. However, overall impacts to recreationists would be experienced over a longer total time period compared with Alternative B as Phase I construction-related disturbances, including noise, traffic delays, and temporary loss of recreationist parking along Icicle Creek Road and at the Snow Lakes Trailhead would extend for an additional 2 years, including during the peak recreation season for two additional seasons, compared with Alternative B.
Visual Resources	Temporary impacts would occur from construction-related activities such as use of heavy machinery and warning signs, which would sharply contrast with the natural lines, form, and color within the existing viewshed, and construction noise, light, and level of the activity would draw the attention of the casual observer. Impacts from vegetation removal would diminish over time as planted and seeded vegetation matured. Impacts from O&M would be the same as Alternative A or slightly less due to an expected reduction in frequency of O&M activities.	Impacts would be similar to those described under Alternative B but would be reduced because there would be less construction-related activity due to lining a greater length of the conveyance pipeline. Disturbance in the Icicle Creek riparian zone would be reduced, reducing visual impacts to the characteristic landscape.	Impacts would be similar to those described under Alternative B, however overall impacts to visual resources would be experienced over a longer total time period compared with Alternative B as Phase I construction-related impacts would extend over four years, as compared with two years under Alternative B.

Resource Topic	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Socioeconomics and Environmental Justice	Temporary recreational access constraints and delays would reduce recreational visits and related values and spending. Similarly, there would be temporary economic impacts in terms of value of lost time for motorists due to delays during constriction. There would not be disproportionate environmental effects on low-income, minority or tribal populations.	Impacts on socioeconomics would be similar to those described under Alternative B, but intensity of impacts would be reduced given that the degree of economic impacts from traffic disturbances would be reduced. Impacts on environmental justice would be the same as Alternative B.	Impacts on socioeconomics would be the same as described under Alternative B, but the impacts would be experienced over a longer total time period compared with Alternative B, as Phase I construction-related impacts would extend over four years, as compared with two years under Alternative B. Impacts on environmental justice would be the same as Alternative B.
Hazardous Materials and Public Health and Safety	Lead-based materials on Hatchery infrastructure would be safely removed and disposed. Construction activities occuring from 10:00 p.m. to 7:00 a.m. could temporarily increase the risk of vehicle accidents, and the associated construction noise and light from during this time period may temporarily affect nearby residents and guests. Long-term work conditions would be improved, which would decrease risk of worker injury.	Impacts would be the same as described under Alternative B.	Impacts to hazardous materials would be the same as described under Alternative B. The two additional Phase I construction seasons would continue the risk of impacts to public health and safety described under Alternative B for an additional two years. Because Phase I construction work would not take place past 10:00 p.m. under Alternative D, the risk of vehicular accidents and noise impacts to sensitive receptors near the intake structure from 10:00 p.m. to 7:00 a.m. would be reduced as compared with Alternative B. Noise levels would exceed the nighttime Class A EDNA of 45 dBA or less for several residences off East Leavenworth Road and Cemetery Road near the spillway pool resulting from pumping for the Phase I temporary Hatchery water supply for an 8-month period.

Resource Topic	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Tribal Interests	Impacts on Indian sacred sites, ITAs, and traditionally and culturally important hunting or plant gathering areas would not occur as described under Alternative A. No adverse impacts to access to and activities at the Wenatshapam Fishery are anticipated. Fishing activities could be temporarily impacted during construction from noise disturbance and reduced fishing area from pump screen boxes in the spillway pool. Temporary Hatchery water supply pumping activities at the spillway pool may occur during the same time as scaffolding repair, ceremonial, and fishing activities, but would not impact the ability of the Tribes to perform these functions. Improved fish passage, reduced potential for fish entrainment, and increased Hatchery production reliability would benefit the Tribal fishery.	Impacts on Indian sacred sites and ITAs would be the same as described under Alternative B. There would be slightly less disturbance to vegetation that could support culturally important plants; however, vegetation in the Analysis Area has not been identified as culturally important to date.	Impacts on Indian sacred sites and ITAs would be the same as described under Alternative B. Temporary impacts on the Tribal fishery would be the same as described under Alternative B, but the impacts would be experienced over a longer total time period compared with Alternative B, as Phase I construction-related impacts would extend over four years, as compared with two years under Alternative B. Pumping from the spillway pool would occur over a period of 8 months during Phase I of construction and could result in temporary noise or displacement impacts to Tribal fishers.

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Chapter 1. Purpose of and Need for Action

1.1 Introduction

The Bureau of Reclamation (Reclamation) has prepared this Environmental Impact Statement (EIS) for the Leavenworth National Fish Hatchery (hereafter, LNFH or Hatchery) Surface Water Intake Fish Screens and Fish Passage (SWISP) Project (**Map 1-1** in **Appendix A**). In this EIS, Reclamation evaluated the impacts of the SWISP Project on the natural and human environment. Reclamation used knowledge gained from previous environmental analyses and public scoping to inform the geographic scope and level of analyses for the SWISP EIS.

This EIS complies with the National Environmental Policy Act of 1969, as amended (NEPA; 42 United States Code [USC], Section 4321 et seq.), the Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR], Parts 1500-1508, as updated July 16, 2020), the U.S. Department of Interior's NEPA Regulations (43 CFR, Part 46), and other relevant federal and state laws and regulations.

Reclamation is proposing to rehabilitate, replace, and modernize the LNFH surface water intake and delivery system on Icicle Creek near Leavenworth, Washington by constructing new headworks and a creek-width roughened channel[1], and replacing/lining the surface water conveyance pipeline to the LNFH. Additional details and description of the proposed action can be found in **Chapter 2**, Proposed Action and Alternatives.

1.2 Project Background

The LNFH was designed and constructed in the late 1930s as mitigation for the impacts to anadromous fish resulting from the construction and operation of Grand Coulee Dam. The Hatchery, which is owned and operated by the U.S. Fish and Wildlife Service (USFWS) and funded by Reclamation and Bonneville Power Administration, currently raises and releases 1.2 million spring Chinook salmon smolts annually into Icicle Creek.

The LNFH's primary point of diversion and water delivery system on Icicle Creek is nearly 80 years old and is reaching or exceeding its operational life. Rehabilitation, replacement, and modernization of the LNFH surface water intake and delivery system was evaluated in the *Icicle Creek Restoration Project Final EIS* (USFWS 2002) and the *Icicle Creek Water Resource Management Strategy (Icicle Strategy) Final Programmatic EIS* prepared by the State of Washington Department of Ecology (Ecology) and Chelan County (hereafter, *Icicle Strategy*; Chelan County and Ecology 2019). The existing intake

[1] This is a roughened channel spanning the width of Icicle Creek.

facility does not comply with current National Marine Fisheries Service[2] (NMFS) criteria for anadromous salmonids (NMFS 2011), and can impede fish passage during low flow conditions and entrain[3] fish species listed under the Endangered Species Act (ESA); entrainment of these species would constitute take[4]. Current flows at the fish ladder/sediment sluice do not meet NMFS guidelines for fish attraction. The NMFS Biological Opinion covering LNFH operations (NMFS 2017a) requires the LNFH to have a surface water intake and delivery system that complies with NMFS current screening and fish passage criteria for anadromous fish passage facilities in place and operating by May 2023.

Safety, water conservation, sediment management, and maintaining and prolonging a dependable surface water intake and delivery system are also LNFH priorities to address for the aging infrastructure. Improving employee safety when operating and maintaining intake and delivery facilities is of great concern to the LNFH. During winter months, employees encounter snow, ice, and cold water at the intake and gatehouse, and, at times, a condition known as frazil ice[5]. During these conditions, the water delivery system must be observed 24 hours a day to ensure adequate surface water delivery to the Hatchery. Ice buildup may reduce the amount of water that can be safely diverted to the LNFH, requiring employees to use blow torches, picks, and other methods to remove ice and frazil ice accumulation from the intake structures. Employees also experience safety issues in the existing gatehouse related to hazardous materials (lead paint), fine rack maintenance, and sediment removal.

Water conservation in the Icicle Creek watershed is an important issue to the area's many water users. The Project would facilitate the Hatchery's ability to meet future water conservation goals. Improving LNFH's ability to conserve water is an essential step in modernizing the Hatchery's production facilities and meeting conservation objectives of local stakeholders (i.e., Icicle Work Group[6]).

Decreasing the time, effort, and funding of maintenance activities associated with sediment management in and around the existing facilities has been a chronic challenge (USFWS 2020). Tons of sediment has moved through the system and led to wear on the intake facilities and excessive wear on the conveyance pipeline. Although the original wood stave conveyance pipeline was replaced in the 1960s, the poor condition of the pipeline is a serious matter and its ability to continue the reliable delivery of water to the Hatchery is a priority for LNFH managers. Transported sediments would continue to degrade the existing pipeline if left alone. Failure of the delivery system would jeopardize the ability for LNFH to meet its fish production obligations.

[2] This agency is also known as NOAA Fisheries.
[3] Entrainment means the entrapment of fish into a watercourse diversion that has no screen or into high velocity water along the face of an improperly designed screen (WAC 220-660-030).
[4] Take as defined under the ESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."
[5] Frazil ice is a collection of loose ice crystals that form in supercooled turbulent water that float, are suspended in the water column, or attach to the low-head diversion dam and intake structures.
[6] The Icicle Work Group is made up of a broad coalition of stakeholders representing local, state, and federal agencies, tribes, irrigation and agriculture interests, and environmental organizations. The purpose of the Icicle Work Group is to develop a comprehensive water resource management strategy for the Icicle Watershed that will achieve multiple instream and out-of-stream benefits through investment in conservation, storage restoration and reoperation, water marketing, habitat, and fish passage projects.

The intake facility is the point of diversion for both the Hatchery and the Cascade Orchard Irrigation Company (COIC) water rights from Icicle Creek. The COIC water right is for 12 cubic feet per second (cfs) and the water is transported via the conveyance pipeline to the bifurcation point (**Map 2-1** in **Appendix A**), approximately 1,200 feet east of the intake facility. COIC is finalizing plans to relocate its point of diversion on Icicle Creek downstream of the Hatchery. Once the new point of diversion is constructed, COIC would no longer divert water at the current intake location. Relocation of the COIC point of diversion is expected to be complete before Spring 2022.

1.3 Purpose of and Need for Action

The **need** for Reclamation's proposed action is to comply with the NMFS 2017 Biological Opinion (NMFS 2017a) and current screening and fish passage criteria for anadromous fish passage facilities, improve employee safety when operating and maintaining the intake and delivery structures, and increase reliability and longevity of the water delivery system.

The **purpose** of the SWISP Project is to minimize take of ESA-listed fish species, provide fish passage that complies with current regulatory criteria, and ensure safe, efficient, and reliable delivery of LNFH's full surface water rights from Icicle Creek.

1.4 Decisions to be Made

This EIS complies with the NEPA by supporting federal decisions related to the SWISP Project. It provides necessary information for approving, modifying, or denying a proposal. Based on the analysis in this EIS, Reclamation will make the following decisions:

- Whether or not to rehabilitate, replace, and modernize the LNFH surface water intake facilities on Icicle Creek.
- Whether or not to rehabilitate, replace, and modernize the 1.1-mile surface water conveyance pipeline from the intake facilities on Icicle Creek to the LNFH fish production facilities.

The USFWS will also be signing the Record of Decision for the SWISP Project EIS under Executive Order (EO) 13807: *Establishing Discipline and Accountability in the Environmental Review and Permitting process for Infrastructure Projects* (also referred to as One Federal Decision). The USFWS decision will be whether the USFWS will support the construction of and then operate the proposed facilities once constructed. Additional federal decisions will be made as part of permitting and consultation processes, including those required under the Clean Water Act (CWA) and Section 7 of the ESA.

Additional state jurisdiction decisions would be made as part of permitting processes as discussed in **Section 2.4.2** (see *Permitting* discussion).

1.5 Lead, Cooperating, and Participating Agencies

Reclamation is the lead agency in charge of preparing this EIS. The USFWS and U.S. Army Corps of Engineers (USACE) agreed to be cooperating agencies under One Federal Decision (EO 13807). The USFWS would sign the Record of Decision, while the USACE would not sign the Record of Decision but instead would issue a permit under Section 404 of the CWA. In addition, a variety of federal, state, and local agencies are actively engaged as participating agencies. The Confederated Tribes and Bands of the Yakama Nation, and the Confederated Tribes of the Colville Reservation are also engaged as participating agencies. Cooperating and participating agencies and interested parties are listed in **Section 4.2.1**, Cooperating and Participating Agencies, and **Section 4.2.2**, Interested Parties, respectively. Additional details on consultation and coordination activities associated with the SWISP Project EIS are provided in **Section 4.2**, Consultation and Coordination.

1.6 Public Involvement

Public involvement is a legally required component of the NEPA process. It ensures public disclosure of the effects of major federal actions and alternatives, as well as the opportunity to provide input on agency decision-making. Public involvement requirements under the NEPA are codified in 40 CFR 1506.6.

On April 24, 2020, Reclamation published the Notice of Intent (NOI) to prepare this EIS in the *Federal Register*, announcing the beginning of a public scoping period to solicit public comments and to identify issues. Reclamation solicited comments from cooperating and participating agencies, Tribes, other interested parties and the public through various meetings, including a web-based virtual public meeting room that was available 24 hours a day during the public scoping period. The public scoping period ended on May 26, 2020. The description and outcomes of the scoping process are summarized in a scoping report (Reclamation 2020a), which was published on Reclamation's SWISP Project website[7] in June 2020. Additional details on collaboration and outreach activities are provided in **Section 4.2**, Consultation and Coordination, and **Section 4.3**, Public Collaboration and Outreach.

1.7 Issues Addressed in this EIS

During public scoping, Reclamation categorized substantive comments received into 35 issue categories. The following summaries highlight a few of the issues identified during public scoping and addressed in this EIS. The full list of summaries is available in the final scoping report (Reclamation 2020a):

- Fisheries and Aquatic Ecosystems—Commenters stated concerns about impacts on listed fish and riparian habitat. Commenters requested that the EIS evaluate the functions and values of riparian habitat and disclose impacts in terms of expected changes in the resource function. Commenters stated that Reclamation should minimize ecosystem damage and

[7] The SWISP Project website can be accessed at: https://www.usbr.gov/pn/programs/leavenworth/swisp/index.html.

reduce any detrimental materials from entering Icicle Creek during construction and restore temporarily disturbed areas.

- Water Quality—Commenters stated that the proposed construction in Icicle Creek must not exceed the State Water Quality Standards for Surface Waters (Washington Administrative Code (WAC) 173-201A), nor exceed the Aquatic Life turbidity criteria found in WAC 173-201A- 200(1)(e). The EIS should describe any relevant total maximum daily load (TMDL) allocations for Icicle Creek, describe the effects on sediment loading and transport in Icicle Creek, and describe how Best Management Practices (BMPs), mitigation measures, and monitoring would ensure adequate protection of water quality.
- Tribal Interests—Commenters expressed concern that the traditional and accustomed uses and activities of the Yakama Nation and Confederated Tribes of the Colville Reservation, specifically Tribal fishery activities in Icicle Creek, may be impacted by the Project, and that Reclamation should request Government-to-Government Consultation with these federally-recognized Tribes to ensure Tribal Treaty and federally protected harvest rights are maintained.

1.8 Document Organization

The document is organized as follows:

- *Chapter 1*: Purpose of and Need for Action, introduces the Project and the purpose of and need for action. The chapter also discusses Project background and decisions to be made, lists the lead, cooperating, and participating agencies, and summarizes public involvement and issues addressed in this EIS.
- *Chapter 2*: Proposed Action and Alternatives, provides information on how Reclamation developed the Project alternatives, and includes a description of each alternative being carried forward for analysis. Alternatives and elements considered but eliminated from further consideration are also identified. Chapter 2 concludes with a summary of anticipated impacts on natural and human resources from the Project alternatives.
- *Chapter 3*: Affected Environment and Environmental Consequences, characterizes the existing environment, particularly for the natural and human resources most affected by the alternatives carried forward for analysis. The chapter also identifies the impacts that would occur on the resources as a result of Project construction, and operation and maintenance.
- *Chapter 4*: Consultation and Coordination, presents a list of the agencies, Tribes, and other interested or affected individuals and groups that were contacted during EIS development. It also contains a summary of the public involvement process for this EIS and discusses the consultation and coordination activities that were undertaken with cooperating agencies. A list of Reclamation and consultant staff who prepared this EIS is included.
- *Chapter 5*: References, lists the documents and other sources used to prepare this EIS.
- *Chapter 6*: Glossary, contains definitions of terms found in this EIS.

Appendices are supplemental documents supporting the descriptions and analyses in this EIS.

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Chapter 2. Proposed Action and Alternatives

2.1 Introduction

This chapter describes the process Reclamation used to identify a reasonable range of alternatives for analysis in the SWISP Project EIS. In summary, Reclamation developed criteria to screen alternatives and Project components and elements against these criteria. The major Project components are intake, fish passage, sediment management, conveyance pipeline, temporary Hatchery water supply, and access and staging. Each *component* has technical and operational requirements; generally, there are different techniques to meet these requirements. These different techniques are termed *elements*.

The No Action Alternative and three action alternatives are described in detail in this chapter (see **Section 2.4**, Description of the Alternatives). A summary of the alternatives and component elements considered but eliminated from detailed study is provided (see **Section 2.5**, Alternatives and Alternative Elements Considered but Eliminated from Detailed Study). A summary comparison of the differences and common impacts between the alternatives is also provided (see **Section 2.6**, Summary Comparison of Impacts).

2.2 Alternatives Development Process

The alternative development process incorporated a number of guiding principles as provided by relevant laws and guidance, including the CEQ's Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR Parts 1500–1508), U.S. Department of the Interior's NEPA Regulations (43 CFR Part 46), Reclamation's NEPA Handbook (Reclamation 2012), and Principles and Requirements for Federal Investments in Water Resources (CEQ 2013). These regulations require agencies to:

- Explore all reasonable alternatives that meet the purpose of and need for the proposed action and, for alternatives that were eliminated from detailed study, briefly discuss the reasons for elimination.
- Include the alternative of no action.
- Identify the agency's preferred alternative or alternatives, if one or more exists, in the draft EIS and identify such alternative in the final EIS (40 CFR 1502.14[d]; 43 CFR 46.425(b)).

Reclamation also followed the Principles and Requirements for Federal Investments in Water Resources (CEQ 2013), which lay out broad principles to guide water investments. The principles specify that federal water resources investments shall reflect national priorities, encourage economic development, and protect the environment by: (1) seeking to maximize sustainable economic development; (2) seeking to avoid the unwise use of floodplains and flood-prone areas and

minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used; and (3) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.

Interdisciplinary collaboration was a critical step in the alternative development process. Agencies should seek to achieve agreement from diverse interests on the goals, purposes, and needs for agency plans and activities as well as the methods anticipated to carry out those plans and activities (43 CFR 46.110(a)). The SWISP Project alternative development process involved collaboration with stakeholders, including cooperating and participating agencies, as well as engineering and conceptual design analyses (Reclamation 2020b). During the scoping period from April 2020 through May 2020, Reclamation asked for public and agency input on the scope of the analysis and for alternatives to be considered. Reclamation analyzed the scoping comments it received and published a Scoping Report in June 2020 (Reclamation 2020a). Those comments related to alternatives were carried forward into alternatives development.

2.3 Alternatives Screening

The SWISP Project EIS alternative development process has involved external cooperating and participating agency collaboration and internal engineering and feasibility analysis (Reclamation 2020b). From April 2020 to July 2020, Reclamation coordinated with cooperating and participating agencies to refine a list of reasonable alternatives and a comprehensive suite of Project elements and screened each element to determine which would be carried forward for combination into complete alternatives and detailed analysis. The screening process is detailed in the SWISP Project Alternatives Compilation Report (Reclamation 2020c).

The SWISP Project consists of six components:

1. Intake
2. Fish Passage
3. Sediment Management
4. Conveyance Pipeline
5. Temporary Hatchery Water Supply
6. Access and Staging

There are different ways these components can be implemented, which are called Project elements. Part of the alternative development process included identification of the different elements available for each component. For example, to address the temporary Hatchery water supply (a component) needed during construction, Reclamation assessed the following elements: a gravity-fed surface water bypass at the existing intake facilities, pumping from additional groundwater wells, or pumping surface water from the spillway pool to meet this need.

Screening criteria were used to evaluate each alternative's and element's ability to satisfy the purpose of and need for the Project, its technological and economic practicability and feasibility, and its likelihood to comply with applicable legal requirements, including specifically the CWA and

Section 7 of the ESA. Alternatives and elements that failed to satisfy these criteria were eliminated from detailed consideration, with the exception of Alternative D. Alternative D includes a Phase I construction schedule that would not meet the deadlines in the NMFS Biological Opinion (NMFS 2017a). Reclamation chose nevertheless to include this alternative because it presents important tradeoffs in resource impacts that will help inform the agency decision-maker. The remaining elements that were not eliminated were considered for combination into complete alternatives. Alternatives, components and elements identified and considered in the *Leavenworth National Fish Hatchery Surface Water Supply Value Engineering (VE) Study* (Reclamation and USFWS 2012), *SWISP Project VE Study* (Reclamation 2020a) and the *USFWS Leavenworth National Fish Hatchery Water Supply System Rehabilitation Final Environmental Assessment* (USFWS 2003) were also screened.

2.4 Description of the Alternatives

Keys differences between Alternatives B, C, and D are provided in **Table 2-1**. A summary comparison of impacts from all alternatives is provided in **Section 2.6**, Summary Comparison of Impacts.

2.4.1 Alternative A – No Action

The No Action Alternative represents continuation of current operations and maintenance (O&M) of the LNFH surface water intake and delivery system on Icicle Creek and provides a basis for comparison to the action alternatives. The existing intake and delivery system, constructed in 1939 and 1940, would remain in its current degraded condition and likely continue to deteriorate. All existing features listed and summarized below and depicted in **Map 2-1** and **Map 2-2** in **Appendix A**, would remain in place and would not be modified, improved, or rehabilitated under this alternative.

- Low-head diversion dam
- Intake channel
- Intake trashrack structure
- Access road
- Fish ladder/Sediment sluice
- Gatehouse
- Outlet channel
- Conveyance pipeline
- Sand settling basin
- Inside and outside screen chambers

The diversion dam would continue to divert water from Icicle Creek to the intake channel, through an unscreened diversion. The start of the intake system would remain at the intake trashrack structure. The excavated intake channel above the intake trashrack structure and concrete intake channel below would continue to convey water through gravity flow to the gatehouse. The channel would remain unscreened. The intake trashrack structure at the entrance to the concrete intake channel would remain in operation. The trashrack's 6-inch bar spacing would continue to prevent large debris from entering the concrete intake channel. The road would not be modified or extended

and would continue to provide access to the stairs leading to the intake trashrack structure. The existing fish ladder would not be modified to alter flow or enhance fish passage.

The existing gatehouse serves to transition surface water from the open intake channel to the enclosed conveyance pipeline. It houses a fine rack with 1.5-inch bar spacing and an overflow spill and sediment sluicing sections separated by a bulkhead. The fine rack limits the size of objects that enter the pipeline. A gate valve can be opened to flush sediment; however, it does not function reliably. The gatehouse would remain in place, and the outlet channel would continue to direct bypassed water and sluice material (sediment) from the gatehouse back to Icicle Creek.

The aging 31- to 33-inch diameter buried concrete pipeline would continue to convey water up to 42 cfs from the gatehouse to the Hatchery. No sections would be lined or replaced and introduced sediment would continue to be transported to the Hatchery. Before water enters the Hatchery's rearing units it is either routed into the sand settling basin (normal operation) or directly to the inside or outside screen chamber. The sand settling basin would continue to trap sediment and minimize the amount of remaining sediment from entering fish production facilities. Sediment and entrained fish would continue to be periodically removed from the sand settling basin in accordance with existing biological opinions (USFWS 2011; NMFS 2017a). From the sand settling basin, water can be directed to either the inside or outside screen chamber before entering the Hatchery's rearing units. The screens in the inside and outside screen chambers are composed of vertical static screen panels that filter fish and debris from the Hatchery's water supply. The screen chambers do not meet NMFS current screening criteria (NMFS 2011)[8]. Screens must be manually cleaned, and entrained fish must be captured, removed, counted, and returned to Icicle Creek. LNFH reports the number and species of ESA-listed fish entrained in the intake and delivery system in their annual take report to NMFS and USFWS.

Hatchery O&M is subject to both the National Pollution Discharge Elimination System (NPDES) permit from U.S. Environmental Protection Agency (EPA) and O&M consultations under the ESA Section 7 with NMFS and USFWS (USFWS 2011; NMFS 2017a). Extraordinary maintenance would continue to be handled on a case-by-case basis as determined to be necessary by the Hatchery. ESA Section 7 consultation has been reinitiated with the USFWS for O&M of the Hatchery.

As described in **Section 1.2**, the COIC is expected to relocate its point of diversion on Icicle Creek downstream of the Hatchery. Once the new point of diversion is constructed, COIC would no longer divert water at the current intake location.

[8] The existing inside and outside screen chambers meet NMFS standards for fish screening (NMFS 1997), but not current criteria (NMFS 2011). Even if the screen chambers were upgraded to NMFS current criteria, take would still occur. This is because take occurs at the point of entrainment, at the existing intake facilities on Icicle Creek. The screen chambers are at the distal end of the conveyance pipeline, approximately 6,300 feet from the existing intake facilities on Icicle Creek.

2.4.2 Alternative B – Proposed Action

Reclamation proposes to rehabilitate the LNFH surface water intake and delivery system on Icicle Creek by constructing new headworks[9] and a creek-width roughened channel and replacing and lining the surface water conveyance pipeline to the Hatchery. In addition, the current access road would be modified and extended to provide better entry to an expanded Intake Operations and Maintenance Area (IO&MA). A conceptual drawing of the proposed intake facilities is included as **Map 2-3** in **Appendix A**. See **Map 2-4** and **Map 2-5** in **Appendix A** showing activities proposed under Alternative B.

Intake and Fish Passage

Construction of the headworks and roughened channel would incorporate the existing low-head diversion dam and intake channel. The roughened channel would incorporate a portion of the fish ladder/sediment sluice; the unincorporated portion would be removed. Two self-cleaning, cylindrical, screens would be installed at the diversion headworks to comply with NMFS fish screening criteria, provide redundancy in case of screen maintenance, and to facilitate the Hatchery's ability to meet future water conservation goals. A low-flow boulder weir fishway would be integrated into the roughened channel to provide NMFS-compliant fish passage during typical low flows, and a portion of the roughened channel would be extended upstream of the diversion dam to facilitate fish passage overall and at higher flows in particular. The intake trashrack structure would be removed, and a new pipeline would be placed in the intake channel to connect the headworks to the conveyance pipeline. The intake channel would be filled to cover the pipeline and create the IO&MA to enable Hatchery personnel to safely and efficiently access, operate, and maintain the intake facilities. The existing stairway from the access road to the intake channel would be removed as this area would become part of the IO&MA. See **Map 2-3** in **Appendix A** for a conceptual drawing of the proposed intake facilities.

Sediment Management

Elements to manage sediment accumulated at the intake include a ramp on the upstream side of the roughened channel to help mobilize sediment over the feature, a vertical access pipe incorporated into the IO&MA behind the screens to enable a submersible pump to draw in screened water and force it through a hose and nozzle to mobilize sediment through propulsion, and a series of pipes, valves, and outlet channel at the pipeline intake and sediment management area (PISMA) to flush sediment through the intake pipeline back to Icicle Creek (as needed). Components of the PISMA would be placed at the former gatehouse location. See **Map 2-3** in **Appendix A** for a conceptual drawing of the proposed intake facilities.

Conveyance Pipeline

Under Alternative B, approximately 2,180 feet of the conveyance pipeline would be replaced using cut and cover trenching on USFWS property and approximately 4,000 feet of conveyance pipeline would be lined with cure-in-place pipe (CIPP) on private parcels (**Map 2-4** in **Appendix A**). Construction of several temporary access points (contractor use areas [CUAs]) along the existing

[9] Headworks means any dam, weir, barrage, or reservoir and all works appurtenant thereto, used for or in connection with the storage, control, conveyance or distribution of water. For the SWISP Project, the headworks includes the combined intake structure elements, such as the intake structure, gates, and retaining walls.

conveyance pipeline alignment would be installed to provide ingress and egress for pipe lining on private lands. These areas would be restored to pre-construction conditions following lining activities.

The uppermost segment of the existing concrete cylinder pipeline on USFWS property would be removed and replaced with 520 feet of new 42-inch HDPE pipe in the same location. The 1,660 feet of the lower segment of pipeline on USFWS property would be constructed parallel to the existing concrete cylinder pipeline. The current control valve system at the sand settling basin on USFWS property would be replaced with a new control valve vault to allow safe pipe filling operations. After control valve connections are made, this segment of the existing pipeline would be decommissioned and abandoned-in-place. All rehabilitation, replacement, and modernization of the LNFH intake and delivery facilities would conclude at the control valve system; the sand settling basin and inside and outside screen chambers would remain unaltered.

Temporary Hatchery Water Supply

Temporary Hatchery water would primarily be supplied by a gravity-fed diversion. A 40 cfs water supply to LNFH would be maintained during Phase I construction[10]. Temporary pumping from the spillway pool would supply water while the gravity-fed bypass pipeline and outlet are installed and connected to the existing conveyance pipeline approximately 200-300 feet below the intake construction area. This would occur over an approximately 1-week period. It is likely that multiple pumps would be needed to supply this water.

A 20 cfs water supply to LNFH would be maintained during Phase II construction between April 17 to May 20. This would be needed when pipeline replacement, lining with CIPP, and pipeline interconnections were underway, and would occur through pumping from the spillway pool adjacent to LNFH (**Map 2-4** in **Appendix A**).

Access and Staging

Staging and storage sites for construction equipment and materials, and construction staff administration and vehicle parking would be located at various places on LNFH grounds (see **Map 2-4** and **Map 2-5** in **Appendix A**). Trucks hauling construction equipment and containing construction materials would be required to turn around approximately 1.25 miles southwest of the intake access road, at the Forest Service and Alpine Lakes Wilderness Area kiosk on Icicle Creek Road. Construction access to the conveyance pipeline would use existing roads, temporary access routes, and the pipeline right-of-way (ROW).

Construction

Construction of the SWISP Project would occur in three phases. Phase I would include construction of the intake access road and rehabilitation of the intake structures and facilities (e.g., fish screens, fish passage). Phase II would include replacement and lining of the conveyance pipeline. There would likely be temporal overlap between parts of Phase I and Phase II construction. For instance, in July 2022, it is likely that construction of the proposed intake facilities may overlap with pipeline

[10] During Phase I construction, the LNFH has agreed to a 40 cfs temporary Hatchery water supply, which is different than the LNFH's full surface water right of 42 cfs.

replacement on the Hatchery grounds (see **Appendix C** for additional assumptions). Phase III would include revegetation of upland and riparian areas that are proposed to be disturbed.

Phase I construction activities would occur up to 24 hours per day, 6 days per week, and up to 7 days per week. In addition, the in-water work window would be from July 1 to November 15 each year. Phase II construction activities and Phase III revegetation activities would not include any in-water work and would be limited to workday hours of 7:00 a.m. to 10:00 p.m., 5 days per week, and up to 6 days per week.

Phase I includes:

- Construction activities occurring up to 24 hours a day, up to 7 days a week.
- Construction occurring over two seasons primarily within the in-water work window of July 1 to November 15.
- Construction of intake access road (2022).
- Installation of temporary cofferdams[11] (2022 and 2023).
- Demolition of existing intake trashrack structure (complete), existing gatehouse (complete) and fish ladder/sediment sluice (partial) (2022).
- Construction of headworks, including the intake structure, retaining walls, and vertical access pipe for sediment management tools (2022).
- Placement of new intake pipeline (2022).
- Construction of IO&MA over the headworks, retaining walls, and intake pipeline (2022).
- Placement of guiderails, hydraulic equipment, NMFS-compliant fish screens, slide gates, covered control panel, and safety guardrails around the IO&MA (2022).
- Construction of the PISMA at former gatehouse location (2022).
- Rehabilitation of the outlet channel (2022).
- Construction of roughened channel, including upstream sediment ramp and low-flow boulder weir fishway (2023).
- Suppling LNFH with a temporary water supply of 40 cfs using a temporary above-ground, gravity-fed bypass pipeline connected to the conveyance pipeline or pumping from the spillway pool when necessary (2022).
- Post-construction seeding of disturbed areas that do not have a surface treatment (e.g., gravel) with an upland or riparian seed mix, as appropriate (2023).

Phase II includes:

- Construction activities occurring during workday hours of 7:00 a.m. to 10:00 p.m., 5 days per week, and up to 6 days per week.
- The majority of pipeline lining construction occurring over three seasons during a 4- to 5-week period between April and May.

[11] Temporary cofferdams would likely consist of geo-bags, or non-woven geotextile bags. These are large bags made of synthetic materials, such as polyester, polypropylene, or polyethylene, which are filled with sand, rock, or other material, fastened shut, and used to protect structures or riverbanks from erosion or scour.

- Pipeline replacement construction occurring year-round where practicable.
- Replacing conveyance pipeline segments on USFWS property (2022, 2023, and 2024).
- Utilizing existing roads and temporary access routes to gain access to CUAs, as coordinated with private landowners. No improvements are needed to existing roads and access routes.
- CIPP lining of the conveyance pipeline on private parcels from CUAs.
- Temporarily pumping Hatchery water out of the spillway pool during pipeline replacement, lining with CIPP, and pipeline interconnections. Pumping would take place between April 17 and May 20 during the Phase II construction period (2022, 2023, and 2024).
- Constructing new control valve vault and system on USFWS property (2022 and 2023).
- Post-construction seeding of disturbed upland areas (2022, 2023, and 2024).

Phase III includes:

- Planting of riparian tree cuttings in the riparian zone within the Phase I construction area (2024).
- Planting of containerized upland shrubs and trees in uplands within the Phase I construction area (2024).

Best Management Practices

Reclamation would implement practices to protect water quality and other resources and promote soil conservation during Project construction and O&M activities. While these measures are often called BMPs, they are conservation measures used to reduce Project impacts on resources and resource uses, including, but not limited to, fisheries and aquatic resources, Tribal interests, public health and safety, and recreation. BMPs can be a 'thing' installed on-the-ground (e.g., silt fence, ground cover vegetation) or a 'process' used to plan and conduct an activity (e.g., marking stream buffers). The comprehensive list of BMPs is included in **Appendix B**.

Permitting

Because Alternative B would include work within Icicle Creek, several federal and state regulatory permit approvals would be required before construction begins. Reclamation would obtain all required regulatory permits prior to construction implementation. Reclamation would use the Washington State Joint Aquatic Resources Permit Application form to apply for applicable permits. Permits that would be obtained include:

- USACE Section 404 Nationwide Permits
- Ecology Section 401 Water Quality Certification
- Washington Department of Fish and Wildlife (WDFW) Hydraulic Project Approval

Alternative B would also include the use of Icicle Creek Road on National Forest System lands, between the Snow Lakes Trailhead and the Forest Service and Alpine Lakes Wilderness Area kiosk. As a result, Reclamation would secure the required road use approval from the Forest Service, most likely under a special use permit. The kiosk is approximately 1.25 miles southwest of the intake facilities.

Operations and Maintenance

O&M activities would periodically occur on an as-needed basis as determined by Hatchery staff, including daily visual inspections of the proposed intake facilities. Periodic maintenance of the fish screens would be facilitated by construction of the proposed IO&MA, while O&M of the conveyance pipeline would be facilitated by the PISMA and the new control valve system at the sand settling basin.

Hatchery O&M is subject to both the NPDES permit from the EPA and O&M consultations under the ESA Section 7 with NMFS and USFWS (USFWS 2011; NMFS 2017a). Extraordinary maintenance is handled on a case-by-case basis as determined to be necessary by the Hatchery.

2.4.3 Alternative C

Under Alternative C, Reclamation would rehabilitate the LNFH surface water intake and delivery system on Icicle Creek as described under Alternative B. However, under Alternative C, Reclamation would line the entire upper segment (520 feet) of the conveyance pipeline on USFWS property with CIPP instead of replacing it, as described under Alternative B (**Map 2-6** and **Map 2-7** in **Appendix A**). As a result, the mature trees in the Icicle Creek riparian zone found in this conveyance pipeline segment would not be removed. Under Alternative C, the length of the conveyance pipeline, from the PISMA to CUA 5 (4,520 feet), would be lined with CIPP. The remaining segments lined with CIPP on private parcels and replaced on the Hatchery grounds proper would be the same as described under Alternative B (see **Map 2-6** in **Appendix A**). A conceptual drawing of the proposed intake facilities is included as **Map 2-3** in **Appendix A**.

A 20 cfs water supply to LNFH would be maintained during Phase II construction between April 17 and May 20, as described under Alternative B. No temporary pumping would be necessary for pipeline replacement during Phase II construction because the upper segment of the conveyance pipeline on USFWS property would be lined with CIPP instead. As discussed under Alternative B, temporary pumping would be needed while the conveyance pipeline is lined with CIPP, and when pipeline interconnections were underway.

Hatchery O&M is subject to both the NPDES permit from the EPA and O&M consultations under the ESA Section 7 with NMFS and USFWS (USFWS 2011; NMFS 2017a). Extraordinary maintenance is handled on a case-by-case basis as determined to be necessary by the Hatchery.

2.4.4 Alternative D

Under Alternative D, Reclamation would rehabilitate the LNFH surface water intake and delivery system on Icicle Creek as described under Alternative B but with the following differences. Phase I construction activities would be same as Alternative B but would be limited to workday hours of 7:00 a.m. to 10:00 p.m., 5 days per week, and up to 6 days per week. In addition, the in-water work window would be limited to July 1 to October 31 each year. Alternative D was developed to minimize the effects of 24 hours a day construction and reduce the overlap of cofferdam use with a period of greater high-flow risk. Phase II construction activities and schedule would be the same as described under Alternative B. Phase III revegetation efforts would be the same as described under Alternative B except would occur a year later (2025).

The component and elements of the surface water intake facilities and construction activities would be the same as described for Alternative B during Phase I; however, because construction would be limited to workday hours of 7:00 a.m. – 10:00 p.m. and the in-water work window would be two weeks shorter than under Alternative B, construction of Phase I under Alternative D would require four years (i.e., four in-water work windows from 2022 to 2025) to complete. The sequence of Phase I construction activities would be very similar to those listed for Alternative B but would extend through two additional in-water work windows during two additional years (2024 and 2025). Initial mobilization, construction of the intake access road, temporary Hatchery water supply during the in-water work window, access and staging, BMPs, permitting, and O&M would be unchanged from Alternative B. Details of the Phase I construction schedule for intake and fish passage and temporary Hatchery water supply components for Alternative D are provided below.

During the first in-water work window in 2022, preparation for and installation of cofferdams and the gravity bypass pipeline and gravity bypass outlet, demolition of the intake trashrack structure, gatehouse, fish ladder/sediment sluice (partial), and construction of the PISMA and outlet channel, would be the same as Alternative B (**Map 2-5** in **Appendix A**). However, because of the shorter workdays and shorter in-water work window, construction of the intake structure would be limited to excavation, preparation and construction of the concrete slab foundation, and partial construction of the intake headworks. At the end of the 2022 in-water work window, the intake structure would be approximately 35 percent completed. Although the full extent of the intake headworks foundation would be in place, the area of the partially constructed intake headworks would be inundated between the 2022 and 2023 in-water work windows after cofferdam removal. Demobilization of construction equipment in 2022 would leave the constructed elements of the intake structure in this condition until July 2023 when re-mobilization occurs.

From November 1, 2022 to June 30, 2023, the Hatchery's surface water would be supplied by pumping from the spillway pool on Icicle Creek adjacent to LNFH (**Map 2-4** in **Appendix A**). Two high capacity pumps[12] would provide 40 cfs of water to the Hatchery during this period. An operational third pump would be on site as a backup. The pumps would operate 24 hours per day for the 8-month period; as a result, they would require 24 hour per day, 7 day per week monitoring by the construction contractor.

During the second in-water work window in 2023, preparation for and installation of cofferdams and the gravity bypass pipeline and gravity bypass outlet again would occur as described under Alternative B. The remaining 65 percent of construction of the intake structure components and elements would be completed before cofferdam removal. By the end of the 2023 in-water work window, fish screens would be in place and fully operational, and the temporary gravity bypass pipeline and gravity bypass outlet would be removed. In addition, the transition to the new intake structure would be completed by connecting intake facilities to the conveyance pipeline to deliver the LNFH surface water supply by October 31, 2023. Because the intake structure would be fully operational at the end of this in-water work window, there would be no need to supply temporary water to the Hatchery during the remainder of Phase I construction.

[12] Pumps are assumed to be high-lift, 16-inch, trailer-mounted with 150 horsepower diesel engines.

During the third in-water work window in 2024, mobilization similar to previous Phase I in-water work window construction seasons would be required before construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel could occur. Construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel would include placement of cofferdams, dewatering of the construction area, regrading of the stream channel bottom, construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel and finally, removal of the cofferdam.

During the fourth in-water work window in 2025, mobilization similar to previous Phase I in-water work window construction seasons would be required before construction on the remaining portion (right bank) of the roughened channel could occur. Construction of the remaining portion of the roughened channel would include placement of cofferdams, dewatering of the construction area, regrading of the stream channel bottom, construction of the roughened channel and finally, removal of the cofferdam. Once the entire roughened channel is complete and all cofferdams have been removed, the intake facilities would undergo final testing and commissioning to ensure proper operation and compliance with NMFS current screening and fish passage criteria for anadromous fish passage facilities (NMFS 2011), which would occur by October 31, 2025.

2.4.5 Comparison of Action Alternatives

Table 2-1 compares the key differences between the three action alternatives. Alternatives B and C provide a reliable source of water to meet the purpose and need and would increase the likelihood of timely Project completion as required in the 2017 NMFS Biological Opinion (NMFS 2017a) either before or shortly after May 2023. Alternative D does not assume completion of these requirements until October 2025. Alternative D is included to provide a range of action alternatives for analysis and to demonstrate the tradeoffs in resource impacts and Project schedule to better inform the decisionmakers and the interested public per the NEPA process.

2.5 Alternatives and Alternative Elements Considered but Eliminated from Detailed Study

Federal agencies are required to explore and evaluate all reasonable alternatives and to discuss the reasons for eliminating any alternatives not analyzed in detail (40 CFR, Subpart 1502.14).

Through the alternatives screening process, Reclamation, with input from the USFWS as a cooperating agency, eliminated several stand-alone alternatives and alternative elements because they did not meet the purpose of and need for action (see **Section 1.3**), or because they would not meet the technical, socioeconomic, or regulatory screening criteria as outlined in the *Alternatives Compilation Report* (Reclamation 2020c).

To determine which alternatives and alternative elements would meet the purpose of and need for action, and the technical, socioeconomic, and/or regulatory screening criteria, Reclamation engaged in collaborative discussions with agency specialists and Project cooperators and considered their input. Reclamation and cooperating agencies also reviewed past NEPA and other documentation related to the LNFH water delivery system for this information.

Table 2-1. Comparison of Key Differences Between Action Alternatives

	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Phase I Construction Schedule	Up to 24 hours per day, up to 7 days per week	Same as Alternative B	7:00 a.m. to 10:00 p.m. workday, up to 6 days per week
Phase II Construction Schedule	7:00 a.m. to 10:00 p.m. workday, up to 6 days per week	Same as Alternative B	Same as Alternative B
In-water work window Season Dates (including installation and complete removal of cofferdams)	July 1 to November 15	Same as Alternative B	July 1 to October 31
Phase I In-water work window Construction Seasons	2	Same as Alternative B	4
Construction Season (including out of water work)	2022 - 2024 Phase I: 2022-2023 Phase II: 2022-2024 Phase III: 2024	Same as Alternative B	2022 - 2025 Phase I: 2022-2025 Phase II: 2022-2024 Phase III: 2025
Fish Screens Operational (Date)	November 2022	Same as Alternative B	October 2023
Intake Facilities compliant with regulatory criteria1 (Date)	November 2023	Same as Alternative B	October 2025
Conveyance pipeline replaced (feet)	2,180	1,660	Same as Alternative B
Conveyance pipeline CIPP-lined (feet)	4,000	4,520	Same as Alternative B
Temporary Hatchery Water Supply Needed During Phase I Construction via Pumping	Total of approximately 10 days in 2022 (estimated 7 and 3 days in July and November, respectively); 24 hours per day, 7 days per week	Same as Alternative B	Total of approximately 8 months and 10 days in 2022 and 2023 (7 days in July 2022, 8 months from November 1, 2022 to June 30, 2023, and 3 day in October 2023; 24 hours per day, 7 days per week

	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Temporary Hatchery Water Supply Needed During Phase II Construction via Pumping	March 17 – May 20, 2022 (5 weeks) March 17 – May 20, 2023 (5 weeks) March 17 – May 20, 2024 (5 weeks)	Same as Alternative B	March 17 – May 20, 2022 (5 weeks) March 17 – May 20, 2024[2] (5 weeks)

[1]Compliance with NMFS current screening and fish passage criteria for anadromous fish passage facilities (NMFS 2011) is achieved with full build-out and operation of the screened intake structure, low-flow boulder weir fishway, and roughened channel.

[2]The temporary Hatchery water supply needed during Phase I construction via pumping would take place November 1, 2022 to June 30, 2023, which covers the March 17 – May 20 timeframe for 2023.

The stand-alone alternatives eliminated from detailed study are described below, along with the rationale for elimination. Further, alternative elements eliminated from detailed study are listed below by Project component, along with the rationale for their elimination. Additional discussion of the alternative development process can be found in the *Alternatives Compilation Report* (Reclamation 2020c).

2.5.1 Alternatives Considered but Eliminated from Detailed Study

New Hatchery Location

Reclamation considered an option to relocate the LNFH outside of the Icicle Creek sub-basin. However, this alternative is outside of the scope of the Project. This alternative would also not meet the purpose of and need for action, and would not meet other screening criteria, as described below.

The USFWS previously analyzed five alternatives to relocate LNFH production to geographically separate locations, including moving Spring Chinook Salmon production to a new hatchery location in the Wenatchee River basin upstream of the Icicle Creek confluence, to a new hatchery location in the Wenatchee River basin downstream of the Icicle Creek confluence, to a facility on the mainstem Columbia River, or to facilities on the Entiat, Methow, or Okanogan Rivers. Also analyzed was an option to maintain Spring Chinook Salmon incubation and over-winter acclimation at the LNFH, but to move juvenile rearing to a geographically separate site (USFWS 2016).

Relocating fish production to geographically separate locations would require extensive consultation with NMFS, and re-negotiations of *U.S. v. Oregon* harvest targets with Tribes and other parties, decreasing the likelihood of timely Project completion under the 2017 NMFS Biological Opinion (NMFS 2017a). In addition, relocating production would entail substantial costs for planning, design, environmental compliance, and construction of any new facilities. Based on known costs of recently constructed hatcheries, total Project construction costs would be approximately $35 to 40 Million (USFWS 2016), plus there would be undetermined additional expenses to undergo consultation and re-negotiations.

The five alternatives, which considered more than a dozen specific geographic sites, were initially evaluated based on screening factors including potential land issues, water supply quality and quantity, effects on harvest (*U.S. v. Oregon*) and Grand Coulee Dam mitigation obligations, policy and legal consideration (such as Tribal access to usual and accustomed fishing areas), biological risks and benefits, and fishery health and disease risk. After a review of the initial screening analysis, none of the five alternatives were viable enough to justify advanced screening (USFWS 2016). The potential fatal flaw factors in reaching this decision include:

- Difficulty in obtaining funding for the project cost of a new $50 to $75 million hatchery facility[13],
- Difficulty obtaining adequate new water rights and supplies that also meet water quality criteria at a reasonable cost,

[13] Personal communication between David Child, Project Manager, Leavenworth Fisheries Complex, Reclamation, and Christina Davis-Kernan, Technical Projects Program Manager, Reclamation. Subject: L-SWISP: DEIS – Alts Eliminated reference, October 14, 2020.

- The risks of hatchery fish straying and spawning with wild fish, which is a major concern to USFWS, NMFS, and regional fisheries managers, and may increase take of threatened and endangered fish species, and
- The risks of negative impacts on Tribal usual and accustomed fishing areas locally and throughout the Columbia River generally.

To summarize, relocating fish production to geographically separate locations would not meet the purpose and need for action because it would decrease the likelihood of timely Project completion as required in the 2017 NMFS Biological Opinion (NMFS 2017a), and may increase take of threatened and endangered fish species. Further, this alternative would not minimize costs, and ultimately is outside of the scope of the Project. For these reasons, Reclamation eliminated this alternative from detailed study.

New Gravity-fed Surface Water Intake Location Alternatives

Decommission Existing Intake and Build New Intake at Structure 2 or Structure 5

Reclamation considered the options of constructing a new surface water intake located on Icicle Creek at Structure 2 or at Structure 5[14] (see **Map 1-1** in **Appendix A** for reference). A new gravity pipe under the Hatchery channel would move water from the new intake to a new sand settling basin and fish screening facility on the west bank of the channel (for the Structure 2 option) or the east bank of the channel (for the Structure 5 option). Screened water from the sand settling basin would then be pumped to supply LNFH's full surface water rights from Icicle Creek on a permanent basis. This option would be developed rather than replacing the existing surface water intake on Icicle Creek and replacing and/or rehabilitating the existing conveyance pipeline; these components would be decommissioned following construction of the new water supply infrastructure. These proposals were previously considered and dismissed as part the USFWS' *Hatchery Water Supply System Rehabilitation Final Environmental Assessment* (EA) (see Alternatives E and F; USFWS 2003). These options were dismissed at that time because the USFWS determined that a pumped groundwater supply did not provide a reliable water supply for the Hatchery. This was because a pumped groundwater supply would create a dependence on electrical power to supply LNFH's full water rights. Any power loss would require an emergency backup system to power the pumps, and any system failure would result in the need for alternative water sources, decreasing the overall reliability of water delivery. Reclamation revisited this alternative element and determined that the USFWS determination from 2003 is still valid. This option would not meet the purpose and need to ensure safe, efficient, and reliable delivery of LNFH's full surface water rights. This option would also require extensive modification of the Icicle Creek ordinary high water mark, as well as riparian vegetation removal in the Icicle Creek riparian zone, which would increase permitting complexity, decreasing the likelihood of timely Project completion as required in the 2017 NMFS Biological Opinion (NMFS 2017a). Further, adjacent private landowner acceptability is anticipated to be low due to the anticipated O&M noises associated with pumping and pump maintenance. For these reasons, Reclamation eliminated these options from detailed study.

[14] When the LNFH was constructed, a one-mile section of Icicle Creek (Historical Channel) was used for holding and spawning adult fish (USFWS 2011). To control streamflow into this channel, a head gate (Structure 2) was built at the upstream end, and Structure 5, composed of a bridge with a foundation to support racks, flashboards, and/or fish traps, was built at its downstream end.

Surface Water Pumping Alternatives

Construct a Downstream Pump Station Reclamation considered building a downstream pump station at one of several potential locations on Icicle Creek to supply LNFH's full surface water rights from Icicle Creek on a permanent basis. The pump station would be developed rather than replacing the existing surface water intake on Icicle Creek and replacing and/or rehabilitating the existing conveyance pipeline; these components would be decommissioned following pump station construction. However, Reclamation eliminated this option from detailed study because a pumped water supply would not provide a reliable water supply for the Hatchery. This is because a pumped water supply would create a dependence on electrical power to supply LNFH's full water rights. Any power loss would require an emergency backup system to power the pumps, and any system failure would result in the need for alternative water sources, decreasing the overall reliability of water delivery. Further, by moving the surface water intake to locations downstream of the Hatchery, there is a concern for Hatchery production and fish health. Under this scenario, the pumping station intake would be downstream of both Hatchery outfalls. Should pathogens or other contaminants be present in the Hatchery, they may be recaptured at the new pump station intake and be redistributed to the Hatchery, increasing the difficulty of maintaining LNFH production to meet production obligations. Reclamation (2010) previously considered building a pump station on Icicle Creek near Structure 2 (see **Map 1-1** in **Appendix A**). While this location would not be subject to potential fish health or production issues described above, adjacent private landowner acceptability was very low due to the anticipated O&M noise of pumping, and the project was not pursued further. Reclamation revisited this alternative element and determined that landowner acceptability would remain very low.

Groundwater Pumping Alternatives

Decommission Existing Surface Water Intake and Pump from Existing Groundwater Wells and New Groundwater Infiltration Gallery Reclamation considered decommissioning the existing intake facilities on Icicle Creek and using existing groundwater wells and a newly constructed infiltration gallery[15] system to supply LNFH with water on a permanent basis. This alternative was previously considered and dismissed as part the USFWS' *Hatchery Water Supply System Rehabilitation Final EA* (see Alternative D, USFWS 2003). This option was dismissed at that time because the USFWS determined that a pumped groundwater supply did not provide a reliable water supply for the Hatchery. This was because a pumped groundwater supply would create a dependence on electrical power to supply LNFH's full water rights. Any power loss would require an emergency backup system to power the pumps, and any system failure would result in the need for alternative water sources, decreasing the overall reliability of water delivery. There were also concerns regarding the overall reliability and feasibility of an infiltration gallery in terms of total available groundwater output and ability to supply LNFH's full water rights, long-term reliability given site-specific subsurface conditions, and the required extensive network of gallery piping. Installing gallery piping would require extensive excavation and vegetation removal in the Icicle Creek riparian zone, which would greatly increase permitting complexity. Reclamation determined that the rationale above, as developed in 2003, remains valid. Since this option would not provide a reliable source of water to meet the purpose and need, and would decrease the likelihood of timely

[15] For the purposes of this proposal, an infiltration gallery is a horizontal system of open-jointed or perforated pipes, which is installed below the water table. It passively collects groundwater.

Project completion as required in the 2017 NMFS Biological Opinion (NMFS 2017a) due to increased permitting complexity, Reclamation eliminated this option from detailed study.

Replace the Surface Water Intake with Pumping from Existing and New Groundwater Production Wells Reclamation considered replacing the existing intake facilities on Icicle Creek with additional drilled groundwater wells on the LNFH property. Water pumped from new and existing groundwater wells would be used for Hatchery production on a permanent basis. However, as described above, a pumped groundwater supply would be inherently less reliable than a gravity water supply, and pumping from groundwater wells only would not ensure delivery of the LNFH's full water rights in terms of total available groundwater output. This would be the case even if additional groundwater wells were developed. As a result, this option would not meet the purpose and need to ensure safe, efficient, and reliable delivery of LNFH's full surface water rights. Pumping groundwater would only provide 8-15 cfs which would require fish production levels to be reduced, which would not allow the LNFH to maintain fish production to meet Tribal obligations. For the reasons described above, Reclamation eliminated this option from detailed study.

Replace the Surface Water Intake with Injection and Production Wells Reclamation received a request during the public scoping period (Reclamation 2020c), to evaluate Project alternatives that would improve water conservation and management through O&M activities. Consistent with this request, Reclamation considered replacing the surface water intake with a system of drilled injection and existing groundwater production wells on the LNFH property. Water used during LNFH production would be injected into the groundwater aquifer via new injection wells, instead of being discharged into Icicle Creek. LNFH would then pump from existing groundwater wells, using the augmented groundwater aquifer to support production on a permanent basis. As described above, a pumped water supply would be inherently less reliable than a gravity water supply and would not meet the purpose and need to ensure safe, efficient, and reliable delivery of LNFH's full water rights. Further, developing injection wells could require regulatory approvals from state or federal agencies, increasing permitting complexity and decreasing the likelihood of timely Project completion as required in the 2017 NMFS Biological Opinion (NMFS 2017a). This is because injecting production water, as opposed to returning it to Icicle Creek, may cause Ecology to change LNFH's water use designation from non-consumptive use to consumptive use[16], and because injected water could need to meet State drinking water standards. Further, monitoring indicates that the ground water beneath the LNFH has a higher level of naturally occurring phosphorous than Icicle Creek (USFWS 2016). Because phosphorus is also produced during Hatchery production, injecting water used for Hatchery production into the groundwater aquifer may cause total phosphorus in the groundwater to increase over time, eventually raising levels in pumped groundwater beyond those required for production. Over time, this may preclude the LNFH from maintaining fish production to meet obligations. Finally, this option would not negate the need for periodic supplemental surface water intake from Icicle Creek because injecting and re-using groundwater for production would result in eventual loss of water from the re-use system. It would

[16] Nonconsumptive use means a type of water use where either there is no diversion from a water source, or where there is no diminishment of the amount or quality of the water source. Consumptive use means use of water that diminishes the volume or quality of the water source (WAC 173-518-030).

not be feasible to build a re-use system that is 100 percent efficient. For these reasons, Reclamation eliminated this option from detailed study.

Construction Work Schedule Alternative

Phase I Construction 6:00 a.m. – 8:00 p.m. Workday Hours Schedule/16-month In-water Work Window Reclamation considered an alternative that would use a 6:00 a.m. and 8:00 p.m. workday and 16-month in-water work window schedule to construct Phase I, the proposed intake facilities. A workday schedule would include construction between the hours of 6:00 a.m. and 8:00 p.m., Monday through Saturday. However, this alternative was eliminated from detailed study because it would not meet the purpose and need for action. It would not ensure safe, efficient, and reliable delivery of LNFH's full surface water rights from Icicle Creek, avoid and/or minimize impacts on threatened and endangered fish species, nor ensure timely Project completion per the 2017 NMFS Biological Opinion (NMFS 2017a). Further, this alternative would not maintain fish production to meet Tribal obligations (*U.S. v. Oregon*), nor would it provide TMDL and Water Quality Standard-compliant management. Finally, private landowners and/or recreationists would have a low acceptability of disturbance under this alternative. For these reasons, Reclamation eliminated this alternative from detailed study.

Under this alternative, temporary cofferdams would be used to isolate the in-water work area and facilitate the temporary gravity-fed bypass pipeline in Icicle Creek, as described under Alternative B. However, instead of being removed from Icicle Creek by November 15 of each year, cofferdams would be left in Icicle Creek on a continuous basis from approximately July 2022 to October 2023. Additionally, as noted under Alternative B, it is most likely that the construction contractor would use geo-bag cofferdams to isolate the in-water work area, as the bedrock geology of the intake construction area would not allow for the use of mechanically driven piles to construct and anchor the cofferdams. Geo-bag cofferdams are intended to be used in situations with relatively steady, average to below-average flows, and not in high-flow or flashy-flow situations, such as runoff resulting from spring snowmelt, rain-on-snow events, or heavy or prolonged precipitation events. This is because the bags are kept in place by their own weight and are not anchored into bedrock. Geo-bag cofferdams would not be suitable for use in Icicle Creek during heavy or prolonged precipitation or rain-on-snow events that typically occur between November and April, or during typical flows resulting from spring runoff in May and June. The possibility of flash-flooding events in Icicle Creek is not speculative; analysis of long-term flow data indicate a 50 percent probability that mean daily flow rates can more than double during fall flash-flow events (from 109 cfs to 274 cfs), and increase by an order of magnitude during certain spring runoff events (from 109 cfs to 1,641 cfs; Reclamation 2020d). Both typical and unpredictable high-flow events would have the potential to dislodge or destroy geo-bag cofferdams.

This alternative would not meet the purpose and need to ensure safe, efficient, and reliable delivery of LNFH's full surface water rights. Cofferdam failure during high flows, particularly failure of the geo-bags facilitating the gravity-fed bypass pipeline, could jeopardize the temporary Hatchery water supply during Phase I of construction. Disrupted surface water supply may require the Hatchery water supply to be supplemented with groundwater pumping. However, as discussed above in *Replace the Surface Water Intake with Pumping from Existing and New Groundwater Production Wells*, pumping groundwater would only provide 8-15 cfs which would require fish production levels to be reduced,

which would not allow the LNFH to maintain fish production to meet obligations (*U.S. v. Oregon*). Depending on the severity of the disruption, an entire fish cohort could be lost.

This alternative also would not meet the purpose and need to avoid and/or minimize impacts on threatened and endangered fish species. Because cofferdams would be left in Icicle Creek year-round from approximately July 2022 to October 2023, they may interfere with or disrupt ESA-listed fish migration, movement, foraging, spawning, or other behavior. Further, cofferdam failure during high flows could release tons of sediment or rock into Icicle Creek. Depending on the volume and type of material released, there could be long term changes to the Icicle Creek streambed, primarily by increasing the proportion of sands, gravels, and fine sediments. Released materials could reduce ESA-listed fish habitat quantity or quality by burying or degrading suitable spawning substrate in Icicle Creek. Depending on the timing of cofferdam failure, released materials could bury ESA-listed fish species redds or eggs, which would be considered take under the ESA.

This alternative would not meet the purpose and need to ensure timely Project completion as required by the 2017 NMFS Biological Opinion (NMFS 2017a). Timely Project completion could not be ensured primarily because leaving the cofferdams in Icicle Creek on a continuous basis would increase permitting complexity. This would come about for several reasons. First, Reclamation anticipates obtaining regulatory approvals for the SWISP Project under several programmatic agreements, such as USACE Section 404 Nationwide Permits (see the *Permitting* discussion in **Section 2.4.2**), and the programmatic biological opinion from the NMFS for fish passage and restoration (NMFS 2017b; see **Section 4.2.6**). In contrast to Alternative B, continuous cofferdam placement in Icicle Creek would be unlikely to be compatible with these programmatic permitting agreements.

This alternative would not provide TMDL and Water Quality Standard-compliant management. Cofferdam failure during high flows could release tons of sediment or rock into Icicle Creek. In the short-term, this would increase turbidity within and downstream of the intake construction area. Icicle Creek is sensitive to any addition of nutrients, especially phosphorus. Although phosphorus levels are relatively low, they are consistently too high to meet state water quality standards for the potential of hydrogen (pH). Depending on the volume and type of materials released, and if released materials contributed phosphorus to the system, water quality could be degraded in violation of pH and phosphorus TMDLs established for Icicle Creek. Further, cofferdam failure that could occur during heavy or prolonged precipitation or rain-on-snow events between November and April, or during typical flows resulting from spring runoff in May and June, could expose uncured concrete to water in Icicle Creek. Concrete is highly alkaline (pH 12.5). If concrete was cast less than 4 days before cofferdam failure, the leaching of alkali from the uncured concrete would likely result in increases to both the pH and phosphorus levels in Icicle Creek, which could also lead to a violation of the pH and phosphorus TMDLs**.**

This alternative would have low private landowner and/or recreationist disturbance acceptability. This is because construction under this alternative would affect private landowners and/or recreationists for a relatively long time period compared with Alternative B. Instead of construction at the intake construction area being done between July 1 and November 15 over two seasons, it would occur year-round from July 2022 to October 2023, meaning that construction-related

disturbances would extend for an additional 7.5 months, compared with Alternative B. The additional construction-related disturbance to private landowners and recreationalists, including noise, traffic delays, and temporary loss of recreationist parking along Icicle Creek Road, would likely be unacceptable to these groups. For the reasons detailed above, Reclamation eliminated this alternative from detailed study.

2.5.2 Component Elements Considered but Eliminated from Detailed Study

Intake Component

The intake component includes all types of, and potential placements of, NMFS-compliant (NMFS 2011) screens that could be utilized to keep fish out of the surface water intake system while facilitating the delivery of LNFH's full surface water rights.

Alternative Fish Screen Locations and Technology Reclamation considered using several different types of fish screens in various locations as part of the intake component: an in-channel fish screen, and indoor fish screen in the existing gatehouse, and a screen at the existing sand settling basin.

Reclamation considered placing an in-channel fish screen in the existing excavated intake channel, between the low-head diversion dam (see **Map 2-2** in **Appendix A**) and the Icicle Creek left bank[17]. Given physical site constraints, Reclamation modeling indicates that using an in-channel fish screen would not allow for sufficient sweeping velocities (NMFS 2011) to be attained, which would increase the potential for threatened and endangered fish to be impinged on the screen. More water would need to be diverted from Icicle Creek to reach sufficient sweeping velocities when using an in-channel fish screen, which would detrimentally affect threatened and endangered fish habitat in Icicle Creek, particularly during times of low flow. Further, an in-channel fish screen would not be in Icicle Creek, but rather would be in the excavated intake channel, physically outside of the main Icicle Creek channel. Given its location away from Icicle Creek, threatened and endangered fish would be entrained in the surface water intake before being screened and ultimately returned to Icicle Creek through a fish bypass. This entrainment would also be considered take of threatened and endangered fish species. For these reasons, this option would not meet the Project's purpose and need to avoid and/or minimize impacts on threatened and endangered fish species.

Reclamation considered using an indoor fish screen located within the existing gatehouse (see **Map 2-2** in **Appendix A**). Under this option, threatened and endangered fish would be entrained in the surface water intake system for a greater distance and longer time before being screened and returned to Icicle Creek through a fish bypass, compared to an in-channel fish screen. This would result in increased take and would not meet the purpose and need to avoid and/or minimize impacts on threatened and endangered fish species. Further, this option would not be technologically or economically feasible or practicable[18], given the increased staffing requirements, electrical costs and complexity of de-icing solutions that would be required.

[17] The terms left bank and right bank refer to the perspective of an observer looking downstream.
[18] As described in the *Alternatives Compilation Report* (Reclamation 2020c), technological and economic feasibility and practicability criteria are based on the need for efficient and acceptable project design and construction.

Reclamation considered rehabilitating the existing intake facilities on Icicle Creek, and screening fish at the existing sand settling basin (see **Map 2-1** in **Appendix A**). Under this option, fish screening would still occur, but would take place at the existing sand settling basin at the distal end of the conveyance pipeline, approximately 6,300 feet from the surface water intake on Icicle Creek. Since screening would occur over a mile from the point of diversion, threatened and endangered fish would be entrained in the surface water intake system for a greater distance and longer time before being screened and returned back to Icicle Creek through a fish bypass, increasing the amount of take compared with other screen options. This alternative was previously considered and eliminated as part the USFWS' *Hatchery Water Supply System Rehabilitation Final EA* (see USFWS 2003, Alternative C). The USFWS determined that screening at this location would not meet the purpose and need of protecting the fishery resource in Icicle Creek. Reclamation revisited this alternative element and determined that the USFWS determination from 2003 is still valid. Therefore, this option was eliminated from detailed study because it would not meet the purpose of and need for the action.

Alternative Intake Locations In response to comments received during the public scoping period (Reclamation 2020a), Reclamation considered moving the intake component elements outside of the Icicle Creek riparian zone, and into the footprints of the existing intake access road and Icicle Creek Road. Also, in response to comments received, Reclamation considered restoring the existing surface water intake and outlet channel to a continuous side channel habitat area to enhance juvenile fish rearing and/ or passage and migration habitat, using a combination of natural stream features and bioengineered structures. Moving infrastructure outside of the riparian zone and restoring the existing surface water intake and outlet channels would require moving the surface water intake further away from Icicle Creek and using an in-channel fish screen. As described above in *Alternative Fish Screen Locations and Technology*, take of threatened and endangered fish species would be increased using this screen option. Further, constructing a continuous side channel habitat area in this location would require large amounts of ground disturbance and associated riparian vegetation removal due to the steep topography. This would increase permitting complexity, decreasing the likelihood of timely Project completion as required in the 2017 NMFS Biological Opinion (NMFS 2017a). In addition, due to its short length, small overall size, and steep gradient, there is little opportunity for meaningful juvenile fish rearing habitat restoration in the existing surface water intake and outlet channel area. Finally, based on geological and physical constraints such as steep slopes, shallow soils, and granite bedrock at the intake site, this option would not be technologically or economically feasible or practicable, because of the increased costs and complexity of construction. For these reasons, Reclamation eliminated this option from detailed study.

Trash Protection Features Reclamation considered installing a pipe-style trash[19] protection feature directly in front of the screens. Reclamation eliminated this element from detailed study because it was determined not necessary to meet the Project purpose and need, since Alternative B would include a floating log boom trash protection feature upstream of the screens. Alternative B also includes a self-cleaning cylindrical screen that would be submerged at a depth that, under most stream flow scenarios, would be unaffected by floating debris.

[19] In this context, trash refers to primarily natural debris such as leaves, tree limbs, and logs.

Alternative Intake Access Road Configurations In response to comments received during the public scoping period (Reclamation 2020a), Reclamation considered reconfiguring the existing intake access road using a semicircular design to provide improved sight lines to Icicle Creek Road during intake site ingress and egress. However, Reclamation determined that such a design would require a large amount of excavation and vegetation removal in the Icicle Creek riparian zone to meet road engineering standards, which may increase permitting complexity. This would decrease the likelihood of timely Project completion as required in the 2017 NMFS Biological Opinion (NMFS 2017a). Also, given geological and physical constraints in the surface water intake area (see *Alternative Intake Locations* above), this option would not be technologically or economically feasible or practicable, because of the increased costs and complexity of construction. For these reasons, the option to construct a semi-circular intake access road design was eliminated from detailed study.

Fish Passage Component

Modify the Existing Fish Ladder Reclamation considered incorporating the existing fish ladder/sediment sluice and low-head diversion dam (see **Map 2-2** in **Appendix A**) into a new NMFS-compliant fishway (Reclamation 2020b). Under this proposal, the existing fish ladder/sediment sluice would be reconstructed using a standard, scalable fish passage design, such as a vertical slot fishway[20]. This option was eliminated from detailed study for several reasons. First, a new fishway incorporating the existing fish ladder/sediment sluice may not be used by upstream-migrating fish because it may not adequately attract them during upstream migration. This is because the existing fish ladder/sediment sluice outlet, which would become the new fishway entrance providing attraction flow for upstream-migrating fish, is sub-optimally located outside of the stream thalweg[21] and likely primary upstream migration paths. Under most observed flow scenarios these paths are roughly at mid-channel, or near the Icicle Creek right bank (Anglin et al. 2013). Therefore, there is a low probability that this option would meet current fish passage criteria for anadromous fish passage facilities (NMFS 2011) and satisfy the purpose and need for the action. Further, this option would require an in-channel fish screen, which as described in *Alternative Fish Screen Locations and Technology* above, would increase potential for take of threatened and endangered fish. Also, in contrast to the proposed fish passage option, this option is not widely supported by the regulating agencies and would present a challenge for permitting and Project completion within the timeframe required in the 2017 NMFS Biological Opinion (NMFS 2017a).

Roughened Creek-Width Channel with Low-Flow Channel Alignments Reclamation considered two fish passage options that would incorporate a shorter creek-width roughened channel than the one proposed. The two creek-width roughened channel options would have a low-flow channel toward the right bank or left bank of Icicle Creek, respectively. The Icicle Creek thalweg is not oriented towards the right bank (Anglin et al. 2013); therefore, positioning the roughened channel only on that side of the creek would not provide optimal fish passage. While a shorter creek-width roughened channel on the left bank would satisfy the regulatory criterion of minimizing in-water construction, Reclamation modeling indicates that this option would increase the difficulty in meeting the current fish passage criteria for anadromous fish passage facilities

[20] This type of fishway consists of a series of pools with baffled vertical slots between them.
[21] A line defining the lowest points along the length of a river or stream bed; the deepest part of a river or stream channel.

(NMFS 2011), including but not limited to, length of fishway, channel slope, and water depth and velocity. These options would decrease fish passage effectiveness overall, and at higher flows in particular. Therefore, Reclamation determined these options would not meet the purpose of and need for the action and eliminated them from detailed study.

Conveyance Pipeline Component

Reclamation considered several options for replacing and/or rehabilitating the conveyance pipeline. They include:

- Lining the entire conveyance pipeline with CIPP,
- Excavating and replacing the two most deteriorated sections and lining the remaining sections with CIPP,
- Excavating and replacing the entire conveyance pipeline, and
- Excavating and replacing the two most deteriorated conveyance pipeline sections only.

Reclamation considered lining the entire conveyance pipeline with CIPP to minimize impacts on the Icicle Creek riparian zone between the PISMA and private lands. Reclamation steady-state modeling indicates that lining the entire length of the conveyance pipeline with CIPP, while maintaining LNFH's full surface water rights of 42 cfs, is not a technically viable option because it would not ensure safe, efficient, and reliable delivery of LNFH's full surface water rights from Icicle Creek[22]. This is due to the relatively small diameter of the conveyance pipeline, combined with the changes happening both upstream with the fish intake and screens and downstream with the new control valves, lining the full pipeline results in a hydraulic high point roughly mid-way along the pipeline, on private lands. In order to overcome the hydraulic high point to deliver 42 cfs of water, both sections of pipe on USFWS property would need to be replaced with larger diameter pipes, which would necessitate excavation and replacement. This option would not meet the purpose and need for action. Therefore, Reclamation eliminated this option from detailed study.

Reclamation considered excavating and replacing only the two most deteriorated conveyance pipeline sections and rehabilitating the remainder of the conveyance pipeline by lining it with CIPP. The two most deteriorated conveyance pipeline sections are on USFWS property lands near the sand settling basin, and on private lands near the bifurcation point where the Hatchery's surface water supply is split from COIC's surface water supply (Reclamation 2020b; see **Map 2-1** in **Appendix A**). As described above, steady-state modeling indicates that maintaining delivery of 42 cfs of water could not be accomplished without increasing the pipeline diameter in the section of pipeline on USFWS property. Therefore, excavating and replacing only the two most deteriorated sections and lining the remaining length of the conveyance pipeline with CIPP is not a technically viable option. This option would not meet the purpose and need for action because it would not ensure safe, efficient, and reliable delivery of LNFH's full surface water rights from Icicle Creek. Therefore, Reclamation eliminated this option from detailed study.

[22] Personal communication between Kylie Pelzer, Civil Engineer, Reclamation, and David Child, Project Manager, Leavenworth Fisheries Complex, Reclamation. Subject: LNFH Phase II - CIPP and FY Budgets, June 23, 2020.

Reclamation considered excavating and replacing the entire conveyance pipeline, from the surface water intake to the LNFH production facilities, on both USFWS property and private lands. Reclamation has previously discussed this option with the private landowners and they were not receptive to it (Reclamation 2020b). This option was revisited during the design process, and landowner acceptability remains low; however, they were receptive to other alternatives that would have less impact on their businesses. This option would have low private landowner acceptability which could present a challenge for Project completion within the timeframe required in the 2017 NMFS Biological Opinion (NMFS 2017a). Since timely Project completion is part of the Project purpose and need, Reclamation eliminated this option from detailed study.

Reclamation also considered excavating and replacing only the two most deteriorated conveyance pipeline sections (Reclamation 2020b), which are on USFWS property near the sand settling basin, and on private lands near the bifurcation point. The remainder of the conveyance pipeline would not be rehabilitated or replaced. While this option would replace the two most deteriorated sections, observations indicate that the entire conveyance pipeline is in poor condition. Continuing to operate the pipeline in poor condition would decrease the likelihood of continued safe, efficient, and reliable delivery of LNFH's full surface water rights from Icicle Creek, and therefore would not meet the purpose and need for action. For these reasons, Reclamation eliminated this option from detailed study.

Temporary Hatchery Water Supply Component

Reclamation considered several options to supply the LNFH with a temporary water supply of 40 cfs during Project construction. A temporary water supply is needed for the LNFH to continue production during Project construction. The temporary water supply source for the Hatchery would vary based on the construction phase.

Temporary Pumping from Existing Groundwater Wells Only Reclamation considered pumping water from existing groundwater wells on the LNFH property to provide the temporary Hatchery water supply of 40 cfs during construction on the conveyance pipeline. However, the existing groundwater wells do not have sufficient availability to ensure delivery of the temporary Hatchery water supply of 40 cfs. As a result, pumping water from existing groundwater wells would only provide 8-15 cfs during construction on the conveyance pipeline which would require Hatchery production levels to be reduced. Further, a pumped water supply would create a dependence on electrical power to deliver LNFH's temporary water supply. Any power loss would require an emergency backup system to power the pumps, and any system failure would result in the need for alternative water sources, decreasing the overall reliability of temporary water delivery. This option would not allow the LNFH to maintain fish production to meet Tribal obligations and would not provide a reliable source of water; therefore, Reclamation eliminated this option from detailed study.

Develop additional groundwater wells to pump additional groundwater Reclamation considered developing additional groundwater wells on the LNFH property to pump additional groundwater to provide the temporary water supply of 40 cfs to the Hatchery during construction of the conveyance pipeline. Developing additional groundwater wells would require regulatory approvals from the State, increasing permitting complexity and decreasing the likelihood of timely Project completion as required in the 2017 NMFS Biological Opinion (NMFS 2017a), which is part

of the Project purpose and need. Further, as discussed under *Temporary Pumping from Existing Groundwater Wells Only*, pumping from groundwater wells only would not ensure delivery of the temporary Hatchery water supply of 40 cfs. This would be the case even if additional groundwater wells were developed. As a result, pumping water from groundwater wells only during construction on the conveyance pipeline would require Hatchery production levels to be reduced. This option would also create a dependence on electrical power to deliver LNFH's temporary Hatchery water supply, decreasing the overall reliability of temporary water delivery. This option would decrease the likelihood of timely Project completion, would not allow the LNFH to maintain fish production to meet Tribal obligations, and would not provide a reliable source of water. For these reasons, Reclamation eliminated this option from detailed study.

Temporary Full-time Pumping from Spillway Pool Only Reclamation considered full-time pumping of surface water from the spillway pool to provide the temporary Hatchery water supply of 40 cfs during construction of the surface water intake. Pumping would be done from the spillway pool only; a gravity bypass would not be used. However, it is not feasible to ensure delivery of the temporary Hatchery water supply of 40 cfs by pumping from the spillway pool only. This is because sustained pumping of this volume of water would present a high risk of equipment failure. Inability to ensure delivery of the temporary Hatchery water supply of 40 cfs would likely require Hatchery production levels to be reduced. Further, there would be a concern for Hatchery production and fish health under this scenario. This is because the surface water intake would be near the Hatchery outfall. Should pathogens or other contaminants be present in the Hatchery, they may be recaptured at the pumping intake and be redistributed to the Hatchery, increasing the difficulty of maintaining LNFH production. For these reasons, full-time pumping from the spillway pool only during construction on the surface water intake would not ensure LNFH's ability to maintain fish production to meet Tribal obligations. Further, the capital costs and operational costs of needed equipment for full-time pumping would be significantly higher than other temporary Hatchery water supply options. For these reasons, Reclamation eliminated this option from detailed study.

Access and Staging Component

Construction vehicle turnaround locations Reclamation considered several locations for a temporary construction truck turnaround location. Trucks hauling construction equipment would need to access the intake construction area using the eastbound lane of Icicle Creek Road. To safely accomplish this, they would need to turn around at a location west (upstream) of the intake site. Options for a turnaround location on Icicle Creek Road are limited given the steep topography of the Icicle Creek canyon.

Reclamation considered establishing a temporary truck turnaround at the Forest Service Snow Lakes Trailhead parking area, approximately one mile west of the intake site. The Snow Lakes Trailhead is a main access point to the Alpine Lakes Wilderness Area, an extremely popular recreational destination on the Okanogan-Wenatchee National Forest. Establishing a truck turnaround at the trailhead would significantly disrupt recreationist access to the trail and wilderness area by temporarily decreasing parking capacity at this location. This option would have low recreationist acceptability due to decreased parking capacity. Further, discussions with the Forest Service indicate they are not supportive of using this location as a truck turnaround. Therefore, Reclamation eliminated this option from detailed study.

Reclamation also considered establishing a temporary truck turnaround on private lands west of the intake site. However, Reclamation anticipates that this option would have low private landowner acceptability which would lead to difficulties of finding an accepting landowner and increases in the time and expense of securing temporary access to their lands. For these reasons, this option would present a challenge for Project completion within the timeframe required in the 2017 NMFS Biological Opinion (NMFS 2017a), which is part of the Project's purpose and need. Therefore, Reclamation eliminated this option from detailed study.

2.6 Summary Comparison of Impacts

Table 2-2 briefly describes the impacts on resources and resource uses under each alternative, including Alternative A – No Action. For further analysis of the impacts under each alternative, see **Chapter 3**, Affected Environment and Environmental Consequences, and the SWISP Project Resource Reports (available on the Project website at https://www.usbr.gov/pn/programs/leavenworth/swisp/docs.html.

2.7 Federal Lead Agency Preferred Alternative

Under NEPA, the "preferred alternative" is a preliminary indication of the lead agency's preference of action among the Proposed Action and alternatives. The lead agency may select a preferred alternative for a variety of reasons, including the agency's priorities and environmental considerations discussed in the Draft EIS. In accordance with the NEPA implementing regulations (40 CFR 1502.14[d] and 43 CFR 46.425(a)), Reclamation has identified **Alternative C** as the preferred alternative. In addition to ensuring safe, efficient, and reliable delivery of the Hatchery's full surface water right through construction of the new intake facilities, Alternative C best meets the purpose and need for the Project by reducing take and providing passage for ESA-listed fish species and complying with 2017 Biological Opinion requirements in the timeliest manner. Alternative C would also have the least impacts to vegetation in the riparian corridor by limiting ground disturbance through more CIPP-lining of the conveyance pipeline. In addition, as One Federal Decision agencies under EO 13807, and in accordance with requirements therein, the USFWS and USACE have concurred with Reclamation's selection of Alternative C as the preferred alternative.

While Reclamation has identified a preferred alternative in this Draft EIS, actual selection of an alternative for implementation will not occur until the Record of Decision. The decision on the alternative to implement will consider public comments and the full analysis in the Final EIS.

Table 2-2. Summary Comparison of Impacts

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Air Quality and Climate	Fugitive dust, air pollutant, and greenhouse gas emissions related to O&M would continue. These include emissions from vehicles and equipment, dust from travel on unpaved access roads, and emissions from periodic sediment removal operations.	Construction would generate temporary and localized fugitive dust, greenhouse gas emissions, and other air pollutants, which would be minimized using standard dust control and other BMPs. Contribution to global greenhouse gas emissions are expected to be well below 25,000 metric tons of carbon dioxide equivalents per year, which is the greenhouse gas reporting requirement threshold under 40 CFR 98. The types of emissions from O&M would be similar but reduced compared with Alternative A because less maintenance would be needed.	Impacts from construction would be similar to Alternative B, but emissions would be slightly reduced because there would be less construction activity associated with the shorter length of conveyance pipeline being replaced. Contribution to global greenhouse gas emissions would be well below the greenhouse gas reporting requirement threshold under 40 CFR 98 of 25,000 metric tons of carbon dioxide equivalents per year. Emissions associated with O&M of the LNFH would be the same as described under Alternative B.	Impacts from construction would be similar to Alternative B, but emissions would be greater because of the increased Phase I construction timeline and the need for additional pumping for the temporary Hatchery water supply. Contribution to global greenhouse gas emissions would be well below the greenhouse gas reporting requirement threshold under 40 CFR 98 of 25,000 metric tons of carbon dioxide equivalents per year. Emissions associated with O&M of the LNFH would be the same as described under Alternative B.

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Geology and Soils	There would be no new impacts to geology or soils from construction. Sediment from upstream sources would continue to be diverted from Icicle Creek into the Hatchery, and it would periodically be removed and stored on-site.	Construction would result in localized effects from ground disturbance and movement of geologic materials. BMPs to minimize surface disturbance, control erosion, and reclaim temporarily disturbed areas would reduce impacts. Permanent facilities would result in the irretrievable commitment of soil resources in limited areas.	Impacts would be similar to Alternative B, but slightly reduced because there would be less construction activity associated with the shorter length of conveyance pipeline being replaced.	Impacts would be the same as described under Alternative B.
Water Resources	Sediment would continue to be diverted from Icicle Creek, removing its contribution to stream geomorphology and stream conditions. There would be no change in compliance with water quality standards (for temperature, dissolved oxygen, pH, and turbidity) outlined in Chapter 173-201A WAC.	Intake rehabilitation would greatly reduce sediment diversion, allowing it to remain in the creek and contribute to stream conditions. Surface disturbances from construction within the 100-year floodplain would occur. Surface disturbances and equipment use in and adjacent to Icicle Creek could result in contaminants (e.g., soil, lubricants, fuel, etc.) entering the creek and affecting water quality. There would be two weeks of cofferdam use during November, a month when prolonged precipitation or	Impacts would be similar to Alternative B, but slightly reduced because less conveyance pipeline would be replaced, and fewer shade-producing trees would be removed. As a result, effects from increased water temperature and lowered dissolved oxygen would be reduced.	Impacts would be similar to those described under Alternative B, except Alternative D would involve additional seasons of cofferdam use (four construction seasons instead of two). This would increase surface disturbances and equipment use in and adjacent to Icicle Creek that could result in contaminants (e.g., soil, lubricants, fuel, etc.) entering the creek and affecting water quality. Additionally, cofferdam use would end on October 31 each year, avoiding cofferdam use during November when prolonged precipitation or

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Water Resources (*continued*)	(*see above*)	rain-on-snow events could overtop, dislodge, or destroy the cofferdam. Cofferdam failure during high flows could release tons of sediment or rock into Icicle Creek. Shade-producing trees would be removed, allowing an increase in water temperature and a lowering of dissolved oxygen. BMPs and permit conditions would reduce impacts.	(*see above*)	rain-on-snow events could overtop, dislodge, or destroy the cofferdam.
Biological Resources	Alternative A would not comply with current NMFS fish screening and passage criteria. Existing intake facilities do not comply with current NMFS criteria for anadromous salmonids, and result in take of ESA-listed fish. Existing intake facilities impact fish passage and aquatic habitat quantity, quality, and connectivity. The NMFS Biological Opinion covering LNFH operations requires the LNFH comply with current criteria by May 2023. There would be no impacts on vegetation or terrestrial wildlife species.	Alternative B would comply with current NMFS fish screening and passage criteria for anadromous salmonids and would reduce take of ESA-listed fish compared with current conditions. Construction would temporarily affect ESA-listed fish, critical habitat, and EFH, but BMPs (**Appendix B**) and conservation measures developed during ESA Section 7 consultation with the USFWS, and in the NMFS 2017 FPRP III programmatic biological opinion (NMFS 2017b), would reduce effects. Fish passage and aquatic	Alternative C would comply with current NMFS fish screening and passage criteria for anadromous salmonids and would reduce take of ESA-listed fish compared with current conditions. Impacts on fish and aquatic habitat and vegetation would be similar to Alternative B, but slightly reduced because less conveyance pipeline would be replaced, and fewer shade-producing trees would be removed. Effects on terrestrial wildlife species would be the same as	Alternative D would comply with current NMFS fish screening and passage criteria for anadromous salmonids and would reduce take of ESA-listed fish compared with current conditions. The types of impacts on fish and aquatic habitat would be similar to Alternative B, but the time frame over which they occur would differ. This may increase impacts to fish and aquatic habitat because, although the daily and seasonal timeframe would be shorter, the total time needed to complete the Project

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Biological Resources (*continued*)	(*see above*)	habitat quantity, quality, and connectivity would be improved post Project implementation. Effects on vegetation would be minor and effects on terrestrial wildlife species would be minor or negligible.	described under Alternative B.	would be longer. There would also be additional impacts from Phase I construction temporary Hatchery water supply pumping for a longer time period, inundation of the partially constructed intake headworks after cofferdam removal, and remobilization/demobilization efforts before and after each additional in water work window. The fish species affected may differ relative to Alternative B due to the 2-week shorter in-water work window and the workday hours of 7:00 a.m. and 10:00 p.m. Effects on vegetation and terrestrial wildlife species would be the same as described under Alternative B.

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Cultural Resources	Continued deterioration of the existing intake facilities and conveyance pipeline may unavoidably adversely affect the overall integrity of the LNFH Historic District. There would be no effect on documented archaeological resources eligible for listing in the National Register of Historic Places (NRHP) or documented Native American Traditional Cultural Properties (TCPs).	There would be no adverse effect on historic properties, archaeological sites eligible for listing in the NRHP, or Native American TCPs per the *no adverse effect* determination by the State Historic Preservation Officer on March 12, 2020. Professional archaeological monitoring would occur, and an inadvertent discovery plan would be followed.	Impacts would be the same as described under Alternative B.	Impacts would be the same as described under Alternative B.
Land Use, Utilities, and Service Systems	There would be no changes to existing intake facilities. The existing easement containing the underground conveyance pipeline would remain in effect. There would be no change in the current land uses, zoning, landownership, entitlements, or existing utilities aside from routine maintenance or future improvements.	Existing intake facilities and the conveyance pipeline would be modified, replaced, rehabilitated, and new intake elements would be constructed. Effects on land use would be unchanged. There would be no change in the current land uses, zoning, landownership, or entitlements. Relocation of at least one power pole and minor upgrades to the overhead electrical infrastructure could result in a temporary lapse in electrical supply to area users.	Impacts would be the same as described under Alternative B.	Impacts would be the same as described under Alternative B.

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Transportation and Traffic	There would be no change in the Level of Service (LOS), and drivers would not experience increase or decrease in delays or frustrations. Routine or extraordinary maintenance could impact traffic; the timing and extent of potential impacts would depend on the nature, extent, and timing of maintenance.	Heavy vehicle traffic using Icicle Road and Icicle Creek Road and the turnaround at the Forest Service and Alpine Lakes Wilderness kiosk would temporarily reduce the Level of Service (LOS) in these areas. Prohibiting parking at the turnaround would reduce access. Impacts could be greatest during weekends and in summer when traffic volumes and demands for access are highest. Traffic control BMPs would reduce effects.	Temporary reductions in LOS would be less than those described under Alternative B because there would be fewer heavy equipment vehicle trips accessing the intake construction area. Impacts on access would be the same as described under Alternative B.	Temporary reductions in LOS would be similar to those described under Alternative B during daytime hours. Overall daily impacts to traffic and transportation would be reduced under Alternative D as compared with Alternative B, as construction activities after 10:00 p.m. would not occur. However, these impacts would be experienced over a total of four construction seasons under Alternative D, instead of two seasons under Alternative B.

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Noise and Vibration	There would be no new construction activity that would affect ambient sound levels. Sensitive noise receptors would continue to experience community and traffic noise. There would continue to be noise and occasional vibration associated with current O&M of existing intake facilities and the conveyance pipeline.	Equipment and vehicle use associated with construction would raise ambient noise levels for sensitive receptors and increase vibration. Expected loudest noise levels would be generated by a pneumatic tool (Phase I construction) and hot air blower (Phase II construction). Increases in ambient noise levels could occur for up to 24 hours per day, and up to 7 days per week during construction.	Impacts would be similar to those described under Alternative B. However, under Alternative C, starting at the PISMA, the conveyance pipeline would be lined with CIPP to the USFWS parcel boundary, which could result in a slight increase in the duration of noise from use of the hot air blower. Additionally, Alternative C would require fewer truck trips to access the intake construction area, resulting in less construction noise for sensitive receptors along Icicle Road/Icicle Creek Road.	There would be no Phase I construction work from 10:00 p.m. to 7:00 a.m. under Alternative D, which would reduce daily noise impacts as compared with Alternative B. However, the overall duration of Phase I construction noise impacts would be experienced over four years under Alternative D, as compared to two under Alternative B. Additionally, the two diesel pumps associated with the temporary Hatchery water supply for Phase I construction would operate 24 hours per day and 7 days per week for a period of 8 months, as opposed to approximately 10 days under Alternative B.

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Recreation	There would be no construction-related changes to recreational opportunities, conditions, or access. More frequent maintenance may temporarily impact recreational conditions or access.	Temporary impacts to recreational conditions and access would occur during construction, which may temporarily depress recreational visitation rates by approximately 8 percent. Long-term benefits to recreational fishing would result from enhanced fish passage and aquatic ecosystem productivity.	Impacts on recreational opportunities, conditions, and access would be similar to those described under Alternative B, but impact intensity would be reduced because there would be less excavation of the conveyance pipeline and associated truck traffic and delays.	There would be less of a decline in annual recreation visits at the Snow Lake Trailhead (6 percent) as compared to Alternative B due to a shorter in-water work window. However, overall impacts to recreationists would be experienced over a longer total time period compared with Alternative B as Phase I construction-related disturbances, including noise, traffic delays, and temporary loss of recreationist parking along Icicle Creek Road and at the Snow Lakes Trailhead would extend for an additional 2 years, including during the peak recreation season for two additional seasons, compared with Alternative B.

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Visual Resources	Visual quality would remain unchanged and there would be no additional impacts to the viewshed. O&M activities would continue to be largely naturally screened from view to the casual observer.	Temporary impacts would occur from construction-related activities such as use of heavy machinery and warning signs, which would sharply contrast with the natural lines, form, and color within the existing viewshed, and construction noise, light, and level of the activity would draw the attention of the casual observer. Impacts from vegetation removal would diminish over time as planted and seeded vegetation matured. Impacts from O&M would be the same as Alternative A or slightly less due to an expected reduction in frequency of O&M activities.	Impacts would be similar to those described under Alternative B but would be reduced because there would be less construction-related activity due to lining a greater length of the conveyance pipeline. Disturbance in the Icicle Creek riparian zone would be reduced, reducing visual impacts to the characteristic landscape.	Impacts would be similar to those described under Alternative B, however overall impacts to visual resources would be experienced over a longer total time period compared with Alternative B as Phase I construction-related impacts would extend over four years, as compared with two years under Alternative B.

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Socioeconomics and Environmental Justice	Existing recreational opportunities, including recreational fishing in Icicle Creek and related values and spending, could be affected by decreased fish production due to degraded facilities. There would not be disproportionate environmental effects on low-income, minority and tribal populations.	Temporary recreational access constraints and delays would reduce recreational visits and related values and spending. Similarly, there would be temporary economic impacts in terms of value of lost time for motorists due to delays during constriction. There would not be disproportionate environmental effects on low-income, minority or tribal populations.	Impacts on socioeconomics would be similar to those described under Alternative B, but intensity of impacts would be reduced given that the degree of economic impacts from traffic disturbances would be reduced. Impacts on environmental justice would be the same as Alternative B.	Impacts on socioeconomics would be the same as described under Alternative B, but the impacts would be experienced over a longer total time period compared with Alternative B, as Phase I construction-related impacts would extend over four years, as compared with two years under Alternative B. Impacts on environmental justice would be the same as Alternative B.

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Hazardous Materials and Public Health and Safety	Lead-based materials are present at existing Hatchery infrastructure, these may enter the environment causing exposure to LNFH workers and aquatic species. Unsafe work conditions for LNFH workers, particularly during frazil ice events, would continue.	Lead-based materials on Hatchery infrastructure would be safely removed and disposed. Construction activities occurring from 10:00 p.m. to 7:00 a.m. could temporarily increase the risk of vehicle accidents, and the associated construction noise and light from during this time period may temporarily affect nearby residents and guests. Long-term work conditions would be improved, which would decrease risk of worker injury.	Impacts would be the same as described under Alternative B.	Impacts to hazardous materials would be the same as described under Alternative B. The two additional Phase I construction seasons would continue the risk of impacts to public health and safety described under Alternative B for an additional two years. Because Phase I construction work would not take place past 10:00 p.m. under Alternative D, the risk of vehicular accidents and noise impacts to sensitive receptors near the intake structure from 10:00 p.m. to 7:00 a.m. would be reduced as compared with Alternative B. Noise levels would exceed the nighttime Class A EDNA of 45 dBA or less for several residences off East Leavenworth Road and Cemetery Road near the spillway pool resulting from pumping for the Phase I temporary Hatchery water supply for an 8-month period.

Resource Topic	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C (Preferred Alternative)	Alternative D
Tribal Interests	There would be no impacts on Indian sacred sites, Indian Trust Assets (ITAs), or traditionally and culturally important hunting or plant gathering areas because these interests are not present in the Analysis Area. There would be no changes in access to or activities at the Wenatshapam Fishery. Ongoing impacts on fish passage from LNFH operations would continue, and fish production at the Hatchery could be jeopardized in the future due to continued degradation of existing facilities.	Impacts on Indian sacred sites, ITAs, and traditionally and culturally important hunting or plant gathering areas would not occur as described under Alternative A. No adverse impacts to access to and activities at the Wenatshapam Fishery are anticipated. Fishing activities could be temporarily impacted during construction from noise disturbance and reduced fishing area from pump screen boxes in the spillway pool. Temporary Hatchery water supply pumping activities at the spillway pool may occur during the same time as scaffolding repair, ceremonial, and fishing activities, but would not impact the ability of the Tribes to perform these functions. Improved fish passage, reduced potential for fish entrainment, and increased Hatchery production reliability would benefit the Tribal fishery.	Impacts on Indian sacred sites and ITAs would be the same as described under Alternative B. There would be slightly less disturbance to vegetation that could support culturally important plants; however, vegetation in the Analysis Area has not been identified as culturally important to date.	Impacts on Indian sacred sites and ITAs would be the same as described under Alternative B. Temporary impacts on the Tribal fishery would be the same as described under Alternative B, but the impacts would be experienced over a longer total time period compared with Alternative B, as Phase I construction-related impacts would extend over four years, as compared with two years under Alternative B. Pumping from the spillway pool would occur over a period of 8 months during Phase I of construction and could result in temporary noise or displacement impacts to Tribal fishers.

Chapter 3. Affected Environment and Environmental Consequences

3.1 Introduction

This chapter summarizes the current environmental resources and resource uses that could be affected by the No Action Alternative and the action alternatives carried forward for detailed analysis, as described in **Chapter 2**. Potential impacts are described in terms of duration, intensity, and context.

For the purposes of this analysis, impact duration is defined as follows:

- Temporary: impacts that would only occur during construction.
- Short-term: impacts that would be less than 3 years in duration.
- Long-term: impacts that would be 3 years or greater in duration.

For the purposes of this analysis, impact intensity is defined as follows:

- Negligible: changes would not be detectable or measurable. The resource topic would be essentially unchanged or unaltered.
- Minor: changes would be detectable, localized, and/or measurable and would have a slight change or alteration to the resource.
- Moderate or major: changes would be measurably to clearly or readily detectable, and/or have an appreciable to severe effect on the resource or resource use. The resource or resource use would be notably to substantially changed or altered. Project activities could change the indicator over a small to large area and/or from a moderate to large degree.

For the purposes of this analysis, impact type is defined as follows:

- Adverse: impacts that would have a detrimental effect to a resource.
- Beneficial: impacts that would have a positive effect to a resource.

Context is the setting within which an impact is analyzed:

- Local: within and immediately adjacent to the Project Area.
- Regional: the area outside of the Project Area but within Chelan County.

3.2 Resource Topics Analyzed

Table 3-1 identifies the presence or absence of resources or resource uses in the Project Area and the rationale for those that warrant detailed analysis in the EIS. All resources went through an analysis of alternatives; these analyses are included in the SWISP Project EIS Resource Reports, which are available on the Project website: https://www.usbr.gov/pn/programs/leavenworth/swisp/docs.html.

The potential for the No Action alternative and action alternatives to affect other resources or resource uses are also documented in **Table 3-1**. Resources or resource uses that may be affected by the alternatives more than a negligible or minor amount or are required to be addressed in NEPA are further described in the EIS as noted in **Table 3-1**.

Table 3-1. Determination and Rationale for Detailed Analysis by Resource Topic

Resource Topic	Determination and Rationale for Detailed Analysis
Air Quality and Climate	**Air Quality** LNFH is in an area that is in attainment for all national and state ambient air quality standards. Five-year air quality trends in Chelan County show that the air quality most days is good. These conditions are not expected to change under the No Action alternative. Construction activities under the action alternatives would generate fugitive dust during surface-disturbing activities and from travel on unpaved portions of access roads and staging areas. Emissions would be localized to the area surrounding any given construction activity and would cease when construction ends, and any temporary disturbance areas are revegetated, or water is returned to previously dewatered areas. Most activities would occur on already disturbed areas, limiting the creation of new areas of disturbance. Fugitive dust impacts would be minimized using standard dust control measures. Construction activities under the action alternatives would also generate a temporary, unavoidable adverse source of criteria air pollutants and small amounts of hazardous air pollutants through the combustion of fuel in commute vehicles, trucks, construction equipment, and pumps and generators. BMPs would be implemented to minimize combustion-related emissions, including from traffic congestion. Emissions associated with O&M would be less than under current conditions because the frequency and intensity of maintenance activities would be reduced. **Climate** Greenhouse gas emissions are expected to continue along current trends under the No Action alternative. The action alternatives would result in temporary emissions of greenhouse gases through the combustion of fuels and would release minor amounts of carbon in soils and vegetation during surface-disturbing activities. These would contribute to global greenhouse gas levels but would be below 25,000 metric tons of carbon dioxide equivalents per year. BMPs that reduced

Resource Topic	Determination and Rationale for Detailed Analysis
Air Quality and Climate (*continued*)	combustion-related criteria pollutant emissions would also reduce greenhouse gas emissions. Historical trends and future climate projections show increased warming and shifts in the seasonality of precipitation. The movement of the Wenatchee River Watershed and the Icicle Creek Subbasin from a snow-dominant watershed to a rain/snowmelt transient watershed would result in less snowpack, earlier runoff, and more precipitation falling as rain, affecting the timing and volume of flows entering Icicle Creek. Projected climate-induced hydrological changes are generally not anticipated to affect Hatchery operations, as water needs would continue to be met through a combination of surface water and groundwater inputs, as well as storage from Nada and Snow Lakes. However, the timing of groundwater inputs and storage water use may be affected based on instream flow and temperature conditions that differ from those found historically. Under the action alternatives, LNFH would continue to divert instream waters from Icicle Creek and draw on groundwater resources to support Hatchery operations. Rehabilitating the LNFH surface water intake and delivery system would not affect water usage requirements or rates compared with current conditions; the authorized diversion rate from Icicle Creek or groundwater or storage water rights would be the same as under current conditions. Because there would be no changes in diversions from Icicle Creek, the action alternatives would not impact the hydrological conditions of Icicle Creek and therefore not enhance any climate-induced hydrological changes. Because temporary, unavoidable adverse impacts would be minimized by BMPs and because there would be no long-term impacts on air or climate, these resources are not discussed further. Detailed analysis in this EIS is not warranted.
Geology and Soils	Under the No Action alternative, there would be no new impacts to geology or soils and there would be no change to existing conditions. Under the action alternatives, the construction of Project components, temporary access routes, storage and work areas, and the cut and cover replacement of sections of conveyance pipeline would result in localized, unavoidable adverse effects on geologic material and soils. BMPs such as minimizing surface disturbance, erosion controls, and reclamation of temporarily disturbed areas would reduce the intensity of impacts; however, the construction of permanent facilities would result in the irretrievable commitment of soil resources (0.18 acres), and impacts on geology would include the movement of geologic materials. Because impacts would be routine, the action alternatives would have minor adverse impacts on soils and geology, and these resources are not discussed further. Detailed analysis in this EIS is not warranted.
Water Resources	See detailed analysis in **Section 3.3**, Water Resources.

Biological Resources	**Vegetation, including Special Status Species** Vegetation in the Project Area is departed from historic, natural conditions and does not provide high ecosystem value. The majority of vegetation in the Project Area is characterized by early seral disturbed communities or is developed and landscaped in the urban areas of the City of Leavenworth. These conditions are not expected to change under the No Action Alternative. Under the action alternatives, Project design and BMPs would avoid vegetation modification to the extent feasible, reduce potential spread of nonnative, invasive and noxious weed species, and rehabilitate temporarily disturbed vegetation after construction. Reclamation would implement a Revegetation Plan that would include seeding of temporarily disturbed areas during Phase I and II of construction, and replanting of upland and riparian vegetation at the intake construction area (Phase III). This would help maintain existing vegetation conditions in most temporarily disturbed areas and improve native species and structural diversity of upland and riparian vegetation in the Icicle Creek riparian zone near the intake construction area. The action alternatives would result in negligible unavoidable adverse effects on vegetation outside of the Icicle Creek riparian zone (0.18 acres of permanent disturbance) and would ultimately result in long-term benefits to vegetation in the Icicle Creek riparian zone. There are no occurrences of ESA-listed or other special status plants and there is low potential for these species to occur due to the low quality of the habitat in the Analysis Area. As such, this resource is not discussed further. Detailed analysis in this EIS is not warranted. **Fisheries, including Special Status Species and Aquatic Ecosystems** See detailed analysis in **Section 3.4**, Fisheries, including Special Status Species and Aquatic Ecosystems. **Terrestrial Wildlife, including Special Status Species** Wildlife diversity is related to the structure and composition of vegetation communities. As vegetation communities in the Analysis Area are departed from natural conditions and fragmented by development, most of the Analysis Area provides lower-quality wildlife habitat and support limited wildlife diversity and populations. Existing urban development and human-related disturbances limit wildlife use to those species adapted to disturbance. These conditions are not expected to change under the No Action alternative. Most terrestrial wildlife species are mobile and would avoid temporary construction impacts so potential for injury or mortality is not expected. Project BMPs to remove vegetation outside the breeding bird season or avoid nesting birds through pre-construction surveys would minimize impacts to migratory birds to negligible levels. Wildlife habitat that is potentially disturbed during construction would be rehabilitated to pre-construction conditions through seeding or improved through Phase III upland and riparian plantings at the intake construction area. The action alternatives may affect, but are not likely to adversely affect, the endangered gray wolf (*Canis lupus*), as described in the SWISP Project EIS **Biological Resources Report** and SWISP Project EIS Biological Assessment. Gray

Resource Topic	Determination and Rationale for Detailed Analysis
Biological Resources (*continued*)	wolves are not known to occupy the Analysis Area, and this area does not contain high quality, continuous habitat for wolf breeding or hunting, but sightings of transitory individual wolves have been reported in the vicinity. There is a possibility that an individual wolf could move through the Analysis Area and be affected by the action alternatives, though any effects are expected to be negligible. Other ESA-listed and special status terrestrial wildlife species have low potential to occur in the Analysis Area and would be able to avoid temporary construction activities. BMPs would reduce impacts to nesting birds, mule deer, and mountain goats during sensitive periods. The action alternatives would provide long-term beneficial effects to terrestrial wildlife in the Icicle Creek riparian zone, and negligible adverse impacts to terrestrial wildlife, including special status species in other portions of the Project Area. As such, this resource is not discussed further. Detailed analysis in this EIS is not warranted.
Cultural Resources	The LNFH Historic District is the only recorded historic aboveground/architectural property within the Area of Potential Effects (APE). There are four noncontributing resources associated with the LNFH in the APE associated with the LNFH water supply. They are outside of the Historic District, however, and are noncontributing due to a lack of historic integrity. There are four archaeological sites within a mile of the APE, but none within it. One site has been determined eligible for listing in the National Register of Historic Places (NRHP), while another site has been determined not eligible for listing, and two sites have not been formally evaluated. There are no Traditional Cultural Properties (TCPs) within a mile of the APE. There are no local or county historic registers that list historic properties within or in the vicinity of the APE. Under the No Action alternative, the continued deterioration of the existing intake facilities and conveyance pipeline may adversely affect buildings or structures within the LNFH Historic District, resulting in a greater risk to historic properties than the action alternatives. There would be no effect on documented archaeological resources eligible for listing in the NRHP or documented Native American TCPs. As lead agency for Section 106 consultation, the USFWS determined, and the Washington State Department of Archaeology and Historic Preservation (DAHP) concurred, that Alternative B would have no adverse effect on historic properties. The DAHP also concurred that Alternative B would not adversely affect any archaeological sites eligible for listing in the NRHP or Native American TCPs. This concurrence was made with the stipulation that professional archaeological monitoring and an inadvertent discovery plan be included as part of the proposed undertaking. Effects would be the same under Alternatives C and D. As such, this resource is not discussed further. Detailed analysis in this EIS is not warranted.

Resource Topic	Determination and Rationale for Detailed Analysis
Land Use, Utilities, and Service Systems	There would be no change in the current land uses, zoning, landownership, or entitlements under any alternatives. Under the No Action alternative, no new impacts to land use, utilities, and service systems would occur. Under the action alternatives, Reclamation would obtain a temporary easement or use authorization to accommodate construction activity outside the existing pipeline easement. The easement or authorization would temporarily preclude other activities from taking place in that area. Once construction is completed the temporary easement or authorization would cease and the existing or temporary easements would be returned to pre-Project or better conditions, including reseeding any disturbed areas of vegetation. The relocation of electrical infrastructure at the intake construction area could temporarily disrupt electrical service. Other utility infrastructure would be avoided during construction with no impacts on those utilities. As such, these resources are not discussed further. Detailed analysis in this EIS is not warranted.
Transportation and Traffic	See detailed analysis in **Section 3.5**, Transportation and Traffic.
Noise and Vibration	See detailed analysis in **Section 3.6**, Noise and Vibration.
Recreation	See detailed analysis in **Section 3.7**, Recreation.
Visual Resources	Under the No Action alternative, no new impacts to visual resources would occur and there would be no change to existing conditions. Development of the action alternatives would temporarily impact visual resources in the Analysis Area, mainly due to construction-related and O&M activities. These impacts would generally be weak in intensity, based on the relative time span, the location and size of staging areas, and the amount of associated activity. Generally, these unavoidable adverse impacts would be temporary and would end once construction is complete. Additionally, various design features and BMPs would help reduce the visual contrast of the proposed Project elements within the existing viewshed and would have beneficial and long-term effects for the casual observer. Alternative C would result in slightly less impacts on visual resources, given that the pipeline would be lined as opposed to replaced, reducing disturbance on surrounding riparian areas. All action alternatives would have negligible short-term adverse and long-term beneficial impacts on visual resources. As such, this resource is not discussed further. Detailed analysis in this EIS is not warranted.

Resource Topic	Determination and Rationale for Detailed Analysis
Socioeconomics and Environmental Justice	**Socioeconomics** Under the No Action alternative, no new impacts to socioeconomics would occur and there would be no change to existing conditions from O&M activities. Existing recreational opportunities, including recreational fishing in Icicle Creek and related values and spending, could be affected by decreased fish production due to degraded facilities. Development of Alternative B would result in job contributions representing a 2.4 percent increase in the Chelan County construction workforce and a 0.1 percent increase in total workforce in the county. This relatively small, short-term increase in construction labor would not contribute notably to regional employment and income. No measurable increase in employment or income is expected to occur from normal ongoing O&M of the Hatchery once the proposed improvements to the surface water intake and delivery system are complete. Temporary recreational access constraints and delays on Icicle Creek Road would result in a reduction in recreational visits and a corresponding estimated economic value reduction of $412,000 annually over the Project construction timeframe. When compared to the "without Project" scenario, this represents 0.2 percent of the total economic value of recreation benefit in the Analysis Area. Similarly, the estimated total cost in terms of value of lost time for motorists due to Alternative B would total approximately $22,484 over the total duration of the Project construction period. Under Alternative C, the nature and type of temporary impacts would be the same as described under Alternative B, but the intensity of impacts would be reduced given that the degree of economic impacts from traffic disturbance would be reduced. Under Alternative D, the nature and type of temporary impacts would be experienced over a longer total time period as compared with Alternative B. For these reasons, this resource is not discussed further. Detailed analysis in this EIS is not warranted. **Environmental Justice** See detailed analysis in **Section 3.8**, Environmental Justice.
Hazardous Materials and Public Health and Safety	**Hazardous Materials** Lead-based materials were detected at existing Hatchery infrastructure in the Analysis Area. Under the No Action alternative, there would be unavoidable adverse impacts as Hatchery employees would continue to be exposed to lead-based materials from the gatehouse and intake access pad. Hazardous materials such as used oil, diesel fuel, and solvent-based paints may be used in construction under the action alternatives. All hazardous materials used during construction under the action alternatives would either be recycled or disposed of at an appropriately permitted treatment or disposal facility. BMPs would help to reduce to negligible levels or eliminate impacts related to hazardous materials. For these reasons, this resource is not discussed further. Detailed analysis in this EIS is not warranted. **Public Health and Safety** See detailed analysis in **Section 3.9**, Public Health and Safety.
Tribal Interests	See detailed analysis in **Section 3.10**, Tribal Interests.

Source: SWISP Project EIS Resource Reports are available on the Project website: https://www.usbr.gov/pn/programs/leavenworth/swisp/docs.html

3.3 Water Resources

3.3.1 Analysis Area

For water resources (stream geomorphology and water quality), the Analysis Area is where proposed Project activities would occur along the Icicle Creek corridor. It stretches from the hydraulic drop approximately 230 feet upstream from the LNFH intake facilities to river mile (RM) 2.3 at the Ecology compliance point on Icicle Creek, downstream from the LNFH, and includes the Hatchery Channel and the Historical Channel (**Map 3-1** in **Appendix A**).

3.3.2 Affected Environment

The nearly 80-year-old LNFH surface water intake and delivery system is rapidly deteriorating and is reaching the end of its design life, creating excessive operation and maintenance problems for the LNFH. The current diversion system on Icicle Creek, at RM 4.5, consists of a concrete rubble dam and modified intake. Upgrades have been retrofitted into the existing older system. Operation of the system is complicated by large accumulations of silt and sediment during spring runoff. In addition, during harsh winter conditions, intake water can be cut off or reduced due to massive frazil, and anchor ice builds up on the existing intake racks. The removal of this ice is required to maintain proper water supply to the LNFH (Reclamation 2020b).

The current diversion system is in a confined canyon and channel width is limited. A rapid exists about 1,000 feet upstream of the diversion pool that creates a natural break in the extent of the backwater pool. Immediately downstream of the existing low-head diversion dam, a natural boulder drop of about 2 to 3 feet is present with a deep 3-foot scour hole formed from the hydraulic drop over the boulders. The channel profile consists of numerous runs and riffles with occasional shallow pools. The channel bed consists of large boulders and bedrock armor with sand, gravel, and cobble deposits. The hydrology and sediment characteristics of Icicle Creek are described in further detail in *Surface Water Intake Screening and Fish Passage 2D Hydraulic Modeling* and incorporated by reference (Reclamation 2020d).

The largest portion of the incoming sediment load to the diversion structure is estimated to be sand to fine gravel, with a small portion being larger gravels and cobbles. The channel bed is visibly composed of large cobbles and boulders in rapids, with sand and gravels present in pools and on sediment bars and low floodplain. Channel margins often contain pockets of fine sediment (silt and clay) and fine sand deposited in between the exposed boulders (Reclamation 2020d).

As described in the *Icicle Strategy* (Chelan County and Ecology 2019), designated uses for various locations in Icicle Creek are aquatic life uses, recreational uses, water supply uses, and miscellaneous uses. Potential sources of water quality degradation include flow diversion, stormwater runoff from adjacent roads and developed areas, point-source discharges from water treatment plants and other facilities, non-point-source pollutants from septic systems, and recreational uses. Water quality parameters affected by pollutants from these sources include temperature, dissolved oxygen, pH, turbidity, nutrients, fecal coliform bacteria, and concentrations of various pollutants, including heavy metals and organic compounds (Chelan County and Ecology 2019).

Chapter 173-201A WAC contains water quality standards for surface waters of the state of Washington. Waters whose designated uses (listed in WAC Sections 173-201A-200, 173-201A-600, and 173-201A-602) that are impaired by pollutants are placed in the polluted water category (Category 5) of the water quality assessment (Ecology 2020a). The 303(d) list contains waters in the polluted water category. TMDLs or other approved water quality improvement projects are required for waterbodies with Category 5 impairments (Ecology 2020b). A TMDL is a numerical value that represents the highest amount of a pollutant a surface water body can receive and still meet the standards (Ecology 2020c).

Sections 303(d) and 305(b) of the CWA require states to identify and characterize waters that do not meet, or are not expected to meet, applicable water quality standards. The Washington State water quality standards applicable to Icicle Creek are as follows (Reclamation and USFWS 2018):

- Temperature: 55 degrees Fahrenheit (13 degrees Celsius) from August 15 to July 15 and 61 degrees Fahrenheit (16 degrees Celsius) from July 15 to August 15.[23]
- Turbidity: To protect core summer salmonid habitat, the maximum turbidity shall not exceed 5 nephelometric turbidity units (NTUs) over background when the background is 50 NTUs or less; or a 10 percent increase in turbidity when the background turbidity is more than the 50 NTUs.
- Ecology completed a TMDL for the Wenatchee River watershed, including Icicle Creek, for dissolved oxygen and pH, which was approved by the EPA on August 25, 2009.
  - Phosphorus: The TMDL allocates 5.7 micrograms per liter (maximum daily total phosphorus concentration) and 0.52 kilograms per day of total phosphorus maximum daily mass loading during the critical periods of March through May and July through October to the LNFH. Construction activities may need a separate NPDES permit than what the LNFH operates under. If needed, this would be obtained by the construction contractor.
  - Dissolved oxygen: To protect core summer salmonid habitat, the 1-day minimum dissolved oxygen criterion is 9.5 milligrams per liter and should not fall below this concentration frequency more than once every 10 years on average.
  - pH: pH shall be within the range of 6.5 to 8.5 standard units, with a human-caused variation within the above range of less than 0.2 units.

3.3.3 Environmental Consequences

Actions associated with the alternatives are described in **Chapter 2** of the EIS. Also, proposed Project features are described in *Surface Water Intake Screening and Fish Passage 2D Hydraulic Modeling* and incorporated by reference (Reclamation 2020d).

Indicators and Assumptions

The indicators for identifying impacts on water resources relative to the baseline conditions are the following:

- Changes to stream geomorphology

[23] Natural water temperatures for Icicle Creek often exceed the limits set in the TMDL.

- Increase or decrease to water quality standards (for temperature, dissolved oxygen, pH, and turbidity) outlined in Chapter 173-201A WAC.
- Compliance with the TMDL at Ecology monitoring point at RM 2.3.

The following analysis assumptions were used in the water resources analysis:

- An application for a water right is not needed for this Project, nor will there be a change in the point of diversion, and no water rights held for the LNFH or its neighbors will be impacted by any action under the alternatives.

Additional Project assumptions used in the analysis are described in **Appendix C**, SWISP Project EIS Analysis Assumptions.

Alternative A – No Action Alternative

Under Alternative A, there would be no new proposed projects that would affect stream geomorphology or water quality. There would continue to be surface disturbances for O&M within the 100-year floodplain and Icicle Creek affecting 0.03 acres under Alternative A. During cold weather, ice accumulation at the intake and subsequent alterations in water flow would continue, which would continue to affect stream geomorphology, such as through sedimentation. Throughout the year, sedimentation affects the intake and conveyance structures, which can reduce effective water delivery. Accumulation of sediment in the intake channel and associated O&M needs would continue. Sediment would continue to be removed from the creek, thereby removing it from its contribution to stream geomorphology and stream conditions. When needed, the outlet channel would continue to direct bypassed water and sluice material (sediment) from the gatehouse back to Icicle Creek. Because ongoing operations would continue with existing conditions, there would be no change in compliance with water quality standards (for temperature, dissolved oxygen, pH, and turbidity) outlined in Chapter 173-201A WAC.

Alternative B – Proposed Action

Surface disturbances within the 100-year floodplain and Icicle Creek would affect 0.73 acres under Alternative B (Reclamation GIS 2020), an increase of 0.7 acres compared with Alternative A because of construction activities. Only 0.25 acres would be permanent disturbances because of new infrastructure in the 100-year floodplain and Icicle Creek. None of the new infrastructure would be of a configuration or height that would alter water flow during a 100-year flood in such a manner as to threaten downstream conditions.

Temporary in-stream impacts would occur during the use of cofferdams. **Appendix B**, Best Management Practices, contains BMPs that would be implemented to minimize impacts on stream geomorphology during construction.

Preparation of the streambed, placement, and removal of the cofferdams would mobilize sediments on the Icicle Creek streambed. This could increase turbidity in and downstream of the work area during and shortly after cofferdam placement or removal. Also, the cofferdams would confine surface water flow through a constricted portion of Icicle Creek during construction. Natural stream flow, excluding the temporary 40 cfs diversion to the Hatchery, would be maintained within the

greatest amount of natural streambed width as possible during the use of the cofferdams. A minimum depth of 0.8 feet would always be maintained within the greatest amount of the natural stream channel during the use of the cofferdams to facilitate fish passage.

The cofferdam design is estimated to be approximately 12-feet wide at the base with a tapered width as it rises to approximately 9-feet. The temporary cofferdams would likely consist of geo-bags, or non-woven geotextile bags. These are large bags made of synthetic materials, such as polyester, polypropylene, or polyethylene, which are filled with sand, rock, or other material, and fastened shut. Cofferdam configurations are modeled for a July through October construction timeframe in *Surface Water Intake Screening and Fish Passage 2D Hydraulic Modeling* and are incorporated here by reference (Reclamation 2020d). The hydraulic modeling informs height requirements to prevent overtopping and identifies high velocity areas that may require additional stabilization to prevent breaching failure from lateral erosion.

Cofferdams would be used between July 1 and November 15 for two separate construction seasons to complete Phase I construction. Typically, mean daily flows peak during snowmelt months in late spring (May to June) and can drop quite low for autumn months (September to December) (Reclamation 2020d). Changes to stream geomorphology from cofferdam use would be minimized during autumn months because of low flow conditions.

High flows generally occur in May and June, but winter months can have high flows or extensive snow and ice conditions. Occasionally peak annual floods have occurred in July and October, which may require adjustment to the start and completion date for a given construction year (Reclamation 2020d). As flow in the creek increases, more water is forced to flow through a constricted portion of Icicle Creek during construction. The rapid flow through a confined area can scour the creek bed or creekbank. Snow and ice can block water flow; this would be more likely to occur in confined areas.

Floods would also be a concern for inundating areas and overtopping a cofferdam. Geo-bag cofferdams would not be suitable for use in Icicle Creek during heavy or prolonged precipitation or rain-on-snow events that typically occur between November and April, or during typical flows resulting from spring runoff in May and June. The possibility of flash-flooding events in Icicle Creek is not speculative; analysis of long-term flow data indicates a 50 percent probability that mean daily flow rates can more than double during fall flash-flow events, and increase by a dramatic order of magnitude during certain spring runoff events (Reclamation 2020d). Cofferdams are proposed for use from July 1 to November 15 of each of the two Phase I construction seasons, thus there is the potential for overtopping in early November, depending on the precipitation events.

Both typical and unpredictable high-flow events would have the potential to dislodge or destroy geo-bag cofferdams. Further, cofferdam failure during high flows could release tons of sediment or rock into Icicle Creek. Depending on the volume and type of material released, there could be long-term changes to the Icicle Creek streambed, primarily by increasing the proportion of sands, gravels, and fine sediments. Further, cofferdam failure could expose uncured concrete to water in Icicle Creek. Concrete is highly alkaline (pH 12.5). If concrete was cast less than four days before cofferdam failure, the leaching of alkali from the uncured concrete would likely result in increases to both the

pH and phosphorus levels in Icicle Creek, which could also lead to a violation of the pH and phosphorus TMDLs.

During construction, open trench work would occur next to Icicle Creek. This would involve removing trees adjacent to Icicle Creek during Phase I and Phase II. Activities that modify the amount of shade over streams have been associated with increases in water temperature. The loss of riparian vegetation can be directly linked to increased water temperatures due to the loss of shade. Also, the solubility of oxygen decreases as water temperature increases. The number of trees that would be removed is unknown, but tree removal under Alternative B could contribute to increasing water temperature and lower dissolved oxygen. To address this, Phase III would involve planting riparian trees. These impacts would persist until riparian trees matured.

During operation and maintenance, compared with Alternative A, the intake design would manage sediment deposition to prevent accumulation of sediment that would impede or bury the fish screens at the intake location. It would also manage debris including large logs that may be transported into the site and impact fish passage or intake operations. This would allow sediment and logs to remain in the creek and contribute to stream conditions and no longer affect intake operations.

Arrangement of bed materials would demonstrate similar channel complexity to the adjacent stream reaches. The cap of the existing low-head diversion dam would be removed or buried, and the channel would be recontoured to promote fish passage and the movement of sediment from above the intake to downstream areas, thereby improving stream flow and stream conditions. Also, because the site uses a constructed roughened channel, an annual (at a minimum) monitoring plan at least until after a 50-year stream flow event has occurred would be prepared and implemented. This would identify any stream geomorphology concerns, such as accumulation of sediment exceeding levels that cannot be managed by proposed intake and delivery system design. Such cases would be considered extraordinary maintenance, which would occur on a case-by-case basis as determined to be necessary by the Hatchery.

During construction, surface disturbances and equipment use in and adjacent to Icicle Creek could result in contaminants entering the creek and affecting the quality of the water. Construction would occur within the area isolated by the cofferdam and adjacent to the creek. This would involve the use of equipment containing lubricants, fuel, or other substances, that could contaminate creek water if, for example, these materials were deposited on the ground during construction work and carried to the creek by surface water runoff. Surface water runoff can also carry soil into the creek from areas where the soil surface is disturbed during construction work, thereby increasing turbidity downstream in the creek.

Under Alternative B, increases or decreases to water quality concentrations or limits as they relate to the state standards and construction permit limits would be addressed by complying with the following permits or approvals:

- CWA Section 401 from Ecology
- CWA Section 404 from the USACE
- Hydraulic Project Approval from WDFW

Water quality would continue to be monitored during construction at the LNFH by the USFWS. Compliance with TMDLs for the LNFH would be monitored at RM 2.3, Ecology's TMDL monitoring site, to verify that construction at the intake is not exceeding TMDL limitations; exceedance of the TMDLs are not expected to occur. Additionally, BMPs in **Appendix B**, Best Management Practices, would be implemented to minimize impacts on water quality.

Cement is rich in calcium and contains aluminum and iron also. All three can readily bind phosphorus. The TMDL indicates phosphorus is the limiting nutrient in Icicle Creek, and the nutrient tied to pH levels. Concrete used for proposed in-water infrastructure would be cured in place behind cofferdams for at least four days before exposure to Icicle Creek water. Similarly, because work to break apart and remove large boulders from the intake construction area would be done behind cofferdams, freshly fractured rock would not be expected to contribute phosphorus to Icicle Creek water. This would guard against fresh concrete or broken rock increasing phosphorus in surface water, especially during the critical periods March to May and July to October.

In addition to Alternative B, other plans and projects in or near the Analysis Area would benefit water resources in the long term. These include the Trout Unlimited Icicle Creek Boulder Field Fish Habitat Improvement Project, continued implementation of the Recovery Plan for Upper Columbia River Spring Chinook Salmon and Steelhead and the USFWS Bull Trout Recovery Plan, relocating and replacing the City of Leavenworth water supply pipeline and fish screen, replacing and relocating the Icicle and Peshastin Irrigation District's fish screens, and improving fish passage at the Icicle and Peshastin Irrigation District and City of Leavenworth diversion dam. These projects would improve stream geomorphology and water quality parameters for Icicle Creek.

Alternative C

The impacts under Alternative C on stream geomorphology and water quality would be similar to those under Alternative B, except Alternative C would remove fewer streamside trees that shade Icicle Creek, so the potential for increased water temperature and lowered dissolved oxygen would be reduced compared to Alternative B. There would be no tree removal in the area adjacent to Icicle Creek associated with Phase II construction.

Alternative D

The nature and type of impacts on stream geomorphology and water quality under Alternative D would be the same as those described under Alternative B; however, under Alternative D, Phase I construction would span four in-water work windows as compared to two under Alternative B, because construction would be limited to 7:00 a.m. to 10:00 p.m. and the in-water work window would be two weeks shorter (July 1 to October 31). Phase I construction would start in 2022 and end in 2025. As such, temporary impacts to stream geomorphology and water quality would be experienced over a longer total duration than under Alternative B.

Installation and removal of cofferdams would be required for each of the four Phase I construction in-water work windows (July 1 to October 31). For comparison, under Alternative B, installation and removal of cofferdams would be required for only two Phase I construction in-water work windows (July 1 to November 15). The types of impacts from cofferdam use would be the same as those described under Alternative B, but they would span two more in-water construction seasons.

Additionally, due to the shorter in-water work window, Alternative D would reduce the potential for geo-bag cofferdams to be dislodged or destroyed due to high-flow events potentially occurring in November.

From November 1, 2022 to June 30, 2023, the Hatchery's surface water would be supplied by pumping from the spillway pool. Two high-capacity pumps would be used to provide 40 cfs of water to the Hatchery, with an additional back-up pump on site. Although long-term reliable delivery of water and the ability to meet Hatchery production goals would be improved under this alternative; there would be a risk of temporary impacts to Hatchery production from relying on pumps operating continuously for 8 months from 2022-2023. Pumping water from the spillway pool would recirculate Hatchery effluent water, as the pool is the location of the Hatchery's main discharge point. Over time, without water treatment, water quality reaching the Hatchery would be decreased.

3.4 Fisheries, including Special Status Species and Aquatic Ecosystems

3.4.1 Analysis Area

The Analysis Area for fisheries, including special status species, and aquatic ecosystems, includes the area below the ordinary high water mark (OHWM) of Icicle Creek, from 230 feet upstream of the intake construction area at RM 4.5, to the ecology compliance monitoring location at RM 2.3, downstream of the LNFH (see **Map 3-1** in **Appendix A**).

3.4.2 Affected Environment

Aquatic Habitat

Icicle Creek is a snowmelt-fed, 31.8-mile-long, fourth order tributary of the Wenatchee River (USFWS 2011). The measured flow in Icicle Creek ranges from a minimum of 44 cfs to a maximum of 14,100 cfs, according to readings taken from the U.S. Geological Survey (USGS) gauging station (No. 12458000) at RM 5.8, located above all major water diversions (Reclamation and USFWS 2018, pp. 43–49). The discharge of Icicle Creek is altered by water diversions, which can reduce the flow in the lower reaches to very low levels during summer and early fall. Near the LNFH, Icicle Creek splits to form the Hatchery Channel and the Historical Channel of Icicle Creek. The Hatchery and Historical Channels split at Structure 2 (RM 3.8) and rejoin one another at RM 2.9 (**Map 3-1** in **Appendix A**). The Hatchery Channel is a human-made, straight channelized section of this creek segment.

Icicle Creek is characterized by steep slopes on both banks. Vegetation on the banks of both the Historical and Hatchery Channels of Icicle Creek is primarily upland vegetation and shrub habitat (USFWS 2016). Thus, aquatic habitat within the channels essentially transitions to upland habitats with no intermediate riparian zone or floodplain. This combined with high water fluctuations throughout the year, limits establishment of mature riparian vegetation. Although freshwater wetlands have been documented in the vicinity and are associated with the Historical Channel (see

Section 3.2.1 of the SWISP Project EIS **Biological Resources Report**), there are no wetlands associated with Icicle Creek and the Hatchery Channel in the Analysis Area (USFWS 2016).

There are approximately 4.0 miles of instream (aquatic) habitat in the Analysis Area. Instream habitat includes the combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources (WDFW 2008).

In its entirety, Icicle Creek provides important, high quality, and relatively undisturbed instream habitat for a variety of anadromous and resident fish. However, aquatic habitat quality in lower Icicle Creek (which includes the Analysis Area) is considered impaired due to previous land uses, such as forestry practices, private land development in the historical floodplain and riparian zone, roads, and agriculture. The installation of dams and diversions have created passage barriers, decreased flows, altered in-stream morphology and floodplain function, degraded water quality, and caused overall in-stream habitat degradation (Chelan County and Ecology 2019; NMFS 2017a).

Current streamflow in Icicle Creek during low flow periods is too low for reliable fish passage at the low-head diversion dam or fish ladder/sediment sluice and reduces habitat availability (Reclamation 2020d). The construction of LNFH and continued development in the Icicle Creek basin has exacerbated aquatic habitat and fish passage issues (Chelan County and Ecology 2019; NMFS 2017a). Two instream structures (Structure 2 [RM 2.8], and Structure 5 [RM 3.8]) are used during Hatchery operations and broodstock collection. Operation of these structures periodically limits fish passage on Icicle Creek. Currently, operation of Structures 2 and 5 may limit fish passage during spring and early summer when broodstock collection for LNFH is occurring (beginning as early as June 3). Structure 5 is closed once a 50-fish "trigger" has been hit or low Chinook returns warrant a closure. This also prohibits non-Hatchery fish from moving upstream of LNFH during this time. Until such time, Structure 5 remains open to fish passage (NMFS 2017a). Structure 2 is reopened by June 24, and Structure 5 is reopened by July 7, restoring passage opportunities between RM 2.8 and 3.8 (USFWS 2011).

Operation of Structure 2 can also limit passage by decreasing flows in this reach when the gates are closed to divert water into the Hatchery Channel (Chelan County and Ecology 2019). The Icicle Creek Boulder Field at RM 5.6, upstream of the Analysis Area, also serves as a natural barrier under typical flow conditions, and, thus, limits fish passage above the Analysis Area reach. At the existing intake facilities, the low-head diversion dam diverts water from Icicle Creek to the intake channel, through an unscreened diversion. The diversion sediment sluice has been modified to function as a fish ladder, however, fish passage is impeded because current flows at the fish ladder/sediment sluice do not meet NMFS guidelines for fish attraction. Fish passage is impeded during low flows in particular. Entrainment of anadromous and resident fish occurs at the existing unscreened intake facilities.

Icicle Creek within the Analysis Area has very steep banks, which limits riparian cover and does not provide much access to slow moving pools with overhanging banks, for fish to feed or rest. Stream velocities and substrate limit production of the macroinvertebrate community and do not offer significant foraging opportunity for fish species. Suitable spawning gravel/cobble patches and

substrate is not common within the Analysis Area, and much of the substrate is embedded with fine sediment or armored making it unsuitable spawning habitat for ESA-listed species (USFWS 2005).

Climate change effects (e.g., elevated temperatures and changes in precipitation patterns) are expected to shift the hydrograph so peak flows occur earlier in the year, with low flow periods spanning more of the summer months. These changes in streamflow are expected to impact aquatic habitat conditions and fish passage (Chelan County and Ecology 2019). Also, water temperature may increase as water input from snowmelt decreases, and input from rain increases, due to climate change.

Hatchery Fish Production History

Over the years, the LNFH production program has included a variety of species, including Spring and Summer Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*Oncorhynchus kisutch*), Steelhead, Sockeye Salmon (*Oncorhynchus nerka*), and various resident salmonids. The LNFH currently rears only the "Carson lineage" stock of the Spring Chinook Salmon and targets a release of 1.2 million Spring Chinook Salmon smolts into Icicle Creek (at approximately RM 2.7) during mid-April. Production goals at LNFH are set by the Columbia River Fish Management Plan under *U.S. vs. Oregon*. The migration corridor for LNFH-produced smolts and returning adult fish is approximately 489 RMs (2.8 RM of Icicle Creek, 26 RM of the Wenatchee River, and 460 RM of the Columbia River) and the Pacific Ocean. Adult salmon returning to the LNFH in excess of brood stock needs, support a Tribal fishery, at and just downstream of the spillway pool at RM 2.8, and a sport fishery, from approximately RM 0 to 2.7, in Icicle Creek. For more information regarding the Tribal fishery, see **Section 3.10**, Tribal Interests.

Fish and Aquatic Species

Salmonid species in the Analysis Area are Hatchery-reared Spring Chinook Salmon, Hatchery-reared Coho Salmon, Steelhead, Sockeye Salmon, Bull Trout (*Salvelinus confluentus*), non-native Brook Trout (*Salvelinus fontinalis*), Westslope Cutthroat Trout (*O. clarki lewisi*), Redband Trout (*O. mykiss gairdneri*), and Mountain Whitefish (*Prosopium williamsoni*). Native non-salmonids are also present in Icicle Creek, such as dace (*Rhinichthys* spp.), lamprey (*Lampetra* spp.), sculpin (*Cottus* spp.), and suckers (*Catostomus* spp.) (NMFS 2017a).

Special Status Species

ESA-listed fish that may inhabit the Analysis Area are Bull Trout, Upper Columbia River Spring-run Chinook Salmon, and Upper Columbia River Steelhead. Additionally, designated foraging, migrating, and overwintering critical habitat for Bull Trout and designated critical habitat for Upper Columbia River Steelhead occur in the Analysis Area (USFWS 2010; NMFS 2016). These species are briefly described below. More detailed information on the status and trends of these listed resources, and their biology and ecology, can be found in the species' recovery plans (UCSRB 2007; USFWS 2015) and 5-year reviews published in the *Federal Register*, as well as in the SWISP Project EIS Biological Assessment.

The USFWS listed all U.S. populations of Bull Trout as a threatened species under the ESA in 1999 (64 *Federal Register* 58910, November 1, 1999). The Bull Trout's current range includes the Columbia River and Snake River basins in Washington, Oregon, Montana, Idaho, and Nevada; Puget Sound

and Olympic Peninsula watersheds in Washington; the Saint Mary basin in Montana; and the Klamath River basin of south-central Oregon. At the time of the listing in 1999, Bull Trout were estimated to have been extirpated from approximately 60 percent of their historical range (USFWS 2015).

Bull Trout are native to the Wenatchee River watershed (including Icicle Creek and other tributaries). Upper Icicle Creek and other headwater areas of the basin offer some of the best habitat in the Mid-Columbia region. The Wenatchee River watershed has been designated as one of 24 Bull Trout core areas in the Mid-Columbia Recovery Unit. This is one of four core areas that contain the healthiest and most stable Bull Trout populations (USFWS 2015). Bull Trout have specific habitat requirements, preferring river environments with cold water temperatures (often less than 54 degrees Fahrenheit [12 degrees Celsius]); complex stream habitat with deep pools, overhanging banks and large woody debris; and connectivity between spawning and rearing areas and downstream foraging, migration, and overwintering habitats (USFWS 2015). Populations are isolated to headwater areas by downstream conditions that are too warm for incubation and early rearing (USFWS 2015).

Most of the Icicle Creek population of Bull Trout are resident; they spawn and rear in tributaries upstream of the Analysis Area and mature and forage throughout Icicle Creek, including in the Analysis Area. They could be present in the Analysis Area year-round. A small percentage of the population (15 to 20 percent) may migrate long distances to other subbasins of the Columbia River for foraging or overwintering, returning to spawning areas annually every few years. Bull Trout from other core areas also migrate to Icicle Creek for foraging and refuge habitat in and upstream of the Analysis Area. Most populations in the Wenatchee River Watershed spawn from mid-September to mid-October (USFWS 2015). However, there is no spawning or rearing habitat for Bull Trout in the Analysis Area, nor are there records of Bull Trout redds[24] in the Analysis Area (unpublished data on file with the USFWS Mid-Columbia Fish and Wildlife Conservation Office).

The main threats to Bull Trout are habitat destruction, modification, fragmentation, or curtailment (e.g., dewatering, sedimentation, thermal modification, water quality degradation) due to land and water management activities and isolation and habitat fragmentation due to fish passage issues and impaired connectivity. In the Analysis Area, Bull Trout spawning and rearing habitat is limited in late summer and early fall because of low instream flows in some years (see **Table 3-2**). Entrainment is also an issue; in the 2017 biological opinion (NFMS 2017a), the NMFS required LNFH to provide entrainment protection (fish screens) and fish passage for anadromous fish, which would also benefit Bull Trout.

Designated Bull Trout foraging, migrating, and overwintering critical habitat includes all areas of Icicle Creek in the Analysis Area that are accessible to Bull Trout (75 *Federal Register* 63897). The critical habitat designation for Bull Trout applies only to the stream channel, as defined by its OHWM by the USACE at 33 CFR 329.11. The critical habitat designation does not extend to the floodplain or the adjacent land (USFWS 2010).

[24] Riverbed hollows made and used by fish for spawning.

Table 3-2. Current Listed Fish Habitat Limitations on Lower Icicle Creek

River Mile[1]	Affected Species/Life Stage	Months When Target WUA[2] Not Achieved (Average Year)	Months When Target WUA Not Achieved (Low-Flow Year)
0.2–2.4	• Steelhead rearing • Bull Trout rearing/foraging	• Late July–October • None	• Mid-June through October • September through October
2.7–3.9 (Historical Channel)	• Steelhead rearing/Bull Trout rearing	• None	• Mid-June through October
3.9–4.5	• Steelhead rearing/Bull Trout rearing	• Early August to late October	• Early to mid-April and mid-June through October
6.0-9.1	• Steelhead rearing/Cutthroat Trout rearing/Bull Trout rearing	• September	• No Data

[1]Analysis Area includes RM 2.3–4.5

[2]Weighted Usable Area (WUA): A quantity that can be used to describe the spatial habitat area of a specific fish species for a particular life stage

Source: Chelan County and Ecology 2019

Upper Columbia River Steelhead was listed as an Endangered species under the ESA in 1997 (62 *Federal Register* 43937, August 18, 1997) and reclassified to Threatened in 2006 (71 *Federal Register* 833, January 5, 2006). Upper Columbia River Steelhead exhibit complex life histories. Adults return to the Columbia River in the late summer and early fall. A portion of the returning run overwinters in the mainstem reservoirs, passing over the Upper Columbia River dams in April and May of the following year. Spawning occurs in the late spring following entry into the river. Steelhead currently spawn and rear in the Wenatchee River between Tumwater Canyon and Nason Creek, the Chiwawa River, and in Nason, Icicle, Peshastin, Chumstick, and Mission creeks (UCSRB 2007). Most Steelhead spawning in the wild are hatchery fish. Juvenile Steelhead generally spend one to three years rearing in freshwater before migrating to the ocean, and most adults return to the Upper Columbia River after one or two years at sea (UCSRB 2007). Redds for Upper Columbia River Steelhead have been identified in the Analysis Area within the Historic Channel and Lower Icicle Creek (see **Map 3-1** in **Appendix A**) (unpublished data on file with the USFWS Mid-Columbia Fish and Wildlife Conservation Office).

Upper Columbia River Steelhead critical habitat occurs in the Analysis Area. It is designated in the upper Wenatchee River and lower mainstem areas, as well as the tributaries above and below Tumwater Dam, including Icicle Creek. These waterbodies serve as major migration, spawning, and rearing areas for adults and juveniles (NMFS 2005).

The Upper Columbia River Spring-run Chinook Salmon evolutionarily significant unit (ESU) was listed as Endangered in 1999 (64 *Federal Register* 14308, March 24, 1999). Spring Chinook Salmon broodstock used in the LNFH program are not included in an ESA-listed ESU. Little natural production from the native Spring Chinook population is thought to occur in Icicle Creek (NMFS

2017a; UCSRB 2007). Although Spring-run Chinook Salmon critical habitat is designated in the upper and lower mainstem Wenatchee River, including tributaries above Tumwater Dam that serve as major migration, spawning, and rearing areas for adults and juveniles, none occurs in the Analysis Area. The Analysis Area is designated as essential fish habitat (EFH) for both Chinook and Coho Salmon (NMFS 2017a).

Spring-run Chinook Salmon enter the Upper Columbia tributaries from April through July; spawning occurs in the late summer, peaking in mid to late August. Juvenile Spring-run Chinook Salmon spend a year in freshwater before migrating to salt water in the spring of their second year of life, and most return as adults after two or three years in the ocean (UCSRB 2007). Primary spawning areas of Spring-run Chinook Salmon in the Wenatchee subbasin include Nason Creek and the Chiwawa, Little Wenatchee, and White rivers (UCSRB 2007). Spawning also occurs in Icicle Creek, and these spawners are believed to be primarily returns from LNFH. Between 2014 and 2019, Spring-run Chinook redds were observed and counted. Redds were observed in the Historical Channel and near the existing intake facilities (unpublished data on file with the USFWS Mid-Columbia Fish and Wildlife Conservation Office).

Natural spawning of native anadromous fish in Icicle Creek has been reduced from historical conditions as a result of habitat degradation, including flow diversions, and overfishing. Historical barriers to upstream passage, including historical LNFH infrastructure, also have limited natural anadromous fish spawning to the lower 2 RMs of Icicle Creek until improvements to fish passage were made in recent years (Chelan County and Ecology 2019). Current streamflow in Icicle Creek during low flow periods (late summer and early fall) is too low for reliable fish passage at the low-head diversion dam or fish ladder/sediment sluice and reduces habitat availability (Reclamation 2020d; Chelan County and Ecology 2019).

Habitat degradation and loss is a major threat to the listed fish species described above. These are a lack of habitat diversity (e.g., pools and spawning areas, riparian vegetation) and quantity, excessive sediment load, anthropogenic barriers, a lack of channel stability, low flows, and high summer temperatures (NMFS 2016). Specific areas of concern regarding habitat conditions in the Analysis Area are passage conditions and upstream passage barriers in Icicle Creek at LNFH and the boulder field (NMFS 2016). More detailed information can be found in the SWISP Project EIS Biological Assessment.

Several Washington State Priority Species are found in the Analysis Area. These are the described ESA-listed salmon and trout species, Pacific Lamprey, Mountain Sucker, Leopard Dace, and Umatilla Dace (WDFW 2008).

3.4.3 Environmental Consequences

Indicators and Assumptions

The indicators for fisheries, including special status species, and aquatic ecosystems are as follows:

- Changes to habitat quantity, including spawning habitat (count of redds), EFH (miles), and critical habitat (miles)

- Changes to habitat quality (connectivity/fish passage, water quality (temperature, dissolved oxygen, pH, and turbidity, total phosphorus), and geomorphology)
- Potential for disturbance, injury, or mortality of aquatic wildlife

The following analysis assumptions were used in the analysis:

- Impacts on fish and aquatic resources are directly related to changes within aquatic habitats.
- BMPs will limit impacts on fish and aquatic resources.
- Conservation measures for ESA-listed fish species will be developed under Section 7 consultation and would reduce impacts to most fish and aquatic species.
- Successful installation and utilization of screening will reduce take of ESA-listed fish species.
- Successful completion of the roughened channel and low-flow boulder weir fishway will facilitate and improve fish passage for all aquatic species over a greater range of flows.
- Mobile special status fish species would move away from direct, short-term disturbances to nearby higher quality habitat during Project activities.

Additional Project assumptions used in the analysis are described in **Appendix C**, SWISP Project EIS Analysis Assumptions.

Alternative A – No Action Alternative

The No Action Alternative represents the continuation of the current operations of the LNFH surface water intake and delivery system as well as ongoing O&M activities. Continuing O&M under the No Action Alternative would not fulfill the requirements of the Biological Opinion (NMFS 2017a). This is because continued operation of the LNFH under the baseline condition would leave the existing fish ladder/sediment sluice and low-head diversion dam in place. The fish ladder would not be modified to alter flow or enhance fish passage and current regulatory criteria would not be met. Current flows at the fish ladder/sediment sluice would continue to not meet NMFS guidelines for fish attraction. Therefore, these pieces of infrastructure would continue to limit habitat quality (connectivity) by inhibiting ESA-listed species passage within the Icicle Creek aquatic ecosystem during low flows (see **Table 3-2**).

The No Action alternative would also leave the existing unscreened diversion and conveyance pipeline in place. This continued operation of infrastructure would maintain the current potential for take of ESA-listed species due to entrainment and need for removal from the existing intake facilities. For example, between 30 and 63 Steelhead were removed from the existing intake facilities each year between 2009 and 2013 (Hall et al. 2014). Under existing conditions, between 2008 and 2018, 34 Bull Trout have been entrained in the surface water intake and delivery system (Potter 2019).

NMFS relied on the Hatchery and Genetics Management Plan's description of the proposed action to complete the formal consultation with the release of the September 2017 Biological Opinion (NMFS 2017a). For this consultation to remain valid, the USFWS and Reclamation must implement the conservation actions included as part of the proposed action evaluated in the consultation.

Without completing the fish screening and fish passage improvements by May 2023, the USFWS and Reclamation may be required to reinitiate consultation with NMFS.

Several assessments of LNFH facilities have noted that much of the infrastructure is nearing the end of its expected working lifetime. Repair and improvements are needed to ensure that infrastructure failure does not result in a catastrophic loss of Hatchery facilities or fish production resources. O&M activities would continue, including daily visual inspections of existing intake facilities. Extraordinary maintenance would occur every couple of years and would be expected to continue into the future. This includes the removal of sediment from the intake channel. Failure of the diversion or water delivery system would be an emergency situation. The timing and extent of potential impacts from extraordinary maintenance or emergency repairs would depend on the nature, extent, and timing of the necessary repairs.

As a result of the existing infrastructure within the Analysis Area, the impacts it has on fish passage and aquatic habitat conditions would continue. These include the limitations on fish passage, habitat quantity and connectivity, and habitat quality as described in **Section 3.4.2** (see *Aquatic Habitat*).

Under the No Action Alternative, the existing intake facilities and delivery infrastructure would remain in place and continue to degrade, causing infrastructure problems for the Hatchery and causing it to become even more unreliable. For example, the conveyance pipeline would continue to degrade resulting from the sediments transported through it. This unreliability would jeopardize the Hatchery's ability to meet the *U.S. v. Oregon* agreement annual objectives for the LNFH to release 1.625 million Spring Chinook Salmon smolt to Icicle Creek.

Catastrophic failure of any part of the water delivery system could result in the loss of one to two years of Chinook Salmon broodstock at the Hatchery. This could result in a failure to meet *U.S. v. Oregon* mitigation requirements and would impact the amount of fish returning annually in the out-years. Effects of catastrophic failure could last five to eight years, depending on how long Hatchery production is down to complete necessary repairs.

Alternative B – Proposed Action

Under Alternative B, the existing intake facilities and delivery infrastructure would be replaced and rehabilitated, improving the reliability of water delivery and the Hatchery's ability to meet the *U.S. v. Oregon* agreement annual objectives for the LNFH to release 1.625 million Spring Chinook Salmon smolts to Icicle Creek.

Alternative B would have long-term beneficial effects to fisheries, including special status fish, and aquatic ecosystems in the Analysis Area. Alternative B would provide NMFS-compliant fish screening, reducing potential for injury or mortality to fish species, including ESA-listed species, due to entrainment in the existing intake facilities. The low-flow boulder weir fishway would provide NMFS-compliant fish passage for anadromous salmonids during typical low flows, and the portion of the roughened channel extended upstream of the existing low-head diversion dam would facilitate fish passage overall and at higher flows in particular. This would increase connectivity of aquatic habitat in Icicle Creek, and access to high-quality aquatic habitat upstream of the Analysis Area. Improving habitat connectivity and fish passage, which is currently limited in the Analysis Area,

would allow for a more complete expression of essential life history characteristics related to reproduction, feeding, rearing, and migration.

Despite localized and temporary habitat losses for expansion of the intake structure and IO&MA and for constructing the roughened channel/low flow fishway (described in further detail below), habitat quantity in the Analysis Area would increase overall because the roughened channel would facilitate natural sediment movement past the existing intake facilities. This would ultimately improve habitat quality downstream of the intake facilities by decreasing the amount of spawning gravels that are currently entrained in the intake facilities and lost from the Icicle Creek system, and instead retaining these gravels in Icicle Creek. This could result in increased availability of spawning habitat and number of redds of Spring Chinook Salmon, which have been observed in the Analysis Area. Corresponding beneficial effects on critical habitat for Bull Trout and Upper Columbia River Steelhead and EFH would be expected since these habitats occur in the Analysis Area.

After Phase I and Phase II construction, the woody vegetation that would be removed in the intake construction area would be reestablished by planting of native upland and riparian trees and shrubs to restore vegetation communities to pre-disturbance conditions or better. Container plantings would be installed in temporarily disturbed upland areas at the intake construction area, while riparian cuttings would be installed in the Icicle Creek riparian zone. Revegetation of riparian shrubs and trees would increase shading of Icicle Creek, improving aquatic habitat quality by buffering stream temperatures, and maintaining dissolved oxygen levels in the creek, especially during summer months. It would also stabilize streambanks, helping to decrease erosion and sediment transport into Icicle Creek. However, there would be a delay of several years between the time trees were removed and the time planted trees became large enough to provide these benefits.

Increased fish passage and access to upstream habitat, and minimization of injury, mortality, and take of ESA-listed fish species from installing NMFS-compliant screening, would work in conjunction with other plans and projects in or near the Analysis Area to benefit fisheries, including special status fish species and aquatic ecosystems in the Analysis Area in the long term. These include the Trout Unlimited Icicle Creek Boulder Field Fish Habitat Improvement Project, continued implementation of the Recovery Plan for Upper Columbia River Spring Chinook Salmon and Steelhead and the USFWS Bull Trout Recovery Plan, relocating and replacing the City of Leavenworth water supply pipeline and fish screen, replacing and relocating the Icicle and Peshastin Irrigation District's fish screens, and improving fish passage at the Icicle and Peshastin Irrigation District and City of Leavenworth diversion dam. These projects would increase fish passage, improve stream geomorphology and water quality parameters, and lower the potential for injury or mortality of aquatic species (e.g., by reducing entrainment in water diversions). For example, the Trout Unlimited Icicle Creek Boulder Field Fish Habitat Improvement Project would create accessibility to more than 26 mainstem miles of high-quality fish habitat in Icicle Creek available above the boulder field. The habitat above the boulder field includes more than 20 miles of virtually undisturbed National Forest System lands and wilderness (Trout Unlimited 2020a, 2020b).

Temporary impacts from Phase I construction would occur during the in-water work window of July 1 to November 15; two construction seasons would be needed to complete Phase I construction. The proposed in-water work window extends beyond the approved in-water work

window for Icicle Creek of July 1 to August 15 (USACE 2018). Although the proposed extended window would have to be approved by regulatory agencies prior to construction, working outside the approved window would increase the duration of impacts to aquatic habitat by extending the length of time that in-water work would occur. This may result in changes to the number and types of species and life stages of fish species that are present in the Analysis Area relative to the shorter, approved work window. For example, Upper Columbia River Steelhead adults return to the Columbia River in the late summer and early fall, so conducting in-water work within this window may affect more individuals than if work was restricted to the approved window of July 1 to August 15.

The proposed extended in-water work window would also increase the potential for injury or mortality of special status fish species. Salmon are particularly vulnerable to these effects during the fall and winter, when adults are migrating and spawning, and the extended in-water work window would overlap this sensitive period. It would also increase the potential for interference with spawning Spring Chinook Salmon or Bull Trout (which spawn in late summer and late fall, respectively). This may come about because potential spawning habitat may be unavailable to fish species, either because it was isolated behind a cofferdam, or because it was removed during construction of the intake structure and IO&MA, roughened channel, or another in-stream Project component.

Species that are present in the Analysis Area in late summer through fall (in addition to those present in early summer) would be subject to impacts including changes in habitat quantity, quality, and potential for injury or mortality. Specific impacts are described in more detail below.

Potential temporary effects to habitat quality during in-water construction activities include effects to habitat connectivity and fish passage. Fish passage would be temporarily reduced because cofferdams would be installed to isolate the in-water work area. At no point would the entire width of Icicle Creek be blocked, but cofferdams would temporarily reduce the effective width of Icicle Creek while installed, potentially limiting, but not completely blocking, passage opportunities. For Bull Trout, this would result in migration delays to spawning habitat upstream of the Analysis Area, and post-spawn migrations from spawning and rearing habitat to foraging, migrating, and overwintering habitat in and downstream of the Analysis Area. Effects would be minimized through BMPs (**Appendix B**) that require cofferdam installation maintain a minimum water depth of 0.8 feet within the greatest amount of natural streambed width as possible to facilitate fish passage while cofferdams are in place. Fish passage criteria in *Icicle Creek Fish Passage Evaluation for the Leavenworth National Fish Hatchery* (Anglin et al. 2013, pages 26-28) would be consulted for minimum depth and maximum velocity criteria, and attempts would be made to provide fish passage to the greatest extent practical across the natural stream channel width and hydrograph.

Because cofferdams would be in Icicle Creek beyond the low flow timeframe (lowest flows typically occur from July through September), this creates risk of cofferdam failure during high flows. High flows generally occur in May and June, but winter months can have high flows or extensive snow and ice conditions. Occasionally peak annual floods have occurred in July and October, which may require adjustment to the start and completion date for a given construction year (Reclamation 2020d). Floods would be a concern for inundating areas and overtopping a cofferdam. Geo-bag

cofferdams would not be suitable for use in Icicle Creek during heavy or prolonged precipitation or rain-on-snow events that typically occur between November and April, or during typical flows resulting from spring runoff in May and June.

Cofferdam failure during high flows could release tons of sediment or rock into Icicle Creek. Depending on the volume and type of material released, there could be long term changes to the Icicle Creek streambed, primarily by increasing the proportion of sands, gravels, and fine sediments. Released materials could reduce ESA-listed fish habitat quantity or quality by burying or degrading suitable spawning substrate in Icicle Creek. Depending on the timing of cofferdam failure, released materials could bury ESA-listed fish species redds or eggs, which could be considered take under the ESA.

During low summer flows, constricting the stream and providing a minimum water depth of 0.8 feet would likely be an improvement over baseline water depth conditions, as the water across the width of the stream under the No Action Alternative could be less than 0.8 feet deep during previous low-flow conditions.

During Phase I, the temporary Hatchery water supply of 40 cfs via the gravity-fed bypass would divert water from Icicle Creek, however, more water would be left in Icicle Creek than under typical operations, when 42 cfs is diverted. Since this diversion rate would be less than the Hatchery's water right diversion rate of 42 cfs, no net decrease in stream flows are expected, and there would be no decrease in instream flow or effects to fish passage.

The gravity-fed bypass intake would be unscreened, meaning that fish could be entrained in the bypass pipeline. Entrained individuals would be carried via the conveyance pipeline to the sand settling basin on the LNFH grounds. Effects of entrainment would include risk of injury due to abrasion in the pipeline, and stress and potential for injury associated with capture and salvage from the sand settling basin and return to Icicle Creek. Capture and salvage would be done according to the Terms and Conditions of the LNFH operations consultations with the NMFS and USFWS; however, handling activities, even when accomplished carefully and efficiently, are likely to result in some adverse effects, including stress, of all fish handled.

Potential effects to aquatic habitat quality from instream construction would include changes to stream geomorphology. The SWISP Project EIS **Water Resources Report** and **Section 3.3**, Water Resources describe these types of changes in more detail. Geomorphological alterations could impact fish habitat quality and quantity by altering the availability of features such as pools and riffles. This impact would mainly occur within the area of streambed that would be permanently lost due to construction of the IO&MA, which is approximately 0.15 acres.

Instream surface-disturbing activities, such as placement of cofferdams, partial removal of the fish ladder/sediment sluice, and construction of the intake structure would also affect stream geomorphology through direct physical alterations of the streambed as well as by mobilizing sediments that settle in downstream gravels or pools. However, sediment plumes would be temporary and minimized through BMPs (**Appendix B**), such as working in dewatered areas. As a result, the loss of geomorphological habitat features would be minor.

Placement of cofferdams to isolate the in-water work area in July, and their removal in November, would temporarily disturb fish if they are present in the area through noise and vibration from construction equipment. If present in or near the construction work area, most fish would be expected to move to other areas of Icicle Creek in response to the noise and vibration.

Preparation of the streambed, placement, and removal of the cofferdams would mobilize sediments on the Icicle Creek streambed. This could increase turbidity in and downstream of the work area during and shortly after cofferdam placement or removal, exposing fish to elevated levels of suspended sediment. Suspended sediments can result in short- and long-term effects on fish depending on the quantity and composition of sediment and length of exposure. Potential exposure would be minimized because, as above, most fish would be expected to move to other areas of Icicle Creek in response to the noise and vibration caused by placing and removing the cofferdams. Further, Reclamation would monitor and collect water samples to measure potential increases in turbidity to ensure compliance with Water Quality Standards for Surface Waters (WAC 173-201A) during cofferdam placement and removal.

Fish may be stranded inside the construction work area established by cofferdam placement. Reclamation would capture and remove fish stranded inside the work area. To minimize harm from capture, handling, and relocation into Icicle Creek, this process would be done by qualified biologists, in accordance with the USFWS (2012) *Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards for Bull Trout*.

The area isolated by the cofferdam would be partially dewatered prior to fish capture. To prevent injury or mortality from fish entrainment in sump pumps, Reclamation would screen sump pump intakes to prevent aquatic life from entering the intake. Fish screens or guards would comply with the most recent fish screening guidelines for anadromous salmonids prescribed by the NMFS. Areas isolated by cofferdams would be monitored for aquatic organisms, and fish would be captured and relocated from the construction work area in accordance with approved methods; this would reduce the potential for injury or mortality of fish and aquatic species during construction.

A pneumatic tool would be used to break apart large boulders to facilitate their removal from the intake construction area, and partially demolish existing intake facilities, such as the existing fish ladder/sediment sluice. The pneumatic tool would generate impact sounds, which can propagate into the surrounding water. High levels of underwater sound can have negative physiological effects on fish, the intensity of effects depends on physical, environmental, and biological factors, including the sound-generating activity, sound intensity, distance of fish from the point of origin, depth of fish in the water, size of fish, fish species, and ambient noise levels. While sound generated by the pneumatic tool is not expected to reach intensities associated with blasting or impact pile driving, some physiological effects on fish could occur if individuals were present in or near the work area. Because fish would be removed from work areas isolated by cofferdams as discussed above, effects would be minimized. However, there is a chance that individuals may elude capture and therefore be present during construction activities.

During construction in and adjacent to Icicle Creek, alteration of water quality parameters could also occur due to sediment entering the aquatic ecosystem. Many native salmonid species and aquatic

invertebrates require high oxygen levels, and clear water with low turbidity (UCSRB 2007; USFWS 2015). High concentrations of limiting nutrients, such as phosphorus, can induce excessive growth of algae, resulting in lower dissolved oxygen concentrations, which may reduce habitat quality for aquatic species.

The Ecology TMDL (see **Section 3.3**, Water Resources) indicates phosphorus is the limiting nutrient in Icicle Creek. Cement is rich in calcium and contains aluminum and iron also. All three can readily bind phosphorus. Also, Setunge et al. (2009) reports freshwater contact with freshly cast concrete can lead to an increase in the pH level of water in contact with the concrete during the first four days from the casting of the concrete. To avoid the potential that construction would increase phosphorus in Icicle Creek, concrete used for proposed in-water infrastructure would be cured in place behind cofferdams for at least four days before exposure to Icicle Creek water. This would guard against fresh concrete increasing phosphorus in surface water.

In addition to increasing turbidity levels, sedimentation can alter substrate used by fish species for spawning and rearing. Adhering to BMPs to reduce the potential for impacts on water quality (**Appendix B**), would minimize the potential for water quality degradation and release of sediment into Icicle Creek during construction. The SWISP Project EIS **Water Resources Report** contains additional detail on effects to water quality and sedimentation from construction.

Changes to habitat quantity would arise from the changes to habitat quality as described above if the habitat quality alterations prevent species from using habitat. As described above, these would be temporary changes, generally lasting the duration of construction activities.

Permanent habitat loss would result from expanding the intake structure and IO&MA, and temporary habitat loss would occur from constructing the roughened channel and low-flow fishway within the area isolated by the cofferdam and dewatered work areas. As an approximation, the intake structure and IO&MA would cause about 0.15 acres of fill below the OHWM. This would result in a loss of streambed habitat for fish and aquatic invertebrates. General aquatic habitat, critical habitat for Bull Trout and Upper Columbia River Steelhead, and EFH loss would also result from constructing the IO&MA within the OHWM of Icicle Creek. A permanent change in habitat of approximately 0.45 acres would result from construction of the roughened channel and low-flow fishway.

During Phase II, construction would not occur in Icicle Creek; therefore, the type of potential in-water effects described under Phase I would not occur. However, removing trees in the Icicle Creek riparian zone during conveyance pipeline replacement on USFWS property between the PISMA and the adjacent private parcel would reduce the amount of shading along this reach of Icicle Creek (see **Map 2-5** in **Appendix A**), resulting in potential reductions to water quality parameters (including increased water temperature), especially during summer months. Inputs of woody materials to the creek from fallen trees and limbs, would also be reduced. Together, this would reduce habitat quality for aquatic species. The number of trees removed during Phase II construction would be minimized.

During Phase II construction, sediment that becomes mobilized by erosion would be added to Icicle Creek; this would increase turbidity downstream of the construction area, thereby decreasing habitat quality, including for critical habitat and EFH. WAC 173-201A-200 includes water quality standards,

criteria, and monitoring for turbidity during construction; adhering to these standards would minimize this impact. Construction BMPs (**Appendix B**), including preparation of and adherence to, a stormwater pollution and prevention plan, would further minimize the release of sediment into Icicle Creek during construction. Seeding of temporarily disturbed surfaces with herbaceous vegetation would stabilize soils and minimize or prevent erosion and release of sediment into Icicle Creek as vegetation matured over one to several growing seasons following construction.

Temporary Hatchery water supply pumping at the spillway pool during Phase II would utilize NMFS-approved screened sump-pumps to ensure a continuous water supply while reducing the potential for injury or mortality of fish from entrainment in pump intakes. During the actual CIPP lining process (April 17 to May 20), temporary pumping would supply 20 cfs, and could be augmented by existing groundwater wells (up to 8 cfs). Sound generated by pumps may result in temporary behavioral impacts to fish and aquatic species, such as avoidance of the immediate area, while pumping is ongoing. This is because sound waves and vibration from pumping would propagate into the Icicle Creek water column via the air, and also via the pump intake within the water column. Effects would be temporary, lasting for the duration of pumping. Fish are expected to avoid the immediate area and displace into other areas of Icicle Creek while pumping is ongoing.

The potential for effects on fish and the aquatic ecosystem from surface disturbance and equipment use during rehabilitation of the conveyance pipeline on USFWS property between the PISMA and the adjacent private parcel would be small relative to effects from in-stream work, but there could be some temporary effects to habitat quality, such as alteration of water quality parameters from increased sedimentation. As described for Phase I, the potential for effects would be minimized by implementing water quality measures in **Appendix B**. Native reseeding in uplands would improve aquatic habitat quality by increasing bank stability, thereby reducing the potential for erosion and sediment transport into Icicle Creek.

Following construction of the proposed intake facilities, temporarily removed woody vegetation would be reestablished by planting native upland and riparian trees and shrubs (Phase III). Container plantings would be installed in temporarily disturbed upland areas, while riparian tree cuttings would be installed in the Icicle Creek riparian zone. This would improve riparian vegetation structure and function compared with existing conditions. Over time, and as planted vegetation matured, the amount of shade provided to Icicle Creek would be increased, helping to moderate stream temperatures, especially during summer months.

Extraordinary maintenance activities would occur every couple of years and would be expected to continue into the future. These activities would affect fish, including special status fish species, and aquatic ecosystems; the type of effects would depend on the type of maintenance activities that are required. Likely effects include temporary water quality reductions from increases in turbidity associated with removal of accumulated sediments from the fish screen area as needed.

Alternative C

Alterations to aquatic habitat quantity and quality, critical habitat, and EFH, and potential for injury or mortality of fish species, would be similar to those described in Alternative B. Under Alternative C, there would be less vegetation removal in the Icicle Creek riparian zone during conveyance

pipeline rehabilitation (Phase II) than under Alternative B. This is because the entire conveyance pipeline length between the PISMA and the adjacent private parcel would be lined with CIPP, and no pipeline would be replaced. As a result, loss of shade-generating vegetation would be reduced, and more trees would remain to provide inputs of woody materials to the creek, compared with Alternative B. Therefore, potential impacts to habitat quality such as elevated water temperatures from reduced shading and alteration of water quality parameters from increased erosion and sedimentation would be reduced, relative to Alternative B. Extraordinary maintenance activities would be expected to occur every few years and would be expected to continue into the future. Impacts from extraordinary maintenance activities would be the same as described under Alternative B.

Alternative D

The types and nature of impacts to fish and aquatic ecosystems resulting from components and elements of the surface water intake facilities and Phase I construction activities would be the same as those described for Alternative B. However, under Alternative D, Phase I construction would be limited to 7:00 a.m. – 10:00 p.m.. Additionally, instead of the cofferdams remaining in Icicle Creek until November 15 for two in-water work windows, they would be removed two weeks earlier, by October 31 of each year, and would be placed and removed for a total of four in-water work windows. As a result, Phase I construction would require four years, and four in-water work windows, to complete in comparison to the two in-water work windows described for Alternative B. The types of impacts to fish and aquatic ecosystems described under Alternative D would occur over separate in-water work windows, creating a longer total duration of impacts to fish and aquatic species.

Although the in-water work window would be two weeks shorter under Alternative D relative to Alternative B, it would still extend beyond the approved in-water work window for Icicle Creek of July 1 to August 15 (USACE 2018). Working outside the approved window would increase the duration of impacts to aquatic habitat by extending the length of time that in-water work would occur, though to a lesser extent (2 weeks shorter) than Alternative B. This may result in changes to the number and types of species and life stages of fish species that are present in the Analysis Area. For example, the potential for injury or mortality of special status fish species may decrease slightly under Alternative D relative to Alternative B due to the 2-week shorter in-water work window. This is because salmon are particularly vulnerable to disturbance during the fall and winter when adults are migrating and spawning; there would be less overlap of the in-water work window with salmon migration and spawning periods under Alternative D, and thus, less potential for effects such as disturbance to interfere with these essential life history functions. There would also be lower potential for interference (e.g., due to reduced spawning habitat) with Bull Trout spawning in late fall as a result of the shorter in-water work window under Alternative D relative to Alternative B.

The in-water construction under Alternative D over additional seasons, including installation and removal of cofferdams, would result in additional impacts on listed and non-listed fish species and habitat, compared with Alternative B. Although the types of impacts would be the same as those described for Alternatives B, these impacts could be realized for an additional two construction seasons. These would include temporary alterations to fish passage, stream geomorphology, and water quality and quantity in Icicle Creek, and additional direct effects to fish species from

construction noise, and stress from handling and salvage from the in-water work area. However, impacts would not occur during the first two weeks of November when flows and the risk of cofferdam failure would be higher. Further, because the surface water intake would remain unscreened for additional seasons, listed fish could continue to be entrained into the unscreened intake for a longer time. Because these effects would occur to listed fish species, they could be considered take. As described under Alternative B, impacts would be minimized through BMPs (**Appendix B**).

Inundating the area of the partially constructed intake headworks after cofferdam removal at the end of the 2022 in-water work window would potentially increase the possibility for injury or mortality of fish relative to Alternative B. This is because fish could become entrained in areas where water is isolated due to the partially constructed intake area. For example, there would likely be at least a small strip along the 2-foot foundation slab that could fill with water at higher flows and be isolated from the stream when flows decrease.

Fish may be stranded inside the construction work area established by cofferdam placement. USFWS personnel would capture and remove any fish found stranded inside the work area. To minimize harm from capture, handling, and relocation into Icicle Creek, this process would be done by qualified biologists, in accordance with the USFWS (2012) *Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards for Bull Trout*.

Limiting construction to workday hours of 7:00 a.m. and 10:00 p.m. under Alternative D would reduce impacts to some fish species, such as Bull Trout, which are primarily nocturnal. This is because species that are inactive during the day would be less likely to be disturbed by daytime construction activities because they would not be engaging in activities such as foraging that could otherwise be disrupted.

Under Alternative D, pumping of two high capacity pumps to provide 40 cfs of water to the Hatchery during Phase I construction would occur 24 hours per day, 7 days per week for 8 months (November 1, 2022 to June 30, 2023). Sound generated by pumps may result in temporary behavioral impacts to fish and aquatic species, such as avoidance of the immediate area, while pumping is ongoing, and these effects would last 8 months longer under Alternative D as compared to Alternative B under which pumping would occur for approximately 7 days in 2022 and 3 days in 2023 (**Table 2-1**). Avoidance of the immediate area and displacement into other areas of Icicle Creek while pumping is ongoing may interfere with overwintering, spawning, and migration of fish species for which the 8-month temporary Hatchery water supply pumping period overlaps these life history phases.

Although long-term reliable delivery of water and the ability to meet Hatchery production goals would be improved under this alternative in comparison to Alternative A – No Action, there would be a risk of temporary impacts to Hatchery production from relying on pumps operating continuously for 8 months from 2022-2023. If pumps fail, and back-up pumps do not respond effectively in time, there could be a catastrophic loss of fish. Further, pumping water from the spillway pool would recirculate Hatchery effluent water, as the pool is the location of the Hatchery's

main discharge point. Over time, without water treatment, pathogen loading to the fish would be increased and water quality reaching the Hatchery decreased, compromising health of Hatchery fish.

During the second in-water work window in 2023, impacts resulting from preparation for and installation of cofferdams and the gravity bypass pipeline and gravity bypass outlet would be similar to those described above and under Alternative B, including temporary reduction of fish passage and potential blocking of spawning habitat due to cofferdam installation, potential entrainment of fish in the gravity bypass pipeline, disturbance from cofferdam placement, and noise and vibration from the use of construction equipment. Except for installing the gravity bypass pipeline and gravity bypass outlet, this would also be true for the 2024 and 2025 in-water work windows. Removing cofferdams two weeks earlier each season would minimize the risk of overtopping or failure in comparison to Alternative B. Overall, impacts to fish and aquatic species and habitats would be repeated over four construction seasons under Alternative D as opposed to two seasons under Alternative B.

During the 2024 in-water work window, impacts from construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel (which entail placement of cofferdams, dewatering of the construction area, regrading of the stream channel bottom, construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel and, removal of the cofferdam) would be the same as those described under Alternative B with additional (repeated) temporary impacts from mobilization and demobilization. Likewise, during the 2025 in-water work window, impacts from construction of the remaining portion of the roughened channel would be the same as those described under Alternative B with additional impacts from mobilization and demobilization. Phase I construction would not be completed until fall of 2025, approximately 29 months past the May 2023 Biological Opinion deadline.

Impacts from Phase II construction activities and schedule and Phase III revegetation efforts would be the same as those described under Alternative B.

3.5 Noise and Vibration

3.5.1 Analysis Area

The Analysis Area stretches from the Forest Service kiosk on Icicle Creek Road to the USFWS property, including the LNFH grounds (see **Map 3-2** in **Appendix A**). In addition, because sound waves that create noise propagate outward from their source, the Analysis Area also includes sensitive noise receptors on the lands surrounding the Project Area out to 0.25 miles.

3.5.2 Affected Environment

Sound is measured in decibels (dB). Decibels A-weighted (dBA) is one of the most frequently used sound measurements because it best matches the range of human hearing. Low and very high frequencies are given less weight than on the standard decibel scale.

A sound-level meter is used to measure the decibel level. It is designed to respond in approximately the same way as the human ear and gives an objective assessment of sound pressure level (Ecology 2020d).

Decibels are measured on a logarithmic scale, meaning a small change in the number of dB indicates a large change in the level of sound (Occupational Safety and Health Administration 2020). In general, to measure loudness, a sound must be increased by 10 dB to be perceived as twice as loud (Centers for Disease Control and Prevention 2020). If a sound is generated at a point source in an area with no walls or other obstructions, there will be a reduction by 6 dB each time the distance from the sound source is doubled. A soft whisper about 5 feet away is 40 dBA, a conversation about 3 feet away is about 60 dBA, a freight train 100 feet away is 80 dBA, a night club with music is 110 dBA, and operating heavy equipment is 120 dBA (Occupational Safety and Health Administration 2020).

In describing vibration in the ground and in structures, the motion of a particle (i.e., a point in or on the ground or structure) is used. The concepts of particle displacement, velocity, and acceleration are used to describe how the ground or structure responds to excitation. Although displacement is generally easier to understand than velocity or acceleration, it is rarely used to describe ground and structure-borne vibration because most transducers used to measure vibration directly measure velocity or acceleration, not displacement. Accordingly, vibratory motion is commonly described by identifying the peak particle velocity or peak particle acceleration (California Department of Transportation 2013).

WAC 173-60-030 defines environmental designation for noise abatement (EDNA) zones into three classifications (A, B, and C). Maximum permissible noise levels are established in WAC 173-60-040. The maximum allowed amount of noise coming into a property depends on property type (**Table 3-3**). For example, 55 decibels dBA is the maximum allowed level of noise a Class A property can receive from another Class A property; 57 dBA is the maximum allowed level of noise a Class A property can receive from a Class B property; and 60 dBA is the maximum allowed level of noise a Class A property can receive from a Class C property (Ecology 2020d). Between 10:00 p.m. and 7:00 a.m., the noise limitations in **Table 3-3** shall be reduced by 10 dBA for receiving property in Class A areas.

The existing surface water intake and delivery system is found alongside and in Icicle Creek (see **Map 2-1** in **Appendix A**). The predominant community noise sources involve sounds from rural residential activities, recreation, cultural events, and agricultural activities. Recreation sites and lodging and permanent and seasonal residences flank Icicle Creek, especially on the south side, west of the existing intake facilities, and on the north side of Icicle Creek, east of the existing intake facilities (see **Map 3-2** in **Appendix A**).

Table 3-3. Maximum Permissible Noise Levels for Nonexempt Activities

EDNA of Noise Source	EDNA of Class A Receiving Property (dBA)[1]	EDNA of Class B Receiving Property (dBA)	EDNA of Class C Receiving Property (dBA)
Class A—Lands where humans reside and sleep, such as residential, recreational, entertainment, or community services	55	57	60
Class B—Lands with uses requiring protection against noise interference with speech, such as commercial, retail, or offices	57	60	65
Class C—Lands with economic activities of such a nature that higher noise levels than experienced in other areas is normally anticipated, such as industrial, warehouse, or agricultural	60	65	70

Source: Chapter 173-60-040 WAC
Notes: Exemptions to WAC 173-60-040 are listed in WAC 173-60-050 and include construction noise generated between 7:00 a.m. and 10:00 p.m.
[1] Between the hours of 10:00 p.m. and 7:00 a.m. the noise limitations of the table above shall be reduced by 10 dBA for receiving property within Class A EDNAs.

Sensitive noise receptors (see **Map 3-2** in **Appendix A**) are individuals who would be affected by noise levels. Examples are individuals recreating in the area for such activities as hiking, biking, fishing, rafting, snowshoeing, and cross-country skiing. They also include permanent and seasonal residents. The sensitive noise receptors in the Analysis Area belong to Class A EDNA areas, because they involve areas where humans reside, sleep, or recreate. In addition to residents, sensitive noise receptors are at the Snow Lakes Trail, Sleeping Lady Mountain Resort, Icicle Creek Center for the Arts, the Icicle River RV Resort, Icicle River Trails on USFWS property, and the spillway pool (where Tribal fishing takes place; see **Section 3.10**, Tribal Interests).

The predominant traffic noise sources in the Analysis Area are from Icicle Creek Road, Fish Hatchery Road, and East Leavenworth Road. There are also sparse, single lane, paved and unpaved roads used for residential, commercial, and recreation access within the Analysis Area. Proposed Project activities would take place along Icicle Creek Road, from the Forest Service kiosk to the LNFH. In addition, supplies and materials would be transported to the Project Area on Icicle Road from Highway 2.

During the week of August 3, 2020, Reclamation conducted an ambient noise study around the LNFH using devices calibrated by a Reclamation Industrial Hygienist prior to deployment. Nine locations were tested with noise dosimeters, and ten locations were tested with a sound level meter during the morning and evening. **Table 3-4** lists morning and evening ambient noise levels that were collected before and after the testing, the minimum and maximum ambient noise levels that were collected during the testing, and the equivalent sound level (Leq). Leq quantifies the noise environment to a single value of sound level for a certain duration. The testing occurred over approximately 6 hours and 15 minutes and approximately 10 hours, depending on ambient noise level point location. **Map 3-2** in **Appendix A** shows the locations of the ambient noise points listed in **Table 3-4** for the ambient noise study.

There are no sources of ongoing vibration in the Analysis Area. Occasional construction activities, however, may involve vibration, depending on the type of equipment, construction methods, and ground conditions. Vibrations can spread through the ground and will diminish in strength with distance from the source of the vibrations. Ground vibrations from construction activities can be audible and felt. Vibration can have a high amplitude and short duration, such as for impact pile driving or blasting. It can also have a low amplitude and long duration, such as for excavation equipment, tracked vehicles, or vibratory pile drivers.

Table 3-4. Ambient Noise Levels

Ambient Noise Point	Leq (dBA) Using Dosimeter	Maximum Noise Level (dBA) Using Dosimeter	Minimum Noise Level (dBA) Using Dosimeter	Before and After Noise Levels (dBA) at Ambient Noise Level Sampling Using Sound Level Meter
1	72	98	55	Morning: 60 Evening: 72
2	69	99	51	Morning: 60 Evening: 60
3	69	101	44	Morning: 48 Evening: 39
4	66	98	42	Morning: 46 Evening: 60
5	68	101	47	Morning: 60 Evening: 63
6	70	98	46	Morning: 49 Evening: 62
7	62	94	41	Morning: 42 Evening: 42
8	68	102	37	Morning: 54 Evening: 52
9	69	101	51	Morning: 57 Evening: 58
10	Not available	Not available	Not available	Morning: 55 Evening: 57

3.5.3 Environmental Consequences

Indicators and Assumptions

The indicators for identifying impacts on noise and vibration are the following:

- Changes to ambient community sound level from construction machine and equipment noise
- Changes to ambient traffic sound level from construction traffic noise
- Changes to vibration

In identifying impacts on indicators, the following analysis assumptions were used:

- For every doubling of distance, the sound level reduces by 6 dBA.
- A 3 dBA increase in sound level is barely noticeable to the human ear. A raise in sound level by 5 dBA would be needed before most listeners report a change. It takes a 10 dBA increase before the average listener hears double the sound.
- A free field[25] is used in calculating the reduction of sound levels. A "free field" is defined as a flat surface without obstructions. Also, equipment would be used sequentially rather than at the same time.
- Example noise levels from typical construction equipment that may be used are listed in **Table 3-5**. Of the example construction noise levels listed in **Table 3-5**, the pneumatic tool, usually attached to heavy equipment, is expected to be the loudest piece of equipment used during Phase I construction (i.e., at the intake construction area).
- Hot air blowers can use a heated element or gas to warm air before blowing the heated air. Hot air blowers to completely dry out the existing pipeline prior to lining with CIPP are expected to be the loudest piece of equipment used at the Phase II construction areas (i.e., CUAs) and are assumed to be 115 dB at five feet.[26]
- Example construction noise levels from a truck are listed in **Table 3-5**. In-bound and out-bound tractor trailers or dump trucks are expected to be the loudest mobile source of noise along area roads.
- A 150-horsepower diesel engine for a 16-inch pump is assumed to have a noise level of 93.3 dB at 3.3 feet[27]. Two diesel pumps operating at the same time would have a noise level of 96 dB at 3.3 feet. Two diesel pumps would operate at the same time at the at temporary Hatchery water supply pump site.
- Leq is used for analyzing impacts because it is commonly used to describe sound levels that vary over time.
- Environmental conditions, such as weather, ground surfaces, or vegetation, are not accounted for in the propagation of noise.
- Vehicle speed is not accounted for in the propagation of noise.
- There would be no pile driving for cofferdam installation or blasting.
- The maximum allowed level of noise an EDNA Class A property can receive from an EDNA Class A property during the daytime (between 7:00 a.m. and 10:00 p.m.) is 55 dBA. The maximum allowed level of noise an EDNA Class A property can receive from an EDNA Class A property during the nighttime (between 10:00 p.m. and 7:00 a.m.) is 45 dBA. See Section 2.4.2 and **Appendix C** for details on timing of construction activities.

[25] The free field assumption gives Reclamation the ability to disclose, to the public, sound attenuation over distance as it pertains to impacts on sensitive receptors (such as residents) in the Analysis Area. More complex modelling of sound attenuation is not currently possible since the types and timing of equipment used to construct the proposed project are normally at the contractor's discretion (but within the bounds of the analysis and proposed mitigations of the EIS).
[26] Personal communication from Juddson Sechrist, Reclamation to Derek Holmgren, EMPSi. Subject: Re: [EXTERNAL] RE: L-SWISP - Noise Comments. September 4, 2020.
[27] Personal communication from Crisafulli Sludge Removal Systems to Derek Holmgren, EMPSi. Subject: Crisafulli. October 5, 2020.

Table 3-5. Example Construction Equipment Noise Levels

Equipment	Typical Noise Level (dBA) 50 feet from Source
Air compressor	81
Backhoe	80
Compactor	82
Concrete mixer	85
Concrete pump	82
Concrete vibrator	76
Crane derrick	88
Dozer	85
Generator	81
Grader	85
Jack hammer	88
Loader	85
Pneumatic tool	85
Rail saw	90
Rock drill	98
Truck	88

Source: Federal Highway Administration 2006

Using the expected loudest noise levels (from a pneumatic tool, hot air blower, truck, and diesel pumps) and the other analysis assumptions, **Table 3-6, Table 3-7**, and **Table 3-8** list the noise attenuation distances[28] relevant to Class A EDNA areas. Additional assumptions used in the analysis are described in **Appendix C**, SWISP Project EIS Analysis Assumptions. **Map 3-3** through **Map 3-9** in **Appendix A** show the noise attenuation distances for these stationary noise sources.

Table 3-6. Noise Attenuation Distances for Pneumatic Tool and Truck

Distance from Noise Source (Feet)	Noise Level of Pneumatic Tool at Intake Construction Area (dBA)[1]	Noise Level of Truck Along Area Roads (dBA)[1]
50	85	88
100	79	82
200	73	76
400	67	70
800	61	64
1,600	55	58
3,200	49	52
6,400	43	46
12,800	37	40

Note:
[1] Rounded to the nearest whole number

[28] Distances that it takes for noise to lessen in magnitude

Table 3-7. Noise Attenuation Distances for Hot Air Blower

Distance from Noise Source (Feet)	Noise Level of Hot Air Blower at CUAs (dB)[1]
5	115
10	109
20	103
40	97
80	91
160	85
320	79
640	73
1,280	67
2,560	61
5,120	55

Note:
[1] Rounded to the nearest whole number

Table 3-8. Noise Attenuation Distances for Diesel Pumps

Distance from Noise Source (Feet)	Noise Level of Diesel Pumps at Temporary Hatchery Water Supply Pump Site (dB)[1]
3.3	96
6.6	90
13	84
26	78
52	72
105	66
210	60
420	54
840	48
1,680	42

Note:
[1] Rounded to the nearest whole number

Alternative A – No Action Alternative

Under Alternative A, there would be no new construction activity or Project components that would affect ambient sound levels. Sensitive noise receptors in the area would continue to experience community and traffic noise at, or about, the levels described above in **Section 3.5.2**. There would continue to be noise and occasional vibration (such as from the use of heavy equipment during intake or pipeline repairs) associated with current operations and maintenance of the existing Project

components. See **Section 3.4**, Biological Resources, for impacts on wildlife from noise and vibration.

Alternative B – Proposed Action

Compared with Alternative A, ambient noise levels for sensitive receptors would increase above those listed in **Table 3-4** (which range from 62 dBA to 72 dBA) under Alternative B. The ambient noise levels would increase because of equipment and vehicle use associated with construction activities. The loudest expected equipment and vehicle noises and their attenuation distances are listed in **Table 3-6, Table 3-7**, and **Table 3-8**, above.

Map 3-3, **Map 3-5**, **Map 3-7**, and **Map 3-9** in **Appendix A** show the distances for the expected loudest noise levels to attenuate to Class A EDNA noise levels under Alternative B. A Class A EDNA of 55 dBA is the lowest daytime permissible noise level exposure listed in **Table 3-3**. A Class A EDNA of 45 dBA is the lowest nighttime permissible noise level exposure listed in **Table 3-3**. The sensitive noise receptors in the Analysis Area belong to Class A EDNA areas, which should experience noise levels of 55 dBA during daytime hours and 45 dBA during nighttime hours.

The ambient noise study characterized the ambient noise levels for these areas as already being elevated. Possible causes for the elevated ambient noise levels are any existing construction activities or the valley shape of the topography confining and redirecting sound waves. Noise generated by construction equipment and vehicle use under Alternative B would decrease to the elevated ambient noise levels, described above, before they would decrease to a Class A EDNA. See **Map 3-3**, **Map 3-5**, and **Map 3-7**, and **Map 3-9** in **Appendix A** for how noise levels would decrease over distance.

The temporary noise generated under Alternative B would occur during equipment and vehicle use associated with construction. The in-water work window for Alternative B is July 1 to November 15 (Phase I construction), and would occur up to 24 hours per day, up to 7 days per week. The Phase II construction work associated with lining the conveyance pipeline with CIPP would occur between April and May of 2023 and 2024, from 7:00 a.m. to 10:00 p.m. daily, up to 6 days per week. See Section 2.4.2 and **Appendix C** for details on timing of construction activities.

To minimize impacts from construction, the following would occur:

- BMPs listed in **Appendix B**.
- No pneumatic tool in excess of 30 pounds would be used without prior approval.

Construction equipment would be a source of vibration. The closest sensitive receptor to the intake construction area is approximately 0.2 miles away. The closest sensitive receptor to a CUA is approximately 200 feet away. At these distances, vibration is not expected to damage property from the use of construction equipment. As the distance from the vibration source increases, the amount of vibration decreases.

Alternative C

The impacts under Alternative C would be similar to those described under Alternative B. Under Alternative C, however, Reclamation would line the entire upper segment of the conveyance pipeline on USFWS property. Additionally, under Alternative C, starting at the PISMA, the entire

conveyance pipeline would be lined with CIPP down to the USFWS parcel boundary, which could result in a slight increase in the duration of noise from use of the hot air blower. **Map 3-4** in **Appendix A** shows the distances for the pneumatic tool to attenuate to a Class A EDNA of 45 dBA or less under Alternative C. **Map 3-6** in **Appendix A** shows the distances for the hot air blower noise levels to attenuate to a Class A EDNA of 55 dBA or less under Alternative C.

Under Alternative C, there would be fewer truck trips to access the intake construction area, resulting in less truck noise. **Map 3-7** in **Appendix A** shows the distances for truck noise levels to attenuate to a Class A EDNA of 45 dBA or less under Alternative C.

Map 3-9 in **Appendix A** show the distances for the diesel pump noise levels to attenuate to a Class A EDNA of 45 dBA or less under Alternative C. This would be the same as described under Alternative B.

Alternative D

Under Alternative D, Phase I construction would occur from 7:00 a.m. to 10:00 p.m., up to 6 days per week, instead of up to 24 hours per day, up to 7 days per week as described under Alternative B. This would result in less nighttime noise at the intake construction area as compared with Alternative B. **Map 3-4** in **Appendix A** shows the distances for the pneumatic tool noise levels to attenuate to a Class A EDNA of 55 dBA or less.

Under Alternate D, truck trips related to construction activities would occur between 7:00 a.m. and 10:00 p.m. 6 days per week, instead of 24 hours per day, 7 days per week as described under Alternative B. This would result in less nighttime noise along Icicle Creek Road as compared with Alternative B. **Map 3-8** in **Appendix A** shows the distances for the truck noise levels to attenuate to a Class A EDNA of 55 dBA or less.

Map 3-5 and **Map 3-9** in **Appendix A** show the noise attenuation distances for the hot air blower and the diesel pumps associated with the temporary Hatchery water supply, respectively. The noise attenuation distances for these pieces of construction equipment would be the same as described under Alternatives B and C. The hot air blower would only be used between the hours of 7:00 a.m. and 10:00 p.m. **Map 3-5** in **Appendix A** shows the distances for the hot air blower to attenuate to a Class A EDNA of 55 dBA or less. The diesel pumps associated with the temporary Hatchery water supply for Phase I would operate 24 hours per day and 7 days per week (**Map 3-9** in **Appendix A**). Under Alternative D, the total duration of time the diesel pumps would operate would be approximately 8 months, instead of approximately 10 days under Alternative B (**Table 2-1**). This would result in a longer duration of daytime noise and more nighttime noise as compared with Alternative B. **Map 3-9** in **Appendix A** shows the distances for the diesel pumps to attenuate to a Class A EDNA of 45 dBA or less.

3.6 Transportation and Traffic

3.6.1 Analysis Area

The Analysis Area for transportation and traffic includes East Leavenworth Road and Icicle Road from their intersections with U.S. Highway 2 to the intersection of these two roads north of the LNFH, where Icicle Road turns into Icicle Creek Road; and Icicle Creek Road to the Forest Service kiosk and construction vehicle turnaround area (**Map 3-10** in **Appendix A**). The kiosk is approximately 1.25 miles southwest of the intake facilities. The primary Analysis Area is Icicle Creek Road between the intersection with East Leavenworth Road and the Forest Service kiosk, and Fish Hatchery Road. Icicle Creek Road is accessed by either East Leavenworth Road or Icicle Road.

3.6.2 Affected Environment

Icicle Road is the proposed haul route for the Project. It is used for access to recreation areas, private residences, inns and hotels, and the LNFH. Icicle Creek Road is the main access road to recreation opportunities on the Okanogan-Wenatchee National Forest, including the Snow Lakes Trail, a popular hiking trail (Forest Service 2020). Fish Hatchery Road intersects Icicle Road south of the Icicle Road and East Leavenworth Road intersection and is the main access road to the LNFH facilities.

Seasonal tourism directly influences traffic volume on roads in and near the Analysis Area. In general, traffic is lighter during the recreation off-season, between November and early May. Visitor use and associated traffic volume generally increases during the peak recreation season between mid-May and September. Snow Lakes Trailhead overnight reservation permits are required from May 15 to October 31 due to the heavy use of the Snow Lakes Trail and surrounding wilderness (Forest Service 2020).

Level of Service (LOS) is used in traffic analysis to rate roadway segment operations using a traffic volume to road capacity ratio (TRPC 2016). It is also used to determine how well a transportation facility is operating from a traveler's perspective (TRPC 2016). LOS ratings for the State of Washington range from A to F, with A being the most free-flowing and F the least. (WSDOT 2020). The LOS rating decreases as a result of higher traffic volumes, decreased road capacity, or both. All roads within the Analysis Area are in Chelan County. The Chelan County LOS policy for rural roads is C or better (Chelan County 2015), and the City of Leavenworth strives for an LOS of C or better[29].

The typical LOS, a measure of the operational capacity of a roadway segment or intersection, is C or better on northbound Icicle Road. The intersection of Icicle Road and U.S. Highway 2 is the only road segment or intersection near the Project Area for which LOS has been officially calculated (RBT Consultants 2018). Since average daily traffic counts on Icicle Road are less than the lowest average daily traffic counts for the U.S. Highway 2 and Icicle Road intersection for both Saturdays and weekdays, and roadway capacity is the same, it can be inferred that Icicle Road has a baseline LOS of C or better. While traffic volume at this intersection is not necessarily representative of the

[29] Andrew Brunner, Chelan County Public Works Department, email to Elizabeth Heether, Bureau of Reclamation, on May 20, 2020, regarding "L-SWISP: Transportation—Level of Service (LOS) Data Request."

Analysis Area, it suggests that Icicle Road has an LOS C or better and provides context for possible daily, weekly, and seasonal traffic conditions on roads in the Analysis Area. For example, the available LOS data indicate that Icicle Road and Icicle Creek Road experience an increase in traffic during the peak recreation season and on weekends (RBT Consultants 2018).

Traffic congestion typically occurs near the Snow Lakes Trailhead area due to parking overflow along both sides of the road. During the peak recreation season, especially on weekends when visitor use is highest, traffic conditions on Icicle Creek Road within 0.25 miles of the Snow Lakes Trailhead is more representative of an LOS D.

3.6.3 Environmental Consequences

Indicators and Assumptions

Indicators for impacts on transportation and traffic are changes in the LOS on roads and changes in access on roads to points of interest.

The following assumptions are used for the transportation and traffic analysis:

- Traffic volume in the Analysis Area is greatest during peak recreation season (from mid-May to September), and is typically greater on weekends than weekdays. On a daily basis, typical traffic volumes are greatest during daylight hours.
- Icicle Road and Icicle Creek Road have an LOS of C or better under baseline conditions.
- All impacts on transportation and traffic, including road repairs after Phase I and Phase II construction, would be temporary.

Additional Project assumptions used in the analysis are described in **Appendix C**, SWISP Project EIS Analysis Assumptions.

Alternative A – No Action Alternative

Under the No Action Alternative, there would be no change in the LOS on roads and drivers would not experience any increase or decrease in delays or frustrations while accessing or leaving the Alpine Lakes Wilderness. No planned construction activities would occur; however, the existing intake facilities would continue to operate and require routine maintenance. Operation and maintenance activities would involve one to two pickup trucks entering and leaving the Analysis Area on the days when maintenance occurs. Extraordinary maintenance would occur every couple of years and would be expected to continue into the future, which would require the use of one to three heavy construction vehicles. The LNFH's primary point of diversion and water delivery system on Icicle Creek is nearly 80 years old and is reaching or exceeding its operational life. Failure of the diversion or water delivery system would be an emergency situation. Hatchery staff responding to the situation would have an immediate and potentially sustained impact on traffic both during the emergency and until repairs are made. The timing and extent of potential impacts on transportation and traffic from extraordinary maintenance or emergency repairs would depend on the nature, extent, and timing of the necessary repairs. For the purposes of this analysis, it is assumed the No Action Alternative would result in no changes to the baseline LOS or access in the Analysis Area.

Alternative B – Proposed Action

Compared with Alternative A, there would be an increase in heavy vehicle traffic using Icicle Road and Icicle Creek Road under Alternative B. The requirement to turn around at the Forest Service and Alpine Lakes Wilderness kiosk and the need to back in against traffic onto the intake access road would result in temporary, localized reductions in LOS. The changes would be largely confined to the Wenatchee Bridge and the 1.25-mile segment of Icicle Creek Road between the intake construction area and Snow Lakes Trailhead. Reduced parking at the Forest Service and Alpine Lakes Wilderness Area kiosk to accommodate the construction vehicle turnaround area would change the level of access to the area compared with Alternative A because there would be fewer places for visitors to park. The greatest potential for impacts would be during daylight hours, on weekends, during the summer when traffic volumes and demands for access to nearby recreation opportunities are highest. Distributing certain types of construction traffic across a 24-hour period would result in the potential for impacts occurring 24-hours per day.

Under Alternative B, Phase I construction activities would occur up to 24 hours a day, 7 days a week. During Phase I of construction, temporary reductions in LOS below C would be expected between the intake construction area and the Forest Service and Alpine Lakes Wilderness kiosk as heavy construction vehicles would utilize the turnaround point and then back in to the intake access road. There would continue to be open access to the Snow Lakes Trailhead and businesses along Icicle Creek Road. A LOS below C would also occur on Icicle Road at Wenatchee Bridge when construction vehicles with oversized loads access the bridge. This is because the road would be reduced to one lane and would temporarily stop northbound or southbound traffic, depending on the vehicles' direction of travel. Vehicles in the Analysis Area would be delayed at most 10 minutes (see the SWISP Project EIS **Recreation Resource Report**), accessing Icicle Road and Icicle Creek Road due to temporary and intermittent lane closures at the Wenatchee Bridge, intake access road, and the Forest Service and Alpine Lakes Wilderness kiosk at the turnaround. The lane closure would be considered a delay rather than a change in the level of access because the lane would immediately reopen. Impacts to traffic and transportation within the Analysis Area would be reduced during nighttime construction activities because baseline LOS is typically higher at night due to fewer vehicles on the roads.

Traffic control BMPs such as flagging, cones, delineators, safety barriers, flasher lights, danger signals, and signs would help maintain a LOS of C and maintain vehicle access by maintaining traffic flow, minimizing obstruction, and ensuring public safety (see **Appendix B**). These measures would meet the requirements of the Manual on Uniform Traffic Control Devices for Streets and Highways, Part 6 (Temporary traffic control) and WAC 296-155-305 (Signaling and flaggers).

During Phase II of construction, use of CUAs would temporarily delay access to the Icicle River RV Resort, Icicle Creek Center for the Arts, and Sleeping Lady Mountain Resort from mid-April to mid-May. Cyo Road (accessed from Icicle Road) would be used to access CUA 5, which may delay access, intermittently, to the Mid-Columbia Fish and Wildlife Conservation Office. Impacts on access would be minimized by maintaining convenient access to driveways and buildings along the line of work, as listed in **Appendix B**.

Construction vehicles would make two to three trips daily, per worker, with a maximum of 15 workers per shift during Phase I construction, and 7-10 workers per shift during Phase II construction. While roadways would be maintained to ensure smooth condition (see **Appendix B**), this level of high use may result in any combination of ruts, broken pavement, potholes, or low areas with standing water on Icicle Creek Road. These would be minimized to the extent possible during Phase I and Phase II construction through the applicable BMPs listed in **Appendix B**. The construction contractor would also comply with the permitting requirements for Chelan County ROW use and repairs and Forest Service road repairs within both jurisdictional boundaries on Icicle Creek Road.

Alternative C

Alternative C would temporarily reduce LOS compared with Alternative A, but to a lesser extent than Alternative B. This is because Alternative C would require fewer heavy equipment vehicle trips accessing the intake construction area. The locations where there would be temporary LOS reductions would be the same as discussed under Alternative B. Impacts on access would be the same as described under Alternative B.

Alternative D

Alternative D would temporarily reduce LOS and vehicle access compared with Alternative A. Alternative D would have a similar LOS as Alternative B with respect to impacts from construction vehicle trips along the construction vehicle route. Impacts on access would be the same as described under Alternative B. However, under Alternative D, Phase I construction would be limited to the workday hours of 7:00 a.m. to 10:00 p.m., 5 days per week, and up to 6 days per week under pre-approved circumstances. Even though traffic is usually heavier during daytime hours, overall daily impacts to traffic and transportation within the Analysis Area would be reduced under Alternative D as compared with Alternative B, as construction activities between 10:00 p.m. and 7:00 a.m. would not occur. The LOS and vehicle access would be maintained during inactive construction hours, as described under Alternative A.

By limiting the construction time window to workday hours of 7:00 a.m. to 10 p.m., and 5 days per week instead of up to 24 hours per day, and up to 7 days per week as proposed under Alternative B, two additional years of Phase I construction activities would be required under Alternative D, including two more full equipment and crew mobilizations than would occur under Alternative B. No additional heavy equipment would be required under this alternative. As such, impacts to traffic and vehicle access during Phase I construction would last for a total of four years, or two more years than under Alternative B. Impacts from Phase II construction on transportation and traffic would be the same as described under Alternative B. Traffic conditions and vehicle access would return to baseline conditions in four years, after construction is completed.

3.7 Recreation

3.7.1 Analysis Area

Lands containing access to recreation opportunities within the City of Leavenworth and the surrounding landscape comprise the Analysis Area for recreation, including all areas accessed by Icicle Creek Road (**Map 3-11** in **Appendix A**).

3.7.2 Affected Environment

National Forest System land in the Icicle Creek drainage serves as one of the most popular recreation areas in the Pacific northwest. The Alpine Lakes Wilderness is visited by nearly 150,000 people each year. An unpaved parking area located at the Snow Lakes Trailhead off Icicle Creek Road provides approximately 55 informal parking spaces and is frequently at or above capacity during the summer months, with vehicles often parking along the highway. Driving time to the Snow Lakes Trailhead parking area from the intersection of East Leavenworth Road and Icicle Creek Road/Icicle Road is approximately 5 minutes. Public access to recreational fishing opportunities is located at the end of the Fishing Access Road at the northern end of the LNFH. In addition to offering fishing opportunities, this area is also a popular location for river tubing and boating access on Icicle Creek between the Hatchery and the confluence of the Wenatchee River and Icicle Creek. A sport fishery occurs downstream from the Hatchery during years of abundant LNFH Spring Chinook Salmon returns. Various recreation also occurs year-round on the Icicle River Trails, a system of informal trails located on a 200-acre parcel located on USFWS property at the LNFH. The 5-mile Icicle River Trail is popular for Nordic skiing during winter months. The Icicle River Trail ticket booth and entrance to the trail system are located off Cyo Road. Informal parking is available at this location.

Two privately-owned and operated entities that offer lodging and recreational amenities are located within the Analysis Area. The Icicle River RV Resort is located adjacent to Icicle Creek immediately downstream of the low-head diversion dam. The nearby Sleeping Lady Mountain Resort also offers overnight accommodations to visitors, in addition to providing organized outdoor recreation on the Leavenworth Winter Sports Club trail system. The Icicle Creek Center for the Arts, located immediately west of the Sleeping Lady Mountain Resort, is an arts complex providing visitor amenities on 14 acres containing 19 buildings.

3.7.3 Environmental Consequences

Indicators and Assumptions

Indicators identified for analysis of potential impacts on recreation include:

- Changes in accessibility of local recreation areas, such as trail systems and fishing areas
- Change in quality or quantity of recreational opportunities
- Changes in LOS, a function of roadway capacity and traffic volume, on local roadways providing visitor access to recreation opportunities
- Increased traffic delays and reductions in parking availability

The analysis assumes that the vast majority of vehicle trips along Icicle Road and Icicle Creek Road are recreation related. As described in **Section 3.6.2**, motorists travelling from the City of Leavenworth commonly access the Okanogan-Wenatchee National Forest and Alpine Lakes Wilderness from trailheads located along Icicle Creek Road.

Other assumptions used in the analysis are described in **Appendix C**, SWISP Project EIS Analysis Assumptions.

Alternative A – No Action Alternative

Continuation of current O&M of the LNFH surface water intake and delivery system on Icicle Creek would not result in any changes to the accessibility of local recreation areas, such as trail systems and fishing areas. The quality and quantity of existing recreational opportunities would remain unchanged, and roadway capacities and parking availability at recreational destinations such as trailheads would be unaffected. Overall, there would be no short-term or long-term changes to the quality of the recreation setting or quantity of recreation opportunities under Alternative A. However, in the absence of improvements to the LNFH surface water intake and delivery system on Icicle Creek, the existing intake and delivery system would continue to deteriorate and cause O&M problems for the Hatchery. More frequent repairs to the system could be required, which would temporarily impact recreation users by decreasing the quality of the recreation setting from noise and traffic associated with the repairs, and temporarily displace recreation activities from the vicinity of the maintenance activities. In addition, if conditions were unchanged, fish production could decrease or, in event of catastrophic failure, cease altogether, resulting in adverse effects to recreational fishing in Icicle Creek.

Alternative B – Proposed Action

Under Alternative B, long-term benefits to recreational fishing would result from enhanced fish passage due to improvements at the Hatchery intake facilities. The improvements to aquatic species and resulting long-term productivity of the riverine ecosystem of Icicle Creek would contribute to an enhanced quality of recreational experience over the long term.

Under Alternative B, impacts to recreational users would be caused by temporary access constraints on Icicle Creek Road associated with the Phase I construction period as well as delays caused at the vehicle turnaround point approximately 1.25 miles southwest of the intake facilities. Most recreational visitors accessing areas downstream of the intake structure and near the LNFH (e.g. the public fishing area located at the end of Fishing Access Road, the Sleeping Lady Mountain Resort, and the Icicle Creek Center for the Arts) would experience minimal disturbance from construction-related vehicle traffic or CUAs. Recreational visitors accessing areas upstream of the intake structure (such as the Snow Lakes Trailhead) would experience intermittent traffic delays resulting from trucks exiting and re-entering the highway from the designated turnaround point located at the Forest Service and Alpine Lakes Wilderness Area kiosk. Annual recreational visits at the Snow Lakes Trailhead are anticipated to decline by approximately 8 percent during the in-water work period from July 1 to November 15. Due to safety concerns, haul vehicles bypassing the Snow Lake Trailhead would temporarily eliminate 15 non-developed parking spaces along the roadside during a 138-day construction window. This would result in a maximum loss of approximately 4,761 visits. Construction-related activities, such as haul vehicles using the turnaround at the Forest Service and

Alpine Lakes Wilderness Area kiosk, would also temporarily reduce available parking by 14 spaces resulting in an additional 4,444 visits lost. Overall, due to the above-described construction-related disturbances and access constraints related to staging, temporary negative impacts to recreational users would be experienced.

Where CUAs and associated access routes prevent recreational visitors from entering certain locations, impacts would result in noticeable reductions in the quality or quantity of recreational opportunities. For instance, amenities at Icicle River RV Resort would be temporarily reduced to accommodate active replacement/lining of the conveyance pipeline at CUA 2 between April and May. One seasonal guest would be displaced by Project activities, should they occur within the April to October timeframe, as a result of the need to utilize up to five RV sites for staging, maneuvering and ingress/egress related to the CUA 2 site where conveyance pipe lining would be installed.

Construction of several temporary access points on private lands along the conveyance pipeline alignment would be required to provide ingress and egress for construction. Noise propagated from construction activities could, depending on the timing and nature of visitor activities, potentially affect visitors and guests at the Icicle Creek Center for the Arts and Sleeping Lady Mountain Resort.

At the Icicle Creek Center for the Arts, the locations of the CUAs and timing of activities could noticeably impair sound quality at noise-sensitive locations. CUA 4 would be located away from the theater, stage, rental cabins and practice huts, and CUA 3 would be located on the south end of the staff and student parking lot. Although these locations are not near noise-sensitive areas of the Icicle Creek Center for the Arts, the loudest potential construction-related noise source, a hot air blower, would have the noise levels and attenuation distances depicted in **Map 3-5** in **Appendix A**.

Similarly, noise could measurably affect visitor experience at the Sleeping Lady Mountain Resort. CUA 5, while not near guest accommodations, is located on USFWS property adjacent to the Sleeping Lady Mountain Resort. The associated contractor parking area would be located across Cyo Road. CUA 4 is located approximately 280 feet west of the fountain cluster of lodging facilities of the Sleeping Lady Mountain Resort and approximately 150 feet northwest of the Tadpole Meeting Room at the Resort. Noise propagated from construction activities at CUA 4 would potentially affect visitors and guests at these locations, depending on the timing and nature of visitor activities (see **Map 3-5** in **Appendix A**).

Alternative B would result in temporary, localized LOS reductions along Icicle Creek Road at the surface water intake and turnaround locations due to construction vehicle movements. The greatest intensity of Project activities and associated disturbances would occur from July 1 through November 15 during the in-water work period. When combined with recreational traffic, this would effectively result in adverse impacts to recreational visitors. Traffic delays are anticipated to be, on average, 10 minutes for motorists travelling to recreational destinations along Icicle Creek Road. These delays would be caused by the need for construction vehicles to access the LNFH surface water intake area off Icicle Creek Road, as well as a truck turnaround point located approximately 1.25 miles southwest of the intake facilities. BMPs, which would be incorporated into Project design to mitigate impacts to recreation, include prohibiting construction activities (such as parking, storage, or vehicle turnaround) in the Snow Lakes Trailhead parking area (**Appendix B**). No

impacts to recreation are expected to occur during normal O&M once construction activities are complete.

Alternative C

Under Alternative C, Reclamation would line the entire upper segment of the conveyance pipeline on USFWS land rather than replace the pipeline as described under Alternative B. As a result, less disruption to recreational activities would occur under Alternative C than described under Alternative B. Effects to recreation users under Alternative C would be of lower intensity than under Alternative B given that the degree of noise and traffic disturbances would be reduced from Alternative B. This is because Alternative C would require less overall excavation of the conveyance pipeline, which would normally occur over several days and require daily hauling of equipment to construction sites, adding additional traffic and possible delays. Aside from these differences in recreational impacts due to replacement and lining of the conveyance pipeline, all other impacts to recreation (both adverse and beneficial) from Alternative C would be the same as described under Alternative B.

Alternative D

Under Alternative D, temporary changes in accessibility of local recreation areas during each Phase I construction season would be similar to those described under Alternative B. There would be less of a decline in annual recreational visits at the Snow Lakes Trailhead under Alternative D (a maximum loss of approximately 3,485 visits or approximately 6 percent of annual visits) as compared to Alternative B, due to the shorter in-water work window from July 1 to October 31. However, overall impacts to recreationists would be experienced over a longer total time period compared with Alternative B. Instead of Project completion in 2024 as described under Alternative B, Project completion, including Phases I, II, and III of construction, would likely extend until 2025 under Alternative D. This means that Phase I construction-related disturbances, including noise, traffic delays, and temporary loss of recreationist parking along Icicle Creek Road and at the Snow Lakes Trailhead would extend for an additional 2 years, including during the peak recreation season for two additional seasons, compared with Alternative B.

As described under Alternative B, long-term benefits to recreational fishing would result from enhanced fish passage under Alternative D. However, temporary adverse impacts may occur during Phase I construction from the presence of noise generated at the spillway pool from two high-capacity 16-inch diesel-powered pumps which would be in operation from November 1, 2022 to June 30, 2023 for the purpose of providing a temporary water supply to the Hatchery. These pumps would operate 24 hours per day, 7 days per week during the 8-month period (**Map 3-9** in **Appendix A**). Noise propagated from pumping during this period would potentially affect the experience of recreationists using the Icicle River Trails at the LNFH.

As described under Alternative B, temporary, localized LOS reductions would occur along Icicle Creek Road at the intake and turnaround locations due to construction vehicle movements. These reductions in LOS would extend for an additional 2 years of construction seasons under Alternative D as compared with Alternative B, including during the peak recreation season for two additional seasons, compared with Alternative B. Similarly, delays would be caused by the need for construction vehicles to access the surface water intake area on Icicle Creek, as well as at the truck

turnaround point located approximately 1.25 miles above the intake access road, at the Forest Service and Alpine Lakes Wilderness Area kiosk. Under Alternative D, these delays would extend for an additional 2 years of Phase I construction seasons as compared with Alternative B. No impacts to recreation are expected to occur resulting from Project O&M activities once construction is complete.

3.8 Environmental Justice

3.8.1 Analysis Area

The Analysis Area for environmental justice is shown in **Map 3-12** in **Appendix A**. It includes the City of Leavenworth and Chelan County, Washington. Data were collected from these geographic areas to best represent the Analysis Area.

3.8.2 Affected Environment

Low-Income and Minority Populations

The CEQ guidance on environmental justice (CEQ 1997) defines low-income populations based on the U.S. Census Bureau's annual statistical poverty thresholds. The U.S. 2018 poverty level is based on total income of $12,140 for an individual and $25,100 for a family of four (HHS 2018). The CEQ guidance does not specify percentage guidelines for defining a population as low income; for this analysis, this is defined as an area where the number of individuals living below the poverty line exceeds 50 percent of the total population, or if the percentage of the low-income population is meaningfully greater than the percentage below poverty in the comparison population. The CEQ guidance defines a minority population as one where an individual group or the aggregate population of all minority groups combined exceeds 50 percent of the total population, or if the percentage of the population comprising all minority groups is meaningfully greater than the minority population percentage in the broader region. Chelan County and the City of Leavenworth do not meet the criteria for low-income and minority environmental justice populations. As a result, no minority or low-income populations have been identified for further environmental justice consideration at these geographic levels.

Native American Tribes

Potentially affected minority populations include members of area Native American Tribes. Tribal affiliated groups with a connection to resources within the Analysis Area include members of the Yakama Nation and Confederated Tribes of the Colville Reservation. Both tribes have legally defined fishing rights in the Analysis Area. These groups represent populations of environmental justice concern.

3.8.3 Environmental Consequences

Indicators and Assumptions

Indicators for socioeconomics and environmental justice include effects on the following:

- Disproportionate environmental effects on low-income, minority and tribal populations

Project assumptions are described in **Appendix C**, SWISP Project EIS Analysis Assumptions.

Alternative A – No Action Alternative

Impacts on socioeconomic conditions under Alternative A would be indirectly related to the potential reduction in fishing opportunities, as described in the SWISP Project EIS **Socioeconomics and Environmental Justice Report**. Such effects would impact all users and there would not be disproportionate environmental effects on low-income, minority and tribal populations. Impacts to Tribal fisheries are discussed in **Section 3.10**, Tribal Interests.

Alternative B – Proposed Action

Alternative B is generally not expected to result in disproportionate environmental effects on low-income, minority and tribal populations because these populations do not reside in the Analysis Area. However, there are tribal populations which use the fishery resource to meet subsistence needs. Impacts to Tribal fisheries are discussed in **Section 3.10**, Tribal Interests.

Alternative C

Impacts to environmental justice under Alternative C would be the same as described under Alternative B.

Alternative D

Impacts to environmental justice under Alternative D would be the same as described under Alternative B.

3.9 Public Health and Safety

3.9.1 Analysis Area

The Analysis Area for public health and safety is shown in **Map 3-13** in **Appendix A**.

3.9.2 Affected Environment

The LNFH is an active site, where employees are exposed to weather and other safety concerns during daily operations. Snow and ice removal from the existing intake facilities, especially from the fine rack in the gatehouse, is one of the primary safety concerns. Employees must manually remove ice, so it does not accumulate on the racks and prevent water from entering the system. This requires them to move on and around icy, slippery surfaces while trying to remove ice and debris from the structures.

Icicle Creek Road is the only access point to the existing surface water intake facilities and would be used for all construction vehicles to access the Phase I construction area. Icicle Creek Road is also the only transportation corridor for residents in the Icicle Creek canyon, upstream of the existing intake facilities, and for the Snow Lakes Trailhead.

3.9.3 Environmental Consequences

Indicators and Assumptions

Analysis indicators for public health and safety include:

- Change in health and safety concerns for the public, construction workers, and LNFH staff

Project assumptions are described in **Appendix C**, SWISP Project EIS Analysis Assumptions.

Alternative A – No Action Alternative

Under Alternative A, impacts to the safety of LNFH employees would continue associated with O&M activities for the intake trashrack structure and conveyance pipeline. Because the existing sediment sluice does not function reliably, difficulties and inefficiencies in removing accumulated sediment from the intake channel and associated O&M and safety issues would persist. The existing intake facilities would not be modified, which would continue unsafe work conditions for workers attempting to clear the intake trashrack structure of debris, snow, or ice, especially during frazil ice events. Employees would also continue to experience safety issues in the existing gatehouse related to hazardous materials (lead paint), fine rack maintenance, and sediment removal.

Alternative B – Proposed Action

Proposed improvements would no longer require LNFH staff to access the existing intake facilities and gatehouse during icy, slippery conditions to remove frazil ice and snow. This would have the beneficial effect of decreasing the risk of injury from unsafe conditions for LNFH employees compared with Alternative A.

Occupational Safety and Health Administration regulations for worker safety would be followed during construction under Alternative B, minimizing the potential for injury. Under Alternative B, traffic would increase on Icicle Creek Road during construction. Reclamation would implement a traffic control program to maintain traffic flow through the area and minimize exposure to construction traffic for the public and implement BMPs included in **Appendix B** to protect public safety and maintain traffic flow.

Phase I construction activities could take place up to 24 hours per day, and up to 7 days per week. Phase II construction activities could occur up to 12 hours per day, and up to 7 days per week, but no overnight work would occur, and construction activities would not occur past 10:00 p.m. While residential traffic levels would decrease during the night, the added construction traffic could increase the risk of accidents. Increased risk of vehicular accidents with either wildlife or other drivers could be caused due to the lack of light, shadows, blinding light, or increased fatigue. In addition, construction noise and light pollution could affect local residents at nearby houses, and guests and visitors at the Icicle River RV Resort, Icicle Creek Center for the Arts, and the Sleeping Lady Mountain Resort. **Section 3.5**, Noise and Vibration outlines permissible noise levels for construction. Between 10:00 p.m. and 7:00 a.m., the noise limitations in **Table 3-3** shall be reduced by 10 dBA for receiving property in Class A areas. This would reduce possible noise impacts on local residents, which could include health-related impacts such as disrupted sleep patterns from construction traffic or discomfort from construction noise.

The proposed configuration of the intake access road under Alternative B would not allow for safe construction vehicle turnaround; therefore, large construction vehicles would use a turnaround area at the Forest Service kiosk west of the intake construction area. Reclamation would obtain a road use permit from the Forest Service prior to construction, provide flaggers to direct traffic, and install signs to prevent Snow Lakes Trail users from parking on or near the turnaround area.

Reclamation has identified temporary access routes through the Icicle River RV Resort, Icicle Creek Center for the Arts, and the Sleeping Lady Mountain Resort to access CUAs 2, 3, and 4 required for lining several sections of the conveyance pipeline. Reclamation would coordinate with these entities to separate construction traffic from public access where feasible using BMPs identified in **Appendix B**.

Alternative C

Impacts to public health and safety under Alternative C would be the same as those described under Alternative B.

Alternative D

Types of impacts to public health and safety under Alternative D would be the same as those described under Alternative B; however, the timing and duration of Phase I construction work would change. Alternative D would restrict work on Phase I to the workday hours of 7:00 a.m. to 10:00 p.m.; restricting the construction work hours would require two additional years to complete Phase I construction compared to Alternative B, for a total of four years. The extra construction seasons for Phase I would continue the risk of impacts to public health and safety described under Alternative B for an additional two years. Because Phase I construction work would not take place from 10:00 p.m. to 7:00 a.m., this would reduce the risk of vehicular accidents and noise impacts to sensitive receptors near the intake structure during these times as compared with Alternative B.

Between the first two in-water work window Phase I construction seasons, from November 1, 2022 to June 30, 2023, the temporary Hatchery water supply would be pumped using two high-capacity diesel pumps that would operate 24 hours per day and 7 days per week for a total duration of approximately 8 months. This would result in a longer total duration of daytime noise and more nighttime noise as compared with Alternative B. **Map 3-9** in **Appendix A** indicates that noise levels would exceed the nighttime Class A EDNA of 45 dBA or less for several residences off East Leavenworth Road and Cemetery Road near the spillway pool, although the ambient noise study characterized the ambient noise levels around the Project as already being elevated over noise thresholds (**Table 3-4** in Section 3.5.3). Nighttime noise impacts could include disrupted sleep patterns and general discomfort.

3.10 Tribal Interests

3.10.1 Analysis Area

The Analysis Area for Tribal Interests includes the Tribal fishery on Icicle Creek just downstream of the spillway pool at RM 2.8, and the Project's APE, which begins at an area centered on the existing intake facilities and follows the route of the conveyance pipeline to its end point at the sand settling

basin (**Map 3-14** in **Appendix A**). In 2020, the USFWS, the designated lead agency for carrying out the National Historic Preservation Act (NHPA) Section 106 review for this Project, received concurrence from the Washington DAHP on the Project's APE.

3.10.2 Affected Environment

Indian Sacred Sites

EO 13007, Indian Sacred Sites (May 24, 1996), directs federal agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites on federal land. The EO further directs agencies to provide reasonable notice for proposed land actions or policies that may restrict future access to or ceremonial use of, or adversely affect the physical integrity of, sacred sites. The EO defines a sacred site as a "specific, discrete, narrowly delineated location on federal land that is identified by an Indian Tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion."

Sacred sites may include ceremonial areas and natural landmarks that are religious or symbolic representations. Sacred sites are typically identified during NHPA Section 106 consultation (54 USC 300101) or during Government-to-Government consultation. Consultation that has occurred for the SWISP Project is detailed in **Chapter 4**, Consultation and Coordination. To date, no sacred sites have been identified in the Analysis Area.

Indian Trust Assets

ITAs are legal interests in property held in trust by the U.S. for Indian Tribes or individuals. ITAs include trust lands, natural resources, trust funds, or other assets held by the federal government in trust. An ITA has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset.

The Department of the Interior requires that all impacts to trust assets, even those considered nonsignificant, be analyzed in NEPA documentation, and that appropriate compensation and/or mitigation be implemented for impacts. To date, coordination with the Yakama Nation and Confederated Tribes of the Colville Reservation has occurred as part of NHPA Section 106 consultation, which was completed April 2020 (see **Section 4.2.4**, State and Tribal Historic Preservation Office Consultation), and as part of the NEPA process, as initiated with publication of the NOI in April 2020 (see **Section 4.2.3**, Government-to-Government Consultation).

There are no Native American lands, including reservation and trust lands, within 25 miles of the Analysis Area (Reclamation GIS 2020). The Analysis Area is on federal and private lands that do not occur on any identified or known trust lands or otherwise relate to any trust assets.

Tribal Fisheries and Culturally Important Plants and Wildlife

Tribal Fisheries The Yakama Nation and Confederated Tribes of the Colville Reservation have legally defined fishing rights in the Analysis Area and fishing in Icicle Creek is closely tied to the cultural traditions of the Wenatchi people (USFWS 2002). Tribal members mainly fish the portion of Icicle Creek at and just downstream of the spillway pool at RM 2.8, referred to as the Wenatshapam

Fishery; fishing occurs from both left and right banks. Ceremonial and subsistence fishing, consisting of scaffolding repair, ceremonies, and fishing, typically occur between April and July. Scaffolding repairs typically occur in April each year, and ceremonies take place the first weekend in May. There are no exact dates for the Tribal fishing window. The fishery is dependent upon the return of Spring Chinook Salmon to Icicle Creek. The trend over the last several years has been that fishing starts late-May and runs through July.

Culturally Important Plants and Wildlife Historical Wenatchi subsistence practices revolved around the seasonal availability of specific resources. Anadromous salmon is considered to have been the primary traditional staple food among the Wenatchi (Miller 1998; Ray 1933), and Wenatchi people from both the Yakama Nation and Confederated Tribes of the Colville Reservation have continued to fish at the Wenatchapam Fishery, as described above (Shutler 2011).

Among plant foods, edible roots and bulbs were the most significant in terms of their contribution to subsistence. These plants included bitterroot, arrowleaf balsamroot, various types of *Lomatium*, and camas (Scheuerman 1982), with roots gathered from late spring into the summer months. An important camas gathering area for the Wenatchi was located in the present-day City of Leavenworth (Sharley and Hamilton 2017), approximately 3 miles north of the Analysis Area. Various types of berries were also an important food and were gathered from mountain locations in the summer and fall. Deer, mountain goat, bear, and elk were among the primary animals hunted by the Wenatchi (Curtis 1911; Miller 1998; Ray 1933), with other smaller mammals and birds also hunted. Coordination with the Yakama Nation and Confederated Tribes of the Colville Reservation (see **Section 4.2.3**, Government-to-Government Consultation) to date has not identified traditional or culturally important hunting or plant gathering areas.

3.10.3 Environmental Consequences

Indicators and Assumptions

Impact indicators for Indian sacred sites are the potential for disturbing or limiting access to such sites. Impact indicators for ITAs are the potential for effects to ITAs.

Impact indicators for tribal fisheries and culturally important plants and wildlife include:

- Changes in access to and activities at the Wenatshapam Fishery
- Changes in access to traditional plant gathering and hunting areas
- Disturbance or removal of culturally important plants

Assumptions used in this analysis are as follows:

- Reclamation policy is to avoid impacts on Indian sacred sites whenever possible. Continued coordination with affected Tribes may result in future identification of sacred sites. If this occurs, Reclamation would further evaluate impacts on these resources. Consultation with the Yakama Nation and Confederated Tribes of the Colville Reservation would identify how to protect sacred sites if they were identified and how to provide continued access if any such sites were affected by Project construction.

- Because there are no ITAs in the Analysis Area, mitigation for impacts on ITAs is not required.
- In-water work would not occur in the spillway pool during the Tribal fishing preparations or season.
- Installation, use, and removal of pumps for the temporary Hatchery water supply is not considered in-water construction work since it would occur at an authorized point of diversion.
- BMPs would be incorporated to preserve existing native vegetation to the extent possible. Where preservation is not possible, damage to native vegetation would be minimized.

Additional Project assumptions used in the analysis are described in **Appendix C**, SWISP Project EIS Analysis Assumptions.

Alternative A – No Action Alternative

Indian Sacred Sites Impacts on Indian sacred sites are not anticipated under the No Action Alternative. This is because to date, Reclamation has not identified any Indian sacred sites in the Analysis Area.

Indian Trust Assets Impacts on ITAs would not occur under the No Action Alternative. This is because there is no trust land or other trust assets in the Analysis Area.

Tribal Fisheries and Culturally Important Plants and Wildlife There would not be changes in access to or activities at the Wenatshapam Fishery. Traditionally and culturally important hunting or plant gathering areas have not been identified specific to the Analysis Area and would therefore not be impacted.

Ongoing effects on fisheries and aquatic ecosystems in the Analysis Area, such as impacts on fish passage, would continue due to LNFH operations (see **Section 3.4**, Biological Resources). Further, fish production at the Hatchery, which is important to the Tribes, could be jeopardized in the future due to continued degradation of the system (see **Section 3.4**, Biological Resources).

Alternative B – Proposed Action

Indian Sacred Sites To date, Reclamation has identified no Indian sacred sites in the Analysis Area. Therefore, no impacts are anticipated to the access to or use of Indian sacred sites or to the physical integrity of such sites.

Indian Trust Assets Alternative B would not occur on any identified or known trust lands or trust assets. Therefore, there would be no impacts on ITAs under Alternative B.

Tribal Fisheries and Culturally Important Plants and Wildlife As described in **Section 3.4.3**, Fish and Aquatic Resources, Alternative B would improve fish passage and reduce the potential for entrainment in the existing intake facilities over the long-term. It would also improve the reliability of water delivery and the ability to meet Hatchery production goals. These would be benefits to the Tribal fishery.

Changes to access to the Wenatshapam Fishery are not anticipated during construction or subsequent O&M activities. Further, there would be no change to activities at the fishery because of O&M. However, there could be temporary impacts to fishing activities during construction. No construction activities would impact access to the fishery. Temporary traffic delays along Icicle Creek Road would occur during the Phase I and Phase II construction periods (see **Section 3.6**, Transportation and Traffic) but are not expected to affect access to the Tribal fishery, as multiple access points to the fishery are available from East Leavenworth Road. The majority of Tribal fishing activities would occur outside of the in-water work window (which is from July 1 to November 15) and no in-water construction work would occur in the fishing areas. Any in-water construction that would occur between July 1 and November 15 would occur during Phase I at the intake construction area over 1 mile upstream from the fishery. There would be, however, some overlap of land-based construction activities in April and May with the Tribal fishing period.

Temporary Hatchery water supply pumping at the spillway pool during Phase I of construction (approximately 1 week in July 2022) and during Phase II of construction (in April and May 2022, 2023, and 2024) may overlap some scaffolding repair, ceremonial, and/or fishing activities, depending on timing of such activities, but would not impact the ability of the Tribes to perform these functions. Noise would be generated during pumping at the spillway pool that would exceed Class A EDNA noise levels and could exceed ambient noise levels (see **Section 3.5**, Noise and Vibration, and **Map 3-9** in **Appendix A)**. The noise generated by the pumps and potential smell from the diesel could disrupt or annoy tribal members performing activities at the fishery. Pumping at the spillway pool could potentially lead to temporary behavior modifications of fish in the vicinity of the pump, including avoidance of the immediate area and displacement to other areas of Icicle Creek. However, it is uncertain if these behaviors would result in any impact on fishing success and catch rates. Pumping would utilize NMFS-approved screened sump-pumps to ensure a continuous water supply to the Hatchery while reducing the potential for injury or mortality to fish (see **Section 3.4**, Biological Resources). Other potential impacts to Tribal fishers from pumping at the spillway pool could include a reduction in area to fish due to the physical presence of pump screen boxes within the spillway pool or possible entanglement of fishing equipment with pumps and screen boxes.

Map 3-3, **Map 3-5**, and **Map 3-7** in **Appendix A** show the noise attenuation distances for the stationary noise sources (pneumatic tool and hot air blower) and mobile noise sources (a single truck) on area roads, respectively. Of these noise sources, the hot air blower used at CUA 5 during Phase II construction would generate noise that would be above the acceptable noise level of 55 dBA at the fishing platforms. The potential for disruption of fishing activities at the fishing platforms due to temporary noise from the hot air blower would depend on the timing of both fishing and hot air blower use. Phase II construction timing most likely would not overlap much or at all with Tribal fishing activities.

No traditional or culturally important hunting or plant gathering areas have been identified specific to the Analysis Area; therefore, access to such areas would not be affected under Alternative B. Construction activities would result in removal of limited amounts of ponderosa pine savanna and mixed conifer woodland (see the SWISP Project EIS **Biological Resources Report**); culturally important plants may grow in these areas. However, Coordination with the Yakama Nation and

Confederated Tribes of the Colville Reservation (see **Section 4.2.3**, Government-to-Government Consultation) to date has not identified vegetation in the Analysis Area as culturally important, and BMPs (**Appendix B**) would be implemented to minimize disturbance to native vegetation.

Alternative C

Indian Sacred Sites Effects on Indian sacred sites under Alternative C would be the same as described under Alternative B.

Indian Trust Assets Effects on ITAs under Alternative C would be the same as described under Alternative B.

Tribal Fisheries and Culturally Important Plants and Wildlife Long-term benefits to the Tribal fishery described for Alternative B would be the same under Alternative C. Effects on the Wenatshapam Fishery, and culturally important hunting or plant gathering areas would be similar to those described under Alternative B. Impacts from pumping out of the spillway pool to Tribal fishing activities would be the same as under Alternative B. Slightly less vegetation that could support culturally important plants would be disturbed during construction at the intake construction area compared to Alternative B, because lining the conveyance pipeline with CIPP would cause less surface disturbance and vegetation removal than replacing the same segment. However, as described under Alternative B, vegetation in the Analysis Area has not been identified as culturally important to date.

Alternative D

Indian Sacred Sites Effects on Indian sacred sites under Alternative D would be the same as described under Alternative B.

Indian Trust Assets Effects on ITAs under Alternative D would be the same as described under Alternative B.

Tribal Fisheries and Culturally Important Plants and Wildlife Long-term benefits to the Tribal fishery under Alternative D would be the same as described under Alternative B. Likewise, there would be no change in access to the Wenatshapam Fishery during construction or subsequent O&M activities or changes to activities at the fishery from O&M under Alternative D. Temporary traffic delays along Icicle Creek Road are not expected to affect access to the Tribal fishery as described under Alternative B. Additionally, under Alternative D, Phase I construction activities would only occur 5 days per week, and up to 6 days per week under pre-approved circumstances versus up to 7 days per week under Alternative B. However, Phase I construction activities would occur over two more construction seasons than Alternative B. Temporary impacts to Tribal fishing activities during Phase I construction could occur, and the duration of such impacts during Phase I would occur over a longer period of time than for Alternative B. Temporary disturbance to Tribal fishers from noise during Phase II construction would be the same as described under Alternative B.

Pumping from the spillway pool would occur during Phase I of construction and could result in temporary impacts to Tribal fishing activities. In addition to the approximately 1 week of pumping at the spillway pool during Phase I of construction in early July 2022 described for Alternative B,

water would need to be pumped from the pool continuously for an additional 8 months (November 1, 2022 through June 30, 2023) under Alternative D to supply water to the Hatchery. Pumping activities during 2023 for Phase I would therefore overlap all activities occurring at the Tribal fishery between April and the end of June 2023. Pumping would temporarily impact the ability of the Tribes to perform scaffolding repair, ceremonial, and fishing activities; however, the temporary construction noise generated could exceed community noise level limits (see **Section 3.5.3**, Noise and Vibration) and disturb and annoy tribal members. Sound generated by pumps may result in avoidance or displacement of fish, as described under Alternative B, and would continue for more than half of the Tribal fishing season. Two high capacity pumps would be used during the 8-month period in Phase I with an additional back-up pump on site. Potential reduction in area for Tribal members to fish or possible entanglement of fishing equipment with pumps and screen boxes could also occur as described under Alternative B, but would occur over a longer time period under Alternative D. Relying on pumps operating continuously for 8 months would also create a risk of temporary impacts to Hatchery production (see **Section 3.4.3**, Fish and Aquatic Ecosystems). Temporary Hatchery water supply pumping at the spillway pool during Phase II of construction and associated potential impacts to activities at the Tribal fishery would be the same as described for Alternative B.

Access to traditional or culturally important hunting or plant gathering areas would not be affected since such areas have not been identified within the Analysis Area. Limited removal of vegetation under Alternative D would be the same as described under Alternative B and has not been identified as culturally important. BMPs (**Appendix B**) would be implemented to minimize disturbance to native vegetation.

3.11 Short-Term Uses and Long-Term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR, Subpart 1502.16). This involves using all practicable means and measures, including financial and technical assistance, in a manner calculated to: foster and promote the general welfare; to create and maintain conditions under which man and nature can exist in productive harmony; and fulfill the social, economic, and other requirements of present and future generations of Americans. Short-term refers to the temporary phases of construction for the SWISP Project, while long-term refers to the operational life of the Project and beyond.

All action alternatives analyzed in this EIS would involve new construction, such as installing a new headworks and creek-width roughened channel and replacing portions of the surface water conveyance pipeline to the Hatchery. Current access routes into the Intake would also be modified and extended to provide better entry to an expanded IO&MA. Short-term uses related to implementation of the action alternatives would include construction activities resulting in temporary impacts such as increased noise, traffic delays, disturbances to recreational access and Tribal fishers, and increases in fugitive dust. The temporary installation of cofferdams to isolate the instream work area would confine surface water flow through a constricted portion of Icicle Creek

during construction and temporarily reduce fish passage. These impacts would be balanced through the implementation of BMPs listed in **Appendix B**, as applicable.

Short-term benefits would result from increased employment (construction jobs) and revenue generated for the local economy during the construction phases.

Long-term productivity of fish and aquatic species would result from the new surface water intake facilities implemented under the action alternatives. This would result from improved fish passage and access to upstream habitat, and minimization of take through the new intake and fish passage component of the action alternatives. The improvement of fish passage would also result in the long-term productivity to the recreational and Tribal fisheries. The revegetation plan associated with Phase III would increase the structural diversity and species composition of upland and riparian vegetation near the intake construction area, which could improve the long-term productivity of vegetation communities, wildlife habitat, and water quality.

3.12 Unavoidable Adverse Impacts

Unavoidable adverse impacts are those on natural and human resources that would remain after mitigation measures have been applied. They are environmental consequences of an action that could not be avoided, either by changing the nature of the action or through mitigation. After consideration of actions, operations, and features to avoid, mitigate, or compensate for adverse effects, as detailed in **Appendix B**, the action alternatives would likely result in the unavoidable adverse impacts detailed below.

There would be unavoidable adverse impacts occurring during construction of the action alternatives on visual resources, increased air emissions, and localized impacts on geology. These impacts are detailed in the SWISP Project EIS Resource Reports, available on the Project website: https://www.usbr.gov/pn/programs/leavenworth/swisp/docs.html.

Biological Resources. Under the No Action alternative, adverse impacts to fish passage, aquatic habitat quantity and connectivity, and habitat quality resulting from the existing surface water intake and delivery system would continue. Continuing current operations and maintenance of the deteriorating facilities would not fulfill the requirements of the Biological Opinion (NMFS 2017a). The unreliability of the system would also jeopardize the Hatchery's objectives for Spring Chinook Salmon production.

Noise. Unavoidable adverse impacts from noise or vibration would occur during Project construction to varying degrees depending on the action alternative. Ambient noise levels for sensitive receptors would intermittently experience temporary increases due to construction vehicle and equipment use.

Public Health and Safety. Hatchery employees would continue to experience unavoidable adverse impacts under the No Action alternative resulting from operations and maintenance activities for the intake trashrack structure, particularly during frazil ice events. Employees would also continue to be exposed to lead-based materials from the gatehouse and intake access pad.

Recreation. Recreational visitors would experience unavoidable adverse impacts through intermittent traffic delays, reductions in access to the Icicle River Trail System, and reductions in available parking at the Snow Lakes Trailhead during various periods of Project construction under all action alternatives. Visitor experience at the Icicle River RV Resort, Icicle Creek Center for the Arts, and Sleeping Lady Mountain Resort would be temporarily adversely impacted from disruptions to patron access or facility use, or from noise or views associated with construction equipment.

Transportation. The action alternatives would result in temporary unavoidable adverse impacts on traffic and transportation and an increase in delays and frustration of drivers during Project construction. Likewise, delays associated with vehicles crossing the Wenatchee Bridge, turning around at the Forest Service and Alpine Lakes Wilderness Area kiosk, and backing into the intake construction area would result in a change of LOS on the roads. These changes would also delay access on roads by inhibiting access to points of interest within the Analysis Area.

Tribal Interests. Tribal fishers would experience temporary unavoidable adverse impacts to fishing activities from noise generated from hot air blowers and water pumps and the physical presence of pump screen boxes in the spillway pool under all action alternatives.

3.13 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments involve the use of nonrenewable resources and the effects of use on future generations. Irreversible effects primarily result from the use or destruction of specific resources that cannot be replaced within a reasonable time frame, such as energy and minerals. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action, such as extinction of a listed species or the disturbance of a cultural resource.

The action alternatives would result in the irreversible and irretrievable commitment of the following resources during Project construction and operation:

- Construction materials, including resources such as soil and rocks
- Labor
- Land area committed to new/expanded Project facilities
- Energy expended in the form of electricity, gasoline, diesel fuel, and oil for equipment and transportation vehicles that would be needed for Project construction and operations

Nonrenewable resources are expected to account for a minimal portion of the region's resources; the Project's use of nonrenewable resources would not affect the availability of these resources for other needs within the region. Construction would not result in inefficient use of energy or natural resources. The selected construction contractors would use best available engineering techniques, construction and design practices, and equipment operating procedures.

Chapter 4. Consultation and Coordination

4.1 Introduction

This chapter describes the consultation and coordination among Reclamation and other federal, state, and local agencies, Native American Tribes, and the public in preparing this EIS. Reclamation followed the public involvement requirements documented in the CEQ regulations implementing NEPA (40 CFR 1501.9 for scoping, and 1506.6 for public involvement). NEPA and associated laws, regulations, and policies require Reclamation to seek public involvement early and throughout the EIS process, to develop a reasonable range of alternatives to the proposed action, and to prepare environmental documents that disclose the potential impacts of the proposed action and alternatives. As summarized in **Section 1.6**, Public Involvement, and fully detailed in the public scoping report (Reclamation 2020a), Reclamation involved the public, Tribes, and other agencies through Federal Register notices, news releases, the virtual public meeting room, a live question and answer video teleconference session, and updates on Reclamation's Project website[30].

4.2 Consultation and Coordination

Federal laws require Reclamation to consult with certain federal and state agencies and other entities and Native American Tribes during the NEPA decision-making process (40 CFR 1502.24). Reclamation is also directed to integrate NEPA requirements with other environmental review and consultation requirements to reduce paperwork and delays (40 CFR 1500.4-5).

4.2.1 Cooperating and Participating Agencies

Cooperating agencies are those federal, state, and local agencies, and tribes, that have jurisdiction by law or special expertise with respect to any environmental impact involved in a proposed project or project alternative (40 CFR 1508.5). At the outset of the EIS process, Reclamation, as the Lead Agency, asked federal, state, and local agencies and Tribes if they would like to be cooperating agencies. Those entities that declined the cooperating agency request but desired to participate in the design and EIS processes became participating agencies. Although the Tribes have not accepted the invitation to become cooperating agencies, they are listed as participating agencies because representatives from their respective Fisheries and Fish and Wildlife Departments have been actively engaged with the design and planning for the SWISP Project since its inception. Reclamation will continue coordinating with each Tribe throughout the NEPA process. Agency and Tribal status are as follows:

[30] The project website can be accessed at: https://www.usbr.gov/pn/programs/leavenworth/swisp/index.html.

Cooperating Agencies

- USACE
- USFWS

Participating Agencies

- Chelan County
- Confederated Tribes and Bands of the Yakama Nation (Yakama Nation Fisheries)
- Confederated Tribes of the Colville Reservation (Fish and Wildlife Department)
- NMFS
- Forest Service
- Washington DAHP
- Ecology
- WDFW
- Washington Department of Natural Resources (WDNR)

Reclamation has held numerous meetings with the cooperating and participating agencies throughout the Project design and EIS development process and will continue through development of the Record of Decision. Cooperating and participating agency meetings were held at Project and permitting milestones and as needed. The purpose of these meetings was to inform and receive input from cooperating and participating agencies respective to their jurisdiction, special expertise, or interests. Reclamation has also met with various interested parties (particularly through participation in the Icicle Work Group) and will continue outreach throughout the NEPA process. Meetings with the cooperating and participating agencies throughout the Project design and EIS development process are summarized in **Table 4-1**.

Table 4-1. Cooperating and Participating Agency Meetings

Meeting	Date	Cooperating and Participating Agency Representation
Biweekly design meetings	Starting March 6, 2019	USFWS, Yakama Nation, Confederated Tribes of the Colville Reservation
30 percent Design, Permitting, and ESA Meeting	October 23, 2019	USFWS, Yakama Nation, Confederated Tribes of the Colville Reservation, NMFS, USACE, Ecology, WDFW, WDNR, Chelan County
Value Engineering Study	November 4-8, 2019	USFWS, WDFW
60 percent Design, Permitting, and ESA Meeting	February 19, 2020	USFWS, Yakama Nation, Confederated Tribes of the Colville Reservation, NMFS, USACE, Ecology, WDFW, WDNR, Chelan County
NEPA kickoff field visit	March 11, 2020	USFWS, USACE, WDFW
Alternatives Screening	April 14, 2020	USFWS
Yakama Nation Kickoff Meeting	April 21, 2020	Yakama Nation

Meeting	Date	Cooperating and Participating Agency Representation
Confederated Tribes of the Colville Reservation Kickoff Meeting	April 29, 2020	Confederated Tribes of the Colville Reservation
90 percent Design, Permitting, and ESA Meeting	May 5, 2020	USFWS, Yakama Nation, Confederated Tribes of the Colville Reservation, NMFS, USACE, Ecology, WDFW, WDNR, Chelan County
Resolve 90 percent design concerns focus calls	Starting May 21, 2020	USFWS, Yakama Nation, Confederated Tribes of the Colville Reservation, NMFS, USACE, WDFW
Agency Scoping Meeting	May 12, 2020	USFWS, USACE, Ecology, WDFW
Alternatives Development	June 15, 2020	USFWS
Biological Assessment Coordination	August 17, 2020, October 2, 2020	USFWS
100 percent Design, Permitting, and ESA Meeting	September 9, 2020	USFWS, USACE, WDFW, Ecology, Yakama Nation, Chelan County, NMFS

4.2.2 Interested Parties

Interested parties were identified by their proximity to the SWISP Project or through their involvement in the Icicle Work Group that was co-convened in December 2012 by Chelan County and Ecology's Office of Columbia River to find collaborative solutions for water management within the Icicle Creek Watershed. Interested parties include:

- Cascade Orchard Irrigation Company
- City of Leavenworth
- Icicle Creek Center for the Arts
- Icicle Peshastin Irrigation District
- Icicle River RV Resort
- Icicle Watershed Council
- Icicle Work Group
- Sleeping Lady Mountain Resort
- Trout Unlimited
- Wild Fish Conservancy Northwest
- Washington Water Trust

4.2.3 Government-to-Government Consultation

EO 13175 requires federal agencies to coordinate and consult on a Government-to-Government basis with sovereign Native American Tribal governments whose interests may be directly and substantially affected by activities on government-administered lands. Coordination and consultation with Native American Tribes is part of the NEPA scoping process. On April 14, 2020, Reclamation sent letters to notify the Yakama Nation and Confederated Tribes of the Colville Reservation of the publication of the NOI for the SWISP Project EIS, to invite the Tribe to participate in the EIS process as a cooperating agency, and to invite the Tribe to formally consult on the Project on a Government-to-Government basis. As captured in **Table 4-1**, Reclamation held kickoff meetings

with both Tribe's Natural Resources Department staff. Reclamation provided a copy of the presentation to be shared with the respective Tribal Councils. To date, Reclamation has not received a request for formal Government-to-Government consultation from either Tribe. Outreach and coordination will continue throughout the EIS development process. Continued coordination will help to ensure that management actions are consistent with rights retained by Tribes and that the concerns of Tribal groups are considered. Reclamation will engage in formal Government-to-Government consultation when requested by either Tribe.

4.2.4 State and Tribal Historic Preservation Office Consultation

The USFWS, acting as the lead agency for National Historic Preservation Act compliance for the SWISP Project, consulted with the Washington DAHP and Yakama Nation and Confederated Tribes of the Colville Reservation Tribal Historic Preservation Officers (THPOs) to identify historic properties. Although the LNFH complex was listed on the NRHP in 1998, the surface water intake, gatehouse, and conveyance pipeline were found to be non-contributing elements of the Hatchery complex at the time of listing. On February 11, 2020, the USFWS requested the DAHP concur with the determination that Alternative B (the proposed action) would have no adverse effect on historic properties (36 CFR 800.4(d)(l)). On February 12, 2020, the USFWS requested the Yakama Nation and Confederated Tribes of the Colville Reservation THPOs concur with the determination that that Alternative B (the proposed action) would have no adverse effect on historic properties (36 CFR 800.4(d)(l)) and requested input regarding sites of religious or cultural significance. On March 12, 2020, the DAHP concurred with the USFWS' determination, with stipulations requiring preparation of an unanticipated discovery plan and conducting archaeological monitoring during construction. On April 14, 2020, the Confederated Tribes of the Colville Reservation THPO concurred with the USFWS' determination that Alternative B (the proposed action) would have no adverse effect on historic properties and no additional cultural resource identification efforts are necessary. Because the impacts to cultural resources are identical or less than Alternative B, Alternative C and D would also have no adverse effect on historic properties. To date, the USFWS has not received a response from the Yakama Nation THPO. The USFWS Zone Archaeologist has prepared a *Plan and Procedures for the Inadvertent Discovery of Cultural Resources and Human Remains* (Inadvertent Discovery Plan) in advance of Project implementation.

4.2.5 U.S. Fish and Wildlife Service Consultation

In 2008, the NMFS and USFWS prepared the ESA Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic (FPRP; NMFS and USFWS 2008). The FPRP provided ESA coverage by both NMFS and USFWS for the USACE's Nationwide Permit program. The USACE has reinitiated Section 7 Consultation with USFWS; however, a Biological Opinion covering their Nationwide Permit program has not been completed and the temporary extension of the current Biological Opinion has expired. Therefore, to comply with ESA Section 7(a)(2) and 50 CFR 402, Reclamation has prepared a biological assessment to determine the potential impacts of the agency preferred action on the threatened Bull Trout (*Salvelinus confluentus*) and its designated critical habitat and the gray wolf (*Canis lupus*). Reclamation expects a Biological Opinion from the USFWS before publication of the Final EIS.

4.2.6 National Marine Fisheries Service Consultation

For this Project, Reclamation would use the Programmatic ESA Section 7(a)(2) Biological Opinion and the Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Seattle District Corps of Engineers Permitting of Fish Passage and Restoration Action in Washington State (FPRP III; NMFS 2017b) from NMFS as part of Section 7 (a)(2) of the ESA. The FPRP III provides ESA coverage for 12 categories of actions related to aquatic habitat restoration under the USACE's Nationwide Permit authority. NMFS, USACE and Reclamation agreed that the SWISP Project would fall under the programmatic biological opinion. As the lead federal agency for the SWISP Project, Reclamation will submit the FPRP Project Information Form to NMFS. NMFS will then review the federal action for certification under the FPRP before the action is authorized by the USACE.

4.2.7 U.S. Army Corps of Engineers

Reclamation has held meetings with the USACE Seattle District Regulatory Branch to assess potential permitting requirements for the Project. These were the 30, 60, 90, and 100 percent Design, Permitting, and ESA meetings, in addition to other meetings described in **Table 4-1**, above. The CWA establishes a program to regulate the discharge of dredged or fill material into waters of the U.S., to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the Nation's waters. Activities in waters of the U.S. regulated under this program include water resource projects such as dams, levees, and irrigation outlets. Reclamation will comply with the CWA by submitting the Joint Aquatic Resource Permit Application (JARPA) for review under USACE's CWA Section 404 and Ecology's CWA Section 401 permitting programs. In accordance with Section 404 of the CWA, the USACE intends to issue the following Nationwide Permits for the Project: Nationwide Permit 27, Aquatic Habitat Restoration, Enhancement, and Establishment Activities, and a Nationwide Permit 33, Temporary Construction, Access, and Dewatering.

4.2.8 U.S. Department of Agriculture, Forest Service

Alternative B (the proposed action) includes the use of Icicle Creek Road on National Forest System lands, between the Snow Lakes Trailhead and the Forest Service and Alpine Lakes Wilderness Area kiosk. As a result, Reclamation would secure the required road use approval from the Forest Service, most likely under a special use permit, which would not require separate NEPA review.

4.2.9 Washington State Department of Ecology

Reclamation has held meetings with Ecology to assess potential permitting requirements for the Project. These were the 30, 60, 90, and 100 percent Design, Permitting, and ESA Meetings, in addition to other meetings described in **Table 4-1**, above. Under Section 401 of the CWA, a federal permit to conduct an activity that may affect water quality in the State of Washington is subject to a water quality certification request. Ecology would review the Project's JARPA permit applications for compliance with State of Washington water quality standards and provide certification if the application complies with these standards. In accordance with Section 401 of the CWA, Ecology intends to issue a Letter of Verification certifying the Project is in compliance with State of Washington water quality standards.

4.2.10 Washington State Department of Fish and Wildlife

Reclamation has held meetings with WDFW to assess potential permitting requirements for the Project. These were the 30, 60, 90, and 100 percent Design, Permitting, and ESA meetings, in addition to other meetings described in **Table 4-1**, above. Washington State law (Revised Code of Washington [RCW 77.55]) requires hydraulic projects in or near state waters to obtain Hydraulic Project Approval (HPA) from the WDFW. An HPA ensures that construction is done in a manner that protects fish and their aquatic habitats.

4.3 Public Collaboration and Outreach

Public involvement allows interested and affected individuals, organizations, agencies, and other governmental entities to be consulted and included in the decision-making process. Reclamation solicited comments from the public on the proposed Project through the NEPA scoping process to help shape the alternatives considered in this document and the analysis of the impacts.

4.3.1 Scoping Process

As required by NEPA and its public involvement guidance, Reclamation solicited comments from cooperating and participating agencies, consulting parties, and other interested parties and the public, then organized and analyzed all comments received. Reclamation then evaluated the position statement of each comment and extracted the overarching issue or issues to address during the NEPA process. These issues define the scope of analysis for the SWISP Project EIS and were used to develop the Project alternatives.

As defined under the NEPA, the scoping period began with the publication of the NOI in the Federal Register on April 24, 2020. It was titled *Notice of Intent to Prepare an Environmental Impact Statement and Public Scoping Virtual Meeting Room for the Leavenworth National Fish Hatchery Surface Water Intake Fish Screens and Fish Passage Project, Chelan County, Washington*. For the 32-day period between April 24, 2020 and May 26, 2020, Reclamation sought public comments to determine relevant issues that could influence the scope of the environmental analysis, including alternative development, and guide the process for developing the SWISP Project EIS. The comment period ended on May 26, 2020. There were no comment submissions received or postmarked after this date.

The public had an opportunity to participate in the scoping process and provide input through a web-based virtual public meeting (VPM) website that was available 24 hours a day, from April 24, 2020 to May 26, 2020 (https://www.virtualpublicmeeting.com/leavenworth-swisp-eis). The VPM was structured around stations, which were modeled on the topics typically seen at open house public scoping meetings. The website provided access to information and materials including Project background, the purpose and need for the Project, the proposed action, Project diagrams and Project Area maps. Additionally, the VPM provided the public an opportunity to submit their comments and questions for Reclamation's consideration. Each VPM station was a single web page that the public could view and interact with. The welcome station provided a place for website visitors to sign in and add themselves to the Project mailing list. The welcome station also contained a link that visitors could use to download all maps and documents in the VPM room. A commenting station allowed visitors to submit written comments directly through the VPM comment form and

provided information on how to submit comments via mail or email. Reclamation also hosted a live question and answer video teleconference on May 18, 2020 from 4:00 p.m. to 6:00 p.m. Pacific Daylight Time. Reclamation provided a short presentation, followed by the question and answer session, during which Reclamation and USFWS management and resource specialists were available to discuss Project information and questions from teleconference participants.

In accordance with NEPA, Reclamation must document the public scoping results. The scoping report (Reclamation 2020a) summarizes the scoping process and the comments received during the formal scoping period, including those provided during the agency scoping meeting. The scoping report is available at: https://www.usbr.gov/pn/programs/leavenworth/swisp/scopingrpt.pdf.

4.3.2 Draft EIS Distribution

Information about the availability of the Draft EIS was distributed to the cooperating and participating agencies (see **Section 4.2.1**), interested parties (see **Section 4.2.2**), as well as individuals and businesses on the Project mailing list. The Draft EIS was also posted on the Project website for viewing and download: https://www.usbr.gov/pn/programs/leavenworth/swisp/deis.html.

4.4 Preparers and Contributors

The Draft EIS was prepared by the individuals identified in **Table 4-2**.

Table 4-2. List of Preparers

Name	Role/Responsibility
Reclamation Interdisciplinary Team	
David Child	Project Manager
Dan Church	Assistant Project Manager
Jason Sutter	NEPA Management Team; Fish and Aquatic Species, Terrestrial Wildlife and Vegetation, including special status species; Wetlands/Riparian; Uplands; invasive species
Elizabeth Heether	NEPA Management Team; Vegetation, including special status species; Wetlands/Riparian; Uplands; invasive species
Heidi McMaster	Air Quality; Public Health and Safety
Juddson Sechrist	Climate; Noise
Marit Bovee	Cultural Resources; Traditional Cultural Properties; Indian Sacred Sites; Historic Structures
Corey Carmack	Tribal Liaison; Environmental Justice; Tribal Interests
Todd Maguire	Geology; Soils
Nasha Flores	Land Use and Planning
Eve Skillman	Recreation; Visual Quality
Iris Maska	Socioeconomics
Jennifer Johnson	Water Resources – Surface water; Groundwater; Watershed Hydrology
Kerrie Mathews	Water Rights and Authorities
Gina Hoff	Water Quality
Dottie Fitzgerald	Contracting Officer Representative

Name	Role/Responsibility
Rebecca Thompson	NEPA Management Team; Tribal Interests
Edward Young	Geographic Information System Specialist
USFWS Interdisciplinary Team	
Carla Burnside	Cultural Resources; Traditional Cultural Properties; Indian Sacred Sites; Historic Structures
Hayley Muir	Fish and Aquatic Species, including special status species
EMPSi – Environmental Management and Planning Solutions, Inc.	
Amy Lewis	Project Manager
Morgan Trieger	Assistant Project Manager
Amy Cordle	Air Quality; Climate
Alexis Kantor	Air Quality; Climate
Josh Schnabel	Recreation; Socioeconomics; Environmental Justice
Lindsay Chipman, PhD	Fish and Aquatic Species, including special status species
Alex Dierker	Fish and Aquatic Species, including special status species
Francis Craig	Geology; Soils
Peter Gower, AICP, CEP	Land Use and Planning; Public Services; Utilities and Energy; Transportation and Traffic
Derek Holmgren	Noise and Vibration; Water Resources
Matthew Smith	Public Health and Safety; Water Resources
Julie Remp	Terrestrial Wildlife, including special status species
Kirstin Settas	Transportation and Traffic
Meredith Zaccherio	Vegetation, including special status species; Wetlands/Riparian; Uplands; invasive species
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Rob Lavie	GIS
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Cindy Schad	Word Processing
Andy Spellmeyer	Section 508 Compliance
Historical Research Associates, Inc.	
Ron Adams	Cultural Resources; Traditional Cultural Properties; Indian Sacred Sites; Historic Structures
Brent Hicks	Cultural Resources; Traditional Cultural Properties; Indian Sacred Sites; Historic Structures
Matthew Sneddon	Cultural Resources; Traditional Cultural Properties; Indian Sacred Sites; Historic Structures
Glenn Patterson	
Glenn Patterson	Water Rights and Authorities

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Chapter 6. Glossary

Access—the ability of a particular transportation mode, such as a vehicle, bicycle, or pedestrian, to enter or use a portion of the transportation network.

Anadromous—the term that describes fish born in freshwater who spend most of their lives in saltwater and return to freshwater to spawn, such as salmon and some species of sturgeon.

Archaeological site—a location that contains material remains of past human activities, generally defined as over 50 years old.

Artifact—A human-modified object, often appearing on an archaeological site, that typically dates to over 45 years in age.

Attenuate—To lessen the amount, force, magnitude, or value of.

Average daily traffic—The number of vehicles that pass a point on a given road in a determined number of days, divided by the number of days.

Biological opinion—Document which includes: (1) the opinion of the USFWS or the NMFS as to whether or not a Federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of designated critical habitat; (2) a summary of the information on which the opinion is based; and (3) a detailed discussion of the effects of the action on listed species or designated critical habitat. [50 CFR §402.02, 50 CFR §402.14(h)]

Climate—The collective typical weather conditions in a region averaged over a series of years.

Climate change—A change in global or regional climate patterns, in particular a change apparent from the mid- to late twentieth century onward and attributed largely to the increased levels of atmospheric carbon dioxide.

Cofferdam—A watertight enclosure pumped dry to permit construction work below the waterline.

Consumptive use— use of water that diminishes the volume or quality of the water source (WAC 173-518-030).

Cooperating Agency—those federal, state, and local agencies, and tribes, that have jurisdiction by law or special expertise with respect to any environmental impact involved in a proposed project or project alternative (40 CFR 1508.5).

Cubic feet per second (cfs) —An Imperial unit/U.S. customary unit volumetric flow rate, which is equivalent to a volume of 1 cubic foot flowing every second. The amount of cubic feet of water that passes a specific point on the river in 1 second.

Cultural resources—The present expressions of human culture and the physical remains of past activities, such as historic buildings, structures, objects, districts, landscapes, and archaeological sites. These resources can be significant in the context of national, regional, or local history, architecture, archaeology, engineering, or culture. They may also include sacred sites and natural features of landscapes that are significant to living communities.

Distinct Population Segment—"Population," or "distinct population segment," are terms with specific meaning when used for listing, delisting, and reclassification purposes to describe a discrete vertebrate stock that may be added or deleted from the list of endangered and threatened species. [61 FR 4722-4725 (February 7, 1996)]

Easement—Conveys a possessory interest (control of property without ownership) in real property.

Entrainment—Entrainment means the entrapment of fish into a watercourse diversion that has no screen or into high velocity water along the face of an improperly designed screen (WAC 220-660-030).

Environmental designation for noise abatement (EDNA)—An area or zone (environment) within which maximum permissible noise levels are established (Chapter 173-60-020 WAC).

Essential fish habitat—defined in the Magnuson-Stevens Act as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

Frazil ice—a collection of loose ice crystals that form in supercooled turbulent water that float, are suspended in the water column, or attach to the low-head diversion dam and intake structures.

Fugitive dust—Atmospheric dust arising from the mechanical disturbance of granular material exposed to the air. Dust generated from these open sources is termed fugitive because it is not discharged to the atmosphere in a confined flow stream. Common sources of fugitive dust are unpaved roads, agricultural tilling operations, aggregate storage piles, and heavy construction operations.

Headworks—any dam, weir, barrage, or reservoir and all works appurtenant thereto, used for or in connection with the storage, control, conveyance or distribution of water. For the SWISP Project, the headworks includes the combined intake structure elements, such as the fish screen structure, gates, and retaining walls.

Historic district—An area possessing a significant concentration, linkage, or continuity of sites, buildings, structures or objects unified historically or aesthetically by plan or physical development.

Impingement—The physical contact of a fish with a fish screen due to intake velocities which are too high to allow the fish to escape.

Incidental take—Take of listed fish or wildlife species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by a Federal agency or applicant. [50 CFR Section 402.02]

Incidental take statement—The part of a biological opinion issued by the USFWS or NMFS that specifies the extent to which a federal agency's proposed action will result in the incidental taking of a threatened or endangered species; includes measures that minimize the incidental taking's impact, as well as terms and conditions that implement the measures.

Invasive plants—Nonnative plants that have been introduced into an environment that they did not evolve in and are capable of establishing free-living populations in areas beyond their natural range of dispersal.

Lead—Lead is a naturally occurring element found in small amounts in the earth's crust. While it has some beneficial uses, it can be toxic to humans and animals, causing health effects.

Level of Service—A metric that describes the operating conditions of a roadway based on factors such as physical roadway capacity, speed, maneuverability, safety, and traffic volume.

Listed species—Any species of fish, wildlife or plant which has been determined to be endangered or threatened under section 4 of the Endangered Species Act [50 CFR §402.02]

National Register of Historic Places—A listing of resources that are considered significant at the national, state, or local level and that have been found to meet specific criteria of historic significance, integrity, and age

Noise—The intensity, duration, and character of sounds, from any and all sources (Chapter 173-60-020 WAC).

Noise dosimeter—a specialized sound level meter intended specifically to measure the noise exposure of a person integrated over a period of time; usually to comply with Health and Safety regulations.

Nonconsumptive use—a type of water use where either there is no diversion from a water source, or where there is no diminishment of the amount or quality of the water source (WAC 173-518-030).

Noxious weeds—Designated and regulated by state and federal laws because they are known to be detrimental to agriculture, commerce, natural resources, and public health. Noxious weeds are a subset of invasive plants.

Ordinary high water line (OHWL)—"the mark on the shores of all water that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in ordinary years as to mark upon the soil or vegetation a character distinct from the abutting upland. Provided, that in any area where the ordinary high water line cannot be found, the ordinary high water line adjoining saltwater is the line of mean higher high water and the ordinary high water line adjoining freshwater is the elevation of the mean annual flood." (WAC 220-660-030). Also see *Ordinary high water mark*.

Ordinary high water mark (OHWM)—"that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas." (33 CFR 328.3(e)). Also see *Ordinary high water line*.

Pollutants (pollution)—Unwanted chemicals or other materials found in the environment. Pollutants can harm human health, the environment, and property. Air pollutants occur as gases, liquid droplets, and solids. Once released into the environment, many pollutants can persist, can travel long distances, and can move from one environmental medium—air, water, or land—to another[31].

Reportable quantity—The quantity of a hazardous substance that triggers reports under CERCLA. If a substance exceeds its reportable quantity, the release must be reported to the National Response Center, the State Emergency Response Commission, and community emergency coordinators for areas likely to be affected.

Riparian zone—the land adjacent to streams, rivers, ponds, lakes, and those wetlands whose soils and vegetation are influenced by ponded or channelized water. They are the transition areas between aquatic and upland habitats often with elements of both ecosystems (WAC 220-660-030).

Roughened channel—a constructed channel of a graded mix of sediment with enough roughness and hydraulic diversity to achieve fish passage. Roughened channels are designed to resist erosion and are often built at a steeper gradient than the prevailing channel (WAC 220-660-030).

Section 7—The section of the Endangered Species Act of 1973, as amended, outlining procedures for interagency cooperation to conserve Federally listed species and designated critical habitats. Section 7(a)(1) requires Federal agencies to use their authorities to further the conservation of listed species. Section 7(a)(2) requires Federal agencies to consult with the Services to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat.

Take—To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. [ESA §3(19)] Harm is further defined by the USFWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by the USFWS as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. [50 CFR §17.3]

Thalweg—A line connecting the lowest points of successive cross-sections along the course of a river.

[31] Source: http://www.epa.gov/oms/invntory/overview/definitions.htm, EPA Glossary for Mobile Source Emissions

Trashrack—A device designed to keep trash and other natural debris from entering the spillway and causing damage.

Viewshed—The landscape that can be directly seen under favorable atmospheric conditions, from a viewpoint or along a transportation corridor.

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Appendix A

Maps

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Appendix A. Maps

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BUREAU OF RECLAMATION

Map 1-1
Project Area Overview

- Potential Temporary Disturbance Area
- Staging
- Temporary Pump
- Pipeline Rehabilitation
- Construction Vehicle Turnaround
- Temporary Access Routes
- Spillway Pool
- Road
- Trailhead
- LNFH Production Facilities and Associated Structures
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Land Ownership

- Private
- Chelan-Douglas Land Trust
- Fish and Wildlife Service
- Forest Service
- Icicle Irrigation District
- City of Leavenworth
- Chelan County

To HWY 2

To HWY 2

Icicle Rd

E Leavenworth Rd

Fishing Access Rd

Icicle Creek

Fish Hatchery Rd

Leavenworth National Fish Hatchery

Spillway Pool

Structure 5

Icicle Creek Rd

Hatchery Channel

Cyo Rd

Intake Facilities

Structure 2

Icicle Creek

Hatchery Channel

Icicle Creek Rd

Hwy 2

Forest Service Wilderness Area Kiosk

Icicle Creek

Snow Lakes Trailhead

N

0 500 1,000

Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 12, 2020
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BUREAU OF RECLAMATION

Map 2-1
Alternative A: No Action

- Existing Intake Facilities
- Spillway Pool
- Trailhead
- Vehicle Parking
- Road
- Conveyance Pipeline
- LNFH Production Facilities and Associated Structures
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Icicle Rd
E Leavenworth Rd
Fishing Access Rd
Icicle Creek
Fish Hatchery Rd
Leavenworth National Fish Hatchery
Spillway Pool
Structure 5
Section of Worst Condition Pipeline (8 feet)
Icicle Creek Rd
Cyo Rd
Hatchery Channel
Structure 2
Historical Channel
Section of Worst Condition Pipeline (6 feet); at Bifurcation Point
flow >>
Forest Service Wilderness Area Kiosk
Snow Lakes Trailhead

N
0 250 500
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
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BUREAU OF RECLAMATION

Map 2-2
Alternative A: No Action (Intake)

Conveyance Pipeline

Stairs

Intake Trashrack Structure

Intake Channel

Access Road

Icicle Creek Rd

Gatehouse

flow >>

Outlet Channel

Fish Ladder/ Sediment Sluice

Low-Head Diversion Dam

Icicle Creek

flow >>

N

0 50 100

Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
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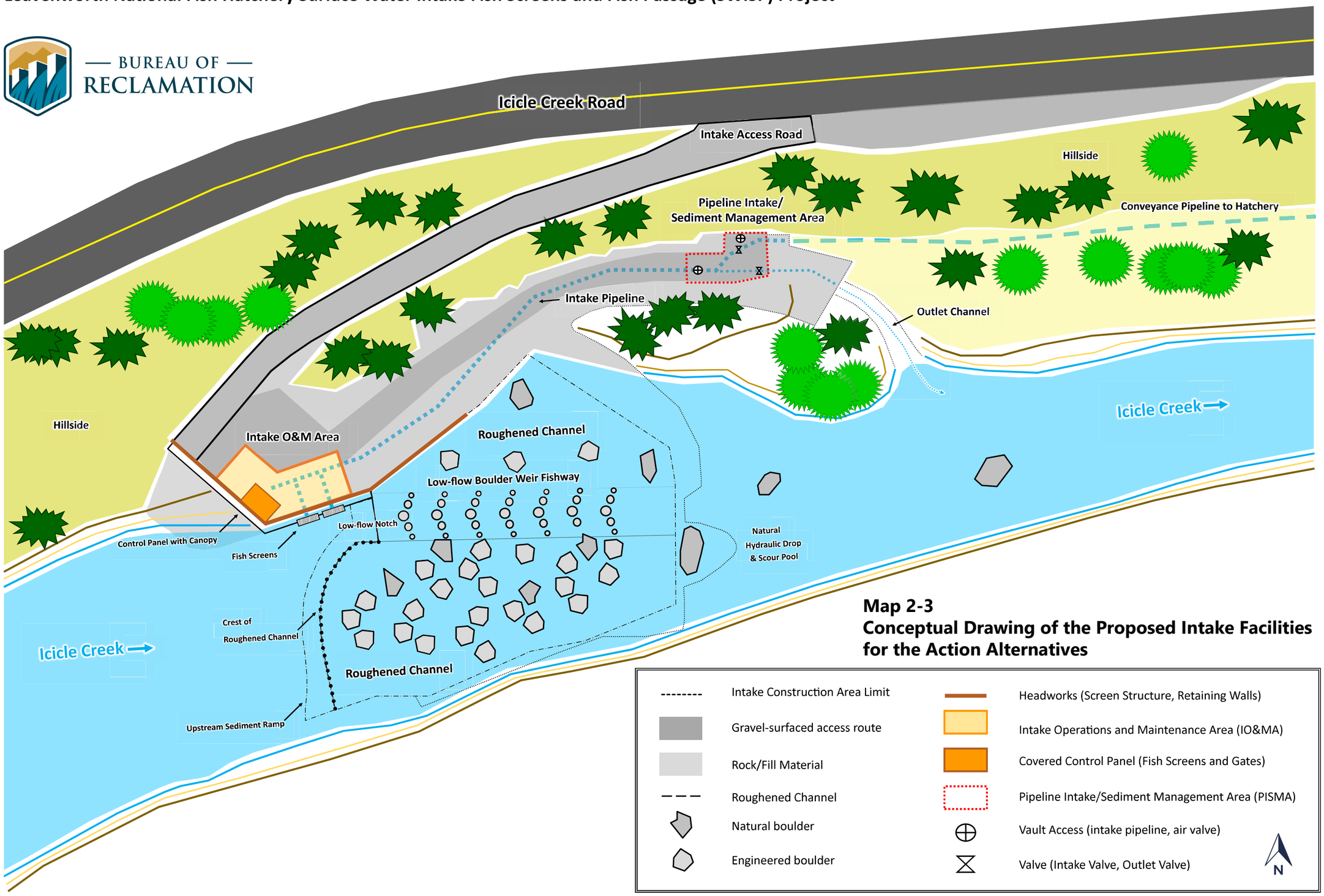
Leavenworth National Fish Hatchery Surface Water Intake Fish Screens and Fish Passage (SWISP) Project

— BUREAU OF —
RECLAMATION



Map 2-3
Conceptual Drawing of the Proposed Intake Facilities for the Action Alternatives

--------	Intake Construction Area Limit		Headworks (Screen Structure, Retaining Walls)
	Gravel-surfaced access route		Intake Operations and Maintenance Area (IO&MA)
	Rock/Fill Material		Covered Control Panel (Fish Screens and Gates)
— — —	Roughened Channel		Pipeline Intake/Sediment Management Area (PISMA)
	Natural boulder	⊕	Vault Access (intake pipeline, air valve)
	Engineered boulder	⧖	Valve (Intake Valve, Outlet Valve)

N

BUREAU OF RECLAMATION

Map 2-4
Alternative B (Proposed Action) and Alternative D

Phase I

- Intake Facilities
- Temporary Access Route

Phase II

- Construction Area
- Contractor Use Area (CUA)
- Temporary Pump and Pipeline
- Temporary Access Route
- Conveyance Pipeline lined with Cure-in-Place Pipe (approximately 4,000 feet)
- Pipeline Replacement
- Access Routes

Phase I and II

- Staging and Storage Site for Construction Equipment and Materials, and Construction Staff Administration
- Construction Vehicle Turnaround/ Vehicle Parking
- Road
- Spillway Pool
- Trailhead
- LNFH Production Facilities and Associated Structures
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Icicle Rd
E Leavenworth Rd
Fishing Access Rd
Contractor trailer, storage
Reclamation trailer
Icicle Creek
Fish Hatchery Rd
Leavenworth National Fish Hatchery
Spillway Pool
Structure 5
Staging
Control Valve Vault
Icicle Creek Rd
5
Replacement Pipeline (Approx. 1,660 feet)
4
Cyo Rd
Staging
Hatchery Channel
3
Intake Facilities *See Map 2-5 for Additional Details
1
Structure 2
Historical Channel
2
Replacement Pipeline (Approx. 520 feet)
flow >>
Icicle Creek Rd
Icicle Creek
Forest Service Wilderness Area Kiosk
Snow Lakes Trailhead

N

0 250 500
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
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BUREAU OF RECLAMATION

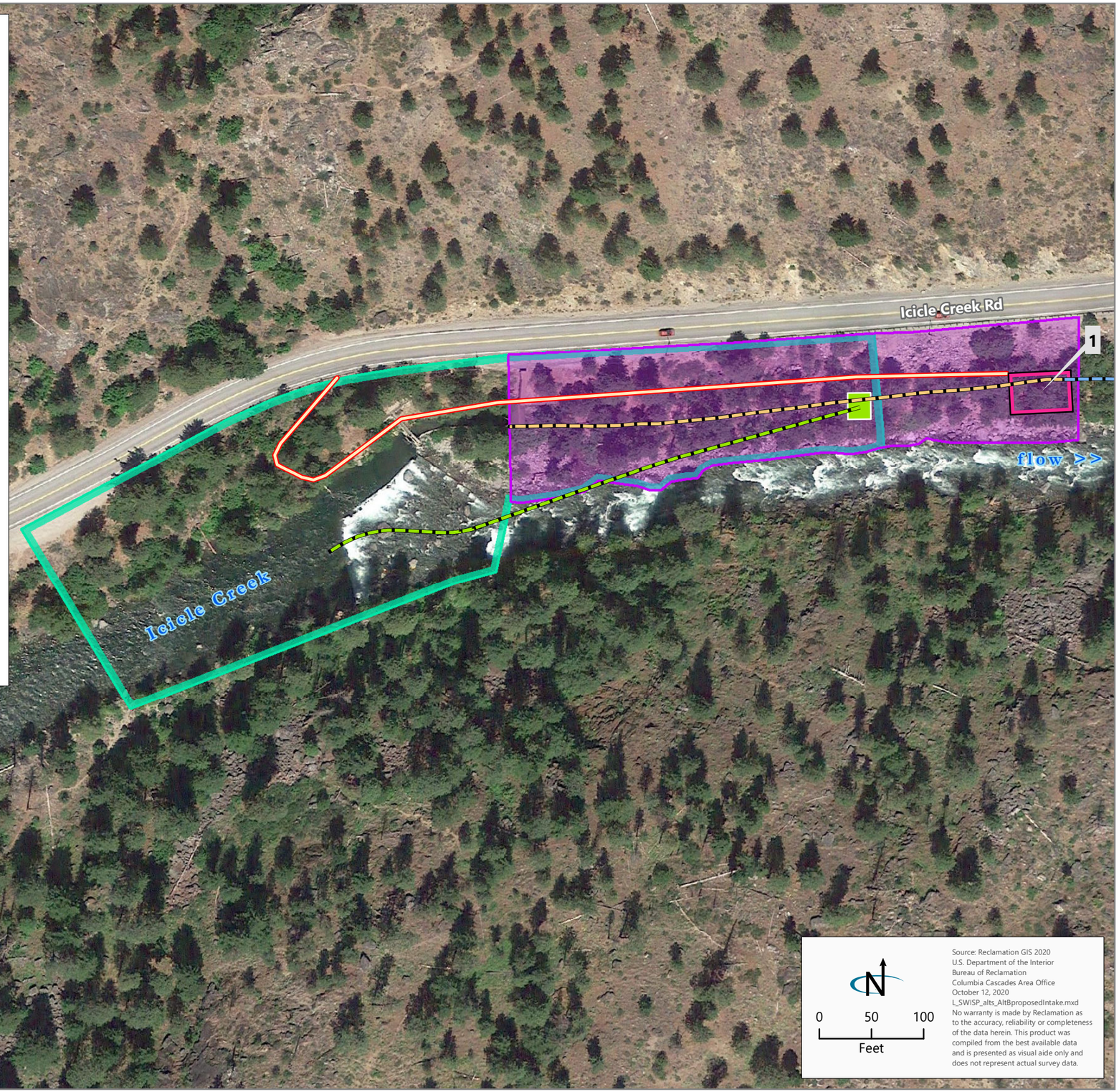
Map 2-5
Alternative B (Proposed Action) and Alternative D: Intake

Phase I

- Intake Facilities
- Gravity Bypass Outlet
- Gravity Bypass Pipeline
- Temporary Access Route

Phase II

- Conveyance Pipeline lined with Cure-in-Place Pipe
- Pipeline Replacement
- Construction Area
- Contractor Use Area (CUA)



N

0 50 100

Feet

Source: Reclamation GIS 2020
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Bureau of Reclamation
Columbia Cascades Area Office
October 12, 2020
L_SWISP_alts_AltBproposedIntake.mxd

BUREAU OF RECLAMATION

Map 2-6
Alternative C

Phase I

- Intake Facilities
- Temporary Access Route

Phase II

- Construction Area
- Contractor Use Area (CUA)
- Temporary Pump and Pipeline
- Temporary Access Route
- Conveyance Pipeline lined with Cure-in-Place Pipe (approximately 4,520 feet)
- Pipeline Replacement
- Access Routes

Phase I and II

- Staging and Storage Site for Construction Equipment and Materials, and Construction Staff Administration
- Construction Vehicle Turnaround/ Vehicle Parking
- Road
- Spillway Pool
- Trailhead
- LNFH Production Facilities and Associated Structures
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Icicle Rd
E Leavenworth Rd
Fishing Access Rd
Contractor trailer, storage
Reclamation trailer
Icicle Creek
Fish Hatchery Rd
Leavenworth National Fish Hatchery
Spillway Pool
Structure 5
Staging
Control Valve Vault
Icicle Creek Rd
5
Replacement Pipeline (Approx. 1,660 feet)
4
Cyo Rd
Staging
Hatchery Channel
3
Intake Facilities
*See Map 2-7 for Additional Details
Structure 2
Historical Channel
2
flow >>
Icicle Creek Rd
Forest Service Wilderness Area Kiosk
Icicle Creek
Snow Lakes Trailhead

N
0 250 500
Feet

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U.S. Department of the Interior
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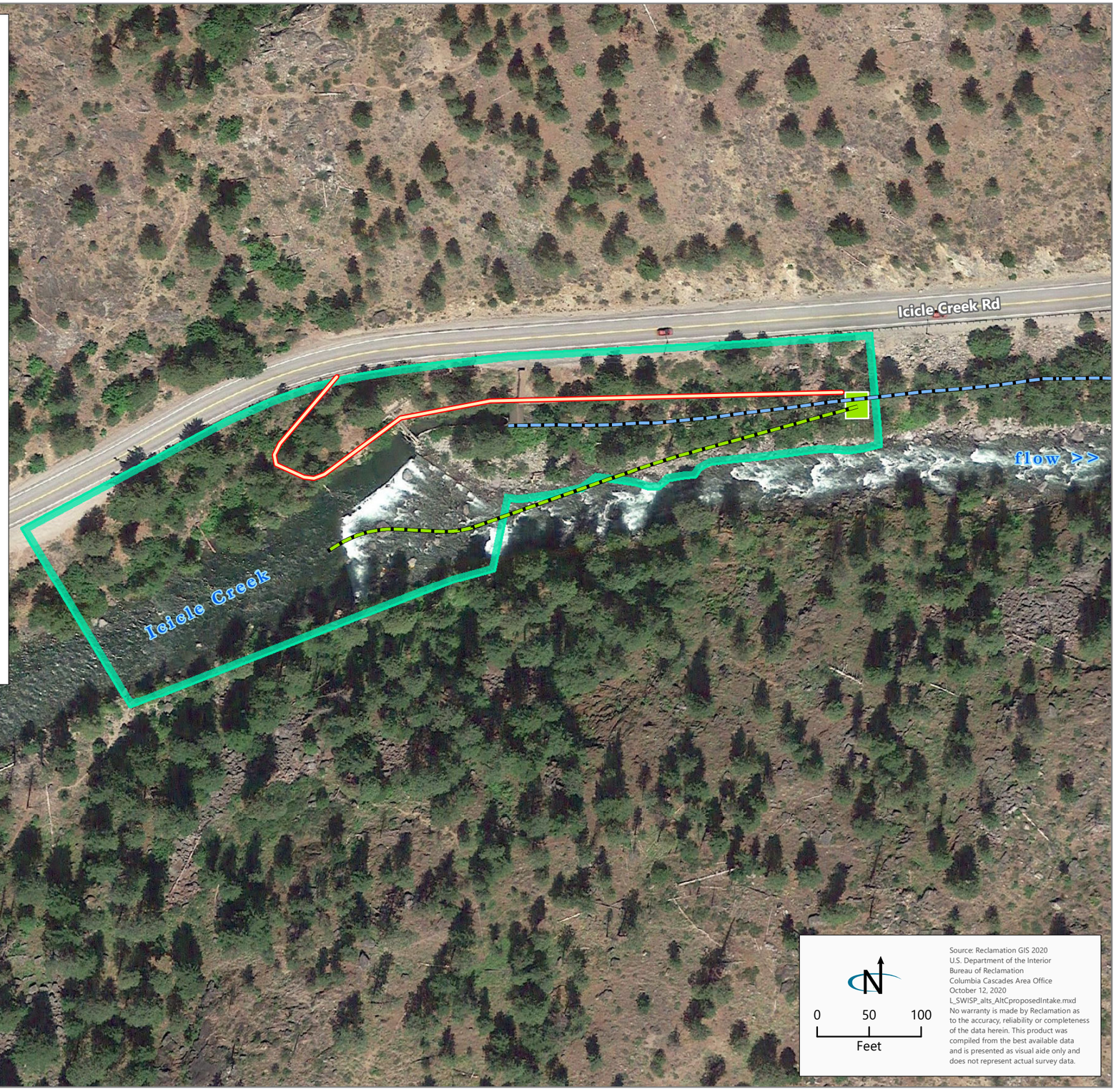
BUREAU OF RECLAMATION

Map 2-7
Alternative C (Intake)

Phase I
- Intake Facilities
- Gravity Bypass Outlet
- Gravity Bypass Pipeline
- Temporary Access Route

Phase II
- Conveyance Pipeline lined with Cure-in-Place Pipe



0 50 100
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
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BUREAU OF RECLAMATION

Map 3-1
Fisheries, Aquatic Ecosystems, and Water Resources Analysis Area

Fisheries, Aquatic Ecosystems, and Water Resources Analysis Area

Intake Facilities

Trailhead

Conveyance Pipeline

LNFH Production Facilities and Associated Structures

Boulder Field

Ecology Compliance Point

Spillway Pool

Construction Vehicle Turnaround

Temporary Pump

Road

LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Icicle Rd

E Leavenworth Rd

Ecology Compliance Point

Fishing Access Rd

Icicle Creek

Fish Hatchery Rd

Leavenworth National Fish Hatchery

Spillway Pool

Structure 5

Icicle Creek Rd

Cyo Rd

Hatchery Channel

Intake Facilities

Structure 2

Historical Channel

flow

Forest Service Wilderness Area Kiosk

Boulder Field

Snow Lakes Trailhead

N

0 250 500

Feet

Source: Reclamation GIS 2020
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BUREAU OF RECLAMATION

Map 3-2
Noise and Vibration Analysis Area

Noise and Vibration Analysis Area

*Houses, farms, and other occupied buildings within the Visual Analysis Area are also sensitive noise receptors.

Ambient Noise Point

Sensitive Noise Receptor

Intake Facilities

Conveyance Pipeline

LNFH Production Facilities

Contractor Use Area (CUA)

Road

LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Icicle Rd
E Leavenworth Rd
Fishing Access Rd
Icicle Creek
LNFH Tribal/Public Fishing Access
4
Fish Hatchery Rd
Leavenworth National Fish Hatchery
10
Icicle Creek Rd
Control Valve Vault
3
7
5
Icicle Creek Center for the Arts
Sleeping Lady Mountain Resort
Hatchery Channel
8
4
Cyo Rd
3
Icicle River RV Resort
Intake Facilities
1
1
Icicle Creek
Historical Channel
2
2
5
flow >>
Icicle Creek Rd
6
Icicle Creek
9
Snow Lakes Trailhead

N

0 250 500
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 12, 2020
L_SWISP_AE_Noise_SensitiveReceptors.mxd
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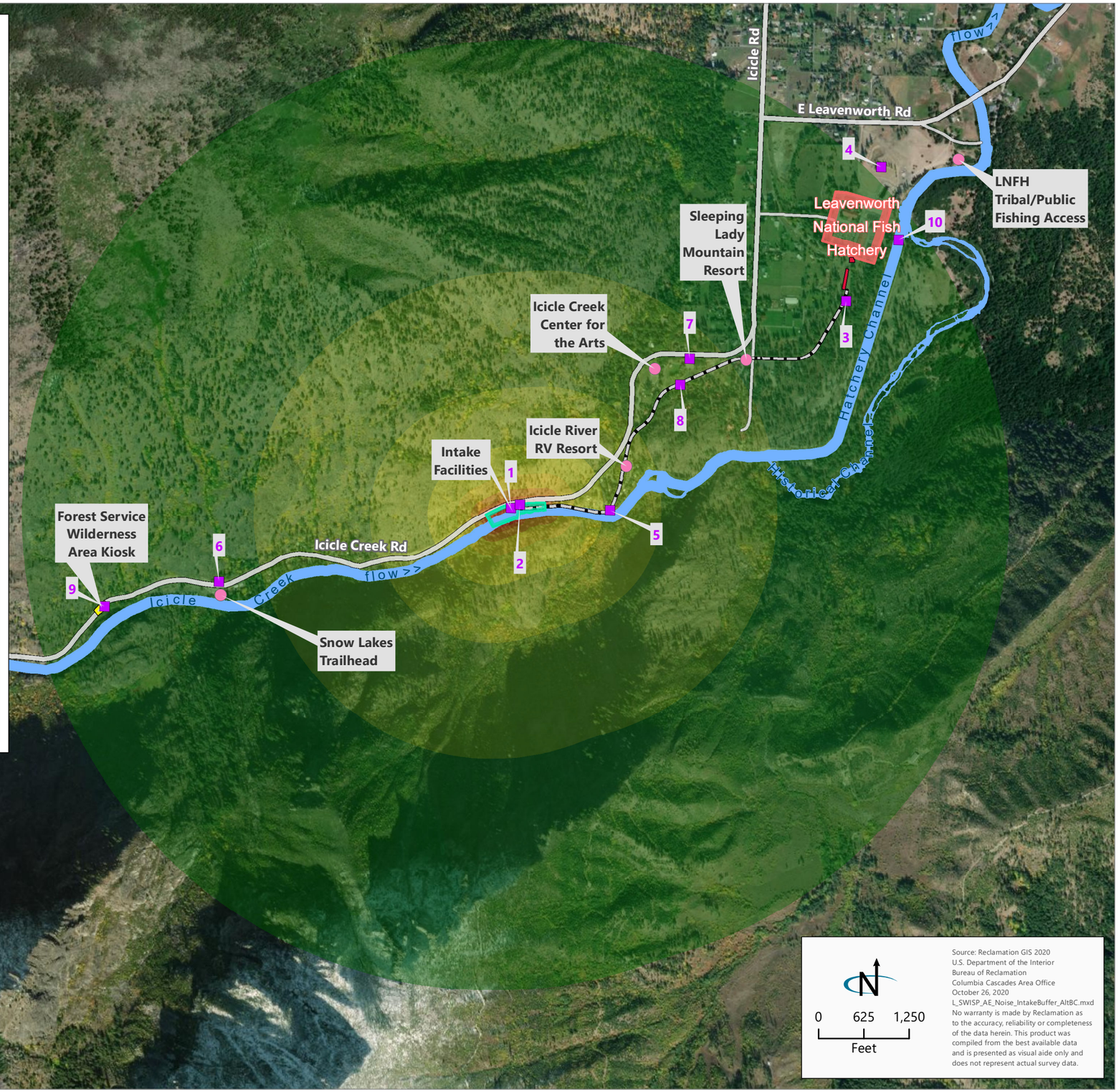
BUREAU OF RECLAMATION

Map 3-3
Noise Attenuation Distances for Pneumatic Tool at Intake Construction Area - Alternatives B and C

Noise Level

- 50 ft. - 85 dBA
- 100 ft. - 79 dBA
- 200 ft. - 73 dBA
- 400 ft. - 67 dBA
- 800 ft. - 61 dBA
- 1,600 ft. - 55 dBA
- 3,200 ft. - 49 dBA
- 6,400 ft. - 43 dBA

- Ambient Noise Point
- Sensitive Noise Receptor
- Intake Facilities
- Construction Vehicle Turnaround
- Conveyance Pipeline
- Road
- LNFH Production Facilities
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers



N

0 625 1,250

Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 26, 2020
L_SWISP_AE_Noise_IntakeBuffer_AltBC.mxd
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BUREAU OF RECLAMATION

Map 3-4
Noise Attenuation Distances for Pneumatic Tool at Intake Construction Area - Alternative D

Noise Level
- 50 ft. - 85 dBA
- 100 ft. - 79 dBA
- 200 ft. - 73 dBA
- 400 ft. - 67 dBA
- 800 ft. - 61 dBA
- 1,600 ft. - 55 dBA

- Ambient Noise Point
- Sensitive Noise Receptor
- Intake Facilities
- Conveyance Pipeline
- Road

Icicle Creek Center for the Arts
7
8
Icicle River RV Resort
Icicle Creek Rd
Intake Facilities
1
2
5
Icicle Creek
flow >>
6
Icicle Creek
Snow Lakes Trailhead

N
0 250 500
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 26, 2020
L_SWISP_AE_Noise_IntakeBuffer_AltD.mxd
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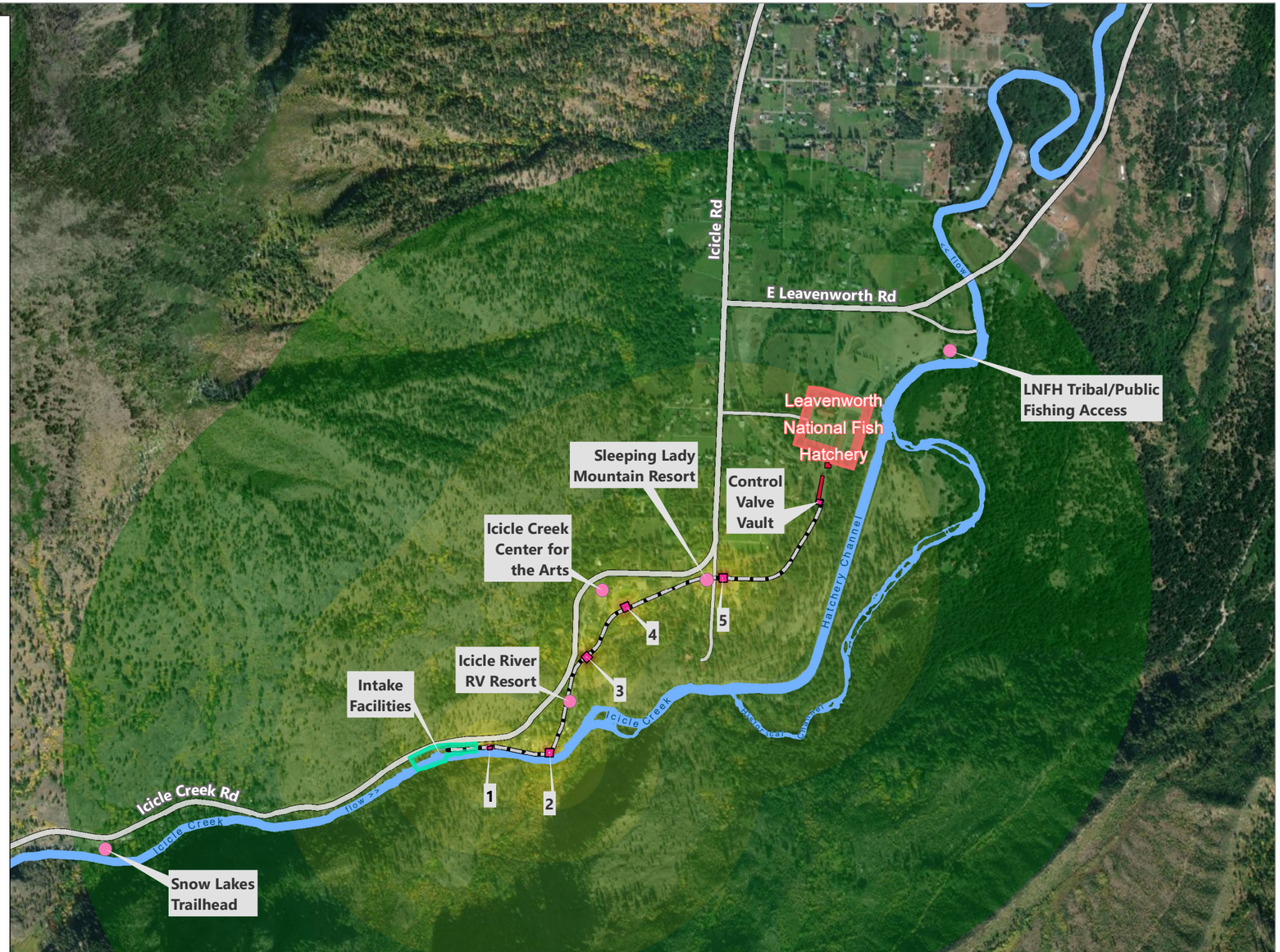
BUREAU OF RECLAMATION

Map 3-5
Noise Attenuation Distances for Hot Air Blower at Contractor Use Areas - Alternatives B and D

Noise Level

- 5 ft. - 115 dB
- 10 ft. - 109 dB
- 20 ft. - 103 dB
- 40 ft. - 97 dB
- 80 ft. - 91 dB
- 160 ft. - 85 dB
- 320 ft. - 79 dB
- 640 ft. - 73 dB
- 1,280 ft. - 67 dB
- 2,560 ft. - 61 dB
- 5,120 ft. - 55 dB

- Sensitive Noise Receptor
- Intake Facilities
- Contractor Use Area (CUA)
- Conveyance pipeline
- Road
- LNFH Production Facilities
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers



N

0 500 1,000
Feet

Source: Reclamation GIS 2020
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Bureau of Reclamation
Columbia Cascades Area Office
October 26, 2020
L_SWISP_AE_Noise_CUABuffer_AltBD.mxd

BUREAU OF RECLAMATION

Map 3-6
Noise Attenuation Distances for Hot Air Blower at Contractor Use Areas - Alternative C

Noise Level

- 5 ft. - 115 dB
- 10 ft. - 109 dB
- 20 ft. - 103 dB
- 40 ft. - 97 dB
- 80 ft. - 91 dB
- 160 ft. - 85 dB
- 320 ft. - 79 dB
- 640 ft. - 73 dB
- 1,280 ft. - 67 dB
- 2,560 ft. - 61 dB
- 5,120 ft. - 55 dB

- Sensitive Noise Receptor
- Pipeline Intake/ Sluice Management Area (PISMA)
- Intake Facilities
- Contractor Use Area (CUA)
- Conveyance pipeline
- Road
- LNFH Production Facilities
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 26, 2020
L_SWISP_AE_Noise_CUABuffer_AltC.mxd
No warranty is made by Reclamation as to the accuracy, reliability or completeness of the data herein. This product was compiled from the best available data and is presented as visual aide only and does not represent actual survey data.

BUREAU OF RECLAMATION

Map 3-7
Noise Attenuation Distances for a Truck along Icicle Road and Icicle Creek Road - Alternatives B and C

Noise Level
- 50 ft. - 88 dBA
- 100 ft. - 82 dBA
- 200 ft. - 76 dBA
- 400 ft. - 70 dBA
- 800 ft. - 64 dBA
- 1,600 ft. - 58 dBA
- 3,200 ft. - 52 dBA
- 6,400 ft. - 46 dBA
- 12,800 ft. - 40 dBA

- Sensitive Noise Receptor
- Intake Facilities
- Contractor Use Area (CUA)
- Construction Vehicle Turnaround
- Conveyance Pipeline
- Road
- LNFH Production Facilities
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Wenatchee River >>
2
Icicle Rd
E Leavenworth Rd
Sleeping Lady Mountain Resort
Icicle Creek Center for the Arts
Leavenworth National Fish Hatchery
LNFH Tribal/ Public Fishing Access
Icicle River RV Resort
4
5
3
Control Valve Vault
Forest Service Wilderness Area Kiosk
Icicle Creek >>
Icicle Creek Rd
1
2
Snow Lakes Trailhead
Intake Facilities

N
0 1,250 2,500
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 26, 2020
L_SWISP_AE_Noise_RoadBuffers_Icicle_AltBC.mxd
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BUREAU OF RECLAMATION

Map 3-8
Noise Attenuation Distances for a Truck along Icicle Road and Icicle Creek Road - Alternative D

Noise Level

- 50 ft. - 88 dBA
- 100 ft. - 82 dBA
- 200 ft. - 76 dBA
- 400 ft. - 70 dBA
- 800 ft. - 64 dBA
- 1,600 ft. - 58 dBA
- 3,200 ft. - 52 dBA

- Sensitive Noise Receptor
- Intake Facilities
- Contractor Use Area (CUA)
- Construction Vehicle Turnaround
- Conveyance Pipeline
- Road
- LNFH Production Facilities
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Icicle Rd
E Leavenworth Rd
LNFH Tribal/ Public Fishing Access
Leavenworth National Fish Hatchery
Sleeping Lady Mountain Resort
Control Valve Vault
Icicle Creek Center for the Arts
Hatchery Channel
Icicle River RV Resort
Intake Facilities
Icicle Creek
Forest Service Wilderness Area Kiosk
Icicle Creek Rd
flow >>
Snow Lakes Trailhead
1
2
3
4
5

N

0 500 1,000
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 26, 2020
L_SWISP_AE_Noise_RoadBuffers_Icicle_AltD.mxd
No warranty is made by Reclamation as to the accuracy, reliability or completeness of the data herein. This product was compiled from the best available data and is presented as visual aide only and does not represent actual survey data.

BUREAU OF RECLAMATION

Map 3-9
Noise Attenuation Distances for Diesel Pumps at Temporary Hatchery Water Supply Pump Site - Action Alternatives

Noise Level

- 3.3 ft. - 96 dB
- 6.6 ft. - 90 dB
- 13 ft. - 84 dB
- 26 ft. - 78 dB
- 52 ft. - 72 dB
- 105 ft. - 66 dB
- 210 ft. - 60 dB
- 420 ft. - 54 dB
- 840 ft. - 48 dB
- 1,680 ft. - 42 dB

- Temporary Pump and Pipeline
- Spillway Pool
- Conveyance Pipeline
- Road
- LNFH Production Facilities
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 26, 2020
L_SWISP_AE_Noise_PumpBuffer.mxd
No warranty is made by Reclamation as to the accuracy, reliability or completeness of the data herein. This product was compiled from the best available data and is presented as visual aide only and does not represent actual survey data.

BUREAU OF RECLAMATION

Map 3-10
Transportation and Traffic Analysis Area

- Key Transportation Area
- Key Intersection
- Haul Road Route
- Road
- Intake Facilities
- Conveyance Pipeline
- LNFH Production Facilities
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

City of Leavenworth
2
Wenatchee River >>
Icicle Rd
E Leavenworth Rd
Icicle Creek Rd
Leavenworth National Fish Hatchery
Sleeping Lady Mountain Resort
Icicle Creek Center for the Arts
Cyo Rd
Hatchery Channel
Icicle River RV Resort
Intake Facilities
Forest Service Wilderness Area Kiosk
Snow Lakes Trailhead
Icicle Creek Rd
Icicle Creek >>

N

0 1,000 2,000
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 12, 2020
L_SWISP_AE_transportation.mxd
No warranty is made by Reclamation as to the accuracy, reliability or completeness of the data herein. This product was compiled from the best available data and is presented as visual aide only and does not represent actual survey data.

BUREAU OF RECLAMATION

Map 3-11
Recreation Analysis Area

- Recreation Analysis Area
- Recreation Access Point
- Intake Facilities
- Road
- Conveyance Pipeline
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers
- LNFH Production Facilities

Okanogan-Wenatchee National Forest

Alpine Lakes Adjacent Inventoried Roadless Area

Alpine Lakes Wilderness

Icicle Rd
E Leavenworth Rd
Fishing Access Rd
LNFH Tribal/Public Fishing Access
Fish Hatchery Rd
Leavenworth National Fish Hatchery
Icicle Creek
Icicle Creek Rd
Hatchery Channel
Icicle Creek Center for the Arts
Sleeping Lady Mountain Resort
Cyo Rd
Icicle River RV Resort
Historical Channel
Intake Facilities
flow ->
Forest Service Wilderness Area Kiosk
Snow Lakes Trailhead

Land Ownership
- Private: no public access
- US Fish and Wildlife Service: public access to outdoor areas
- Chelan-Douglas Land Trust: public access allowed
- Forest Service: public access allowed
- Forest Service Wilderness: public hiking allowed
- Forest Service Inventoried Roadless Area: public hiking allowed
- Chelan County: no public access
- Icicle Irrigation District: no public access
- City of Leavenworth: no public access

N

0 500 1,000
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 12, 2020
L_SWISP_AE_recreation.mxd
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BUREAU OF RECLAMATION

Map 3-12
Environmental Justice Analysis Area

Environmental Justice Analysis Area

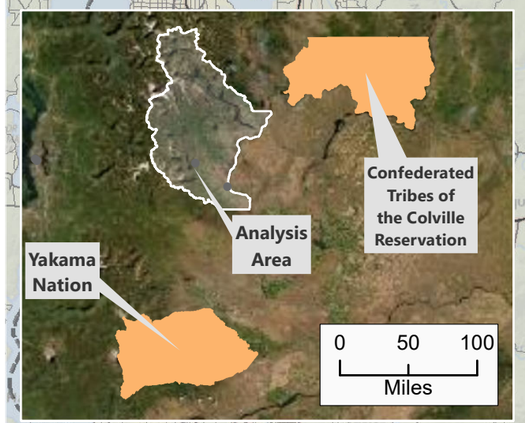
City of Leavenworth

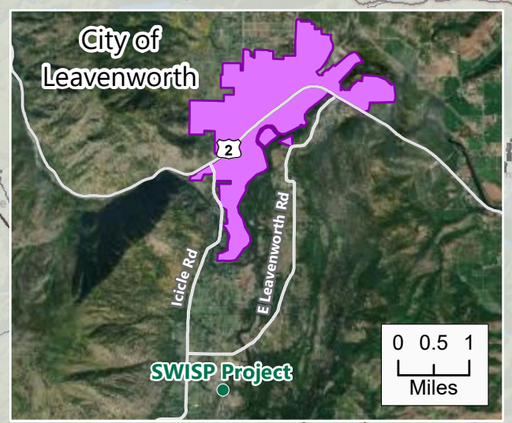
County

SWISP Project

Native American Reservation

Highway





Skagit County

Snohomish County

King County

Pierce County

Chelan County

Okanogan County

Douglas County

Kittitas County

City of Leavenworth

SWISP Project

Wenatchee

Brewster

Bridgeport

97

97A

2

90

N

0 5 10
Miles

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 07, 2020
L_SWISP_AE_SocioEnviroJustice.mxd
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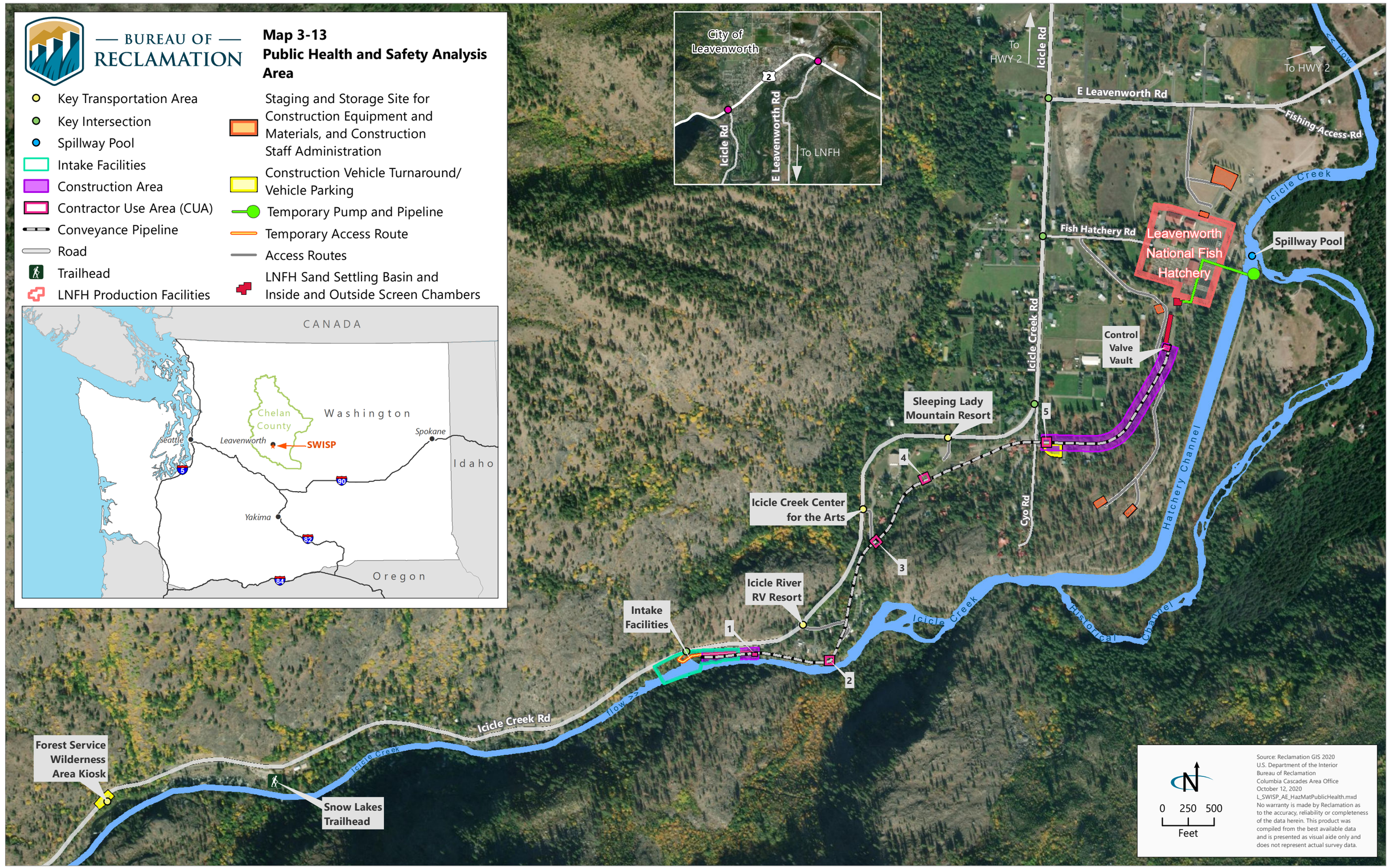
BUREAU OF RECLAMATION

Map 3-13
Public Health and Safety Analysis Area

- Key Transportation Area
- Key Intersection
- Spillway Pool
- Intake Facilities
- Construction Area
- Contractor Use Area (CUA)
- Conveyance Pipeline
- Road
- Trailhead
- LNFH Production Facilities
- Staging and Storage Site for Construction Equipment and Materials, and Construction Staff Administration
- Construction Vehicle Turnaround/ Vehicle Parking
- Temporary Pump and Pipeline
- Temporary Access Route
- Access Routes
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers



N

0 250 500
Feet

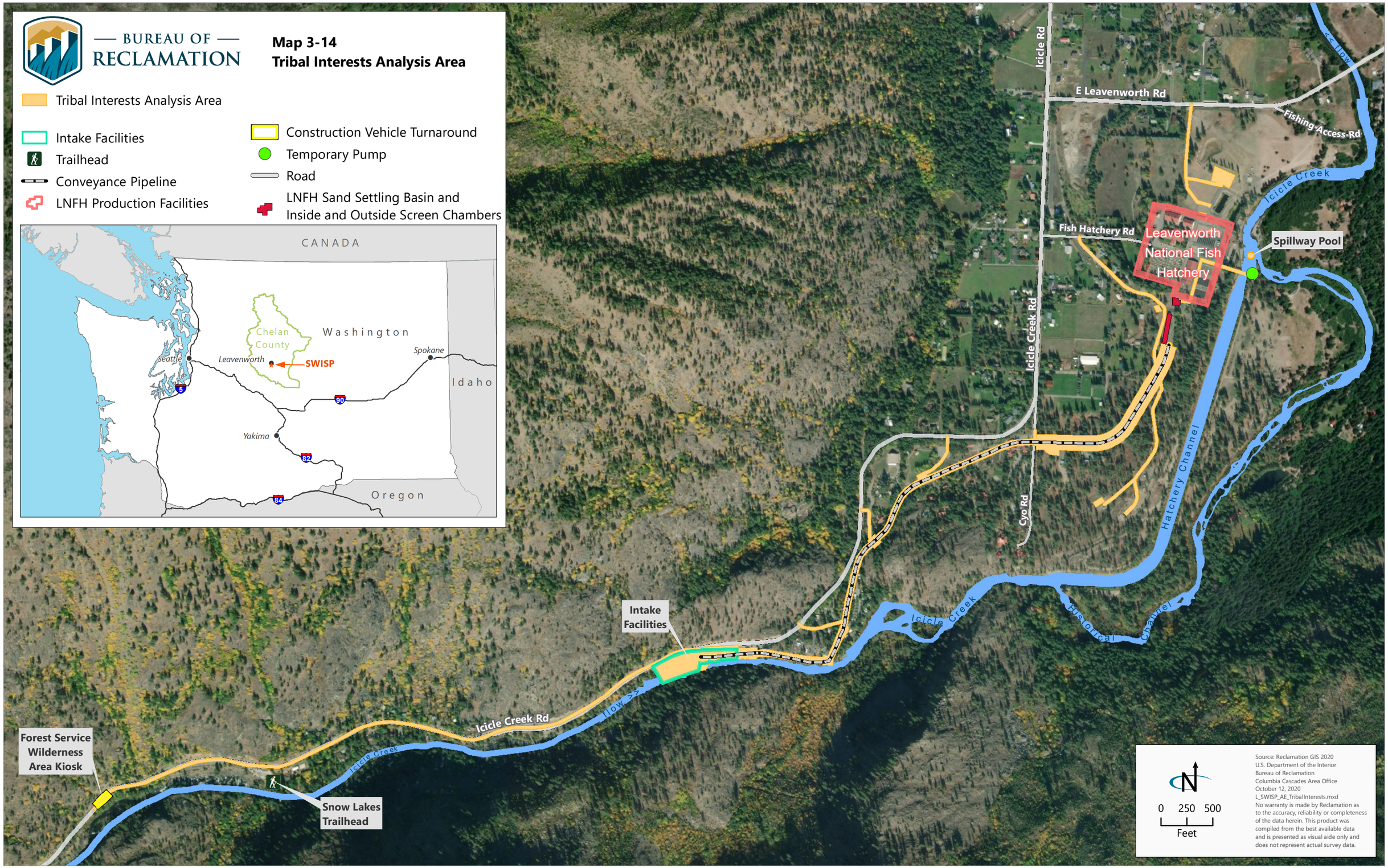
Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 12, 2020
L_SWISP_AE_HazMatPublicHealth.mxd
No warranty is made by Reclamation as to the accuracy, reliability or completeness of the data herein. This product was compiled from the best available data and is presented as visual aide only and does not represent actual survey data.

BUREAU OF RECLAMATION

Map 3-14
Tribal Interests Analysis Area

Tribal Interests Analysis Area

Intake Facilities
Trailhead
Conveyance Pipeline
LNFH Production Facilities
Construction Vehicle Turnaround
Temporary Pump
Road
LNFH Sand Settling Basin and Inside and Outside Screen Chambers



Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
October 12, 2020
L_SWISP_AE_TribalInterests.mxd
No warranty is made by Reclamation as to the accuracy, reliability or completeness of the data herein. This product was compiled from the best available data and is presented as visual aide only and does not represent actual survey data.

Appendix B

Best Management Practices

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Appendix B. Best Management Practices

B.1 Best Management Practices

To minimize impacts on resources from the Proposed Action, the Best Management Practices (BMPs) described in **Table B-1** would be implemented. BMPs are drawn from the following sources:

- Biological opinions for LNFH operations, issued by the USFWS (addressing threatened Bull Trout; USFWS 2011) and by the NMFS (addressing endangered spring Chinook Salmon and threatened Steelhead; NMFS 2015, NMFS 2017a).
- General Conservation Measures (GCMs) for ESA-listed salmonids in the programmatic biological opinion for USACE permitting of fish passage and restoration actions in Washington State (FPRPIII; NMFS 2017a).
- GCMs for Bull Trout and other ESA-listed salmonids in the programmatic biological opinion for the Washington State fish passage and habitat enhancement and restoration program (NMFS and USFWS 2008)[32].
- Measures described in the construction specifications, including measures associated with site layout, temporary access, staging and stockpile areas, equipment use, erosion control, dust abatement, timing of in-water work and worksite isolation, and spill prevention and control.

Reclamation would also obtain required regulatory permits and implement terms and conditions contained therein. If permit requirements, BMPs, or other measures contradict each other, the contract specification requires that the contractor abide by the most stringent of requirements. A list of general, applicable permit conditions is included following **Table B-1**.

[32] This combined agency programmatic biological opinion expired on December 31, 2013. The USACE and NMFS reinitiated consultation and NMFS has issued subsequent biological opinions for the nationwide permit program. However, the USACE has been operating under consultation extensions from USFWS, with the most recent extension expiring June 30, 2020. Reclamation anticipates that ESA Section 7 consultation with the USFWS for the SWISP Project will result in similar conservation measures as those contained in the expired programmatic biological opinion.

Table B-3. Best Management Practices

Resource Topic	Best Management Practice
General	• Heavy equipment use will be limited to that with the least adverse effects on the environment (e.g. minimally-sized, low ground pressure equipment, use of matting, etc.; NMFS 2017a). • Conduct operations to prevent unnecessary destruction, scarring, or defacing of natural surroundings in the vicinity of the work.
Air Quality and Climate	• Dust control and abatement measures will be implemented during construction. • Vehicle traffic on unpaved surfaces would be limited to 10 miles per hour to minimize dust generation. • Vehicle traffic on government rights-of-way, dirt roads, and paved roads through LNFH property would be limited to 10 miles per hour. • Prevent, control, and abate dust pollution on government rights-of-way. • Provide labor, equipment, and materials, and use efficient methods wherever and whenever required to prevent dust nuisance or damage to persons, property, or activities. • Provide means for eliminating atmospheric discharges of dust during mixing, handling, and storing of cement, pozzolan, and concrete aggregate. • Use reasonably available methods and devices to prevent, control, and otherwise minimize atmospheric emissions or discharges of air contaminants. • Do not operate equipment and vehicles that show excessive exhaust gas emissions until corrective repairs or adjustments reduce such emissions to acceptable levels.
Geology and Soils	• The number of temporary access roads will be minimized, and roads will be designed to avoid adverse effects like creating excessive erosion (NMFS 2017a). • Temporary roads and trails across slopes greater than 30 percent will be avoided when feasible (NMFS 2017a). • Existing roadways or travel paths will be used whenever possible (NMFS 2017a).
Water Resources (Stream Conditions)	• Coffer dam placement will maintain natural stream flow, minus the 40 cfs diversion to the hatchery, within the greatest amount of natural streambed width as possible. • Additional flow outage shall require the prior written approval of the COR, and of appropriate Federal and State water quality control agencies.

Resource Topic	Best Management Practice

Water Resources (Water Quality)	**General**
	• Perform construction activities by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, or other pollutants or wastes into streams, flowing or dry watercourses, lakes, wetlands, reservoirs, or underground water sources.
	• Measures shall be taken to ensure that no petroleum products, hydraulic fluid, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or deleterious materials are allowed to enter or leach into waters of the U.S. (NMFS 2017a).
	• The use of acids for cleaning or preparing concrete surfaces for repair will not be permitted.
	
	In-water work
	• Prepare a Work Area Isolation Plan for all work below the bankfull elevation requiring flow diversion or isolation. Include the sequencing and schedule of dewatering and rewatering activities, plan view of all isolation elements, as well as a list of equipment and materials to adequately provide appropriate redundancy of all key plan functions (e.g., an operational, properly sized backup pump and/or generator) (NMFS 2017a).
	• Use of rapidly deployable prefabricated cofferdam systems would minimize impacts to subgrade and surrounding water.
	• When conducting in-water or bank work, machine hydraulic lines will be filled with vegetable oil for the duration of the Project to minimize impacts of potential spills and leaks. If this conservation measure is not practicable, the applicant will propose alternative BMPs to avoid the discharge of hydraulic fluids to the aquatic environment. If this conservation measure is not practical the applicant will use low-hour machinery (NMFS 2017a).
	• Spill prevention and clean-up kits will be on site when heavy equipment is operating within 25 feet of the water (NMFS 2017a).
	• To the extent feasible, work requiring use of heavy equipment will be completed by working from the top of the bank (i.e. landward of the OHWM or extreme high tide line) (NMFS 2017a).
	• Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities around the water (NMFS 2017a).
	• Equipment will cross the stream in-water only under the following conditions: (NMFS 2017a).
	  o A. Equipment is free of external petroleum-based products, soil and debris has been removed from the drive mechanisms and undercarriage; and
	  o B. The substrate is bedrock or coarse rock and gravel; or
	  o C. Mats or logs are used in soft bottom situations to minimize compaction while driving across streams; and

Resource Topic	Best Management Practice
Water Resources (Water Quality, continued)	○ D. Stream crossings will be performed at right angles (90 degrees) to the bank if possible; and ○ E. No stream crossings will be performed at spawning sites when spawners of ESA listed fishes are present or eggs or juvenile fish could be in the gravel; and ○ F. The number of crossings will be minimized. • Project operations will cease under high flow conditions that could inundate the Project Area, except as necessary to avoid or minimize resource damage (NMFS 2017a). • If high flow or high tide conditions that may cause siltation are encountered during the Project, work shall stop until the flow subsides or the tide falls (NMFS 2017a). • Where practicable, a turbidity and/or debris containment device shall be installed prior to commencing in-water work (NMFS 2017a). • When working in-water, some turbidity monitoring may be required, subject to the Corps permit requirements or CWA section 401 certification. Turbidity monitoring generally is required when working in streams with more than 40 percent fines (silt/clay) in the substrate. Turbidity will be monitored only when turbidity generating work takes place, for example, installation of coffer dams, pulling the culvert in-water, reintroducing water. The applicant will measure the duration and extent of the turbidity plume (visible turbidity above background) generated. The data will be submitted to the Corps, NMFS, and the USFWS immediately following Project construction. Turbidity measurements will be taken in NTUs and are used by project proponents to develop procedures to minimize turbidity and estimate take for future projects (NMFS 2017a). • Equipment used in the instream channel will have containment methods to address possible fuel and oil leaks. **Erosion and spill prevention and control** • A Temporary Erosion and Sediment Control plan and a Spill Prevention Control and Containment plan, commensurate with the size of the Project, must be prepared and carried out to prevent pollution caused by surveying or construction operations (NMFS 2017a). • A Spill Prevention, Control, and Clean-Up plan will be prepared prior to construction for every project that utilizes motorized equipment or vehicles (NMFS 2017a). • A spill prevention and countermeasures plan (SPCC) in accordance with 40 CFR, Part 112 is required where release of oil and oil products could reasonably be expected to enter into or upon navigable waters of the United States or adjoining shorelines in quantities that may be harmful (40 CFR, Part 110), and aggregate on site oil storage capacity is over 1,320 gallons. Only containers with capacity of 55 gallons and greater are included in determining on site aggregate storage capacity.

Resource Topic	Best Management Practice
Water Resources (Water Quality, continued)	**Erosion and spill prevention and control, continued** o Prevent, stop, and control spills or leaks during construction activities: o Stop source of spill or leak. o Stop migration of spill or leak. o Place berm of sorbent material around perimeter of spill. o Solidify free standing oil. • A supply of emergency erosion control materials will be on hand and temporary erosion controls will be installed and maintained in place until site restoration is complete (NMFS 2017a). • Landward erosion control methods shall be used to prevent silt-laden water from entering waters of the U.S. These may include, but are not limited to, filter fabric, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas (NMFS 2017a). • Control pollutants by use of sediment and erosion controls, wastewater and stormwater management controls, construction site management practices, and other controls including State and local control requirements. • Sediment and Erosion Controls: o Establish methods for controlling sediment and erosion which address vegetative practices, structural control, silt fences, straw dikes, sediment controls, and operator controls as appropriate. o Institute stormwater management measures as required, including velocity dissipators, and solid waste controls which address controls for building materials and offsite tracking of sediment. • Pollution Prevention Measures: o Use methods of dewatering, unwatering, excavating, or stockpiling earth and rock materials which include prevention measures to control silting and erosion, and which will intercept and settle any runoff of sediment-laden waters. o Prevent wastewater from general construction activities such as drainwater collection, aggregate processing, concrete batching, drilling, grouting, or other construction operations, from entering flowing or dry watercourses without the use of approved turbidity control methods. o Divert stormwater runoff from upslope areas away from disturbed areas.

Resource Topic	Best Management Practice

Water Resources (Water Quality, continued)	**Erosion and spill prevention and control, continued**
	• Turbidity Prevention Measures:
	  o Use methods for prevention of excess turbidity which include, but are not restricted to, intercepting ditches, settling ponds, gravel filter entrapment dikes, flocculating processes, recirculation, combinations thereof, or other approved methods that are not harmful to aquatic life.
	  o Wastewaters discharged into surface waters shall meet conditions of Clean Water Act section 402, the National Pollutant Discharge Elimination System (NPDES) permit.
	  o Do not operate mechanized equipment in waterbodies without having first obtained a Clean Water Act section 404 permit, and then only as necessary to construct crossings or perform the required construction.
	• Clean up spills or leaks in a manner that complies with applicable Federal, State, and local laws and regulations.
	• Dispose of spilled or leaked materials:
	  o Handle and dispose of spilled or leaked materials contaminated with 50 ppm or greater polychlorinated biphenyls.
	  o Handle and dispose of spilled or leaked materials not contaminated or contaminated with less than 50 ppm polychlorinated biphenyls in accordance with applicable Federal, State, and local regulations.
	Discharge water and wastes
	• All discharge water created by construction (e.g. concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) will be treated to avoid negative water quality and quantity impacts. Removal of fines may be accomplished with bioswales; concrete washout water with an altered pH, may be infiltrated (NMFS 2017a).
	• Wastewater from Project activities and water removed from within the work area shall be routed to an upland disposal site (landward of the OHWM or extreme high tide line) to allow removal of fine sediment and other contaminants prior to being discharged to the waters of the U.S. (NMFS 2017a).
	• All waste material such as construction debris, silt, excess dirt or overburden resulting from the Project will generally be deposited above the limits of flood water in an upland disposal site. However, material from pushup dikes may be used to restore microtopography (e.g., filling drainage channels) (NMFS 2017a).

Resource Topic	Best Management Practice
Water Resources (Water Quality, continued)	**Storage and staging** • When not in use, vehicles and equipment containing oil, fuel, and/or chemicals will be stored in a staging area located at least 150 feet from the Corps' jurisdictional boundary of wetlands and waterbodies. If possible, staging will be located at least 300 feet away from the Corps' jurisdictional boundary of wetlands and waterbodies, and on impervious surfaces to prevent spills from reaching ground water. If moving equipment between the staging area and the worksite would create unacceptable levels of disturbance (for example, requiring multiple stream crossings, multiple passes over sensitive vegetation), a closer staging location with an adequate spill prevention plan may be proposed (NMFS 2017a). • Equipment will not be stored overnight in the instream channel. • Do not stockpile or deposit excavated materials or other construction materials, near or on, stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff or can in any way encroach upon the watercourse. • Petroleum Product Storage Tanks Management. o Place oil or other petroleum product storage tanks at least 20 feet from streams, flowing or dry watercourses, lakes, wetlands, reservoirs, and any other water source. o Do not use underground storage tanks. o Construct storage area dikes at least 12 inches high or graded and sloped to permit safe containment of leaks and spills equal to storage tank capacity located in the area plus sufficient freeboard to contain the 25-year rainstorm. Line diked areas with an impermeable barrier at least 50 mils thick. o Areas for refueling operations: Lined with impermeable barrier at least 40 mils thick covered with 2 to 4 inches of soil. **Reclamation of temporary disturbance** • All temporary access will be removed (including gravel surfaces) and planted after Project completion (NMFS 2017a). • Within 7 calendar days from Project completion, any disturbed bank and riparian areas shall be protected using native vegetation or other erosion control measures as appropriate. For erosion control, sterile grasses may be used in lieu of native seed mixes. Alternative methods (e.g. spreading timber harvest slash) may be used for erosion control if approved by the Corps (NMFS 2017a).

Resource Topic	Best Management Practice
Water Resources (Water Rights)	• A total of 40 cfs shall be continuously provided to the LNFH during Phase I construction. • A total of 20 cfs shall be continuously provided to the LNFH during Phase II construction activities taking place from April 17 to May 20.
Biological Resources (Vegetation)	• Preserve natural landscape and preserve and protect existing vegetation not required or otherwise authorized to be removed. • Protect vegetation from damage or injury caused by construction operations, personnel, or equipment by the use of protective barriers or other approved methods. • Minimize, to the greatest extent practicable, clearings and cuts through vegetation. • Do not use trees for anchorages except in emergency cases or as approved by Reclamation. Where approved, wrap the trunk with a sufficient thickness of approved protective material before rope, cable, or wire is placed. • Use safety ropes where tree climbing is necessary; do not use climbing spurs. • Before bringing construction equipment on site, clean it to remove dirt, vegetation, and other organic material to prevent introduction of noxious weeds, and invasive plant and animal species. • Contractor cleaning procedures shall result in equipment being cleaned as well or better than the procedures described in Reclamation Cleaning Manual (Reclamation 2010). Reclamation will inspect construction equipment following procedures described in Reclamation Cleaning Manual before allowing the equipment onsite. • Restore contractor use areas to pre-construction condition. • Areas of temporary disturbance must be re-seeded according to a revegetation plan.

Resource Topic	Best Management Practice
Biological Resources (Fisheries and Aquatic Ecosystems)	**Riparian areas** • The removal of riparian vegetation for access will be minimized (NMFS 2017a). • All native, non-invasive organic material (large and small wood) cleared from the action area for access will remain on site (NMFS 2017a). • Boundaries of clearing limits associated with site access and construction will be marked to avoid or minimize disturbance of riparian vegetation, wetlands, and other sensitive sites (NMFS 2017a). • If native riparian vegetation is disturbed it will be replanted with native herbaceous and/or woody vegetation after Project completion. Planting will be completed between October 1 and April 15 of the year following construction. Plantings will be maintained as necessary for 3 years to ensure 50 percent herbaceous and/or 70 percent woody cover in year 3, whatever is applicable. For riparian impact areas greater than 0.5 of an acre, a final monitoring report will be submitted to the Corps in year 3. Failure to achieve the 50 percent herbaceous and 70 percent woody cover in year 3 will require the permittee to submit a plan with contingency measures to achieve standards or reasons to modify standards (NMFS 2017a). • Per NWP 27, post-planting monitoring may be required for up to 10 years in order to ensure an 80 percent planting survival rate is met. • Fencing will be installed as necessary to prevent access to revegetated sites by livestock, beavers or unauthorized persons. Beaver fencing will be installed around individual plants where necessary (NMFS 2017a).

Resource Topic	Best Management Practice
Biological Resources (Fisheries and Aquatic Ecosystems, continued)	**Fisheries and aquatic wildlife** • Instream work is limited to July 1 through November 15. • A minimum depth of 0.8 ft shall be maintained within the greatest amount of the natural stream channel width at all times with placement of cofferdams to facilitate fish passage. Fish passage criteria in Icicle Creek Fish Passage Evaluation for the Leavenworth National Fish Hatchery (Anglin et al. 2013, p. 26-28) should be consulted for minimum depth and maximum velocity criteria. The maximum velocity criteria on pages 26-28 are conservative, but attempts should be made to provide fish passage to the greatest extent practical across the natural stream channel width and hydrograph. • Work site dewatering will follow the Dewatering and Fish Capture Protocol in Appendix D (NMFS and USFWS 2008). Fish removal from dewatered work sites would be overseen by a fisheries biologist. Electrofishing for fish relocation/work area isolation must follow the most recent NMFS guidelines (NMFS 2017a). Record all incidents of listed fish being observed, captured, handled, and released (USFWS 2011). • Re-watering of the construction site occurs at such a rate as to minimize loss of surface water downstream as the construction site streambed absorbs water (NMFS and USFWS 2008). • The design of passage structures will follow the appropriate design standards in the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual (NMFS and USFWS 2008). • Roughened channels will be designed to standards contained in the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual (NMFS and USFWS 2008). • Post-construction monitoring of the low-flow fishway would be done to ensure effectiveness. • Boulder weirs will be low in relation to channel dimensions so that they are completely overtopped during channel-forming, bankfull flow events. Boulder weirs will be placed diagonally across the channel or in more traditional upstream pointing "V" or "U" configurations with the apex oriented upstream (NMFS and USFWS 2008). • Boulder weirs will be constructed to allow upstream and downstream passage of all native listed fish species and life stages that occur in the stream at all flows (NMFS and USFWS 2008). • Boulder weirs shall be designed and inspected by a multidisciplinary team (including a salmon or trout biologist) that has experience with these types of structures (NMFS and USFWS 2008).

Resource Topic	Best Management Practice
Biological Resources (Fisheries and Aquatic Ecosystems, continued)	• Screens, including screens installed in temporary pump intakes, will be designed to meet standards in the most current version of the NMFS Anadromous Salmonid Passage Facility Design manual (NMFS and USFWS 2008). • Pumps used to dewater the work isolation area or supply temporary hatchery water during construction, will have a fish screen installed, operated and maintained according to NMFS' fish screen criteria (NMFS 2017a). • All fish screens will be sized to match the water users documented or estimated historic water use or legal water right, whichever is less. Water diversion rates shall not exceed the design capacity of the screen, as calculated by following NMFS Anadromous Salmonid Passage Facility Design manual (NMFS and USFWS 2008). • Irrigation diversion intake and return points will be designed (to the greatest degree possible) to prevent all native fish life stages from swimming or being entrained into the irrigation system (NMFS and USFWS 2008). • Do not use jackhammers in excess of 30 pounds without Reclamation approval. Blasting is not permitted. • Monitor, capture, and release listed fish species in the sand settling basin in accordance with applicable protocol in NMFS (2017a), USFWS (2011), and as identified through consultation for the Project's Biological Assessment. • Schedule annual intake maintenance to avoid the Bull Trout upstream migration period (USFWS 2011). • Disturbing natural-origin spawning salmon and Steelhead during hatchery maintenance activities of diversions and instream structures shall be avoided, as shall disturbing salmon and Steelhead redds (NMFS 2017b).

Resource Topic	Best Management Practice
Biological Resources (Terrestrial Wildlife)	• Schedule all necessary vegetation removal, trimming, and grading of vegetated areas outside of the bird breeding season (generally March 1 to August 31) to the maximum extent practicable. • Avoid construction activities during the bird breeding season to the extent practicable. When Project activities cannot occur outside the bird nesting season (March 1 to August 31), conduct surveys prior to scheduled activity to determine if active nests are present within the Wildlife Analysis Area and buffer any active nesting locations found during surveys. Surveys should be conducted by a qualified biologist no more than seven days prior to disturbance activities. If active nests are detected during these surveys a no-activity buffer zone around the nest will be established by a qualified biologist based on species, Project disturbance level, topography, existing disturbance levels, and habitat type until fledging has occurred. During ongoing Project activities if a bird establishes a new nest the nest vegetation will not be removed or modified but no buffer zone will be required. If there is a pause in Project activities greater than seven days an additional nesting bird survey would be needed. • Reclamation would minimize the highest construction noise disturbance to avoid or minimize impacts on mule deer and mountain goat during sensitive periods to the extent practicable. This is between mid-spring to early fall (May 1-September 30).
Cultural Resources	• As required by the Washington State Historic Preservation Officer, the *Plan and Procedures for the Inadvertent Discovery of Cultural Resources and Human Remains* (Inadvertent Discovery Plan) will be followed in the case of inadvertent discovery of cultural resources or human remains during construction. • A professional archaeological monitor will be present during ground-disturbing activities.
Land Use	• Restore contractor use areas to pre-construction condition.

Resource Topic	Best Management Practice
Transportation	• Perform work on rights-of-way established by the government as necessary to construct and maintain any roads, bridges, or drainage structures required for establishment and use of haul routes for construction operations. • Use existing available public highways, roads, or bridges as haul routes subject to applicable local regulations. • Minimize interference with or congestion of local traffic. • Provide barricades, flaggers, and other necessary precautions for safety of the public where haul routes cross public highways or roads. • Maintain roadways, parking areas, and haul routes in a sound, smooth condition. • Promptly repair ruts, broken pavement, potholes, low areas with standing water, and other deficiencies to maintain road surfacing and drainage in original or specified condition. • Meet requirements of the Manual on Uniform Traffic Control Devices for Streets and Highways, Part 6 (Temporary traffic control; https://mutcd.fhwa.dot.gov/) and WAC 296-155-305 (Signaling and flaggers). • Provide cones, delineators, concrete safety barriers, barricades, flasher lights, danger signals, signs, and other temporary traffic control devices as required to protect work and public safety. • Provide flaggers and guards as required to prevent accidents and damage or injury to passing traffic. • Do not begin work along public or private roads until traffic control devices for warning, channeling, and protecting motorists are in place in accordance with approved traffic control plan. • Provide unobstructed, smooth, and dustless passageway for one lane of traffic through construction operations except at times when vehicles will be turning around at the USFS kiosk or backing onto the Intake Access Road. • Provide unobstructed, smooth, and dustless passageway for one lane of traffic through construction operations. • Maintain convenient access to driveways and buildings along line of work. • Protect roads closed to traffic with effective barricades and warning signs. Illuminate barricades and obstructions from sunset to sunrise. • Remove traffic control devices when no longer needed.
Noise	• Do not use jackhammers in excess of 30 pounds without Reclamation approval. Blasting is not permitted.
Recreation	• There are no construction activities (such as parking, storage, or vehicle turnaround) allowed in the Forest Service Snow Lakes Trailhead parking lot.

Resource Topic	Best Management Practice
Visual Resources	• Minimize, to the greatest extent practicable, clearings and cuts through vegetation. Irregularly shape authorized clearings and cuts to soften undesirable aesthetic impacts.
Socioeconomics and Environmental Justice	• Reclamation policy is to avoid impacts on Indian sacred sites whenever possible. Continued coordination with affected Tribes may result in future identification of sacred sites. If this occurs, Reclamation would further evaluate impacts on these resources. Consultation with the Yakama Nation and Confederated Tribes of the Colville Reservation would identify how to protect sacred sites if they were identified and how to provide continued access if any such sites were affected by Project construction. • In-water work would not occur in the spillway pool during the Tribal fishing preparations or season.
Utilities	• A locate for underground utilities would be coordinated with the Washington Utility Notification Center (http://www.callbeforeyoudig.org/washington/index.asp) prior to construction.
Hazardous Materials and Public Health and Safety	• Vehicle traffic on government rights-of-way, dirt roads, and paved roads through LNFH property would be limited to 10 miles per hour. • Nuisance flows from seepage and leakage through the cofferdams will be managed to maintain a safe working environment. • Hazardous Waste Disposal: o Dispose by removal from jobsite. o Recycle hazardous waste whenever possible. o Dispose of hazardous waste materials that are not recycled at appropriately permitted treatment or disposal facilities. o Transport hazardous waste in accordance with 49 CFR 171-179. • Provide protection for personnel and existing facilities from harm due to demolition activities. • Arrange protective installations to permit operation of existing equipment and facilities by the government while work is in progress. • Inadvertent discovery of hazardous wastes or materials will be reported to Reclamation and Ecology within 24 hours of discovery. Construction in the vicinity of the discovery would cease until the appropriate disposal procedures were identified and carried out in coordination with Reclamation and Ecology.

Resource Topic	Best Management Practice
Tribal Interests	• Reclamation policy is to avoid impacts on Indian sacred sites whenever possible. Continued coordination with affected Tribes may result in future identification of sacred sites. If this occurs, Reclamation would further evaluate impacts on these resources. Consultation with the Yakama Nation and Confederated Tribes of the Colville Reservation would identify how to protect sacred sites if they were identified and how to provide continued access if any such sites were affected by Project construction.

Sources: As noted in table.

B.2 Regulatory Permit Terms and Conditions

Reclamation will obtain required regulatory permits and comply with the general, regional, and permit-specific terms and conditions contained therein. A general list of anticipated terms and conditions is included below. Regulating agencies may also impose additional conditions on a project-by-project basis.

B.1.1 U.S. Army Corps of Engineers Section 404 Nationwide Permits

USACE General Conditions for all NWPs

- Aquatic Life Movements. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species.
- Spawning Areas. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable.
- Suitable Material. Material used for construction or discharged must be free from toxic pollutants in toxic amounts.
- Fills Within 100-Year Floodplains. The activity must comply with applicable FEMA-approved state or local floodplain management requirements.
- Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.
- Removal of Temporary Fills. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.
- Proper Maintenance. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.
- Tribal Rights. No NWP activity may cause more than minimal adverse effects on tribal rights (including treaty rights), protected tribal resources, or tribal lands.
- Endangered Species. (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the effects of the proposed activity has been completed.
- Endangered Species. (d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species-specific permit conditions to the NWPs.

- Migratory Birds and Bald and Golden Eagles. The permittee is responsible for ensuring their action complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.
- Historic Properties. (a) In cases where the district engineer determines that the activity may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.
- Discovery of Previously Unknown Remains and Artifacts. If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed.
- Water Quality. Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)).
- Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification.

USACE Seattle District NWP Regional Conditions

- Construction Boundaries: Permittees must clearly mark all construction area boundaries before beginning work on projects that involve grading or placement of fill. Boundary markers and/or construction fencing must be maintained and clearly visible for the duration of construction. Permittees should avoid and minimize removal of native vegetation (including submerged aquatic vegetation) to the maximum extent possible.
- Temporary Impacts and Site Restoration: Native soils removed from waters of the U.S. for project construction should be stockpiled and used for site restoration. Restoration of temporarily disturbed areas must include returning the area to pre-project ground surface contours. If native soil is not available from the project site for restoration, suitable clean soil of the same textural class may be used. The permittee must revegetate disturbed areas with native plant species sufficient in number, spacing, and diversity to restore affected functions. Revegetation must begin as soon as site conditions allow within the same growing season as the disturbance. Temporary erosion and sediment control measures must be removed as soon as the area has established vegetation sufficient to control erosion and sediment.

NWP 27 (Aquatic Habitat Restoration, Enhancement, and Establishment Activities) Conditions

- Only native plant species should be planted at the site.

NWP 33 (Temporary Construction, Access, and Dewatering) Conditions

- Appropriate measures must be taken to maintain near normal downstream flows and to minimize flooding.
- Fill must consist of materials, and be placed in a manner, that will not be eroded by expected high flows.

- The use of dredged material may be allowed if the district engineer determines that it will not cause more than minimal adverse environmental effects. Following completion of construction, temporary fill must be entirely removed to an area that has no waters of the United States, dredged material must be returned to its original location, and the affected areas must be restored to pre-construction elevations. The affected areas must also be revegetated, as appropriate.

B.1.2 Ecology Section 401 Water Quality Certification

General Conditions

- Stormwater pollution prevention: All projects that involve land disturbance or impervious surfaces must implement stormwater pollution prevention or control measures to avoid discharge of pollutants in stormwater runoff to waters of the State.
  - For land disturbances during construction, the applicant must obtain and implement permits (e.g., Construction Stormwater General Permit) where required and follow Ecology's current stormwater manual.
  - Following construction, prevention or treatment of on-going stormwater runoff from impervious surfaces shall be provided.

B.3 Potential Contractor Plan Submittals

The list of plans that would need to be prepared before Project construction could begin may include, but are not limited to the following:

- Land Use and Landscape Rehabilitation Plan
- Traffic Control Plan
- Pollution Prevention Plan
- Spill Prevention, Control, and Countermeasure Plan
- Tree and Plant Protection Plan
- Waste Production and Disposal Plan
- Waste Handling and Disposal Plan
- Demolition Plan
- Concrete Removal and Disposal Plan
- Water Control Plan
- Cofferdam Construction Plan
- Seeding Plan
- Work Area Isolation Plan
- Temporary Erosion and Sediment Control Plan
- Inadvertent Discovery Plan

B.4 References

Anglin, D. R., J. J. Skalicky, D. Hines, and N. Jones. 2013. Icicle Creek Fish Passage Evaluation for The Leavenworth National Fish Hatchery. U.S. Fish and Wildlife Service, Columbia River Fisheries Program Office, Vancouver, Washington.

NMFS (National Marine Fisheries Service). 2015. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation; Leavenworth National Fish Hatchery spring Chinook Salmon Program. National Marine Fisheries Service, West Coast Region, Portland, Oregon.

_____. 2017a. Programmatic Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Seattle District Corps of Engineers Permitting of Fish Passage and Restoration Action in Washington State (FPRP III). West Coast Region, Portland, Oregon.

_____. 2017b. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation, Leavenworth National Fish Hatchery Spring Chinook Salmon Program (Reinitiation 2016). National Marine Fisheries Service, West Coast Region, Portland, Oregon.

NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 2008. Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic. NMFS Tracking No. 2008/03598, USFWS No. 13410-2008-FWS#F-0209. Lacey, Washington.

Reclamation (U.S. Bureau of Reclamation). 2010. Technical Memorandum No. 86-68220-07-05: Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species, 2010 Edition. Denver, Colorado.

USFWS (U.S. Fish and Wildlife Service). 2011. Biological Opinion for the operations and maintenance (O&M) of the LNFH and effects on the threatened bull trout (*Salvelinus confluentus)* and its designated critical habitat. USFWS Reference No. 13260-2011-F-0048 and 13260-2011-P-0002. Wenatchee, Washington.

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Appendix C

SWISP Project EIS Analysis Assumptions

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Appendix C. SWISP Project EIS Analysis Assumptions

Reclamation used the following assumptions when analyzing effects from the action alternatives:

- Relocation of the COIC point of diversion on Icicle Creek downstream of the Hatchery, would be complete prior to the start of Phase I Construction.
- There would be no change to LNFH water rights, its point of diversion, place of use, or the beneficial use designation. No other water rights would be affected.
- Reclamation would obtain required regulatory permits and comply with the general, regional, and permit-specific terms and conditions contained therein (see **Appendix B**, **Section B.2**, Regulatory Permit Terms and Conditions). If permit requirements, BMPs, or other measures contradict each other, the contract specification requires that the contractor abide by the most stringent of requirements.
- Trout Unlimited's Icicle Creek Boulder Field Fish Habitat Improvement Project would be completed in fall 2020. Completion of the Project would result in access to more than 20 miles of high-quality aquatic habitat in upper Icicle Creek in the Alpine Lakes Wilderness Area.
- The Icicle Creek in-water work window would include the construction and removal of cofferdams.
- The LNFH low-water needs period is from April 17 to May 20 each year.
- The temporary Hatchery water supply during Phase I construction would be an unscreened gravity-fed bypass pipeline. Surface water would be supplied by pumping from the spillway pool on Icicle Creek.
- Under Alternative D, the temporary Hatchery water supply during Phase I construction would be provided from the spillway pool by using two high-lift 16-inch trailer-mounted pumps with 150 horsepower diesel engines when not being supplied by the gravity bypass pipeline.
- During Phase I construction, while the temporary above-ground, gravity-fed bypass pipeline connected to the conveyance pipeline is in use, USFWS would regularly survey the sand settling basin and capture and release listed fish species in accordance with the procedures outlined in Term and Condition 2g of the NMFS (2017, p. 214) Hatchery Spring Chinook Salmon Program (Reinitiation 2016) Biological Opinion. If listed fish are observed during snorkeling, or the water is too turbid for snorkeling, Hatchery staff would draw down the sand settling basin by redirecting flow to the outside screen chambers, bypassing the sand settling basin, to a point where a shallow (6 to 12-inch) pool of water is left in the basin. Fish would then be removed by seine netting and dip netting the remaining water. Fish would be tallied by species and gross life stage, notes would be made as to any mortalities, and all live fish would be released in the spillway pool to presumably continue migration or movement.

- The control valve vault disturbance area would be approximately 75 feet by 60 feet; the entirety of the disturbance area would be within the footprint of the conveyance pipeline replacement corridor.
- Replacing conveyance pipeline on the Hatchery grounds would occur between May 2022 and April 2023.
- Lining the conveyance pipeline with CIPP between CUA #5 and CUA #4 and between CUA #4 and CUA #3 would occur between April and May 2023.
- Alternative B: Lining the conveyance pipeline with CIPP between CUA #3 and CUA #2 would occur between April and May 2023
- Alternative B: Replacing the conveyance pipeline on USFWS property at the intake would occur between April and May 2024.
- Alternative C: Lining the conveyance pipeline with CIPP between CUA #3 and CUA #2 would occur between April and May 2024
- Alternative C: Lining the conveyance pipeline with CIPP on USFWS property at the intake would occur between April and May 2024
- Between 7 and 10 construction personnel would be required during Phase II construction
- During construction, unobstructed, smooth, and dustless passageway for one lane of traffic will be provided, except at times when construction vehicles will be turning around at the Forest Service kiosk or backing onto the intake access road.
- Construction material delivery could occur at the bottom of the existing intake access road, or on the Icicle Creek Road shoulder above the intake construction area.
- The headworks would be built to withstand a 100-year flood, so it would be approximately 15 feet higher in elevation than the existing low-head diversion dam crest. Nevertheless, it would not be easily visible to motorists on Icicle Creek Road.
- The gatehouse and stairs to the gatehouse would be demolished. Underground vaults would be in the footprint of the former gatehouse, but these will only be detectable by two manhole covers and valve covers that would be flush with the ground surface.
- IO&MA guardrails would be hot rolled galvanized steel. The IO&MA control panel canopy cover would be painted to match the LNFH roof color.