

# INITIAL CONSULTATION DOCUMENT

IN SUPPORT OF APPLICATION FOR NON-CAPACITY-RELATED AMENDMENT OF  
LICENSE FOR MAJOR PROJECT – EXISTING DAM



**NORTH UMPQUA HYDROELECTRIC PROJECT  
(FERC PROJECT No. 1927)**

**CLEARWATER NO. 2 PUMPED STORAGE PROJECT**



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**NORTH UMPQUA HYDROELECTRIC PROJECT  
FERC PROJECT NO. 1927  
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**LICENSE AMENDMENT  
INITIAL CONSULTATION DOCUMENT**

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**LIST OF TERMS, ACRONYMS, AND ABBREVIATIONS**

μS/cm	microsiemens per centimeter
7-DADM	7-day average of the daily maximum water temperature

**A**

AC	alternating current
ADA	Americans with Disabilities Act
amsl	above mean sea level
APE	area of potential effect

**B**

BLM	Bureau of Land Management
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**C**

C	Celsius
CFR	Code of Federal Regulations
cfs	cubic feet per second
Clearwater No. 2	Clearwater No. 2 development

**D**

dbh	diameter at breast-height
DC	direct current
DO	dissolved oxygen
DPS	Distinct Population Segment

**E**

ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit

**F**

FERC	Federal Energy Regulatory Commission
FWS	U.S. Fish and Wildlife Service

**G**

GBT	Gas Bubble Trauma
GSU	generator step-up transformer
GW	gigawatt
GWh	gigawatt hour

**H**

HPMP	historic properties management plan
HSP	Historic Structures Plan

**I**

ICD	Initial Consultation Document
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**K**

kV	kilovolt
kVA	kilovolt ampere
kW	kilowatt

**L**

LUDO	Land Use and Development Ordinance
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**M**

mg/L	milligrams per liter
MW	megawatt
MWh	megawatt hour

**N**

NEPA	National Environmental Policy Act
NGO	non-government organization
NMFS	National Marine Fisheries Service
NRF	nesting, roosting, and foraging
NRHP	National Register of Historic Places
NSO	northern spotted owl
NTP	notice to proceed
NTU	turbidity

**O**

OARRA	Oregon Archaeological Records Remote Access
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ORBIC	Oregon Biodiversity Information Center

**P**

PBF	Physical and biological features
PCE	primary constituent elements
pH	power of hydrogen
PM&E	protection, mitigation, and enhancement
Project	North Umpqua Hydroelectric Project
PURPA	Public Utility Regulatory Policies Act

**R**

Recovery Plan	Revised Recovery Plan for the Northern Spotted Owl
ROW	right of way
rpm	revolutions per minute
RRMP	Recreation Resources Management Plan



**S**

SCADA	Supervisory Control and Data Acquisition
SpC	specific conductance
SWCA	SWCA Environmental Consultants

**T**

TR	Timberland Resource
TKN	total Kjeldahl nitrogen
TDG	total dissolved gas
TOC	total organic carbon
TP	Total phosphorus

**U**

Umpqua LRMP	Land and Resource Management Plan for the Umpqua National Forest
USC	United States Code
USDA	United States Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey

**V**

VMP	Vegetation Management Plan
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**W**

WCS	West Cascades South
WT	water temperature
WY	Water Year

## 1.0 INTRODUCTION

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### 1.1 BACKGROUND

PacifiCorp is the owner, operator, and licensee of the North Umpqua Hydroelectric Project (North Umpqua Project), Federal Energy Regulatory Commission (FERC) Project No. 1927. The North Umpqua Project is located in south-central Oregon on the west side of the Cascade Range in Douglas County, Oregon about 60 miles east of Roseburg. The North Umpqua Project license was issued by FERC on November 18, 2003 (105 FERC ¶ 61,327).

The North Umpqua Project is located in a remote area near the headwaters of the North Umpqua River, and two of its tributaries, the Clearwater River, and Fish Creek. The North Umpqua Project encompasses eight hydroelectric developments, which were constructed between 1947 and 1956, with a total rated capacity of 194 megawatts (MW). Each of the eight North Umpqua Project developments consists of a dam, waterway, penstock, and powerplant, including a combined 21.7 miles of canals, 9.8 miles of flumes, and 5.8 miles of penstocks and tunnels. Together, the developments create a total waterway length of 37.3 miles. There are three major reservoirs (Soda Springs Reservoir, Lemolo Reservoir, and Toketee Reservoir) that provide water storage. The North Umpqua Project includes 117.5 miles of transmission lines.

The intermittency of renewable power generation fuel sources (e.g., solar and wind) has given rise to a greater need for fast-responding and long-duration energy storage, which is essential for grid stability and resiliency. Pumped storage has been the traditional storage option to ensure that there is power available during on-peak hours. Due to its affordability, flexibility, and ability to support other intermittent renewables, there are multiple projects being developed throughout the West to take advantage of development opportunities at existing dams, reservoirs, and hydroelectric facilities. New energy storage resources in PacifiCorp's 2021 Integrative Resource Plan preferred portfolio includes 500 MW of pumped storage hydropower.

PacifiCorp proposes upgrades at the Clearwater No. 2 Development (Clearwater No. 2) and Toketee Development (Toketee) to accommodate an open-loop pumped storage development system utilizing the existing Toketee Reservoir as the lower reservoir and an expanded Clearwater No. 2 forebay as the upper (i.e., storage) reservoir (Pumped Storage Project). The

Pumped Storage Project will include the addition of a new intake on Toketee Reservoir, a pumphouse, a reversible pump-turbine, a new penstock extension from the pumphouse to the existing Clearwater No. 2 penstock, and expansion of the existing Clearwater No. 2 forebay to provide additional volume for water storage and serve as the upper reservoir.

Pursuant to Code of Federal Regulations (CFR) Title 18, Part 4.38, PacifiCorp has developed this initial consultation document (ICD) to describe the proposed amendment to the North Umpqua Project. The proposed Pumped Storage Project does not result in an increase in the maximum hydraulic capacity, defined as the maximum water flow rate that can be discharged simultaneously through all the North Umpqua Project turbines for generation at any time, by 15 percent or more, and therefore does not exceed the threshold for a capacity amendment (18 CFR § 4.201 (b)). However, the Pumped Storage Project is subject to FERC requirements for three-stage consultation under 18 CFR § 4.38 (a)(6)(v) as the proposal includes construction of a new diversion where there is no existing diversion and the addition of a new waterpower turbine. PacifiCorp proposes filing a non-capacity license amendment application for the North Umpqua Project that meets FERC regulations at 18 CFR § 4.201.

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## **2.0 LICENSE AMENDMENT PROCESS PLAN AND SCHEDULE**

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### **2.1 AMENDMENT PROCESS AND SCHEDULE**

Pursuant to 18 CFR § 4.38, PacifiCorp has developed this ICD to describe the proposed amendment to the North Umpqua Project, specific to the Pumped Storage Project, provide supporting background information, describe the existing environment, and involve stakeholders for the purpose of identifying pertinent resource issues. This ICD will function as a platform upon which studies and protection, mitigation, and enhancement (PM&E) measures can be identified and developed through consultation with stakeholders including state and federal agencies, local governments, non-government organizations (NGOs), adjacent landowners, and members of the public. This ICD is a precursor to the environmental analysis section of the non-capacity license amendment application and to FERC's preparation of the National Environmental Policy Act (NEPA) document.

FERC regulations at 18 CFR § 4.38(a)(6) specify a three-stage consultation process for non-capacity license amendments involving the construction of a new diversion and the addition of new waterpower turbines. PacifiCorp is formally initiating consultation through issuance of this ICD. PacifiCorp proposes to continue consultation through the three-stage process as outlined in Table 2-1. Three stage consultation will involve reaching out to relevant agencies, Tribes, and other interested stakeholders, holding a public meeting, conducting study planning and implementation, reporting on study results, and providing a draft application for review and comment to stakeholders. The consultation process culminates in PacifiCorp's filing of a non-capacity license amendment application for the North Umpqua Project that meets FERC regulations at 18 CFR § 4.201.

**TABLE 2-1 PRELIMINARY PUMPED STORAGE PROJECT AMENDMENT PROCESS SCHEDULE**

RESPONSIBLE PARTY	ACTIVITY	ESTIMATED. TIMELINE*
PacifiCorp	Conduct Preliminary Studies	2021
Stage 1		
PacifiCorp	File and Distribute ICD, Request for Designation as FERC’s Non-federal Representative for Consultation, and Newspaper Notice	04/29/2022
PacifiCorp	Provide Notification of Joint Agency/Public Meeting Location and Timing	04/29/2022
FERC	FERC Issues Notice of Approval of Consultation Process	05/16/2022
PacifiCorp/Stakeholders	Joint Agency/Public Meeting and Site Visit	06/08/2022**
FERC/Stakeholders	Comments on ICD/ Proposed Studies Due	08/01/2022
Stage 2		
PacifiCorp	Distribute Study Plans	2022 – 2023 Specific timelines for Stage 2 contingent on progress in study development and implementation.
Stakeholders	Comments on Study Plans	
PacifiCorp	Conduct Studies	
PacifiCorp	Issue Study Reports	
Stakeholders	Comments on Study Report	
PacifiCorp	Submit Draft Amendment Application	
FERC/Stakeholders	Comments on Draft Amendment Application	
Stage 3		
PacifiCorp	Submit Final Amendment Application	Spring 2023
PacifiCorp	FERC Amendment Order (subject to change) †	04/2024

Notes:

\*If due date falls on Saturday or Sunday, due date has been advanced to the following Monday.

\*\*Joint Agency/Public Meeting must be held no earlier than 30 days, but no later than 60 days from the ICD filing date.

†FERC does not have a specific timeline requirement for Amendment Application reviews.

In addition to making the ICD available on the North Umpqua Project website,<sup>1</sup> PacifiCorp plans to distribute the ICD to the consulting agency representatives identified in Table 2-2.

<sup>1</sup> <https://www.pacificorp.com/energy/hydro/north-umpqua-river.html>

**TABLE 2-2 CONSULTING AGENCY REPRESENTATIVES**

AGENCY	NAME	TITLE
Confederated Tribes of Grand Ronde	Cheryle A. Kennedy	Council Chair
Confederated Tribes of Siletz Indians	Delores Pigsley	Council Chair
Cow Creek Band of Umpqua Tribe of Indians	Dan Courtney	Council Chair
National Oceanic and Atmospheric Administration Fisheries	Logan Negherbon	Civil Engineer
Oregon Department of Environmental Quality	Chris Stine	Water Quality Engineer
Oregon Department of Fish and Wildlife	Jason Brandt	SW Hydro Coordinator
Oregon Water Resources Department	R. Craig Kohanek	Water Quality Division
U.S. Bureau of Indian Affairs	Rudy Peone	FERC Coordinator
U.S. Bureau of Indian Affairs	Jennifer Frozena	FERC Coordinator
U.S. Bureau of Land Management	Michael Korn	Swiftwater Field Manager
U.S. Forest Service: Umpqua National Forest	Pam Sighting	Hydropower Program Coordinator
U.S. Fish and Wildlife Service	Frank Weaver	Fish and Wildlife Biologist

### **3.0 DESCRIPTION OF EXISTING AND PROPOSED FACILITIES**

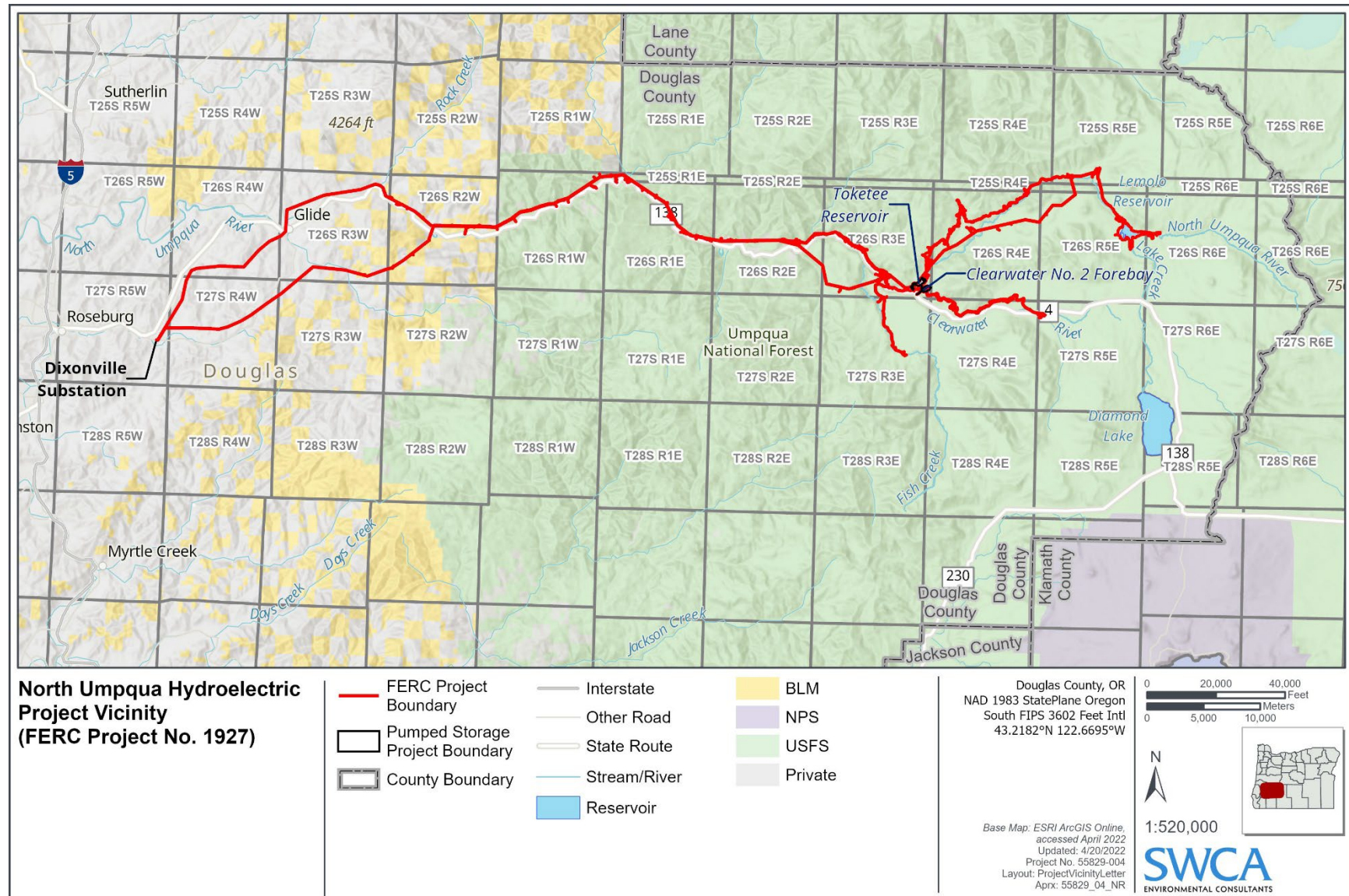
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Pursuant to 18 § CFR 4.201(c) PacifiCorp is seeking a non-capacity amendment to accommodate the proposed Pumped Storage Project. The Pumped Storage Project will utilize portions of existing facilities of the Clearwater No. 2 and Toketee developments in addition to and new, proposed facilities.

#### **3.1 NORTH UMPQUA PROJECT EXISTING FACILITIES**

The North Umpqua Project consist of eight powerplants, eight dams, 21.7 miles of canal, 9.8 miles of flume, and 5.8 miles of penstock and tunnels, for a total waterway length of 37.3 miles (Figure 3-1). Three major reservoirs, Soda Springs Reservoir, Lemolo Reservoir and Toketee Reservoir, provide water storage. All eight hydroelectric generation developments, as well as the eastern portions of transmission lines 39 and 46 are located on lands administered by the U.S. Forest Service (USFS). The western portions of the transmission lines, from the Umpqua National Forest boundary west to the Dixonville Substation, are located on a patchwork of privately-owned and Bureau of Land Management (BLM)-administered public lands. The North Umpqua Project is comprised of 3,081.0 acres (see Section 4.0 for a description of the land ownership acreages of the existing Project Boundary). Additional developments downstream of the Toketee Development include Fish Creek, Slide Creek, and Soda Springs. These developments, while integral to the North Umpqua Project, are not affected by the proposed Pumped Storage Project (Section 3.4), and operations of those developments will not change with implementation of the proposed Pumped Storage Project.

**FIGURE 3-1 NORTH UMPQUA PROJECT LOCATION AND FACILITIES**





### **3.2 CLEARWATER NO. 2 DEVELOPMENT EXISTING FACILITIES**

The existing Clearwater No. 2 development is the second development on the Clearwater River. The development consists of a diversion dam on the Clearwater River immediately downstream of the Clearwater No. 1 powerplant, located approximately 5 miles upstream from the Clearwater River's confluence with the North Umpqua River, and 140 feet downstream of the Clearwater No. 1 powerplant, near the mouth of Mowich Creek. The diversion dam impounds a small reservoir. The reservoir feeds 31,235 feet of canal and flumes, continuing to a 70.7-acre-foot forebay, 1,169 feet of penstock, and a powerplant on the North Umpqua River at Toketee Reservoir. Clearwater No. 2 is rated at 26 megawatts (MW) corresponding to a discharge of 470 cubic feet per second (cfs) and a rated head of 722 feet.

#### **3.2.1 IMPOUNDMENT**

The small impoundment created by the Clearwater No. 2 diversion dam has a surface area of 1.2 acres at normal water surface elevation of 3,212.0 feet. It has no active storage. Forebay active storage capacity and area are 49.5 acre-feet and 8.6 acres, respectively, at the normal maximum water surface elevation of 3,179.5 feet above mean sea level.

#### **3.2.2 DAM**

Clearwater No. 2 diversion dam is located on the Clearwater River 140 feet downstream of the Clearwater No. 1 powerplant and five miles upstream from the Clearwater River's confluence with the North Umpqua River immediately downstream of Toketee Reservoir. The dam is a concrete buttress on a concrete slab, with a free-crest spillway. A concrete canal intake structure and sluice outlet are incorporated in the dam. As water leaves the Clearwater No. 1 facilities, it enters either the Clearwater No. 2 intake, or it is maintained as instream minimum flow for the Clearwater River per the FERC license requirements.

#### **3.2.3 BYPASS REACH**

The existing FERC license requires a minimum instream flow for the Clearwater No. 2 bypass reach of 40 cfs from July through March and 60 cfs from April through June. An automated slide gate and pipe in the Clearwater No. 2 diversion dam provides instream flow to the Clearwater No. 2 bypass reach. Flow through the pipe is measured by an ultrasonic flowmeter, and total

flow in the bypass reach is measured at United States Geological Survey (USGS) Gage No. 14314700 located approximately 600 feet downstream from the Clearwater No. 2 diversion dam.

### **3.2.4 WATERWAY INTAKES**

The Clearwater No. 2 waterway intake includes a 26-foot-long concrete intake bay with trashrack; a single, stainless-steel slide gate; and side-channel spillway.

### **3.2.5 WATERWAY**

The Clearwater No. 2 waterway consists of 31,235 feet of open-channel conduit extending from the Clearwater No. 2 diversion dam to Clearwater No. 2 forebay. The waterway is comprised of concrete culvert (88 feet), concrete flume (8,864 feet), concrete and rock flume (2,852 feet), gunite-lined canal (18,599 feet), rock flume (359 feet), and steel flume (473 feet). Five gate structures, four in trapezoidal canal sections and one in a flume section, are located in the upper two-thirds of the waterway. Each structure has a radial gate to restrict flows and vertical weir walls to avoid canal overtopping. Monitoring stations at each gate site and one independent site are tied to a network control system. The existing capacity of the waterway is 341 cfs.

#### **3.2.5.1 AQUATIC AND TERRESTRIAL CONNECTIVITY SITES**

Nine aquatic connectivity sites were constructed along the waterway between 2003 and 2014 to provide aquatic connectivity across (i.e., perpendicular to) the waterway. The aquatic connectivity sites include four bridges over the waterway and five culverts below the waterway and adjacent access roads. In addition, fifteen wildlife crossings were installed across the gunite canal to provide terrestrial connectivity for big game and other wildlife across the waterway.

Two of the aquatic connectivity sites and wildlife crossings are co-located. Each wildlife crossing is constructed of concrete panels for a finished width of 36 feet and is covered in forest floor material to provide adequate cover for wildlife to cross the canal.

#### **3.2.5.2 CANAL SHUT-OFF AND DRAINAGE SYSTEM**

An emergency canal monitoring network and canal shut-off system have been added to existing facilities to divert continuous canal flows during a breach and to prevent overtopping of the waterway conveyance system. A new stainless-steel headgate operating under stored hydraulic pressure shuts down canal flows. Along the canal are five radial gate structures with raised gates

ready to trip closed upon activation to stop flows already in the canal. The gate structure includes side walls serving as weirs to dampen flows and eliminate canal overtopping. The monitoring and gate tripping systems are solar-powered and use fiber optic cable conveyed under the transmission line between Clearwater switchyard and Clearwater No. 1 powerplant.

### **3.2.6 FOREBAY**

Clearwater No. 2 forebay is an open-excavated reservoir with an embankment levee on the downhill side and a compacted-clay lining. Forebay active storage capacity and area are 49.5 acre-feet and 8.6 acres, respectively, at the normal maximum water surface elevation of 3,179.5 feet above mean sea level. Water is released to the Clearwater No. 2 penstock via a concrete intake structure with trash rack and 7.5-foot by 9.6-foot wheel-type intake gate.

### **3.2.7 PENSTOCK**

Clearwater No. 2 penstock extends 1,169 feet from the forebay to Clearwater No. 2 powerplant. Penstock diameter varies from 7.2 feet near the forebay to 6.3 feet at the powerplant.

### **3.2.8 POWERPLANT**

The Clearwater No. 2 powerplant is a reinforced-concrete structure housing a single turbine-generator. The powerplant is located on river mile 76.1 of the North Umpqua River at Toketee Reservoir. The powerplant is an outdoor-generator-style facility, with a turbine centerline elevation of 2,425.5 feet. Speed/load, voltage/VAR, and load limit control of the Clearwater No. 2 unit are possible from both the powerplant and the Toketee Control Center.

### **3.2.9 TURBINES, GENERATOR, AND APPURTENANT EQUIPMENT**

The Clearwater No. 2 turbine-generator is a vertical-shaft, hydraulic turbine and synchronous generator set. The Francis-type turbine is rated at 36,000 horsepower (hp) under a net effective head of 722 feet. The turbine is equipped with a valve that acts as a turbine bypass (pressure relief valve) during turbine load rejections and outages. Generator rating is 30,588 kilovolt amperes (kVA), 0.85 power factor at 11,500 volts and 450 revolutions per minute (rpm). The rated capacity of the combined turbine-generator set is 26 megawatts (MW) at 470 cfs. The Clearwater No. 2 transformers are three, single-phase, 11.5/125 kilovolt (kV) transformers rated at 10,196 kVA each. Power from the transformers is delivered on Line 55-1 to the Clearwater

switching station, 0.3 miles from the Clearwater No. 2 powerplant. Water is discharged from the Clearwater No. 2 powerplant into the North Umpqua River at Toketee Reservoir.

### **3.3 TOKETEE DEVELOPMENT EXISTING FACILITIES**

Toketee Dam is located immediately upstream of the confluence of the Clearwater and North Umpqua rivers. The Toketee development consists of an embankment dam on the North Umpqua River impounding the 1,051-acre-foot Toketee Reservoir, 6,994 feet of wood stave pipe and tunnel, 1,067 feet of single penstock that trifurcates into three, 158-foot-long penstocks, and a three-unit powerplant on the right bank of the North Umpqua River approximately 2 miles downstream of Toketee Reservoir. Toketee is rated at 42.5 MW corresponding to a rated head of 440 feet.

#### **3.3.1 DAM**

Toketee Dam is located on river mile 75.4 of the North Umpqua River immediately upstream of the mouth of the Clearwater River. The dam is an earth-fill, center-clay-core structure. The reservoir is protected from overfilling by a 310-foot-long, ungated, concrete, ogee spillway section in the dam and a 20-foot, gated sluiceway.

#### **3.3.2 BYPASS REACH**

The FERC license requires minimum instream flows of 60 cfs from November 1 to May 31 and 80 cfs from June 1 to October 31 in the Toketee bypassed reach of the North Umpqua River. Minimum flows in the Toketee bypassed reach are provided by a combination of flows from the Clearwater River and flows from the spillway apron drains. The majority of the flow is provided by two automated, instream-flow gates on the Clearwater River Reconnect facility that route flow downstream of Toketee Dam into the bypassed reach. The total flow in the bypassed reach is measured at USGS Gage No. 14315500 located approximately 300 feet downstream of Toketee Dam.

#### **3.3.3 WATERWAY INTAKE**

The Toketee waterway intake includes a 79-foot concrete, intake structure with trashrack, fixed-wheel intake gate, low-level outlet gate, and sluice conduit. The trashrack was replaced in 2010 with a fish screen that provides bar spacing with 0.5-inch gaps, approach velocity of 0.8 feet per

second, and an automated trash rake. The fish screen is intended to minimize entrainment of trout over five inches in length from Toketee Reservoir for the purposes of maintaining the fishery in Toketee Reservoir and reducing predation on anadromous fish downstream of Toketee Dam.

#### **3.3.4 WATERWAY**

The Toketee waterway measures 6,994 feet extending from Toketee Dam to the tunnel exit. The waterway consists of wood-stave pipe (1,664 feet), concrete-lined tunnel (1,250 feet), and unlined tunnel (4,080 feet). The concrete tunnel lining includes 1,000 lineal feet at the upstream end, and 250 lineal feet at the downstream end. Rated capacity of the waterway is 1,530 cfs.

#### **3.3.5 PENSTOCK**

The Toketee penstock extends 1,067 feet from the tunnel exit to a trifurcation. The penstock ranges from 11 feet to 12 feet in diameter, with wall thicknesses between 0.4 and 1.0 inch. A 128-foot-high surge tank is included in the penstock system to limit penstock pressure rise during turbine-generator shutdowns. Downstream from the surge tank, the penstock trifurcates to three, 6.3-foot-diameter penstocks, which extend an average length of 158 feet to the Toketee powerplant.

#### **3.3.6 POWERPLANT**

The Toketee powerplant has a reinforced-concrete substructure with a steel superstructure enclosed by metal siding. The powerplant houses three turbine-generators. The powerplant is located on the right bank of the North Umpqua River at river mile 73.3 approximately 1.25 miles downstream of Toketee Falls. The powerplant is of the indoor style, with turbine centerline elevation of 1,987.0 feet. Speed/load, voltage/VAR, and load limit control of the Toketee units are possible from either the powerplant or the Toketee Control Center.

#### **3.3.7 IMPOUNDMENT**

Toketee Reservoir serves as the upper forebay for the Toketee Development and is proposed to also serve as the lower reservoir for the Pumped Storage Project. Active storage capacity and area are 491.4 acre-feet and 96.9 acres, respectively, at normal maximum water surface elevation of 2,430.0 feet.

### **3.3.8 TURBINES, GENERATOR, AND APPURTENANT EQUIPMENT**

The Toketee turbine-generators are vertical-shaft, hydraulic turbine, and synchronous generator sets. The three, Francis-type turbines are rated at 21,200 hp each under a net effective head of 440 feet. Each turbine is provided with a 24-inch, Howell Bunger valve, which operates as a turbine bypass during unit load rejections and outages. Generator ratings are 16,667 kVA each, 0.85 power factor at 6,900 volts and 400 rpm. Installed capacity of the combined turbine-generator sets is 42.5 MW at 1,530 cfs.

The Toketee transformers are nine, single-phase 6.9/132 kV transformers rated at 5,555 kVA each. Power from the transformers is delivered to the Toketee switching station, adjacent to the Toketee powerplant, and from the switching station to Dixonville substation via Line 39.

### **3.3.9 TRANSMISSION LINES**

The Clearwater switching station is the collector station for the upper North Umpqua Project developments (Lemolo No. 1, Lemolo No. 2, Clearwater No. 1, and Clearwater No. 2). Lines 53, 55, 57, and 55-1 are radial collector lines from Lemolo No. 1, Lemolo No. 2, Clearwater No. 1, and Clearwater No. 2, respectively. Line 51 transmits all the power from the upper North Umpqua Project developments at the Clearwater switching station to the Toketee switching station. All transmission lines use predominantly wood-pole, "H"-frame structures.

## **3.4 PROPOSED PUMPED STORAGE PROJECT**

18 CFR § 4.38(b)(2)(ii) and (iii) require a general engineering design of the proposed amendment (i.e., the Pumped Storage Project), with a description of any proposed diversion of a stream through a canal or a penstock, and a summary of the proposed operational mode.

In general, open-loop pumped storage projects are connected to a natural body of water. They operate by using reversible pump-turbines to move water between two reservoirs (an upper and a lower) that are at different elevations.

### **3.4.1 PROPOSED FACILITIES**

As noted in Section 1.1, PacifiCorp proposes a Pumped Storage Project that will leverage existing Clearwater No. 2 and Toketee facilities to accommodate an open-loop pumped storage

system, utilizing the existing Toketee Reservoir as the lower reservoir and an expanded Clearwater No. 2 forebay as the upper (i.e., storage) reservoir. The Pumped Storage Project is located within Township 26 South, Range 3 East, Sections 25, 35, and 36 in eastern Douglas County, Oregon, approximately 60 miles east of Roseburg, on the Diamond Lake Ranger District of the Umpqua National Forest. Installation of the proposed Pumped Storage Project will result in modifications to existing structures between the Clearwater No. 2 forebay and Toketee Reservoir. The two, existing Clearwater No. 2 facilities relevant to the Pumped Storage Project are (1) the Clearwater No. 2 forebay, which will be expanded to provide additional storage volume, and (2) the Clearwater No. 2 penstock, which will be connected to the new pumped storage penstock extension. The two, existing Toketee facilities relevant to the Pumped Storage Project are (1) the embankment dam on the North Umpqua River impounding (2) the 1,051-acre-foot Toketee Reservoir.

New facilities for the proposed Pumped Storage Project include the following:

- an intake structure with a fish screen on Toketee Reservoir, immediately downstream of the existing Clearwater No. 2 tailrace;
- a reversible pump-turbine in an enclosed pumphouse to pump water from Toketee Reservoir to the existing Clearwater No. 2 penstock and, subsequently, to Clearwater No. 2 forebay for storage and later power generation;
- a penstock extension connecting the pump-turbine to the existing penstock at a point approximately 110 feet upstream of the Clearwater No. 2 powerplant; and
- expansion of the Clearwater No. 2 forebay.

The proposed facilities are described in additional detail in the following sub-sections.

### **3.4.2 INTAKE/TAILRACE STRUCTURE**

An intake/tailrace structure will be located in the existing Toketee Reservoir on the north side of the proposed pumphouse. This structure will function as an intake during pumping modes and as a tailrace during generating modes through the pump-turbine. Current design plans include connecting the pumphouse foundation and intake structure to reduce concrete quantities and balance loading on both structures. The intake will include a fish screen to minimize entrainment

of trout longer than five inches when water is being pumped out of Toketee reservoir. The proposed fish screen will be designed consistent with the approved designs for the existing Toketee intake fish screen, with 0.5-inch bar spacing, a maximum approach velocity of 0.8 feet per second, and an automated cleaning system.

### **3.4.3 NEW PUMPHOUSE**

The proposed pumphouse will be constructed approximately 160 feet northwest of the existing Clearwater No. 2 powerplant, on the west side of the existing tailrace. The pumphouse structure will house the new reversible pump-turbine, generator, turbine inlet valve, auxiliary equipment, balance of plant, and a crane for maintenance of the unit and the generator. During pumping cycles, water from the existing Toketee Reservoir will be pumped through the pumphouse and upslope through the new penstock extension, which connects to the existing Clearwater No. 2 penstock, where it will discharge into the expanded Clearwater No. 2 forebay. The new pumphouse can be used as both a pumping and generating facility, and as such, generating cycles can occur at either the existing Clearwater No. 2 powerplant or at the new pumphouse using the new pump-turbine.

### **3.4.4 PENSTOCK EXTENSION**

An approximately 300-foot, 75 3/4-inch diameter, and 7/8-inch-thick, steel penstock will be installed to connect the reversible pump-turbine to the existing Clearwater No. 2 penstock approximately 50 feet upslope from the powerplant. The penstock extension connects the new diversion and new reversible pump-turbine to the existing Clearwater No. 2 penstock. The current alignment design includes routing the penstock along the west side of the existing powerplant into the pumphouse. The penstock extension will be buried for most of the alignment from the pumphouse, including below the existing USFS Road 4776100; the penstock extension will be above-grade at its connection to the existing Clearwater No. 2 penstock.

### **3.4.5 EXPANDED CLEARWATER NO. 2 FOREBAY**

The proposed Pumped Storage Project will require expansion of the existing 8.6-acre Clearwater No. 2 forebay (70.7 acre-feet of designed storage at elevation 3,179.5 feet above mean sea level [amsl]), which will increase storage capacity and increase operational flexibility. The proposed, expanded Clearwater No. 2 forebay will encompass approximately 24.3 acres at 3,179.5 feet



amsl, of which 23.6 acres are within the existing FERC boundary and 0.7 acres are outside of the existing FERC boundary. To achieve a storage capacity of 215 acre-feet as needed for 5.5 hours of generation, dredging and/or expansion of the current forebay is needed and may also necessitate the expansion and reinforcement of the existing forebay embankment berm. Dredging and expansion requirements are currently being developed in conjunction with a new operational plan. Forebay fluctuations are further described in Section 6.3.3.2.

This expansion will require modifications to the existing FERC Project Boundary for the North Umpqua Project as outlined in Section 4.0 and depicted in Figure 3-2.

#### **3.4.6 SPOILS DISPOSAL AREA**

The existing FERC Project Boundary for the North Umpqua Project includes approximately 30 acres to the northeast of Clearwater No. 2 forebay for disposal of spoils dredged from the forebay during maintenance activities. The existing spoils disposal area will be used, in part, to expand the Clearwater No. 2 forebay, thereby necessitating additional spoils area adjacent to the newly expanded forebay to provide disposal area for the proposed forebay excavation spoils. Approximately 12.4 acres of spoils area will be generated by the Pumped Storage Project, of which 2.1 acres are within the existing FERC Project Boundary and 10.3 acres are outside of the FERC Project Boundary (Table 4-2).

#### **3.4.7 ROADS**

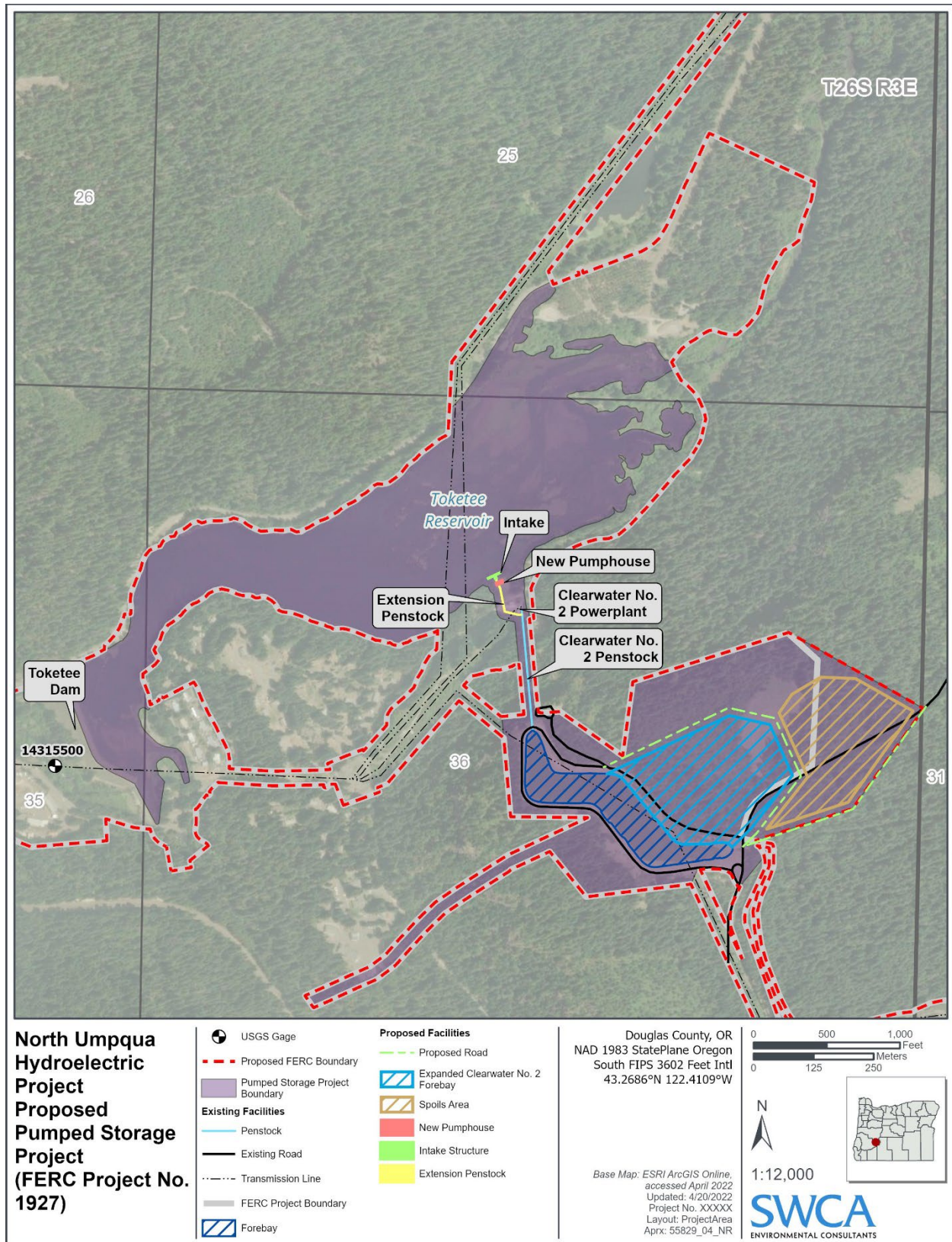
The existing USFS 4776200 (Clearwater No. 2 Forebay) road parallels the north side of the existing Clearwater No. 2 forebay and will be impacted by the proposed forebay expansion. In addition, the USFS 4776252 road crosses the waterway outlet to the forebay and continues along the eastern edge of the existing FERC boundary. With the proposed expansion of the forebay, both roads will need to be re-routed around the new forebay and spoils disposal footprints as depicted in Figure 3-2.

#### **3.4.8 TRANSMISSION LINES**

A transmission intertie will be necessary to route power from the new pump-turbine to the existing Clearwater No. 2 powerplant substation facilities. The general North Umpqua Project transmission line numbers and alignments will remain the same; however, a transformer at the

existing Clearwater No. 2 powerplant substation will be upsized from capacity of 26 MW to 34 MW consistent with the proposed output of the Pumped Storage Project. Several generator relays and breakers will require replacement.

**FIGURE 3-2 PROPOSED PUMPED STORAGE PROJECT**



## 4.0 EXISTING AND PROPOSED PROJECT BOUNDARY

The existing 3,081-acre North Umpqua Project Boundary includes 2,484.7 acres of land administered by the USFS and 128.3 acres of land administered by BLM for a total of 2,613 acres of federal lands as approved in FERC's April 22, 2013 Order Approving As-Built Exhibits A, F, and G, and Revising Annual Charges (143 FERC ¶ 62,044) (Table 4-1). The Pumped Storage Project will be entirely on federal lands administered by the USFS (i.e., the Pumped Storage Project does not contain any privately-owned lands). Table 4-1 compares the existing North Umpqua Project Boundary to the changes needed to the Project Boundary to accommodate the proposed Pumped Storage Project.

**TABLE 4-1 EXISTING AND PROPOSED FERC PROJECT BOUNDARY**

	EXISTING FERC PROJECT BOUNDARY	APPROXIMATE <u>ADDITIONAL</u> AREA INCLUDING PUMPED STORAGE PROJECT
USFS Lands	2,484.7 acres	15.31 acres
BLM Lands	128.3 acres	No change
Private Lands/PacifiCorp	468.0 acres	No change
Total:	3,081.0 acres	3,096.31 acres

As noted above, the proposed Pumped Storage Project will utilize existing elements of the Clearwater No. 2 and Toketee developments. Only two portions of the proposed Pumped Storage Project will require modifications to the existing FERC Project Boundary: (1) the expansion of the existing Clearwater No. 2 forebay; and (2) the spoils pile adjacent to the Clearwater No. 2 forebay. All other elements of the proposed Pumped Storage Project, whether new or modified, are within the existing FERC Project Boundary.

The proposed 3,096.31-acre FERC Project Boundary, including the Pumped Storage Project, will be revised to incorporate the following changes itemized below (Table 4-2):

**TABLE 4-2     PROPOSED NORTH UMPQUA PROJECT BOUNDARY CHANGES FOR THE PUMPED STORAGE PROJECT**

	<b>TOTAL FACILITY AREA</b>	<b>PROPOSED AREA <u>INSIDE</u> EXISTING FERC PROJECT BOUNDARY</b>	<b>PROPOSED AREA <u>OUTSIDE</u> EXISTING FERC PROJECT BOUNDARY</b>
Clearwater No. 2 Forebay Expansion	15.7 acres	15.0 acres	0.7 acres
Spoils Area	12.4 acres	2.1 acres	10.3 acres
Additional USFS Land	N/A	N/A	11.0 acres
Total:	28.1 acres	17.1 acres	11.0 acres

## **5.0 PROPOSED OPERATIONS**

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### **5.1 CLEARWATER NO. 2**

#### **5.1.1 EXISTING OPERATIONS**

The Clearwater No. 2 diversion dam can be operated manually on-site, remotely from the Toketee Control Center using the Supervisory Control and Data Acquisition (SCADA) system, or automatically via Programmable Logic Control. The diversion is typically operated to maintain a stable diversion pool by adjusting the canal headgate and diverted flows to match changes in inflow (natural streamflow from Mowich Creek, Clearwater No. 1 bypassed reach, and discharge from the Clearwater No. 1 powerplant). The canal headgate is operated by an alternating current (AC), motor-driven, rack-and-pinion hoist. Instream flow releases exceeding the minimum requirements (40 cfs July through March and 60 cfs April through June) in the Clearwater No. 2 bypassed reach of the Clearwater River downstream of Clearwater No. 2 dam are provided through a submerged orifice in the diversion dam and controlled by an automated slide gate. When inflows exceed canal and instream flow capacity, and during canal outages, the diversion pool rises until excess flow spills over the fixed concrete spillway into the bypassed reach.

The Clearwater No. 2 forebay operates with a maximum daily fluctuation of 6.5 feet. The penstock headgate has a motor-operated gate hoist that can be operated locally or remotely from the Toketee Control Center but is only closed during maintenance or emergencies. Generation is sometimes load-shaped, but due to the difficulty of local manual restarts of the unit, the powerplant is typically operated at very low flows during periods of low demand to minimize powerplant shutdowns.

#### **5.1.2 PROPOSED OPERATIONS**

Proposed facility changes, as currently designed, are described below in a linear fashion following the flow of water from Toketee Reservoir to the expanded Clearwater No. 2 forebay. When the proposed Pumped Storage Project is in pumping mode, water will be diverted from Toketee Reservoir (i.e., the lower reservoir) via the new intake structure to the northwest of the existing Clearwater No. 2 powerplant. Diverted flows will be pumped through the new trash rack and fish screen of the intake structure; through the pump-turbine located within the pumphouse

located approximately 160 feet northwest of the existing Clearwater No. powerplant; through the penstock extension connecting to the existing Clearwater No. 2 penstock above the existing Clearwater No. 2 powerplant; and discharging into the expanded Clearwater No. 2 forebay (upper storage reservoir). During the pump cycle, pump-turbine demand is estimated at 34 MW to pump 470 cfs from Toketee Reservoir into Clearwater No. 2 forebay. The expanded Clearwater No. 2 forebay will fluctuate up to 11 feet per day under pumped storage operations depending on the supply and demand of electrical power.

When the proposed Pumped Storage Project is in generating mode, stored water from the forebay enters the existing Clearwater No. 2 penstock to travel back downhill. At the convergence of the existing penstock and the new pumped storage penstock extension, an isolation valve will permit flows to take one of the following two paths to a generating unit: 1) circumventing the remainder of the existing Clearwater No. 2 penstock and powerplant to be used for power generation at the pumped storage pump-turbine and discharging from the pump turbine to the intake/tailrace structure on Toketee Reservoir, or 2) continuing through the existing penstock into the existing Clearwater No. 2 powerplant and discharging to the Clearwater No. 2 tailrace and Toketee Reservoir. When in generation mode, the pump-turbine will have the ability to generate 25 MW at 470 cfs. Section 6.3 includes further details on the proposed Pumped Storage Project flow data, water quality information, and environmental effects.

## **5.2 TOKETEE DEVELOPMENT**

### **5.2.1 EXISTING OPERATIONS**

Toketee Reservoir provides active storage for regulation of flow through the Toketee powerhouse. Designed active storage capacity and area are 491.4 acre-feet and 96.9 acres, respectively, at normal maximum water surface elevation of 2,430.0 feet. The current, temporary maximum water surface elevation is 2,428.0 feet in response to ongoing dam safety rehabilitation efforts at Toketee Dam. The normal minimum water surface elevation is 2,426.0 feet.

Flows through the Toketee power plant are adjusted by changing the load settings for the plant, which in turn adjusts the wicket gate opening of the turbines. Starting, stopping, and load

adjustment of each of the three turbine-generators is regularly performed from the Toketee Control Center.

Under the FERC license, instream flows of 80 cfs from June through October and 60 cfs from November through May are required in the North Umpqua River downstream of Toketee Dam. Minimum flows in the Toketee bypassed reach are provided by a combination of flows from the Clearwater River, flows from the spillway apron drains, and naturally occurring accretions between Toketee Dam and Toketee Falls.

### **5.2.2 PROPOSED OPERATIONS**

Toketee Reservoir will function as the lower reservoir in the Pumped Storage Project. Up to 470 cfs may be drafted from Toketee Reservoir to Clearwater No. 2 forebay via the proposed Pumped Storage Project facilities. PacifiCorp will apply to Oregon Water Resources Department for a new or amended water right associated with the Pumped Storage Project diversion.

Minimum instream flows of 80 cfs from June through October and 60 cfs from November through May, as required by the current License, will be maintained in the Toketee bypassed reach, and will not be affected by the proposed Pumped Storage Project.

Due to the current dam safety restrictions, Toketee Reservoir is typically operated with a daily fluctuation of 1.5 feet, from elevation 2,428.0 feet to 2,426.0 feet. After the Toketee Dam remediation project has been completed and operation to the maximum elevation of 2,430.0 feet has been authorized by the Portland Regional Engineer, the operational range will be expanded back to the normal 3.5-foot range (i.e., 2,430.0 to 2,426.5 feet). From elevation 2,426.5 feet to the normal minimum water surface elevation of 2,424.0 feet, accumulated sediments in the reservoir are mobilized during operation and result in turbidity; PacifiCorp currently avoids operating in this range. The identified range of fluctuation allows accretion flows to be captured during off-peak hours and helps regulate flows from Lemolo No. 2 and Clearwater No. 2 developments. Operation of the proposed Pumped Storage Project will be consistent with existing daily fluctuation ranges within Toketee Reservoir. Pumping of approximately 200 acre-feet of water from Toketee Reservoir to Clearwater No. 2 forebay (i.e., the storage reservoir) will account for approximately 2.5 feet of reservoir fluctuation. This 2.5 feet of fluctuation will be within the referenced 3.5 feet of typical daily fluctuation in Toketee Reservoir. Should



PacifiCorp consider operating within the allowable 6-foot range of daily fluctuation (2,430.0 to 2,424.0 feet) for Toketee Reservoir in the future, PacifiCorp will consult with the Settlement Agreement parties.

## **6.0 ENVIRONMENTAL REPORT**

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Pursuant to 18 CFR § 4.38(b)(2)(iv), this section includes the identification of the environment to be affected, and describes significant resources present at the North Umpqua Project.

PacifiCorp's proposed environmental studies and protection, mitigation, and enhancement plans pertaining to these resource areas are also included in this section, with additional detail provided in Section 7.0.

The environmental analysis provided herein is based on information filed with PacifiCorp's Final License Application (1995a), information developed during implementation of the license, information expressly obtained for the purposes of this pumped storage amendment application, and other appropriate information developed or obtained by PacifiCorp as cited. The analysis of direct impacts is limited to the area impacted by the proposed Pumped Storage Project, including the Toketee Reservoir to Clearwater No. 2 forebay, and back to Toketee Reservoir. Ground- or habitat-disturbing activities associated with the proposed action are limited to Toketee Reservoir, the upland bench adjacent to the Clearwater No. 2 tailrace and powerplant, and the Clearwater No. 2 forebay area. Changes to the environment and updated information are provided when applicable.

### **6.1 GENERAL DESCRIPTION OF RIVER BASIN**

The Umpqua River, which includes the North and South Umpqua rivers, drains 4,673 square miles of southwestern Oregon, and flows from its sources in the Cascade Mountain Range to the Pacific Ocean at Reedsport, Oregon. The North and South Umpqua rivers join northwest of Roseburg, Oregon to form the Umpqua River, which then flows 111 miles to the Pacific Ocean. The approximately 106-mile North Umpqua River, which is tributary to the Umpqua River, drains 1,359 square miles in southwestern Oregon. The proposed Pumped Storage Project is located on the North Umpqua River at river mile 76.1.

The North Umpqua River originates in the predominantly low-relief High Cascades province, where highly permeable Pliocene and Quaternary lava flows result in generally low rates of surface-water runoff and sediment transport; downstream of the High Cascades province, the North Umpqua River drains parts of the steeply dissected Western Cascades province (USGS

2022). Peak flows in the North Umpqua River basin typically derive from winter frontal systems, with the largest flows resulting from regional rain-on-snow events (USGS 2022).

## **6.2 GEOLOGY AND SOILS**

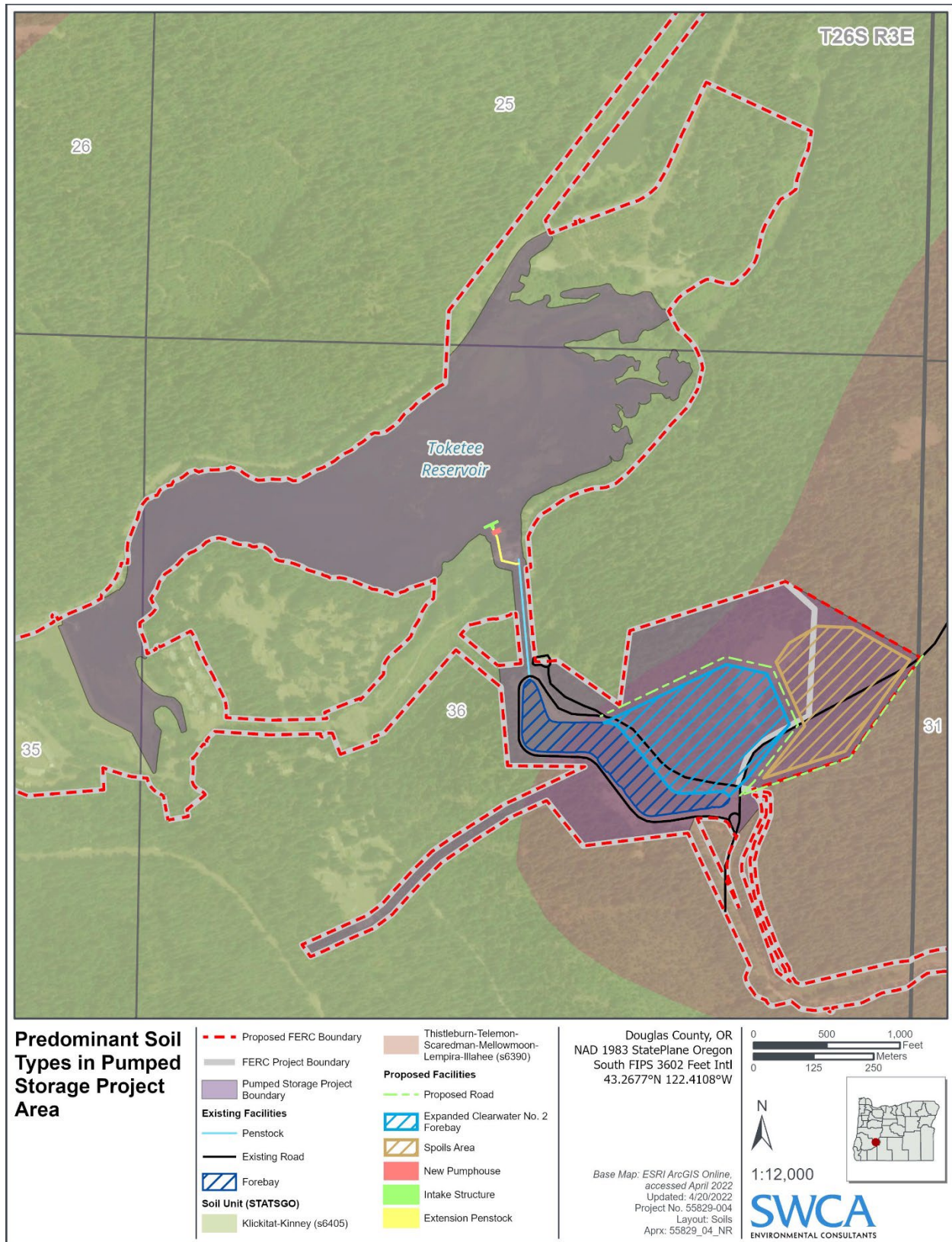
Construction proposed at Toketee Reservoir, the upland bench adjacent to the Clearwater No. 2 tailrace and powerplant, and Clearwater No. 2 forebay may impact geology and soils at the North Umpqua Project.

### **6.2.1 REGIONAL GEOLOGIC SETTING**

The North Umpqua River system is located within the mountainous Cascade Range where geologic formations are predominantly composed of volcanic or volcanoclastic rocks of Quaternary, Oligocene, or Miocene age. Rock types in the North Umpqua Project vicinity are mapped as a mixture of basalt, tuff, and andesite (Oregon Department of Geology and Mineral Industries 2022). The eastern portion of the North Umpqua River canyon and the Clearwater River canyon, where Clearwater No. 2 diversion dam is located, is composed of Quaternary basalt and basaltic andesite lava (PacifiCorp 1995). A variety of soil types are present in the region; most are derived from older volcanoclastic materials or more recent basaltic lava flows. Soils and the underlying geology of the region have the potential for erosion into the river system (PacifiCorp 1995). Steep slopes are present between the Clearwater No. 2 forebay and the Clearwater No. 2 powerplant.

Predominant soil types in the proposed Pumped Storage Project development area (as reported by USDA STATSGO) are Klickitat-Kinney and Thistleburn-Telemon-Scaredman-Mellowmoon-Lempira-Illahee soil units (Figure 6-1). Klickitat-Kinney complex soils are found in mountainous side slopes and ridges and are moderately-deep, well-drained soils with moderate permeability and available water capacity of 5.5 to 10.5 inches. Thistleburn and Telemond soils are found on gently-sloping to steep slopes and are well-drained, have slow permeability and high shrink-swell potential. Scaredman, Mellowmoon, and Illahee soil units formed on gently-sloping to very-steep side slopes and ridges and are typically very deep and well-drained. (USDA undated).

**FIGURE 6-1 PREDOMINANT SOIL TYPES IN PUMPED STORAGE PROJECT AREA**



### 6.2.2 ENVIRONMENTAL EFFECTS

The affected environment for geologic and soil resources is primarily the area of the proposed action subject to ground-disturbing construction activities. This includes the forebay and penstock extensions, spoil pile locations, and the new intake/tailrace and pumphouse structures connected to the pumphouse. Proposed work includes some areas of steep slopes and excavation and placement of spoil piles of soils. Proposed geotechnical investigations will include soil conditions in the location of the proposed spoil disposal pile and soil, slope, and geological factors related to the penstocks, pumphouse, and tailrace elements.

Subsurface investigations during the design phase and construction activities would result in short-term impacts to local soil resources. Ground-disturbing activities would include geotechnical borings, wetland soil pits (i.e., soil samples from wetland delineation surveys), and localized excavations and fills to facilitate proposed improvements. Further details on proposed geotechnical studies are presented in Section 7.0.

To the extent possible, construction spoils will be reused during backfilling operations. Excavated materials, particularly from the proposed forebay expansion, will be placed in a designated location adjacent to the expanded forebay and graded and seeded at the completion of construction. The proposed spoils area would be located partially within the existing FERC Project Boundary, and approximately 10.3 acres of additional area outside the existing FERC Project Boundary would be used for spoils placement (2.1 acres are already inside the existing FERC Project Boundary) (see Table 4-2). Non-natural construction debris, such as unused concrete and construction waste, will be disposed at an approved private (i.e., non-federally-owned), upland location.

Final design and construction of proposed facilities will be informed by the geotechnical investigations. Excavation would increase the potential for erosion of exposed soils and potential sedimentation in adjacent waterbodies. Erosion and sediment control measures will be used during construction to avoid and minimize potential impacts. Placement of excavated material in spoil piles would compact underlying soils. The final design may include an expansion and reinforcement of the forebay embankment berm.

## 6.3 WATER RESOURCES

18 CFR § 4.38(b)(2)(v) requires streamflow and water regime information, including drainage area, natural flow periodicity, monthly flow rates and durations, mean flow figures illustrating the mean daily streamflow curve for each month of the year at the point of diversion or impoundment, with location of the stream gaging station, the method used to generate the streamflow data provided, and copies of all records<sup>2</sup> used to derive the flow data used in the applicant's engineering calculations.

### 6.3.1 EXISTING RIVER FLOW DATA

Gage data sources for the existing Clearwater No. 2 and Toketee Developments, including the associated drainage areas, are provided in Table 6-1. Gage locations in the proximity of the Pumped Storage Project are also reflected in Figure 3-2.

**TABLE 6-1 AVERAGE MONTHLY STREAMFLOWS INTO TOKETEE RESERVOIR FOR THE 2003 TO 2021 PERIOD**

SOURCE/GAGE	DESCRIPTION	PERIOD OF RECORD	DRAINAGE AREA (MI <sup>2</sup> )
USGS No. 14314500	Clearwater River above Trap Creek near Toketee Falls, OR	1927-Present	41.6
USGS No. 14314700	Clearwater River below Mowich Creek, near Toketee Falls, OR	2003-Present	60.4
USGS No. 14314600	Clearwater no. 2 Power Canal near Toketee Falls, OR	2003-Present	Not Applicable
USGS No. 14315500	North Umpqua River at Toketee Falls, OR	1925-Present	334.8
PacifiCorp	Toketee Lake Elevation	1990-Present	Not Applicable
PacifiCorp	Toketee Penstock Outflow	1990-Present	Not Applicable

#### 6.3.1.1 NATURAL FLOW PERIODICITY

Natural flow in the system can be characterized by gage data prior to dam construction. Streamflow data is available for the North Umpqua River at Toketee Falls starting in water year

<sup>2</sup> Clearwater No. 2 (USGS Gage No. 14314700) real-time and historic flow information is available [here](#). Toketee (USGS Gage No. 14315500) is available [here](#).

1926 and for the Clearwater River upstream of Trap Creek near Toketee Falls starting in water year 1928 (Table 6-2). Average monthly streamflow for the 1926 through 1948 period of record for the North Umpqua River near Toketee Falls under unregulated conditions ranges from a low in October of 639 cfs to a peak in May of 1268 cfs. Average monthly streamflow for the Clearwater River for the 1928 through 1948 period of record upstream of Trap Creek ranges from a low in September of 128 cfs to a peak in May of 193 cfs. Note that this gage is located above the proposed Pumped Storage Project site and has a drainage area of 41.6 miles squared (mi<sup>2</sup>) as compared to the Clearwater No. 2 diversion dam, which has a drainage area of approximately 60.4 mi<sup>2</sup>.

**TABLE 6-2 NATURAL AVERAGE MONTHLY STREAMFLOWS FOR THE NORTH UMPQUA RIVER AND CLEARWATER RIVER**

<b>MONTH</b>	<b>NORTH UMPQUA RIVER (CFS) AT TOKETEE FALLS, OR*</b>	<b>CLEARWATER RIVER (CFS) ABOVE TRAP CREEK NEAR TOKETEE FALLS, OR**</b>
January	876	140
February	920	139
March	965	144
April	1134	166
May	1268	193
June	1083	181
July	783	147
August	679	134
September	639	128
October	630	129
November	735	133
December	853	139

Notes:

\*USGS Gage No. 14315500 Water Years 1926 through 1948

\*\* USGS Gage No. 14314500 Water Years 1928 through 1948

### **6.3.1.2 MONTHLY FLOW RATES AND DURATIONS**

#### **6.3.1.2.1 CLEARWATER NO. 2**

Monthly flow rates and durations for inflow to the Clearwater No. 2 diversion dam were calculated as the sum of the Clearwater No. 2 canal flow (USGS Gage No. 14314600) and the

Clearwater No. 2 bypass flow (USGS Gage No. 14314700). Average monthly flows ranged from 139 to 271 cfs (Table 6-3). Monthly duration curves for the average daily flow upstream of the Clearwater No. 2 diversion dam for the years 2003 to 2021 are presented for January through December (Figure 6-2 and Figure 6-3). Most of these data are available from USGS; however, some missing data were obtained from PacifiCorp's operational logs.

**TABLE 6-3 AVERAGE MONTHLY INFLOWS TO CLEARWATER NO. 2 FOR THE 2003 TO 2021 PERIOD OF RECORD**

MONTH	AVERAGE STREAMFLOW (CFS)*
January	197
February	208
March	219
April	271
May	251
June	201
July	156
August	143
September	139
October	143
November	152
December	180

Note: \*Stream flows upstream of Clearwater No. 2 are calculated as the sum of the Clearwater No. 2 canal flow and Clearwater No. 2 bypass flow.

#### **6.3.1.2.2 TOKETEE**

Monthly flow rates and durations were calculated into the Toketee Reservoir as the sum of the outflow from the penstock and bypass (USGS Gage No. 14315500) plus the daily flow associated with the change in reservoir storage. Average monthly flows ranged from 713 to 1,250 cfs (Table 6-4). Monthly duration curves for the average daily flow into Toketee Reservoir for the years 2003 to 2021 are presented for January through December (Figure 6-4 and Figure 6-5).



**TABLE 6-4 AVERAGE MONTHLY STREAMFLOWS INTO TOKETEE RESERVOIR FOR THE 2003 TO 2021 PERIOD**

MONTH	AVERAGE STREAMFLOW (CFS)*
January	1040
February	1052
March	1080
April	1177
May	1250
June	1053
July	797
August	713
September	735
October	760
November	779
December	939

Note: \*Streamflows into Toketee Reservoir are calculated as the sum of the outflow from the penstock and bypass plus the daily flow associated with the change in reservoir storage.

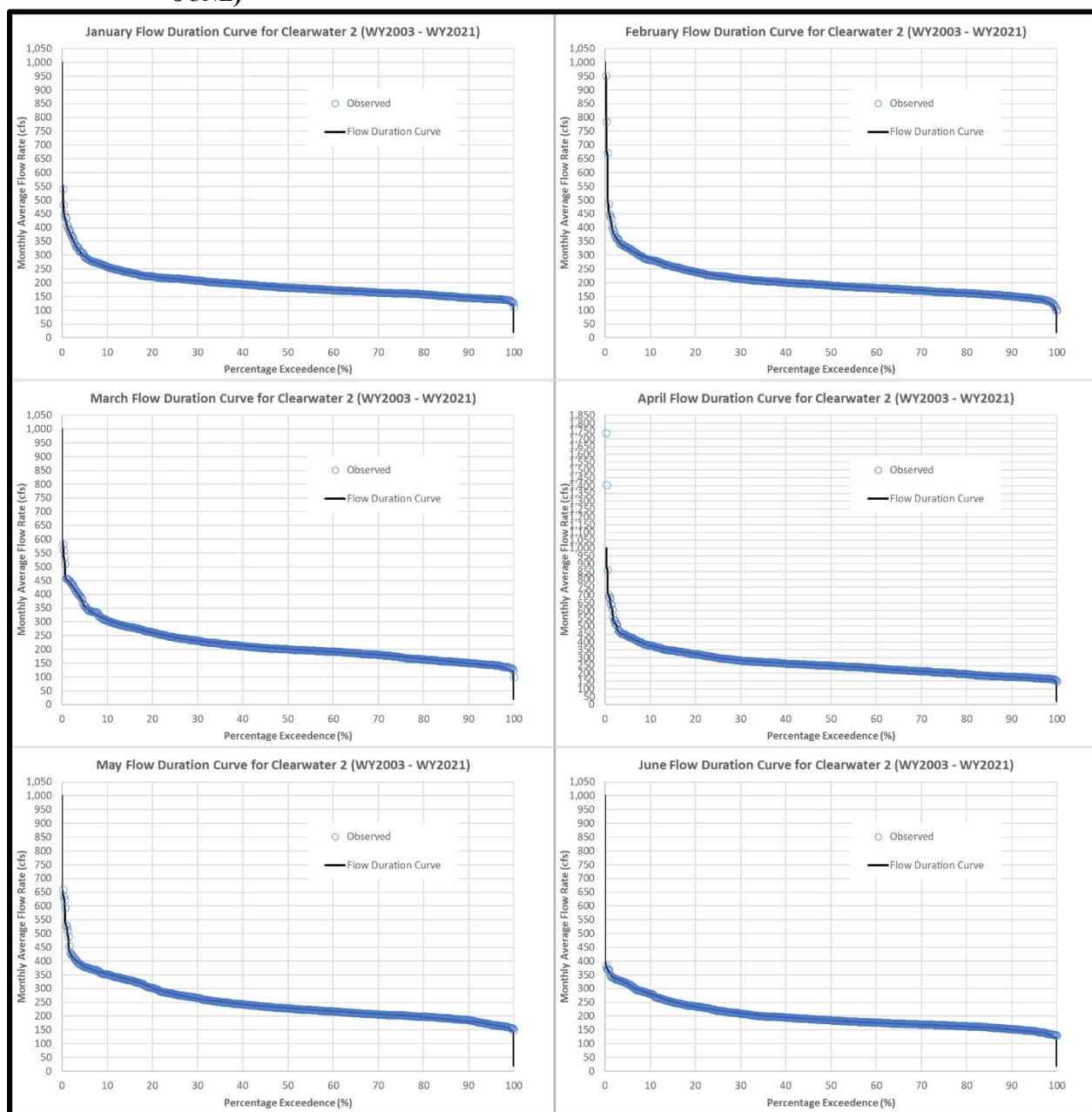
### 6.3.2 EXISTING INSTREAM FLOWS

Minimum instream flows range from 40 to 60 cfs in the Clearwater No. 2 bypassed reach and 60 to 80 cfs in the Toketee bypassed reach. Actual flows in the bypassed reaches are generally 5 to 15 cfs above the minimum required flow during much of the year and are sometimes much higher during natural high flow events exceeding diversion capacity. Flow is measured at USGS-operated stream gages located about 500 ft and 300 ft downstream from the diversions at Clearwater No. 2 (USGS Gage No. 14314700) and Toketee (USGS Gage No. 14315500), respectively. Real-time and historical flow information dating from 2003 are available from the USGS website. Flow in these reaches will not be affected by the proposed Pumped Storage Project.

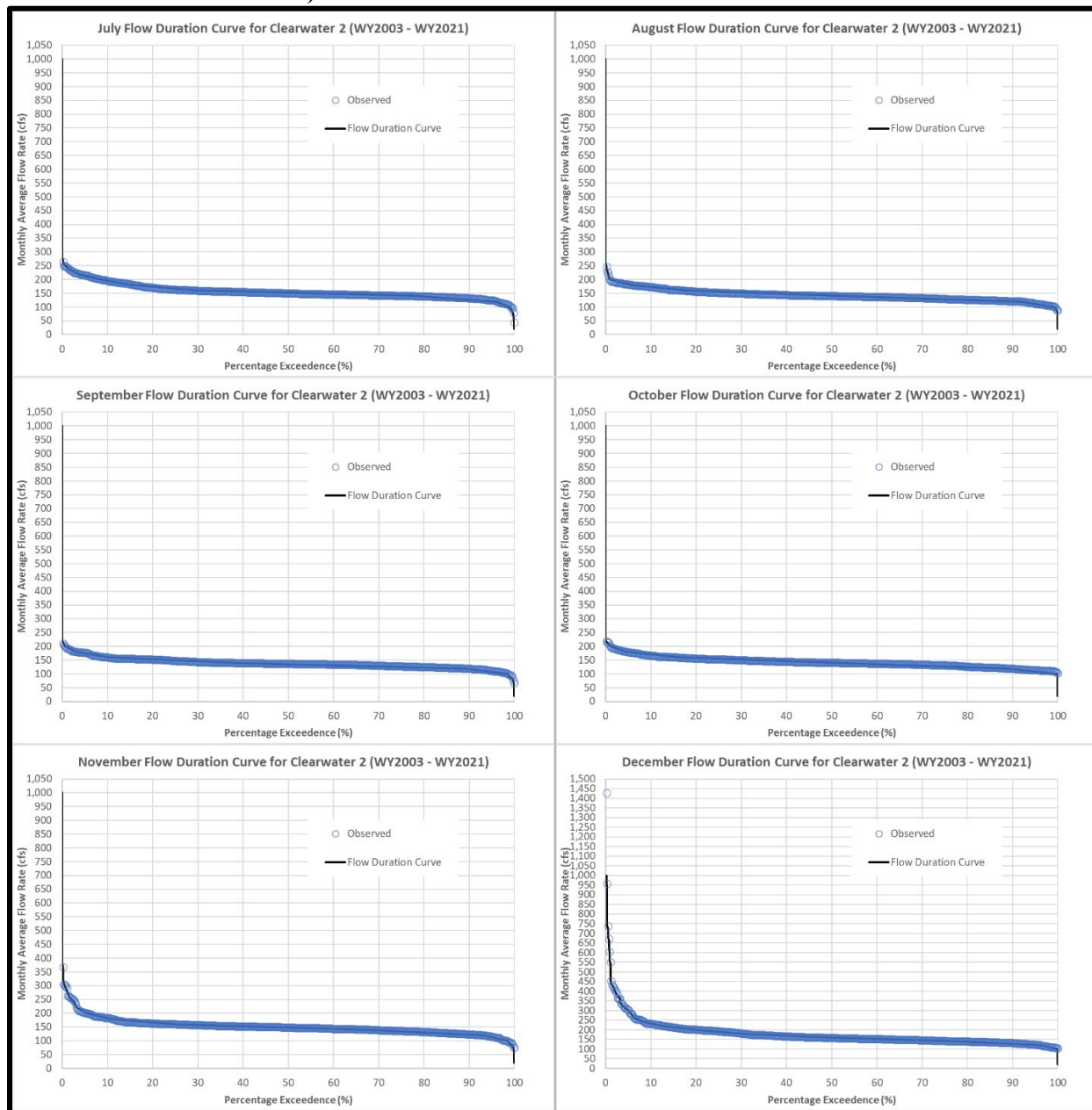
The FERC license requires minimum instream flows of 60 cfs from November 1 to May 31 and 80 cfs from June 1 to October 31 in the Toketee bypassed reach of the North Umpqua River. Minimum flows in the Toketee bypassed reach are provided by a combination of flows from the Clearwater River and flows from the spillway apron drains. The majority of the flow is provided

by two, automated, instream flow gates on the Clearwater River Reconnect facility that route flow downstream of Toketee Dam into the bypassed reach. The total flow in the bypassed reach is measured at USGS Gage No. 14315500 located approximately 300 feet downstream of Toketee Dam. Flow in this reach will not be affected by the proposed Pumped Storage Project.

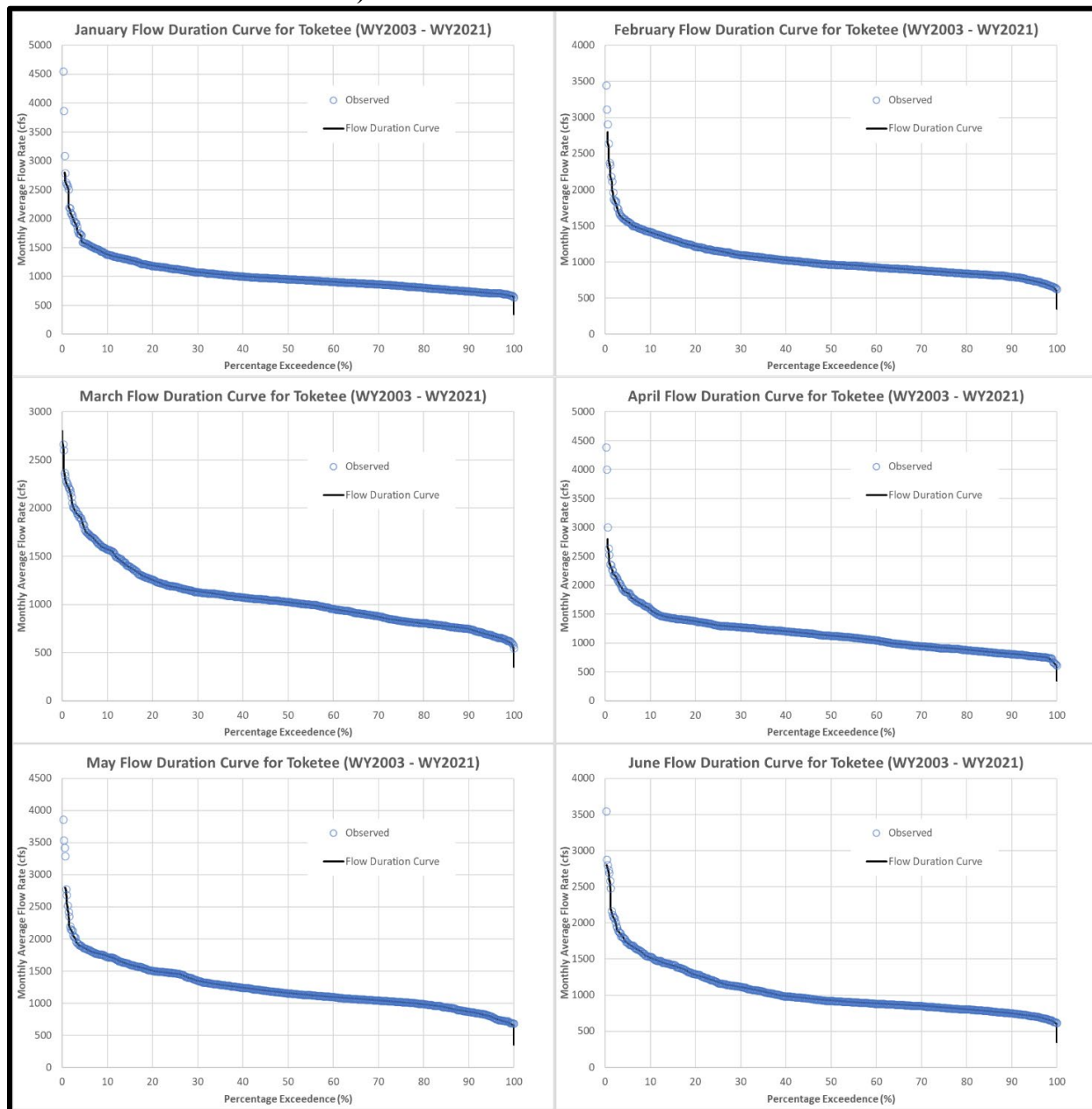
**FIGURE 6-2 CLEARWATER NO. 2 MONTHLY FLOW DURATION CURVES (JANUARY THROUGH JUNE)**



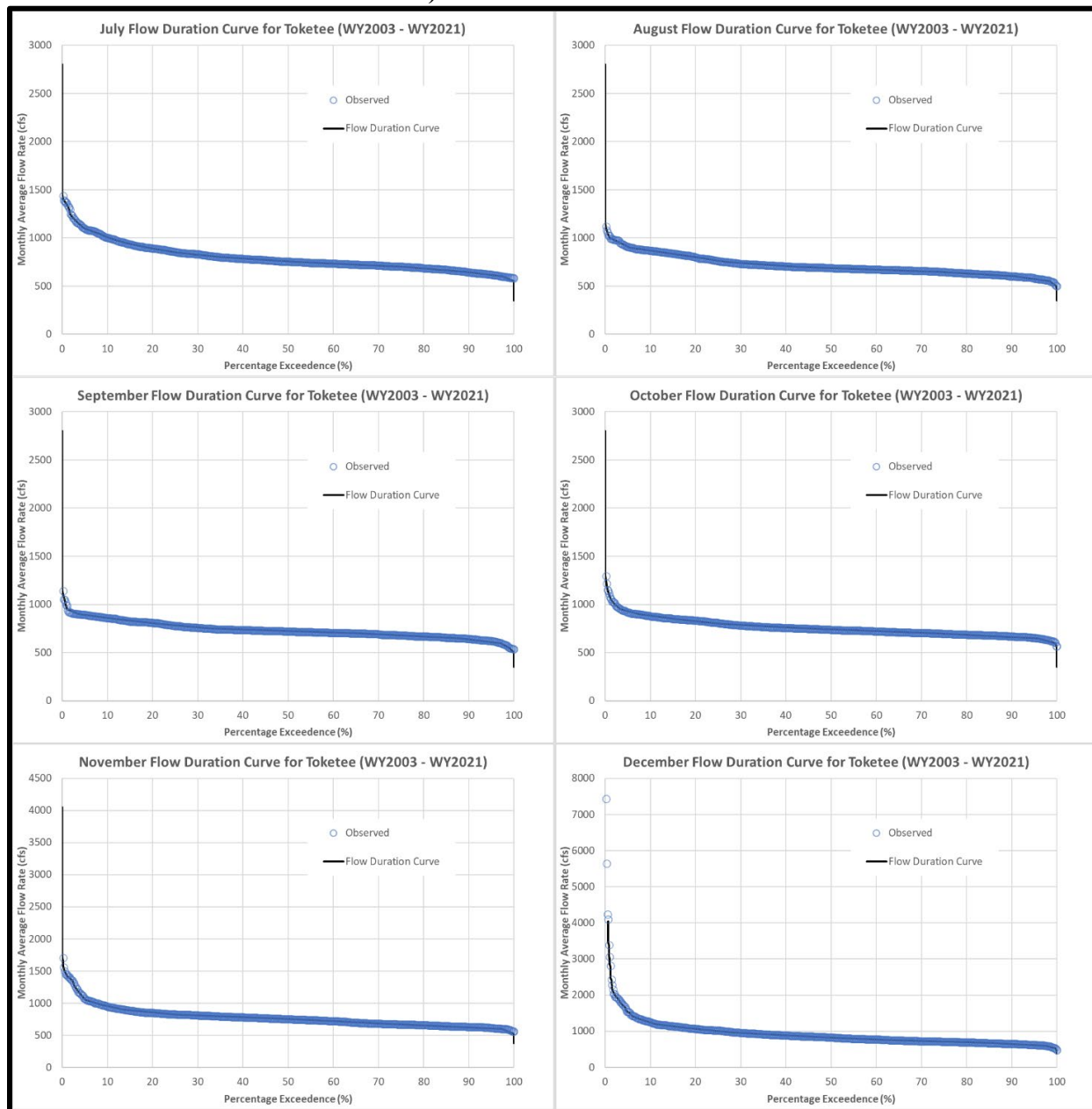
**FIGURE 6-3 CLEARWATER NO. 2 MONTHLY FLOW DURATION CURVES (JULY THROUGH DECEMBER)**



**FIGURE 6-4 TOKETEE RESERVOIR INFLOW MONTHLY FLOW DURATION CURVES (JANUARY THROUGH JUNE)**



**FIGURE 6-5 TOKETEE RESERVOIR INFLOW MONTHLY FLOW DURATION CURVES (JULY THROUGH DECEMBER)**



### 6.3.3 PROPOSED PUMPED STORAGE PROJECT FLOWS

#### 6.3.3.1 WATERWAY

PacifiCorp does not propose any change to diversions from Clearwater No. 2 dam into the Clearwater No. 2 waterway as a result of the proposed Pumped Storage Project. As described in Section 5.1.2, water will be pumped from the new intake on Toketee Reservoir, upslope to the expanded Clearwater No. 2 forebay using the proposed pump/turbine (i.e., a pump cycle). Water

stored in the forebay will then return from the forebay, down the existing penstock, where it will either (1) flow back through the penstock extension and be used to generate power at the new pump-turbine discharging back into Toketee Reservoir, or (2) flow through the existing penstock and be used to generate power at the existing Clearwater No. 2 powerplant discharging into Toketee Reservoir via the Clearwater No. 2 tailrace (i.e., a generating cycle).

### **6.3.3.2 FOREBAY FLUCTUATIONS**

Maximum daily fluctuation of the existing Clearwater No. 2 forebay is currently 6.5 feet per day (from elevation 3,179.5 to 3,173.0 feet amsl) in response to changes in inflow from the canal and outflow to the powerplant, as determined by generation schedules. Proposed daily fluctuations of the expanded Clearwater No. 2 forebay will be approximately 11 feet, from elevation 3,179.5 to 3,168.5 feet amsl. The forebay water surface elevation will fluctuate in response to pumping and/or generating cycles associated with proposed pumped storage operations. Pumped storage operating regimes will respond to power market pricing and demand and are, therefore, variable. Pumping operations will occur when the forebay is below normal maximum operating pool elevations and/or during periods of suspended diversion from Clearwater No. 2 (e.g., during canal or powerplant maintenance). During these periods, the forebay may cycle between the normal maximum and minimum operating elevations up to two times per day with the potential for more cycles of smaller amplitude.

### **6.3.3.3 PUMPED STORAGE**

Up to 470 cfs will be pumped from Toketee Reservoir via the new pumped storage intake, through the pump-turbine at the pumphouse, through the Clearwater No. 2 pumped storage conduit, into the Clearwater No. 2 penstock, and discharged into Clearwater No. 2 forebay. The approximately 24.3-acre, expanded Clearwater No. 2 forebay will operate as the upper (i.e., storage) reservoir in the pumped storage system (the 24.3-acre calculation includes approximately 23.6 acres inside the current FERC Project Boundary and approximately 0.7 acres in the proposed boundary expansion). Subsequent generation with pumped and stored flows will occur through the existing penstock and turbine generator at the Clearwater No. 2 powerplant or through the new reversible pump-turbine. Pumped storage flows from Toketee Reservoir will ultimately be returned to Toketee Reservoir at either the Clearwater No. 2 powerplant tailrace or

at the pumphouse tailrace (i.e., the pumped storage intake) approximately 150 feet to the west of the existing Clearwater No. 2 tailrace.

The inflows to the Clearwater No. 2 forebay from the Clearwater No. 2 waterway are directly managed by the controls at the Clearwater No. 2 diversion dam and measured within the canal. Daily flows measured at USGS Gage No. 14314600 in the Clearwater No. 2 canal were used to compute average flows for each month for the 2011 to 2020 period, which range from 83 to 166 cfs (Table 6-5). The average daily flow for the period of record (October 2003 to present) ranged from 0 (during canal shutdowns) to nearly 350 cfs.

**TABLE 6-5 10-YEAR AVERAGE MONTHLY-AVERAGE AND MONTHLY-MEDIAN FLOWS IN CLEARWATER NO. 2 CANAL FOR WATER YEARS 2011–2020**

MONTH	AVERAGE FLOWS (CFS)*	MEDIAN FLOWS (CFS) *
January	146	137
February	158	147
March	164	148
April	175	183
May	167	167
June	122	115
July	106	103
August	88	91
September	89	89
October	84	92
November	106	105
December	125	112

Note: \* 52 zero-flow values were removed in the calculation of average and median daily flows.

The expanded Clearwater No. 2 forebay will be operated throughout the year between approximately elevation 3,179.5 and 3,168.5 feet amsl. When starting at elevation 3,179.5 feet amsl, it will take approximately 5.5 hours to drain the forebay to 3,169.5 feet amsl at a volumetric flow rate of 470 cfs (the design hydraulic capacity of Clearwater No. 2 penstock). Inversely, it will take approximately 5.5 hours to return to 3,179.5 feet amsl from full pool by pumping with 470 cfs (the design hydraulic capacity of the pump-turbine) through the pump-turbine. Approximately one foot of forebay elevation is anticipated to be reserved for normal (i.e., non-pumped-storage) operation of the Clearwater No. 2 diversion and waterway. Elevations and duration values are subject to alteration based on the final grading of the proposed Clearwater No. 2 forebay expansion.

#### 6.3.4 WATER QUALITY

Water resources potentially affected by the proposed Pumped Storage Project are those within Toketee Reservoir and Clearwater No. 2 forebay. Water pumped from Toketee Reservoir will be temporarily stored in the Clearwater No. 2 forebay, then subsequently returned to Toketee Reservoir. Use of Project waters is strictly non-consumptive. Water resources downstream of Toketee Reservoir may be indirectly and/or cumulatively affected by the proposed action as described below.

Water quality in the affected waters is generally characterized as very high with cold and clear waters and slightly basic pH primarily due to the volcanic nature of the surrounding area and daily primary production cycles during warm seasons. Relicensing studies, in support of Water Quality Certification of the North Umpqua Project, demonstrated water quality impacts were greatest during hot summer afternoons when water temperatures increased, thereby driving increased primary production and pH (PacifiCorp 1995).

Relicensing studies of water quality conditions included the Clearwater River, from Stump Lake (the impoundment upstream of Clearwater No. 1 diversion dam) to the mouth at Toketee Reservoir<sup>3</sup>, and Toketee Reservoir (PacifiCorp 1995). Water temperature, specific conductance, pH, dissolved oxygen (DO), and total dissolved gas (TDG) were monitored at 17 sites in the Clearwater River basin and 5 sites associated with Toketee Reservoir. Both the Clearwater basin and Toketee Reservoir are heavily influenced by cold springs that tend to produce relatively stable water temperatures and other parameters (PacifiCorp 1995). The parameters requiring mitigation since relicensing studies were water temperature and pH in the Clearwater No. 2 forebay and TDG in the Clearwater No. 2 tailrace, as explained below.

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<sup>3</sup> Prior to the new license, the Clearwater River was diverted into Toketee Reservoir. The North Umpqua Settlement Agreement required PacifiCorp to design and construct a structure in the lower Clearwater River near Toketee Reservoir to reconnect the Clearwater River and the North Umpqua River, thereby allowing a portion of the Clearwater 2 bypassed reach flows to travel down the original Clearwater River channel to the confluence of the North Umpqua River downstream of Toketee Dam. This facility was completed in 2005, and the mouth of the Clearwater River is now divided such that some flows into Toketee Reservoir and some flows directly into the North Umpqua River downstream of Toketee Dam (i.e., at the beginning of the Toketee bypassed reach of the North Umpqua River).



Water temperature in the Clearwater No. 2 forebay would increase during periods of reduced diversion flows, such as during waterway and powerhouse maintenance outages, that overlapped with periods of hot summer weather. Such warming events sometimes also drove the pH higher via increased primary productivity. PacifiCorp implemented corrective actions to avoid these conditions by scheduling, to the greatest extent practical, waterway maintenance events lasting longer than one day outside of the hottest months of summer.

TDG in the Clearwater No. 2 tailrace ranged from 107 to 113 percent saturation in the early 1990s (PacifiCorp 1995), with the highest TDG associated with the lowest generation levels. Operational limits were imposed within the Water Quality Certification to disallow generation below 2 MW. However, subsequent mechanical alterations stopped air entrainment to the turbine, and related studies demonstrated that TDG was thus reduced to less than 110 percent saturation throughout the range of generation (PacifiCorp 2015). Consequently, generation limits were removed (ODEQ 2015).

During summer and fall of 2021, spot measurements of water temperature, specific conductance, pH, and dissolved oxygen were made at several sites related to the Pumped Storage Project during a range of weather conditions and operations, including periods of powerplant shutdown, steady generation, and load-shaping generation (Table 6-1 to Table 6-7). The Clearwater No. 2 powerplant was shut down due to wildfire response efforts from the evening of July 5, 2021 until the evening of July 18, 2021, and during this period, the inflow to the forebay was reduced to the minimum required to sustain fish in the canal (about 2 cfs). During the fire shutdown, which was comparable in duration to a multi-week maintenance shutdown, the Clearwater No. 2 forebay warmed into the 23 °C range and the tailrace and surface of Toketee Reservoir exceeded 18 °C (Table 6-6 and Table 6-7), but while operating normally, water temperature was not measured above 18 °C (Table 6-8 through Table 6-12). Thermal stratification of several degrees Celsius was evident at both the Clearwater No. 2 forebay outlet and the Toketee Reservoir outlet (Table 6-6 to Table 6-7). Similarly, pH was elevated in the forebay and tailrace during the fire shutdown period, and again during October, but was mostly less than 8.5 °C at all sites; DO was always higher than the 8.0 mg/l minimum criteria (Table 6-8 to Table 6-12).

**TABLE 6-6 MEASUREMENTS OF WATER QUALITY DURING THE AFTERNOON OF JULY 14, 2021, AND APPLICABLE STATE CRITERIA FOR EACH PARAMETER (LOWEST ROW)**

SITE	TIME	DEPTH OF READING (FEET)	WATER TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (μS/CM)	PH	DISSOLVED OXYGEN (MG/L)
Clearwater No. 2 forebay inlet	1605	1	23.4	69	9.11	13.5
Clearwater No. 2 forebay outlet	1615	1	23.4	70	8.68	10.9
	1620	12	21.1	69	9.06	15.8
Clearwater No. 2 powerplant tailrace	1645	1	18.9	68	8.61	12.6
	1650	6	18.2	67	8.44	12.2
Toketee Reservoir proposed intake site	1700	1	19.5	67	8.26	11.55
	1705	4	14.6	68	8.16	13.7
Toketee Reservoir outlet	—	—	—	—	—	—
ODEQ State Standards	—	—	18.0 (7-DADM)	No Criteria	6.5–8.5	≥8.0 or 90% saturation

Note: Measurements taken while Clearwater No. 2 powerplant was shut down due to wildfire and canal inflow to Clearwater No. 2 forebay was minimal, on a hot, sunny afternoon. Toketee Reservoir outlet data were not collected.

μS/CM = microsiemens per centimeter; mg/L = milligrams per liter; ODEQ = Oregon Department of Environmental Quality; 7-DADM = 7-day average of the daily maximum water temperature (not comparable to the spot measurements in these tables)

**TABLE 6-7 MEASUREMENTS OF WATER QUALITY DURING THE AFTERNOON OF JULY 15, 2021**

SITE	TIME	DEPTH OF READING (FEET)	WATER TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (μS/CM)	pH	DISSOLVED OXYGEN (MG/L)
Clearwater No. 2 forebay inlet	—	—	—	—	—	—
Clearwater No. 2 forebay outlet	—	—	—	—	—	—
	—	—	—	—	—	—
Clearwater No. 2 powerplant tailrace	1526	5	18.9	69	8.52	11.78
Toketee Reservoir proposed intake site	—	—	—	—	—	—
Toketee Reservoir outlet	—	—	—	—	—	—

Note: Measurements taken when a remote-logging Datasonde was deployed in Clearwater No. 2 powerplant tailrace while the powerplant was shut down due to wildfire. Blanks denote sites not measured.

**TABLE 6-8 MEASUREMENTS OF WATER QUALITY DURING THE AFTERNOON OF JULY 20, 2021**

SITE	TIME	DEPTH OF READING (FEET)	WATER TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (μS/CM)	pH	DISSOLVED OXYGEN (MG/L)
Clearwater No. 2 forebay inlet	1550	1	14.0	67	7.91	10.72
Clearwater No. 2 forebay outlet	1605	1	17.3	65	8.03	11.41
	1600	11	13.7	65	8.33	12.88
Clearwater No. 2 powerplant tailrace	1525	4.5	14.4	64	8.32	12.48
Toketee Reservoir proposed intake site	1515	2.1	14.0	69	8.16	12.86
Toketee Reservoir outlet	—	—	—	—	—	—

Note: Measurements taken while powerplant was running. Toketee Reservoir outlet data not collected.

**TABLE 6-9 MEASUREMENTS OF WATER QUALITY DURING THE AFTERNOON OF JULY 27, 2021**

SITE	TIME	DEPTH OF READING (FEET)	WATER TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (µS/CM)	PH	DISSOLVED OXYGEN (MG/L)
Clearwater No. 2 forebay inlet	1355	1.5	11.1	65	7.58	10.66
Clearwater No. 2 forebay outlet	1405	1	12.4	64	7.38	9.34
	1410	15	12.0	64	7.29	9.37
Clearwater No. 2 powerplant tailrace	1306	5	12.7	65	7.24	9.18
Toketee Reservoir proposed intake site	1337	1	12.2	75	7.31	9.52
	1340	3	11.9	76	7.34	10.25
Toketee Reservoir outlet	1442	1	14.8	60	7.65	9.44
	1445	14	12.4	65	7.59	9.64

Note: Measurements taken while powerplant was not running due to the daily load-shaping schedule.

**TABLE 6-10 MEASUREMENTS OF WATER QUALITY DURING THE AFTERNOON OF AUGUST 4, 2021**

SITE	TIME	DEPTH OF READING (FEET)	WATER TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (µS/CM)	PH	DISSOLVED OXYGEN (MG/L)
Clearwater No. 2 forebay inlet	1403	1	12.2	67	7.67	—
Clearwater No. 2 forebay outlet	1410	1	15.7	65	7.97	—
	1415	12	12.0	64	8.04	—
Clearwater No. 2 powerplant tailrace	1432	1	13.1	64	7.84	—
	1434	6	13.1	64	7.89	—
Toketee Reservoir proposed intake site	1440	1	13.9	67	7.97	—
	1442	4	13.0	69	8.24	—
Toketee Reservoir outlet	1505	1	16.2	62	7.69	—
	1507	14	11.7	68	7.42	—

Note: Measurements taken while Clearwater No. 2 powerplant was operating normally on a hot, sunny afternoon. DO data not collected.

**TABLE 6-11 MEASUREMENTS OF WATER QUALITY DURING SEPTEMBER 21, 2021**

SITE	TIME	DEPTH OF READING (FEET)	WATER TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (μS/CM)	pH	DISSOLVED OXYGEN (MG/L)
Clearwater No. 2 forebay inlet	1503	1	8.85	66	8.14	11.6
Clearwater No. 2 forebay outlet	1514	1	10.9	64	8.43	12.5
	1520	12	8.8	64	8.65	12.9
Clearwater No. 2 powerplant tailrace	—	—	—	—	—	—
Toketee Reservoir proposed intake site	1402	1	9.85	77	8.40	11.81
	1404	9	8.93	77	8.35	12.30
Toketee Reservoir outlet	1130	1	10.6	63	7.87	10.42
	1140	23	8.7	66	7.67	10.79

Note: Measurements taken while Clearwater No. 2 powerplant was operating normally. Clearwater No. 2 powerplant tailrace data not collected.

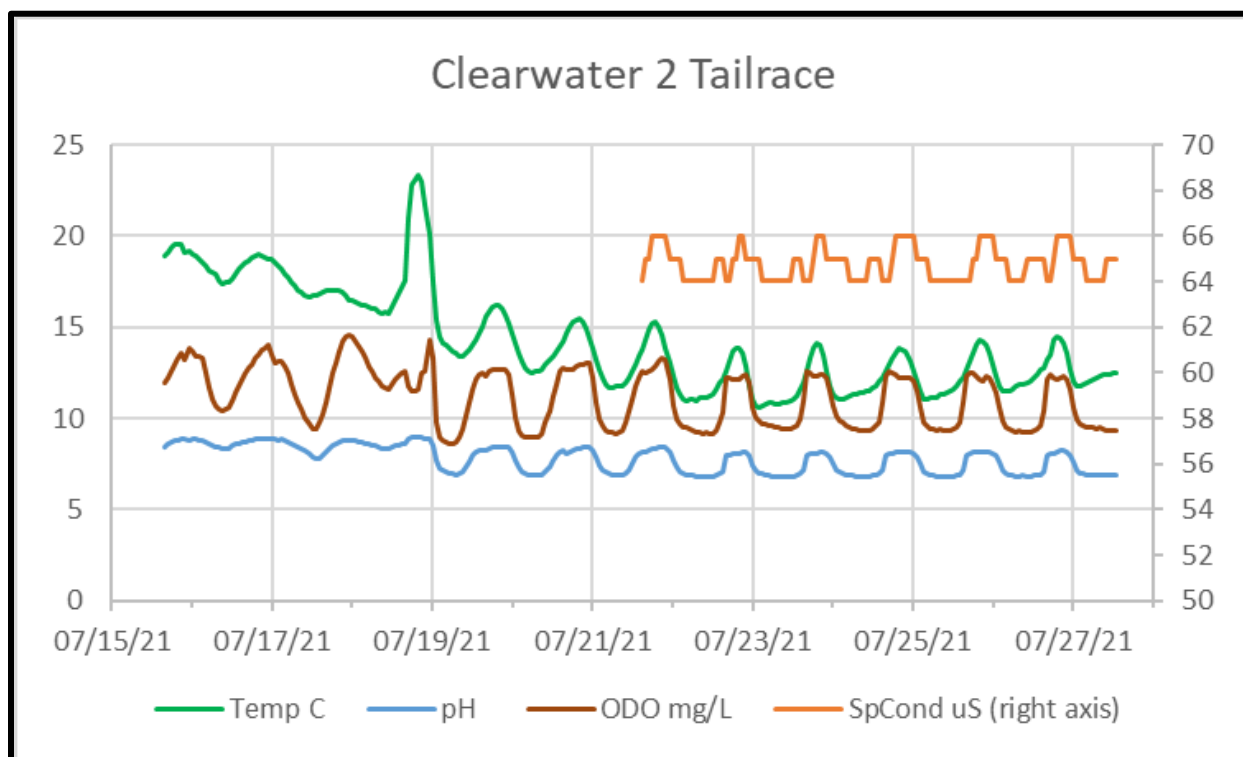
**TABLE 6-12 MEASUREMENTS OF WATER QUALITY DURING THE AFTERNOON OF OCTOBER 7, 2021**

SITE	TIME	DEPTH OF READING (FEET)	WATER TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (μS/CM)	pH	DISSOLVED OXYGEN (MG/L)
Clearwater No. 2 forebay inlet	1615	1	6.78	66	8.19	12.05
Clearwater No. 2 forebay outlet	1623	1	7.81	64	8.72	13.44
	1630	13	7.05	64	8.67	13.54
Clearwater No. 2 powerplant tailrace	1653	1	7.74	64	8.63	13.36
	1651	9	7.74	64	8.62	13.45
Toketee Reservoir proposed intake site	1706	1	7.90	65	8.17	12.36
	1704	5	7.78	65	8.16	12.29
Toketee reservoir outlet	1722	1	10.39	65	7.82	11.04
	1732	27	8.09	69	7.55	10.61

Note: Measurements taken while Clearwater No. 2 powerplant was operating normally.

During the period from July 15, 2021 to July 27, 2021, a remote-logging datasonde was deployed to measure water quality parameters (Figure 6-6) hourly at a depth of 5 feet in the Clearwater No. 2 powerhouse tailrace during periods of diverse operations (Figure 6-7). During the powerhouse wildfire shutdown described earlier, water temperature and pH were somewhat elevated but relatively stable as they reflected conditions below the surface of Toketee Reservoir. The powerhouse resumed operation on the evening of July 18, 2021, and water temperature spiked briefly as forebay water (which had been warming since July 6, 2021) was passed through the turbine. For the period of stable generation (July 19, 2021–July 22, 2021), the daily sinusoidal pattern evident for the four parameters was for each to gradually rise and peak in mid-afternoon then decrease to a lower level by the early morning. This pattern persisted during the period of generation load shaping (July 23, 2021–July 27, 2021) although the magnitude and duration of peak periods was slightly less (Figure 6-6).

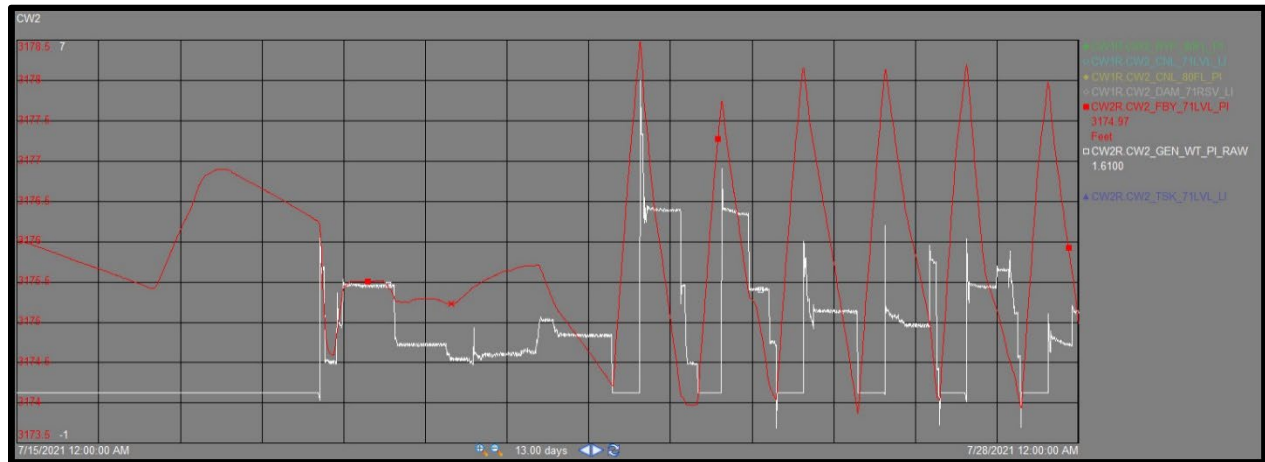
**FIGURE 6-6 HOURLY MEASUREMENTS OF WATER TEMPERATURE, PH, DISSOLVED OXYGEN, AND SPECIFIC CONDUCTANCE**



Note 1: Recorded at Clearwater No. 2 powerplant tailrace during periods of a powerplant shutdown (July 15 through 18), start-up (July 18 evening), and during daily cycles of stable generation (July 19 through 21) and of daily load shaping (July 22 through 27) during July 2021.

Note 2: Specific conductance was not measured during the first week of the study.

**FIGURE 6-7 WATER LEVEL IN CLEARWATER NO. 2 FOREBAY AND GENERATION AT CLEARWATER NO. 2 POWERHOUSE**



Note 1: Recorded at Clearwater No. 2 powerplant during a powerplant shutdown (July 15 through 18), start-up (July 18 evening), and during daily cycles of stable generation (July 19 through 21) and of daily load shaping (July 22 through 27) during July 2021.  
Note 2: Red, range 3,174–3,178.5 Feet above mean sea level; White, range 0–6 MW.

### 6.3.5 ENVIRONMENTAL EFFECTS

The distance between the existing Clearwater No. 2 tailrace and the proposed Pumped Storage Project discharge locations into Toketee Reservoir is approximately 150 feet (from the Clearwater No. 2 tailrace centerline to the pump conduit tailrace centerline).

The proposed Pumped Storage Project will require a new or amended water right for the new point of diversion and a new point of use for up to 470 cfs from Toketee Reservoir for storage in Clearwater No. 2 forebay and subsequent use for power generation at either the existing Clearwater No. 2 powerplant or the proposed pump-turbine.

Travel times for diverted waters resulting from the proposed upgrade have potential to impact water resource values in the affected waters. Travel times through the proposed pumped storage facilities and Clearwater No. 2 penstock are estimated at approximately 1.5 minutes at full capacity. Given this limited transit time, the large volumes of diverted waters, and the fact that all the pump storage water is contained within either the pump conduit or the Clearwater No. 2 penstock and not exposed to solar heating or evaporation, the assumption is that there are minimal temperature changes during transit. Residence time of stored water in Clearwater No. 2 forebay will depend on the seasonal operating regime (i.e., high flow operation versus low flow operation) as well as the variable demand for energy supply addressed by pumped storage operation. PacifiCorp estimates that residence time may be as little as 5.5 hours (i.e., the time to

fill the forebay with pumped storage water during high flow operation) and is most likely to be less than 24 hours and is highly unlikely to exceed 72 hours.

During most high- and low-flow operation, pumped storage waters from Toketee Reservoir will mix with waters from the Clearwater No. 2 waterway in the Clearwater No. 2 forebay. During periods when there is no canal inflow to the forebay, pumped storage diversions from Toketee Reservoir will be the sole source of water within the Clearwater No. 2 forebay.

PacifiCorp analyzed the potential for pumping and generating cycle ramping of water surface elevations in the forebay to erode the forebay liner and result in increases in turbidity within the forebay and downstream of Clearwater No. 2 tailrace. During high flow operation, when pumping or generating cycles are initiated and concluded, the maximum rate of change in water surface elevation would be approximately 1.6 to 2.2 feet per hour (subject to change based on final design of the forebay expansion). During low flow operation, when pumping or generating cycles are initiated and concluded, the maximum rate of change in water surface elevation would be approximately 0.7 to 0.8 feet per hour (subject to change based on final design of the forebay expansion). PacifiCorp evaluated the anticipated pore water pressure that the maximum fluctuation (i.e., up to 2.2 feet per hour) would have on the clay liner of the forebay and determined that there is no expected detrimental effect to the excavated forebay or embankment slopes at the forebay perimeter from the proposed operation. The red clay of the forebay liner has very low permeability, on the order of  $10^{-6}$  to  $10^{-8}$  centimeters per second (equivalent to 0.003 to 0.00003 foot per day). Instantaneous changes in the hydraulic head imposed on the clay via rapid draw down do not influence the pore water pressure or affect stability of the slope. In one study of drawdown rates on pore water pressure (Alonso and Pinyol 2016), pore water effects on comparably permeable soil profiles were not calculated to change for a period of several days following instantaneous draw down of 50 meters. Given the comparatively slower ramping rate of proposed Pumped Storage Project pumped storage operation with maximum water surface elevation changes of 11 feet, no effect on pore water pressure and soil stability is expected.

Given that both the forebay inlet and outlet are oriented to discharge directly into the centerline of the forebay (i.e., not pointed toward a side slope) and that PacifiCorp has not observed significant erosion of the clay-lined forebay slopes at the canal entrance during field



observations, PacifiCorp does not expect erosion of the side slopes to occur as a result of the proposed Pumped Storage Project. However, conceptual discharge vectors are subject to change as the expanded forebay design is developed.

In addition, the minimum pool level in the forebay provides 13.5 feet of total depth and a minimum 5 feet of water submergence over the penstock intake (the outlet, in the case of pumping operations) to further ameliorate the effect of any potential surface wave action. This contrasts with the canal discharge at the forebay inlet, which discharges at the top of the forebay water surface and does not have any buffering affect to its induced wave action but still has not demonstrated any observable erosion of the clay liner.

Because the existing water quality in Clearwater No. 2 forebay and Toketee Reservoir are very similar (e.g., cold, clear, and within ODEQ criteria most of the time), the effects of exchanging those waters more frequently via pumped storage operations is unlikely to impact water quality during most scenarios. The ability to pump water into the forebay during powerhouse and canal maintenance periods would tend to reduce the frequency of forebay warming and pH increases (as can occur now during summer maintenance or emergency shutdowns), and thus improve water quality. A water quality model could provide a better understanding of the potential effects of this proposed Pumped Storage Project operation on water temperature and dissolved oxygen.

Because the pump technology is not yet fully developed, its direct effects on water quality are hypothetical at this conceptual design stage. It is expected to have inconsequential impact on water temperature and most other water quality parameters but could possibly affect TDG within the pumped and discharged water. Pre-project testing and post-project monitoring could address whether TDG is affected by the pump and the project.

## **6.4 FISHERIES RESOURCES**

### **6.4.1 RESIDENT FISH**

Species observed in Toketee Reservoir include bluegill (*Lepomis macrochirus*), rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), and tui

chub (*Siphateles bicolor*). Of these, only rainbow trout are potentially native<sup>4</sup> to the upper North Umpqua basin (Ward 1993). Hydroacoustic and gill net sampling surveys conducted during 1992 and 1993 resulted in an estimated population of 4,600 fish<sup>5</sup> in Toketee Reservoir (PacifiCorp 1995). Based on gill netting and Oregon Department of Fish and Wildlife (ODFW) creel surveys, the estimated species composition within Toketee Reservoir was 90 percent (n=4,140) brown trout, 5 percent (n=230) rainbow trout, and 5 percent (n=230) tui chub. Bluegill are rare and inconsistent within the population of the reservoir.

During fish species composition studies in 1992 to 1994 (PacifiCorp 1995), PacifiCorp found the Clearwater River to be dominated by brook trout, with rainbow trout mostly limited to the upper reaches above Stump Lake.

In a recent effort, fisheries and benthic sampling that took place on September 29, 2021 through September 30, 2021 (PacifiCorp 2022) by boat electrofishing, angling, and Ponar dredge suggested that current site characteristics are similar to those described during relicensing studies in the early 1990s. The Clearwater No. 2 forebay was dominated by brook trout, with 14 brook trout between 5 cm and 30 cm length being the only fish observed or captured. Meanwhile, the Clearwater No. 2 tailrace and Toketee Reservoir in the vicinity of the proposed pump storage intake were dominated by brown trout, with 74 brown trout from 5 cm to 40 cm length captured, as well as one brook trout of about 30 cm in length.

For benthic macroinvertebrates that were sampled near the site of the proposed pump storage intake in 2021, total taxa richness was 13 in the Clearwater No. 2 forebay and 32 in Toketee Reservoir and near the Toketee Reservoir outlet.

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<sup>4</sup> The eruption of Mount Mazama (producing the caldera of Crater Lake approximately 7,700 years ago) may have eliminated historical populations of native rainbow trout above Toketee Falls, which precludes recolonization from downstream populations by its drop of 120 feet in two stages of 40 feet and 80 feet, respectively. As a result of these conditions and the extensive stocking of hatchery rainbow trout in the upper North Umpqua basin, the native ancestry of rainbow trout in the project area is questionable Ward (1993).

<sup>5</sup> The numbers in this paragraph exclude fish under 1 inch, which would not have been identified by hydroacoustic sampling.

Aquatic habitat was also assessed in 2021. The Clearwater No. 2 forebay is fairly uniform in depth and habitat characteristics and dominated by a sediment bottom and dense growth of aquatic macrophytes, with only low-growing riparian vegetation such as grass, sedges, and small willows along the forebay margins. In contrast, the Clearwater No. 2 tailrace and Toketee Reservoir have a greater diversity of depths and habitat characteristics including bedrock, riprap, cobbles, gravel, sand, silt, sparser growths but a larger variety of macrophytes, and extensive riparian vegetation including grass, shrubs of all sizes, and mature trees.

During entrainment studies of the Clearwater No. 2 canal in 1993, only brook trout and rainbow trout were observed being entrained from the Clearwater River into the canal, with most fish being 3 inches to 6 inches long. The estimated weekly entrainment rate did not exceed 30 trout (PacifiCorp 1995). Over an 82-week sampling period, the estimated annual entrainment was 221 brook trout and 25 rainbow trout. Many of these entrained fish reside in the canal and the forebay, as evidenced by capture during fish salvages when the canal is shut down for periodic maintenance, and by sampling of the local recreational fishery in 1992. The catch of trout within the canal during the twelve fish salvages since 2004 has averaged 133 brook trout and 12 rainbow trout, plus 8 hatchery rainbow trout (Table 6-13) which in some years have been planted into the forebay. Some hatchery trout swim upstream into the canal, as they would from a lake into a stream. Fish can enter the canal from the river via entrainment through the waterway intake and from the forebay via swimming upstream to reside, feed, and/or spawn.

**TABLE 6-13 NUMBER OF BROOK AND RAINBOW TROUT CAPTURED IN DEWATERED CW2 CANAL DURING MAINTENANCE SINCE 2004**

DATE	BROOK TROUT			RAINBOW TROUT (WILD)			RAINBOW TROUT (HATCHERY)
	TOTAL #	JUVENILE	ADULT	TOTAL #	JUVENILE	ADULT	ADULT
1/12/04	15	N/A	N/A	1	N/A	N/A	34
8/23/04	56	N/A	N/A	0	N/A	N/A	4
7/14/05	142	N/A	N/A	1	N/A	N/A	21

<sup>6</sup> Taxa richness is a measure of the number of different kinds of organisms (taxa) in a collection or community (USGS 2002). Taxa richness between 11 and 20 is considered moderately impacted while a richness greater than 30 is non-impacted.

DATE	BROOK TROUT			RAINBOW TROUT (WILD)			RAINBOW TROUT (HATCHERY)
	TOTAL #	JUVENILE	ADULT	TOTAL #	JUVENILE	ADULT	ADULT
8/11/08	202	106	96	33	18	15	13
4/5/10	125	74	51	1	1	0	0
4/10/12	24	14	10	3	0	3	0
4/23/13	85	51	34	11	8	3	1
10/7/13	453	189	264	0	0	0	0
10/1/14	90	36	54	19	17	2	1
4/5/16	0	0	0	1	1	0	0
6/5/18	143	121	22	38	31	7	2
5/12/20	259	257	2	32	32	0	15
Average:	133	94	59	12	12	3	8

Clearwater No. 2 forebay supports a small recreational fishery, with some anglers targeting hatchery fish and some targeting wild fish.

An entrainment study of the intake at Toketee Dam determined that 419 trout, of which 353 trout were less than 4.7 inches, were entrained into the Toketee penstock (PacifiCorp 1995). This study occurred prior to the installation of fish screen with 0.5-inch bar spacing to replace the previous trash rack with 2-inch bar spacing and to screen adult fish greater than five inches in length. Assuming that entrainment remains similar, and that all of those 353 smaller trout would pass through the new fish screen, then existing entrainment from Toketee reservoir can be assumed to be 353 trout less than 5 inches long, with a peak intake flow of 1,530 cfs.

Recently, an analysis of fish entrainment and survival at the proposed Fish Creek pumped storage facilities was completed (SWCA 2022) and is referenced here for turbine survival estimates at Clearwater No. 2. To arrive at an estimated survival of trout less than 5 inches in length, SWCA Environmental Consultants (SWCA) relied on Franke et al. (1997). The developments with turbine metrics nearest to Clearwater No. 2 are the Cushman No. 2, Puntledge, Seton Creek, and Shasta hydroelectric plants. However, net head and peripheral velocity are the two most critical components related to turbine survival and Clearwater No. 2 values, with net head at 220 meters and peripheral velocity at 46 meters per second, far exceed

any of the four hydropower developments, and hence fish survival through Clearwater No. 2 powerhouse is expected to be 0.

Aquatic habitat diversity in the Clearwater No. 2 forebay was characterized as one of the lowest of the lentic water bodies on the North Umpqua Project, while Toketee Reservoir exhibited the highest diversity of all the North Umpqua developments (PacifiCorp 1995). Fishery surveys of the Clearwater No. 2 forebay indicate that some trout reside in the forebay and canal, some reach maturity and spawn within the waterway, and some contribute to the local recreational fishery (PacifiCorp 1995).

Annual entrainment rates at the Clearwater No. 2 diversion dam into the canal were estimated to be 221 brook trout and 25 rainbow trout (PacifiCorp 1995). An unknown portion of these resident fish may choose to remain in the canal and the Clearwater No. 2 forebay. Trout in the Clearwater No. 2 forebay may be transported back downstream through either the existing Clearwater No. 2 vertical Francis turbine or through the new pump-turbine, but it is unlikely that any fish would survive entrainment in the penstock and passage through either turbine.

#### **6.4.2 ANADROMOUS AND SPECIAL STATUS FISH**

There are no anadromous fish, fish listed as threatened or endangered, or Regional Forester's 'special status' fish within the proposed project area. The Oregon Coast Evolutionarily Significant Unit (ESU) of coho salmon (*Oncorhynchus kisutch*), federally-listed as threatened, is the only federally-listed threatened or endangered fish species documented or suspected to occur on the Umpqua National Forest according to the Regional Forester's Special Status Species List (USFS 2021). There are four species identified as "strategy species" by ODFW in the Oregon Conservation Strategy that are documented or suspected to occur on the Umpqua National Forest according to the Regional Forester's Special Status Species List: Pacific lamprey (*Entosphenus tridentatus*), steelhead (*Oncorhynchus mykiss*), Oregon chub (*Oregonichthys crameri*), and Umpqua chub (*Oregonichthys kalawatseti*). None of these listed or strategy species occur upstream of Slide Creek Dam or in the proposed Pumped Storage Project area. Toketee Reservoir (i.e., downstream extent of the proposed upgrade and one of the sources of resident fish potentially affected by the proposed upgrade) is upstream of both the current and historical barriers to upstream migration of anadromous fish species (e.g., coho salmon, Pacific lamprey,

and steelhead) at Slide Creek Dam and Toketee Falls, respectively. Oregon chub do not occur within the North Umpqua Basin, and this species was delisted on February 17, 2015, due to recovery of the species (U.S. Fish and Wildlife Service [USFWS] 2021). ODFW has not observed Umpqua chub upstream of Winchester Dam (Leonetti 2021), which is located at approximately river mile 7 of the North Umpqua River, approximately 64 miles downstream of the proposed action. In summary, none of the special status fish species on the Regional Forester's list occur within the proposed Pumped Storage Project area.

### **6.4.3 ENVIRONMENTAL EFFECTS**

Anadromous fish are not anticipated to be affected by the project, because they do not exist in the Pumped Storage Project area and the operation of the Pumped Storage Project will not impact downstream river reaches beyond the limits (e.g., ramp rates, instream flows, and reservoir fluctuations) already in place for resource protection. Any unanticipated impacts to anadromous fish would be identified via the Long-Term Monitoring and Predator Control Study program currently in place and managed by the North Umpqua Project Resource Coordination Committee. Resident fish may be affected directly via potentially increased entrainment mortality, and indirectly via GBT if the Pumped Storage Project causes increased TDG pressure. Based on conceptual design of the new pump-turbine, fish are not expected to survive passage in either the upstream or downstream direction. Thus, if any small fish in Toketee Reservoir pass through the new fish screen at the new intake and into the new pump-turbine, they are not expected to survive. The number of fish thus affected was estimated based on prior entrainment studies and flow ratios. The number of small trout (<5 inches long) entrained at the Toketee intake was 353 (PacifiCorp 1995). The maximum flow into the new pump-turbine intake will be 470 cfs, or 30.7 percent of the maximum flow into the Toketee intake of 1,530 cfs. Assuming fish exposure to entrainment is similar at the new pump turbine intake as at the Toketee intake, then approximately 108 trout (30.7 percent of 353 fish) less than 4.7 inches long could be entrained annually at the new pump intake. A conservative assumption is that zero trout will survive the Clearwater No. 2 pump turbine and, if any do survive, they will not likely survive the Clearwater No. 2 turbine or the pump turbine on the return down the penstock to Toketee Reservoir. Thus, the estimated potential impact of the new pumped storage project due to entrainment is 108 trout less than 5 inches long per year.

PacifiCorp will monitor and correct or mitigate any observed TDG issues from implementation of the proposed upgrade in consultation with the relevant resource agencies.

Although GBT in fish has not been observed in the North Umpqua Project vicinity, it could occur if the new pump-turbine produces TDG pressures in excess of 110 percent near the intake and outlet areas. TDG will be measured during post-project monitoring, and if the ODEQ criterion of 110 percent saturation is exceeded, and the exceedances cannot be corrected through operational changes, fish will also be monitored for any signs of GBT following the protocols used in a study of GBT downstream of the Lemolo No. 2 powerplant in 2004. During that study, PacifiCorp and ODFW biologists sampled 100 wild fish from the Lemolo No. 2 tailrace and downstream, full-flow reach of the North Umpqua River during periods of high TDG (up to 122 percent saturation) and closely examined the fin, skin, and eye tissues for any signs of GBT (PacifiCorp 2004a). All fish appeared healthy and vigorous, and no signs of GBT were observed on any fish. Consequently, the Lemolo No. 2 powerplant was allowed to operate with high TDG until a major maintenance rebuild could correct the elevated TDG by reducing air entrainment and leakage into the turbine. The rebuild occurred in 2009, the tailrace was re-routed in 2011, and subsequent water quality monitoring confirmed that TDG in the tailrace and its outlet was well within the 110 percent criterion during all generation levels (PacifiCorp 2012).

PacifiCorp also surveyed for GBT during periods of high TDG in the Lemolo Nos. 1 and 2 and Clearwater No. 1 tailraces during 1993 (PacifiCorp 2012). During the 1993 studies, 35 fish were examined and found to be healthy with no indications of GBT. The scale of operations (e.g., head, turbine capacity, etc.) at the previously monitored locations is comparable to that of Clearwater No. 2.

Should any additional or unanticipated fishery impacts result from the proposed Pumped Storage Project, they will be addressed during post-project monitoring using adaptive management in consultation with the resource agencies.

## **6.5 WILDLIFE RESOURCES**

A summary of wildlife species known or suspected to occur within the North Umpqua Project and vicinity based on wildlife surveys completed between 1992 and 1994 in support of PacifiCorp's Final License Application for the North Umpqua Project (PacifiCorp 1995) is

provided below. In addition, the USFS Regional Forester's Sensitive Species List was used to identify sensitive species known or suspected to occur within the North Umpqua Project area. Threatened and endangered species are discussed in Section 6.5.5.

Per the terms and conditions of the North Umpqua Project's FERC operating license, PacifiCorp developed a Sensitive Species Plan in consultation with USFS to coordinate the conservation and management of sensitive species identified on the Regional Forester's Sensitive Species List. PacifiCorp must conduct sensitive species surveys prior to ground- or habitat-disturbing activities on National Forest System lands. Per terms and conditions of the North Umpqua Project's FERC license, PacifiCorp has also developed a Survey and Manage Species Plan to coordinate compliance with USFS Survey and Manage standards and guidelines. Pre-disturbance surveys may be required for certain survey and manage species for potential habitat-disturbing actions.

The North Umpqua Project is located within USFS Region 6, and 37 wildlife species on the Regional Forester's Sensitive Species List are known or suspected as of June 2021 to occur in the Umpqua National Forest (USFS 2021). The Regional Forester's Sensitive Species List is periodically subject to revision; to maintain a current Sensitive Species list, PacifiCorp and USFS coordinate annually.

### **6.5.1 MAMMALS**

Black tailed deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*) are known to occur in the North Umpqua Project for one or more seasons of the year, and some deer and elk are year-round residents. The North Umpqua Project area and vicinity provide important deer and elk wintering range due to lower snow accumulations and earlier spring exposure of forage plants than surrounding higher elevation areas. During severe winters with heavy snow accumulation, elk have been known to utilize habitats in the vicinity of Clearwater No. 2 and Toketee Reservoir in lieu of surrounding higher elevation meadows. During spring, summer, and fall, use of the North Umpqua Project area by elk is lower than in winter but still occurs. Black tailed deer tend to use habitats within the North Umpqua Project vicinity year-round with less seasonal movement (PacifiCorp 1995).



Black bear (*Ursus americanus*) and cougar (*Puma concolor*) were also observed in the North Umpqua Project vicinity during 1992 through 1994 surveys (e.g., via tracks or scat; individuals rarely seen). Other small mammals observed within the vicinity of Clearwater No. 2 and Toketee Reservoir include rabbits, chipmunks, Douglas squirrel (*Tamiasciurus douglasii*), western gray squirrel (*Sciurus griseus*), coyote (*Canis latrans*), river otter (*Lontra canadensis*), and beaver (*Castor canadensis*).

There are six mammal species on the Regional Forester's Sensitive Species List with documented or suspected occurrences in the Umpqua National Forest: pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), wolverine (*Gulo gulo*), fringed myotis (*Myotis thysanodes*), fisher (*Pekania pennanti*), and Sierra Nevada red fox (*Vulpes necator*). Of these six species, wolverine and fisher are federally- or state-listed species and are discussed in Section 6.5.5. Of the six species, only red fox was documented as occurring within the North Umpqua Project vicinity during 1992 through 1994 surveys, but since that time Forest Service has also documented fisher on Oak Flats and Fish Creek Desert to the west of the Pumped Storage Project (Hadwen 2021). PacifiCorp will consult with USFS staff to determine which species, if any, have the potential to occur within the proposed Pumped Storage Project area, and whether or not targeted surveys are needed to determine if suitable habitat is present for any of these species. The timing of surveys will be determined with consideration of species-specific life history characteristics.

### 6.5.2 BIRDS

Various waterfowl were observed in project impoundments during 1992 through 1994 relicensing surveys. Other bird species closely associated with water, shoreline, and riparian habitats were also observed in the North Umpqua Project vicinity. A total of 32 waterfowl or water related bird species were observed in the Toketee Reservoir and Clearwater No. 2, and of these the most common species included: mallard (*Anas platyrhynchos*), Barrow's goldeneye (*Bucephala islandica*), bufflehead (*Bucephala albeola*), Canada goose (*Branta canadensis*), spotted sandpiper (*Actitis macularius*), and great blue heron (*Ardea herodias*). Impoundments at Toketee Reservoir and Clearwater No. 2 provide wintering habitat for waterfowl and also

support some waterfowl summer/migration use, and breeding habitat for water-related birds such as green-backed heron and double-crested cormorant.

Fourteen species of raptors, vultures, corvids, and owls were observed in the North Umpqua Project vicinity of Clearwater No. 2 and Toketee Reservoir during 1992 through 1994 surveys. Raptors were most commonly observed near mature forest habitat or open water. Some of the most common species observed were red-tailed hawk (*Buteo jamaicensis*), osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), turkey vulture (*Cathartes aura*), Steller's jay (*Cyanocitta stelleri*), and common raven (*Corvus corax*).

Ground- and habitat-disturbing activities of the Pumped Storage Project are immediately adjacent to, but outside of, a primary nesting zone for bald eagles (Umpqua National Forest 2007). The bald eagle nest is located on the northwest facing slope east of Clearwater No. 2 powerplant, upslope of Toketee Reservoir, and downslope of Clearwater No. 2 forebay. A secondary nesting zone is located to the east of the primary nesting zone and does not have a nexus with the Pumped Storage Project. Construction, operation, and maintenance of the Pumped Storage Project will comply with the Umpqua National Forest's Toketee Bald Eagle Nest Plan (2007).

The Pumped Storage Project is approximately 0.90 miles northwest of a known peregrine falcon (*Falco peregrinus*) eyrie on Pig Iron Mountain and is within the secondary nest protection zone for this eyrie (Umpqua National Forest 2006). A seasonal restriction of January 1 through July 31 is applied within the secondary nest protection zone if it is determined by the Forest Service district wildlife biologist that an activity has the potential to disturb breeding peregrine falcons. Pumped Storage Project construction would comply with seasonal restrictions for peregrine falcons unless otherwise directed by Forest Service.

Other types of bird species observed during 1992 through 1994 surveys included passerines, woodpeckers, and gamebird species. A total of 75 species were observed near the Toketee Reservoir and Clearwater No. 2, of which the most common species were: dark-eyed junco (*Junco hyemalis*), American robin (*Turdus migratorius*), red-breasted nuthatch (*Sitta canadensis*), belted kingfisher (*Megaceryle alcyon*), northern flicker (*Colaptes auratus*), and

mountain quail (*Oreortyx pictus*). Although many passerines are year-round residents, the number of passerines tends to increase in the spring and summer.

There are 10 bird species on the Regional Forester's Sensitive Species List with documented or suspected occurrences in the Umpqua National Forest: bufflehead (*Bucephala albeola*), yellow rail (*Coturnicops noveboracensis*), black swift (*Cypseloides niger*), bald eagle (*Haliaeetus leucocephalus*), harlequin duck (*Histrionicus histrionicus*), Lewis's woodpecker (*Melanerpes lewis*), white-headed woodpecker (*Picoides albolarvatus*), horned grebe (*Podiceps auritus*), red-necked grebe (*Podiceps grisegena*), and purple martin (*Progne subis*). Of these, only two species have been observed in the North Umpqua Project area (bufflehead and bald eagle), and it is unknown if any of the remaining species are present within the proposed Pumped Storage Project area.

PacifiCorp maintains compliance with the existing Agreement for Management of Birds on Powerlines, among PacifiCorp, ODFW, and the USFWS dated February 18, 1988, which is incorporated into their Settlement Agreement to the extent that it applies to the North Umpqua Project lands. This agreement promotes cooperation between PacifiCorp and the signatory agencies and includes procedures for dealing with bird mortality and problem nests. PacifiCorp will consult with USFS staff to determine which species have the potential to occur within the proposed Pumped Storage Project area, and surveys will be conducted for these target species to determine if suitable habitat is present. The timing of surveys will be determined with consideration of species-specific life history characteristics.

### 6.5.3 REPTILES AND AMPHIBIANS

A total of five reptile species were observed within Toketee Reservoir and Clearwater No. 2 areas during 1992 through 1994 surveys. Western pond turtle (*Actinemys marmorata*) was observed in Toketee Reservoir and Stinkhole Pond; garter snake (*Thamnophis sp.*) was observed in Toketee Reservoir only; northern alligator lizard (*Elgaria coerulea*) and western skink (*Eumeces skiltonianus*) were observed in Clearwater No. 2 only; and western fence lizard was observed in both Toketee Reservoir and Clearwater No. 2. Reptiles were most often observed in open, disturbed habitats near waterways or transmission right of ways (ROWS).

Six amphibian species were observed within Toketee Reservoir and Clearwater No. 2 areas during 1992 through 1994 surveys. Pacific giant salamander (*Dicamptodon tenebrosus*), tailed frog (*Ascaphus montanus*), and an unknown *Rana* species (likely cascade frog) were observed in Clearwater No. 2 only and northwestern salamander (*Ambystoma gracile*), western toad (*Anaxyrus boreas*), and Pacific tree frog (*Hyla regilla*) were observed in both the Toketee Reservoir and Clearwater No. 2. Pacific tree frog was also observed in Stinkhole pond.

There are two reptile and amphibian species on the Regional Forester's Sensitive Species List with documented or suspected occurrences in the Umpqua National Forest: western pond turtle (*Actinemys marmorata*) and foothill yellow-legged frog (*Rana boylii*). Western pond turtle has been observed in Toketee Reservoir and Stinkhole Pond, but foothill yellow-legged frog has not been observed in the North Umpqua Project area. PacifiCorp will consult with USFS staff to determine which species have the potential to occur within the proposed Pumped Storage Project area, and surveys will be conducted for these target species to determine if suitable habitat is present. The timing of surveys will be determined with consideration of species-specific life history characteristics.

#### 6.5.4 INVERTEBRATES

There are 13 invertebrate species on the Regional Forester's Sensitive Species List with documented or suspected occurrences in the Umpqua National Forest: western bumble bee (*Bombus occidentalis*), Johnson's hairstreak (*Callophrys johnsoni*), Cascades axetail slug (*Carinacauda stormi*), Siskiyou short-horned grasshopper (*Chloealtis aspasma*), monarch butterfly (*Danaus plexippus*), western ridged mussel (*Gonidea angulata*), Oregon shoulderband (*Helminthoglypta hertleini*), highcap lanx (*Lanx alta*), gray-blue butterfly (*Plebejus podarce klamathensis*), Crater Lake tightcoil (*Pristiloma crateris*), a caddisfly (*Rhyacophila chandleri*), coronis fritillary (*Speyeria coronis coronis*), and Siskiyou hesperian (*Vespericola sierranus*).

It is unknown if these species are present within the proposed Pumped Storage Project area. PacifiCorp will consult with USFS staff to determine which species have the potential to occur within the proposed Pumped Storage Project area, and surveys will be conducted for these target species to determine if suitable habitat is present. The timing of surveys will be determined with consideration of species-specific life history characteristics.

PacifiCorp has consulted with USFS staff for the nearby Fish Creek development, and USFS completed protocol surveys for those mollusk species on the Regional Forester's list that have the potential to occur in the Fish Creek development area (PacifiCorp 2021). Surveyors reviewed the full list to develop a focused list of target species, and the primary target species was Crater Lake tightcoil (*Pristiloma crateris*). The initial survey visit, conducted in October 2021 and consisting of two survey days, resulted in three voucher specimens, which were later identified as traveling sideband (*Monadenia fidelis leonina*), not a special status target species, and Crater Lake tightcoil. Crater Lake tightcoil were found in wet areas within the upper penstock access road ditchline, and traveling sideband were found at the base of the waterfall near the northeastern corner of the Toketee powerplant. Forest Service determined that a second survey period was not necessary as a result of the affirmative species identifications of the first survey effort. Forest Service has previously documented Crater Lake tightcoil on the face of Toketee Dam. Given the presence of Crater Lake tightcoil within the Toketee development, the species may also be present within the areas of proposed upgrades at Clearwater No. 2 but will be confirmed through consultation with USFS staff.

#### **6.5.5 RARE, THREATENED, AND ENDANGERED SPECIES**

The following section addresses the recovery, management, and designated critical habitat for wildlife, fish, and botanical species listed, or proposed to be listed, as endangered, threatened, or candidate species under the federal Endangered Species Act (ESA) and/or by the Oregon Fish and Wildlife Commission or Oregon Department of Agriculture (ODA) under the Oregon Endangered Species Act and with the potential to occur on the Umpqua National Forest. The listed and proposed species and designated and proposed critical habitat have changed since the North Umpqua Project was licensed, and therefore, a review of those species and critical habitats that may be affected by the proposed upgrade is provided herein. Species on the current Regional Forester's Sensitive Status Species List (USFS 2021) for the Umpqua National Forest were crosschecked with the current state lists (ODA 2021; ODFW 2021a) to develop the list of species potentially affected by the proposed action. These species and their listing status are: northern spotted owl (*Strix occidentalis caurina*; threatened – federal and state), wolverine (*Gulo gulo*; threatened – state), fisher (proposed – federal), Franklin's bumblebee (*Bombus franklini*;

endangered – federal), grey wolf (*Canis lupus*; endangered – federal), and Oregon coast coho salmon (*Oncorhynchus kisutch*; threatened – federal).

#### 6.5.5.1 NORTHERN SPOTTED OWL

The northern spotted owl (*Strix occidentalis caurina*; NSO) was listed as threatened on June 26, 1990. A revised recovery plan was finalized on July 1, 2011. A final rule for revised critical habitat was published in the *Federal Register* on January 15, 2021, but on July 20, 2021 USFWS proposed to withdraw the final rule and proposed to revise the designated critical habitat (USFWS 2021a). In the interim, the prior final rule for revised critical habitat published in the *Federal Register* on December 4, 2012, is used for biological assessment (Weaver 2021).

NSOs are found within mature or old growth forests that contain the structures and characteristics required for nesting, roosting, and foraging (NRF). NRF habitat generally consists of moderate to high canopy closure (60 to 90 percent); a multilayered, multi-species canopy with large overstory trees (with diameter at breast-height [dbh] of greater than 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for NSOs to fly (USFWS 2011). Dispersal habitat, at a minimum, consists of forest stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities.

The Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*) (Recovery Plan) identifies the most important threats to NSO as competition with barred owls (*Strix varia*), ongoing loss of NSO habitat because of timber harvest, habitat loss or degradation from wildfire and other disturbances, and loss of amount and distribution of habitat because of past activities and disturbances. The recovery strategy includes completion of a range-wide habitat modeling tool, habitat conservation and forest restoration, barred owl management, and research and monitoring (USFWS 2011).

Relying on the recovery criteria and best available science established in the Recovery Plan, USFWS designated over 9.5 million acres in 11 units and 60 subunits as critical habitat (USFWS 2012). The proposed Pumped Storage Project boundary intersects NSO critical habitat subunit

West Cascades South (WCS 5). The WCS 5 subunit consists of approximately 356,446 acres of federal lands managed by USFS under the Northwest Forest Plan (U.S. Department of the Interior and U.S. Department of Agriculture [USDA] 1994) in Lane and Douglas Counties, Oregon. Special management considerations or protection are required in this subunit to address threats from current and past timber harvest and competition with barred owls. This subunit is expected to function primarily for demographic support to the overall population, as well as north-south and east-west connectivity between subunits and critical habitat units.

The 2012 rule determined a set of primary constituent elements (PCEs) based on the current knowledge of the life history, biology, and ecology of the NSO and the requirements of the habitat to sustain its essential life-history functions. They are as follows:

1. Forest types that may be in early-, mid-, or late-seral stages and that support the NSO across its geographical range
2. Habitat that provides for nesting and roosting.
  - a. Sufficient foraging habitat to meet the home range needs of territorial pairs of NSOs throughout the year.
  - b. Stands for nesting and roosting that are generally characterized by:
    - i. moderate to high canopy cover (60 to over 80 percent),
    - ii. multilayered, multispecies canopies with large (20 to 30 inches [51 to 76 centimeters] or greater dbh) overstory trees,
    - iii. high basal area (greater than 240 square feet per acre [55 square meters per hectare]),
    - iv. high diversity of different diameters of trees,
    - v. high incidence of large live trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and other evidence of decadence),
    - vi. large snags and large accumulations of fallen trees and other woody debris on the ground, and
    - vii. sufficient open space below the canopy for NSOs to fly.

3. Habitat that provides for foraging, which varies widely across the NSO's range, in accordance with ecological conditions and disturbance regimes that influence vegetation structure and prey species distributions.
  - a. West Cascades/Coast Ranges of Oregon and Washington
    - i. Stands of nesting and roosting habitat; additionally, owls may use younger forests with some structural characteristics (legacy features) of old forests, hardwood forest patches, and edges between old forest and hardwoods;
    - ii. moderate to high canopy cover (60 to over 80 percent);
    - iii. a diversity of tree diameters and heights;
    - iv. increasing density of trees greater than or equal to 31 inches (80 centimeters) dbh increases foraging habitat quality (especially above 12 trees per acre [30 trees per ha]);
    - v. increasing density of trees 20 to 31 inches (51 to 80 centimeters) dbh increases foraging habitat quality (especially above 24 trees per acre [60 trees per hectare]);
    - vi. increasing snag basal area, snag volume (the product of snag diameter, height, estimated top diameter, and including a taper function), and density of snags greater than 20 inches (50 centimeters) dbh all contribute to increasing foraging habitat quality, especially above 4 snags per acre (10 snags per hectare);
    - vii. large accumulations of fallen trees and other woody debris on the ground; and
    - viii. sufficient open space below the canopy for NSOs to fly.
4. Habitat to support the transience and colonization phases of dispersal, which in all cases would optimally be composed of NRF habitat (PCEs 2 or 3), but which may also be composed of other forest types that occur between larger blocks of NRF habitat.
  - a. Habitat supporting the transience phase of dispersal, which includes:
    - i. stands with adequate tree size and canopy closure to provide protection from avian predators and minimal foraging opportunities; in general, this may include, but is not limited to, trees with at least 11 inches (28 centimeters) dbh and a minimum 40 percent canopy cover; and
    - ii. younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, if such stands contain some roosting structures and foraging habitat to allow for temporary resting and feeding during the transience phase.



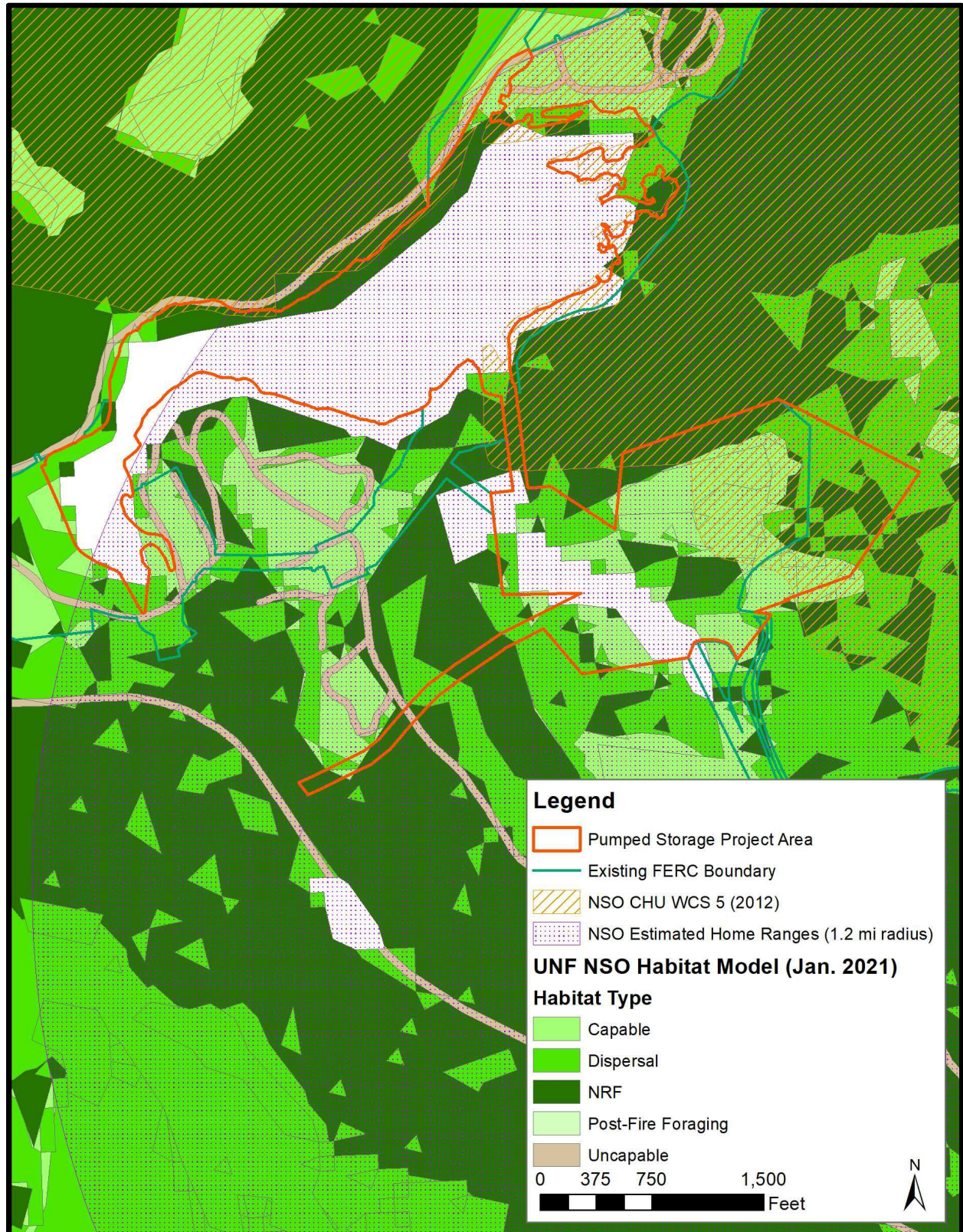
- b. Habitat supporting the colonization phase of dispersal, which is generally equivalent to nesting, roosting and foraging habitat as described in primary constituent elements (PCEs) 2 and 3 but may be smaller in area than that needed to support nesting pairs.

The July 20, 2021 proposed rule clarifies that the PCEs have been replaced with physical and biological features (PBFs) consistent with revised critical habitat regulations. The PBFs correlating with the identified PCEs are:

- forest types that may be in early-, mid-, or late-seral stages and that support the northern spotted owl across its geographical range;
- nesting and roosting habitat;
- foraging habitat; and
- dispersal habitat.

The Pumped Storage Project development area includes a mixture of NRF habitat, dispersal habitat, and capable habitat, as modelled by USFS, and also overlaps a single NSO estimated home range (Figure 6-8).

**FIGURE 6-8 NSO CRITICAL HABITAT AND MODELLED HABITAT IN THE PUMPED STORAGE PROJECT AREA**





A portion of the proposed upgrade area is within designated critical habitat for NSO (USFWS 2022). The area around the forebay was subject to clear-cutting at the time of Clearwater No. 2 construction (ca. 1947–1951) and supports primarily “second-growth” tree species. PacifiCorp’s contractor, Mason, Bruce & Girard, performed a timber cruise within the Clearwater No. 2 forebay expansion area and spoils disposal area (Gagliasso 2022). The timber cruise sampled 54.3 acres and identified approximately 174 trees per acre and a basal area of 169 square feet per acre. These numbers are indicative of relatively high density or smaller diameter trees. Access roads and an elk forage habitat plot likely contribute to the low basal area. The lack of multilayered canopy, low basal area, and low diversity of different diameters of trees indicate that these areas do not support nesting and roosting but could support foraging and/or dispersal.

PacifiCorp is requested from FERC designation as the non-federal representative for carrying out consultation with USFWS pursuant to Section 7 of the ESA throughout the amendment process regarding the design and implementation of studies needed to support the proposed upgrade.

#### **6.5.5.2 WOLVERINE**

On October 13, 2020, USFWS withdrew the proposed rule to list the Distinct Population Segment (DPS) of the North American wolverine occurring in the contiguous United States as a threatened species (USFWS 2020). The withdrawal was based on analysis of current and future threats and the observation that wolverines were readily passing between the United States and Canada. The withdrawal is currently being challenged in court. Wolverines remain listed as threatened in Oregon, but ODFW notes that wolverine are only found in Oregon on Three-fingered Jack in Linn County, on the Steens Mountains in Harney County, on Broken Top Mountain in Deschutes County, in the Eagle Cap Wilderness Area in the Wallowa Mountains of northeastern Oregon, and in Wallowa County (ODFW 2021b). Wolverines are unlikely to occur within the proposed upgrade area due to their high elevation habitat needs and lack of documented sightings on the Umpqua National Forest (Hadwen, 2021). Therefore, the proposed Pumped Storage Project is unlikely to affect wolverine and further consideration is not provided herein.

### **6.5.5.3 FISHER**

On November 7, 2019, USFWS revised the 2014 proposed rule to list the West Coast DPS of fisher as threatened. The DPS is currently identified as a federal species of concern. Fisher are currently listed by ODFW as sensitive. The proposed Pumped Storage Project is outside (to the west) of the potential species range in Oregon identified by USFWS (2021), but USFS has documented Fisher on Oak Flats and Fish Creek Desert to the west and southwest of Clearwater No. 2 forebay, respectively (Hadwen 2021).

Fishers are associated with moderate to dense forest canopy, frequently in riparian areas, with large amounts of coarse downed wood, moderate shrub cover, dead trees, trees with decay elements, and a component of hardwood trees (USFWS 2021b). The mean breeding season home range size for males in the West Cascades is approximately 147 square kilometers, which is over two times larger than non-breeding season home range size for these males (62 square kilometers), which in turn is over two times larger than annual home ranges of females in the West Cascades (Lofroth 2011). Limited habitat impacts within the proposed upgrade area would represent an insignificant portion of any potential fisher home range(s). Therefore, the proposed Pumped Storage Project is unlikely to affect fisher, and further consideration is not provided herein.

### **6.5.5.4 FRANKLIN'S BUMBLEBEE**

By Federal Register notice on August 23, 2021, USFWS listed Franklin's bumblebee as endangered (USFWS 2021c). USFWS determined that designating critical habitat was not prudent due to the bee being a habitat generalist and the lack of threats to the bee from "destruction, modification, or curtailment of habitat." USFWS found that "disease and other natural or manmade factors are likely the primary threats to the species within its habitat." Franklin's bumblebee is a generalist forager found in a variety of habitat types over a broad elevational range; the only known habitat needs for the species include adequate floral resources for nectar, and relatively protected areas for breeding and shelter. Franklin's bumble bee historically occupied portions of Douglas, Jackson, and Josephine Counties in Oregon but has not been observed since 2006 (ODFW 2018). The Pumped Storage Project is outside of High Priority Zones for Franklin's bumble bee delineated by USFWS (USFWS 2022) and outside of

potential habitat polygons for Franklin's bumble bee delineated by USFWS and the Umpqua National Forest (Hadwen 2022), respectively, as of April 2022. Franklin's bumblebee may be present within the proposed Pumped Storage Project area, but the proposed upgrade is unlikely to affect the species due to the lack of species observations since 2006, lack of herbicide or pesticide use associated with the proposed upgrade, lack of adequate floral resources in the habitat-disturbance areas, and because the amount of habitat disturbance from the proposed upgrades would be minimal when compared to overall habitat availability in the species' range.

#### **6.5.5.5 GRAY WOLF**

The gray wolf (*Canis lupis*) was originally listed as endangered in 1978 throughout the contiguous US and Mexico (except for Minnesota, where the species was listed as threatened). In 2020, the species was delisted due to recovery; and in 2022 this decision was reversed, and the species was relisted throughout the US and Mexico, excluding the Northern Rocky Mountain population. The species is currently listed as threatened in Minnesota and endangered in the remaining states. The proposed Pumped Storage Project area occurs within an area of known wolf activity for the pack known as the Indigo Unit, which was designated by ODFW in March 2019. Until recently, gray wolves had not been observed in or near the project area since the 1930s; however, in 2018 the public began reporting observations of wolf activity in the area, which eventually led to the designation of the Indigo Unit in 2019. The Indigo Pack currently consists of 5 individuals. Gray wolves inhabit a wide range of habitats and may be present within the project area. Limited habitat impacts within the proposed upgrade area would represent an insignificant portion of any potential gray wolf home range. Therefore, the proposed Pumped Storage Project is unlikely to affect gray wolf, and further consideration is not provided herein.

#### **6.5.5.6 COHO SALMON**

The Oregon Coast ESU of coho salmon is the only federally-listed threatened or endangered fish species documented or suspected to occur on the Umpqua National Forest according to the Regional Forester's Special Status Species List (USFS 2021) (see Section 6.4.2 for discussion of anadromous fish species). Coho salmon does not occur within the proposed Pumped Storage Project area (including Toketee Reservoir where upgrades are proposed) due to barriers to upstream migration located downstream of the Pumped Storage Project. Slide Creek Dam,

approximately 2.5 miles downstream of the proposed Pumped Storage Project, is the current upstream barrier to migration of anadromous fish, including Oregon coast coho salmon, and there are no additional listed fish species in the proposed Pumped Storage Project area.

The National Marine Fisheries Service (NMFS) addressed Essential Fish Habitat in its biological opinion of December 17, 2002 for the North Umpqua Project. NMFS concluded that continued operation of the North Umpqua Project could affect coho salmon, through obstruction of access to spawning and rearing habitat, retention of sediments, inundation of spawning and rearing habitat, reduction of flows in bypass reaches, and construction activities. However, NMFS also concluded that the incidental take terms and conditions would adequately address these adverse effects on essential fish habitat, and it recommended their adoption as conservation measures. The incidental take terms and conditions were adopted as license conditions through ordering paragraphs adopting mandatory conditions and license articles. The proposed Pumped Storage Project is not expected to increase or intensify overall environmental effects to listed fish species, and the proposed Pumped Storage Project will comply with existing incidental take terms and conditions. PacifiCorp will consult with NMFS throughout the amendment process regarding the design and implementation of studies needed to support the license amendment.

#### **6.5.6 ENVIRONMENTAL EFFECTS**

The proposed Pumped Storage Project would result in effects on birds, amphibians, reptiles, and mammals beyond those of the existing North Umpqua Project. Impacts to wildlife from the proposed Pumped Storage Project would be from removal or degradation of habitat features for construction of the proposed additions. Vegetation removal and habitat modifications within the proposed Clearwater No. 2 forebay expansion and spoils disposal area will impact approximately 10.3 additional acres of existing USFS elk forage habitat; therefore, PacifiCorp will coordinate with USFS to fund a replacement habitat project in the Umpqua National Forest to compensate for these impacts. Maintenance of existing project access roads necessitates the removal of vegetation, which alters the habitat type, reduces vertical complexity, and removes potential wildlife habitat components. Clearing of trees and brush would have cumulative impacts on species that rely on forest canopy and understory. Remaining forest adjacent to the proposed facilities would continue to provide forest canopy and cover within the proposed action area. Construction of the proposed Pumped Storage Project would contribute to above-ambient noise

levels and increased, anthropogenic traffic that may result in minor, short-term, site-specific impacts to localized dispersal, demography, and habitat selection of wildlife. Proposed Pumped Storage Project operations will intermittently increase the surface area of the forebay available to waterfowl during the low-flow operational period when water would not otherwise be available in the forebay.

The proposed Pumped Storage Project involves actions that may affect rare, threatened, and endangered species. PacifiCorp will coordinate with USFS, USFWS, and NMFS during design and conduct surveys to identify species and habitat potentially affected. Effects of the proposed Pumped Storage Project would be avoided and minimized by implementation of mitigation and enhancement measures presented in Section 7.0.

## **6.6 BOTANICAL RESOURCES**

A description of botanical resources known to occur within the project area and vicinity is provided below, based on botanical surveys completed between 1992 and 1994 in support of PacifiCorp's Final License Application for the North Umpqua Hydroelectric Project (PacifiCorp 1995). In addition, the USFS Regional Forester's Sensitive Species List was used to identify sensitive plant species known or suspected to occur within the project area. Threatened and endangered plant species are discussed in Section 6.6.5.

Vegetation is managed within the proposed Pumped Storage Project boundary in accordance with PacifiCorp's Vegetation Management Plan (VMP) (2004), which was developed in consultation with USFS and BLM. In general, the VMP was developed to include three programs: vegetation maintenance, noxious weed prevention and control, and revegetation. Vegetation management activities that regularly occur include hazard tree removal, brush maintenance, and slash/debris management.

### **6.6.1 UPLAND HABITATS**

The majority of upland habitat within the proposed Pumped Storage Project area is composed of Douglas-fir and mixed conifer forests of different stages. Douglas-fir forests are dominated by Douglas-fir (*Pseudotsuga menziesii*), with codominant tree species being western hemlock (*Tsuga heterophylla*), incense cedar (*Calocedrus decurrens*), grand fir (*Abies grandis*), and

ponderosa pine (*Pinus ponderosa*). Common shrub species include Oregon grape (*Mahonia nervosa*), serviceberry (*Amelanchier sp.*), rhododendron (*Rhododendron sp.*), and salal (*Gaultheria shallon*). Mixed conifer forests are comprised of a variety of co-dominant species including true firs (*Abies sp.*), ponderosa pine, sugar pine (*Pinus lambertiana*), lodgepole pine (*Pinus contorta*), and knobcone pine (*Pinus attenuata*). Common understory species include small-leaf huckleberry (*Vaccinium parvifolium*), pinemat (*Ceanothus prostrates*), manzanita (*Arctostaphylos columbiana*), prince's pine (*Chimaphila umbellata*), Oregon boxwood (*Paxistima myrsinites*), and queen's cup (*Clintonia uniflora*). Small patches of ponderosa pine forest, and Douglas-fir/ponderosa pine co-dominant forest also occur near the Clearwater No. 2 forebay and Toketee Reservoir and cover a much smaller area compared to other forest types. As of 1994, the forests around the Clearwater No. 2 forebay were mostly early and mid-successional in age, whereas forests around Toketee Reservoir were mostly late successional in age.

Other types of upland habitats that were mapped within the vicinity of Toketee Reservoir and Clearwater No. 2 forebay during 1992-1994 surveys included mixed conifer/broadleaf, shrublands, grass/forb dry meadow, and exposed rock/talus. Each of these community types comprised less than 3% of these project areas. Shrublands were primarily mapped within the transmission line ROW near the Clearwater No. 2 forebay or on the slope in between the Clearwater No. 2 powerplant and forebay. Shrublands typically consisted of white-thorn ceanothus (*Ceanothus leucodermis*), sticky laurel (*Ceanothus velutinus*), and green leaf manzanita (*Arctostaphylos patula*). Grass/forb habitat was primarily mapped in patches along the edge of Toketee Reservoir, along the Clearwater No. 2 forebay, or on the slope in between the Clearwater No. 2 pumphouse and forebay. Grass/forb areas typically consisted of bracken fern along with a variety of other forbs and grasses. A portion of the proposed Clearwater No. 2 forebay expansion and spoils areas was originally mapped as forest habitat, including a small patch of forest that had been recently clear-cut; the patch of recently clear-cut forest is now considered grass/forb habitat due to the establishment of an elk forage habitat plot.

Developed and/or disturbed areas within the vicinity of Toketee Reservoir and Clearwater No. 2 forebay include buildings, campgrounds, roads, transmission line ROWs, and other disturbed lands. These areas generally lack vegetation, are permanently disturbed, and/or do not provide habitat for native species. During 1992-1994 surveys, disturbed areas were mapped around the



perimeter of the Clearwater No. 2 forebay (which encompasses an access road around the forebay), around the Clearwater No. 2 powerplant, along National Forest Road 47762252 which provides access to the forebay off of Highway 138 around Clearwater Village (USFS residential area), and at Toketee campground.

#### **6.6.2 RIPARIAN HABITAT**

Several patches of riparian broadleaf forest/shrub habitat were mapped in 1992 through 1994 along the banks of Toketee Reservoir near Toketee campground and near the confluence of the Clearwater River and the Toketee reservoir. Riparian habitat adjacent to Toketee Reservoir was dominated by red alder (*Alnus rubra*) and big leaf maple (*Acer macrophyllum*) trees, shrubs, and scrub willow (*Salix* sp), and the riparian corridors generally ranged from about 10 to 100 feet wide.

#### **6.6.3 WETLAND HABITAT**

During 1992 through 1994 surveys, wetlands were mapped at the upstream end of the Toketee Reservoir and along the edges of the Stinkhole Pond. The Clearwater No. 2 forebay area does not contain any known wetlands. Wetland types included palustrine emergent, palustrine shrub-scrub, and palustrine forested. Emergent wetlands consist of cattails (*Typha* sp.), sedges, and rushes; shrub-scrub wetlands are dominated by willows (*Salix* sp.); and forested wetlands are dominated by willow and alder. The impoundments themselves (i.e., Toketee Reservoir and Clearwater No. 2 forebay) are not considered wetlands but are instead classified as deepwater habitat types (i.e., lacustrine, or riverine unconsolidated bottom/shore). The most common species of aquatic vegetation within the Toketee and Clearwater No. 2 impoundments includes stiff-leafed buttercup (*Ranunculus subrigidus*), Canadian water-weed (*Elodea canadensis*), brittlewort (*Nitella* sp.), and Berchtold's pondweed (*Potamogeton berchtoldii*). Illinois pondweed (*Potamogeton illinoensis*) also occurs in the Clearwater No. 2 forebay.

#### **6.6.4 NOXIOUS WEEDS**

In Oregon, both USFS and BLM use the definition for noxious weeds developed by the Oregon State Weed Board, which defines noxious weeds as “exotic, nonindigenous species that are injurious to public health, agriculture, recreation, wildlife, or any public or private property.” Noxious weeds are designated and managed at federal, state, and county levels; specific to the

proposed Pumped Storage Project area, noxious weeds are designated and managed at the federal level by USFS. PacifiCorp's primary guidance document to prevent and control noxious weeds is their VMP. A key component of the VMP was the initial noxious weed inventory, which was completed by PacifiCorp in 2003. Subsequent noxious weed inventories have been completed every three years since. The latest noxious weed inventory was completed in 2021 (AECOM 2022), and results are summarized herein.

A list of target weed species that are known or suspected to occur within the vicinity of the exiting North Umpqua Project was developed by PacifiCorp in cooperation with BLM and USFS. The original VMP list from 2004 included 36 noxious weed species, of which 13 were management priorities (PacifiCorp 2004b). This list has been periodically updated to account for changes in noxious weed classifications and management priorities. As of 2021, there are now 50 target weed species on the list, of which 19 are a high priority for management priority (AECOM 2022).

During 2021 surveys, 147 infestations totaling 5.07 acres were documented near the Toketee Reservoir facilities and 43 infestations totaling 23.77 acres were documented near the Clearwater No. 1 and No. 2 facilities. Infestations are primarily mapped along the edges of the Toketee Reservoir and Clearwater No. 2 forebay, along the Clearwater No 2 waterway, and in disturbed habitats associated with the Clearwater No. 2 powerplant, Toketee campground and Clearwater Village (AECOM 2022).

Noxious weed species mapped at both areas included Scotch broom (*Cytisus scoparius*), meadow knapweed (*Centaurea x moncktonii*), Himalayan blackberry (*Rubus armeniacus*), Canada thistle (*Cirsium arvense*), spotted knapweed (*Centaurea stoebe*), and tansy ragwort (*Senecio jacobaea*). Bull thistle (*Cirsium vulgare*) and common St. John's wort (*Hypericum perforatum*) were mapped at Clearwater facilities only, and giant knotweed (*Reynoutria sachalinensis*), medusahead rye (*Taeniatherum caput-medusae*), sulfur cinquefoil (*Potentilla Recta*), virginia creeper (*Parthenocissus quinquefolia*), and quackgrass (*Elymus repens*) were mapped at Toketee Reservoir facilities only. In addition to terrestrial weed species, one non-native and invasive aquatic plant species was documented within the Clearwater No. 2 forebay

and Toketee Reservoir (curly pondweed [*Potamogeton crispus*]); however, this species is not an ODA-listed noxious weed.

Of the species mapped at the Toketee Reservoir and Clearwater No. 2 forebay, high priority species for management include scotch broom, Himalayan blackberry, spotted knapweed, giant knotweed, and sulfur cinquefoil (AECOM 2021).

### 6.6.5 RARE, THREATENED, AND ENDANGERED SPECIES

A list of target rare, threatened, and endangered plant species with potential to be found in the area has been developed based on the current list of vascular plants documented or suspected to occur on the Umpqua National Forest in the Region 6 Regional Forester's Special Status Species List (USFS 2021). The Regional Forester's list includes all federally listed threatened or endangered species; Oregon Biodiversity Information Center (ORBIC)-ranked S1, S2, and S3 species; and ODA-ranked sensitive species. This list was then refined to include only those species likely to occur in the habitats and elevations in the proposed Pumped Storage Project development area, which resulted in a list of 23 species, shown in Table 6-14. Of the species listed in Table 6-14, only one, Thompson's mistmaiden (*Romanzoffia thompsonii*), was observed within the Clearwater No. 2 waterway alignment during 1992-1994 surveys, and no other species were observed within the remainder of the Clearwater No. 2 development or within or near the Toketee Reservoir. Therefore, although it is unlikely that any rare, threatened, or endangered species are located within the disturbance footprint for the proposed upgrades, PacifiCorp will perform rare plant surveys during the 2022 field season.

**TABLE 6-14 RARE, THREATENED AND ENDANGERED BOTANICAL SPECIES WITH POTENTIAL TO OCCUR IN CLEARWATER NO. 2 DEVELOPMENT AREA**

SCIENTIFIC NAME	COMMON NAME	STATUS			
		FEDERAL	USFS	ODA	ORBIC LIST
<i>Adiantum jordanii</i>	California maiden-hair	—	S	—	2
<i>Asplenium septentrionale</i>	Grass-fern	—	S	—	2
<i>Carex diandra</i>	Lesser panicled sedge	—	S	—	2
<i>Carex lasiocarpa</i>	Slender sedge	—	S	—	2
<i>Cypripedium fasciculatum</i>	Clustered lady's-slipper	—	S	SC	2
<i>Elatine brachysperma</i>	Short seeded waterwort	—	S	—	2
<i>Eriogonum villosissimum</i>	Acker Rock wild buckwheat	—	S	—	1

SCIENTIFIC NAME	COMMON NAME	STATUS			
		FEDERAL	USFS	ODA	ORBIC LIST
<i>Eucephalus vialis</i>	Wayside aster	–	S	ST	1
<i>Iliamna latibracteata</i>	California globe-mallow	–	S	–	1
<i>Kalmiopsis fragrans</i>	Fragrant kalmiopsis	–	S	SC	1
<i>Lewisia columbiana</i> var. <i>columbiana</i>	Columbia lewisia	–	S	–	2
<i>Lupinus oreganus</i>	Kincaid's lupine	FT	–	ST	1
<i>Ophioglossum pusillum</i>	Adder's-tongue	–	S	–	2
<i>Pellaea andromedifolia</i>	Coffee fern	–	S	–	2
<i>Poa rhizomata</i>	Timber bluegrass	–	S	–	2
<i>Polystichum californicum</i>	California sword-fern	–	S	–	2
<i>Romanzoffia thompsonii</i>	Thompson's mistmaiden	–	S	–	1
<i>Rotala ramosior</i>	Lowland toothcup	–	S	–	2
<i>Scheuchzeria palustris</i> ssp. <i>americana</i>	Scheuchzeria	–	S	–	2
<i>Schoenoplectus subterminalis</i>	Water clubrush	–	S	–	2
<i>Utricularia ochroleuca</i>	Northern bladderwort	–	S	–	2
<i>Wolffia borealis</i>	Dotted water-meal	–	S	–	2
<i>Wolffia columbiana</i>	Columbia water-meal	–	S	–	2

Source: USFS (2019).

FT = Federal Threatened; S = USFS Sensitive; ST = State Threatened; SC= State Candidate.

ORBIC List Rank:

1 = contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range.

2 = contains taxa that are threatened with extirpation or presumed to be extirpated from the state of Oregon; these are often peripheral or disjunct species which are of concern when considering species diversity within Oregon's borders.

There are five botanical species which are listed by either the Oregon Fish and Wildlife Commission or ODA under the Oregon Endangered Species Act or listed under the federal ESA as threatened and endangered and with the potential to occur on the Umpqua National Forest. Kincaid's lupine (*Lupinus oreganus*; federal and state – threatened), rough popcornflower (*Plagiobothrys hirtus*; federal and state – endangered), pumice grape-fern (*Botrychium pumicola*; state – threatened), Umpqua mariposa-lily (*Calochortus umpquaensis*; state – endangered), and wayside aster (*Eucephalus vialis*; state – threatened). These species are discussed in more detail below.

#### 6.6.5.1 KINCAID'S LUPINE

Kincaid's lupine is found in native grassland and upland prairie habitats, primarily in the Willamette Valley (USFWS 2021d). Kincaid's lupine is unlikely to occur in the predominantly

forested and disturbed habitat types where ground disturbance is proposed for the upgrades. This species was not observed within or near the Clearwater No. 2 or Toketee developments during 1992-1994 surveys, and it is unlikely to be present within the footprint of proposed disturbance due to lack of suitable habitat. PacifiCorp will perform rare plant surveys during the 2022 field season to confirm the absence of this species within the proposed upgrade area.

#### **6.6.5.2 ROUGH POPCORNFLOWER**

Rough popcornflower is found on the floodplains of interior Umpqua River valleys downstream of the steep river canyons of the proposed upgrade area (USFWS 2021e). Rough popcornflower is unlikely to occur in the predominantly forested and disturbed habitat types where ground disturbance is proposed. This species was not observed within or near the Clearwater No. 2 or Toketee developments during 1992 through 1994 surveys and is unlikely to be present within the footprint of proposed disturbance due to lack of suitable habitat. PacifiCorp will perform rare plant surveys during the 2022 field season to confirm the absence of this species within the proposed Pumped Storage Project area.

#### **6.6.5.3 PUMICE GRAPE-FERN**

Pumice grape-fern is found in loose, fine- to coarse-textured, volcanic soils in alpine and montane habitats at elevations ranging from 4,240 to 9,065 feet amsl (ODA 2022a). This habitat is not present within the proposed Pumped Storage Project area. This species was not observed within or near the Clearwater No. 2 or Toketee developments during 1992-1994 surveys and is unlikely to be present within the footprint of proposed disturbance due to lack of suitable habitat. PacifiCorp will perform rare plant surveys during the 2022 field season to confirm the absence of this species within the proposed Pumped Storage Project area.

#### **6.6.5.4 UMPQUA MARIPOSA-LILY**

The Umpqua mariposa-lily is largely restricted to serpentine-derived soils in the Umpqua River drainage, and its preferred habitat includes the ecotone between open, grassy hillsides and Jeffrey pine woodlands, although some populations are located within forested areas (ODA 2022). This species was originally discovered near Glide, Oregon, approximately 40 miles west of the proposed Pumped Storage Project area. This species was not observed within or near the Clearwater No. 2 or Toketee developments during 1992 through 1994 surveys and it is unlikely

to be present within the footprint of proposed disturbance due to lack of suitable habitat.

PacifiCorp will perform rare plant surveys during the 2022 field season to confirm the absence of this species within the proposed Pumped Storage Project area.

#### **6.6.5.5 WAYSIDE ASTER**

Wayside aster is found in a range of habitat types, including dense coniferous forests, open deciduous woodlands, grassy balds, and exposed serpentine slopes. An interagency Conservation Assessment was updated by USFS and BLM in 2005, and a Conservation Agreement among BLM, USFS, and USFWS was developed in 2006 (ODA 2013). The Conservation Agreement does not identify any known sites within the North Umpqua Project vicinity or on the Umpqua National Forest (BLM et al. 2006). Given the species general habitat preferences, suitable habitat does exist within the footprint of proposed disturbance. However, this species was not observed within or near the Clearwater No. 2 or Toketee developments during 1992 through 1994 surveys. PacifiCorp will perform rare plant surveys during the 2022 field season to confirm the absence of this species within the proposed Pumped Storage Project area.

#### **6.6.6 ENVIRONMENTAL EFFECTS**

Brushing and/or tree removal adjacent to existing access roads will be required to accommodate construction vehicle access. Local removal of trees and vegetation will be required for the forebay expansion, penstock extension, and pumphouse and intake/tailrace structure construction. The size and number of trees to be removed is unknown at this time, but the anticipated level of impact will affect upland habitat surrounding the Clearwater No. 2 forebay. Construction, operation, and maintenance of the facilities have the potential to spread noxious weeds through personnel, equipment, and vehicle vectors, but adherence to the requirements of the VMP will reduce these risks.

Pursuant to the Project Resource Coordination Plan and Condition No. 6 of the USFS's 4(e) terms and conditions to the Project License, PacifiCorp will submit a request for notice to proceed (NTP) with ground- and habitat-disturbing activities. The NTP request will include site-specific construction plans for review, comment, and/or approval.

The proposed Pumped Storage Project will comply with the requirements of the Project VMP, including provisions for noxious weed control and revegetation of areas disturbed by construction activities. More specifically, noxious weed control measures include pre-treatment of weeds in the construction zone, working toward infestations (instead of starting at and moving away from infestations) to prevent unintended spread of seed or viable vegetative parts, vehicle and equipment washing, and revegetation. The spoils pile will be seeded with native grass and forb species as directed by Forest Service.

## **6.7 HISTORICAL AND ARCHAEOLOGICAL RESOURCES**

Article 414 of the current Project License requires PacifiCorp to develop a historic properties management plan (HPMP) for the North Umpqua Project. Following license issuance in 2003, PacifiCorp, in consultation with the affected Tribes and agencies, finalized the HPMP and submitted it to FERC in December 2006<sup>7</sup>. The HPMP identifies the policies and procedures for identification, evaluation, and management of cultural resources within the North Umpqua Project area of potential effects (APE). The proposed action is partially within the North Umpqua Project APE as defined in the HPMP. The proposed Pumped Storage Project APE encompasses Toketee Reservoir, the intake and tailrace structures, penstock extension, and the proposed Clearwater No. 2 forebay expansion and associated spoil area (Figure 6-9). While the majority of the North Umpqua Project has been previously surveyed, the proposed Clearwater No. 2 forebay expansion and associated spoil area have not been previously surveyed for cultural resources.

### **6.7.1 PREVIOUSLY CONDUCTED ARCHAEOLOGICAL SURVEYS AND RESOURCES IN THE VICINITY**

A review of the Oregon Archaeological Records Remote Access (OARRA) database, using a 0.5-mile search buffer, along with information provided by the USFS and PacifiCorp found several previously recorded archaeological resources within the North Umpqua Project APE in the vicinity of the Pumped Storage Project. Archaeological resources overlapping the APE in the

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<sup>7</sup> As noted in FERC's correspondence of October 16, 2007 confirming receipt of the HPMP, neither the Project license, settlement agreement, or programmatic agreement require FERC approval of the HPMP.

vicinity of the Pumped Storage Project consist of two isolates, located adjacent to the inlet structure and one archaeological site located within the proposed Clearwater No. 2 forebay expansion area. There have been several previously conducted archaeological surveys that overlapped or partially overlapped the APE. However, most of these surveys were conducted over 15 years ago and likely did not closely examine the currently proposed Pumped Storage Project area.

The USFS previously conducted an archaeological survey to the east of the proposed Clearwater No. 2 forebay expansion. The USFS archaeologists did not identify any cultural materials in this area; however, USFS created an archaeological probability map that encompasses the Pumped Storage Project area. According to USFS' probability map, there is a high probability for archaeological resources to be present in the southeast portion of the proposed Pumped Storage Project forebay expansion and spoil deposit area. The proposed penstock expansion and the pumphouse with an intake/tailrace structure are considered to be within an area of low probability for archaeological resources.

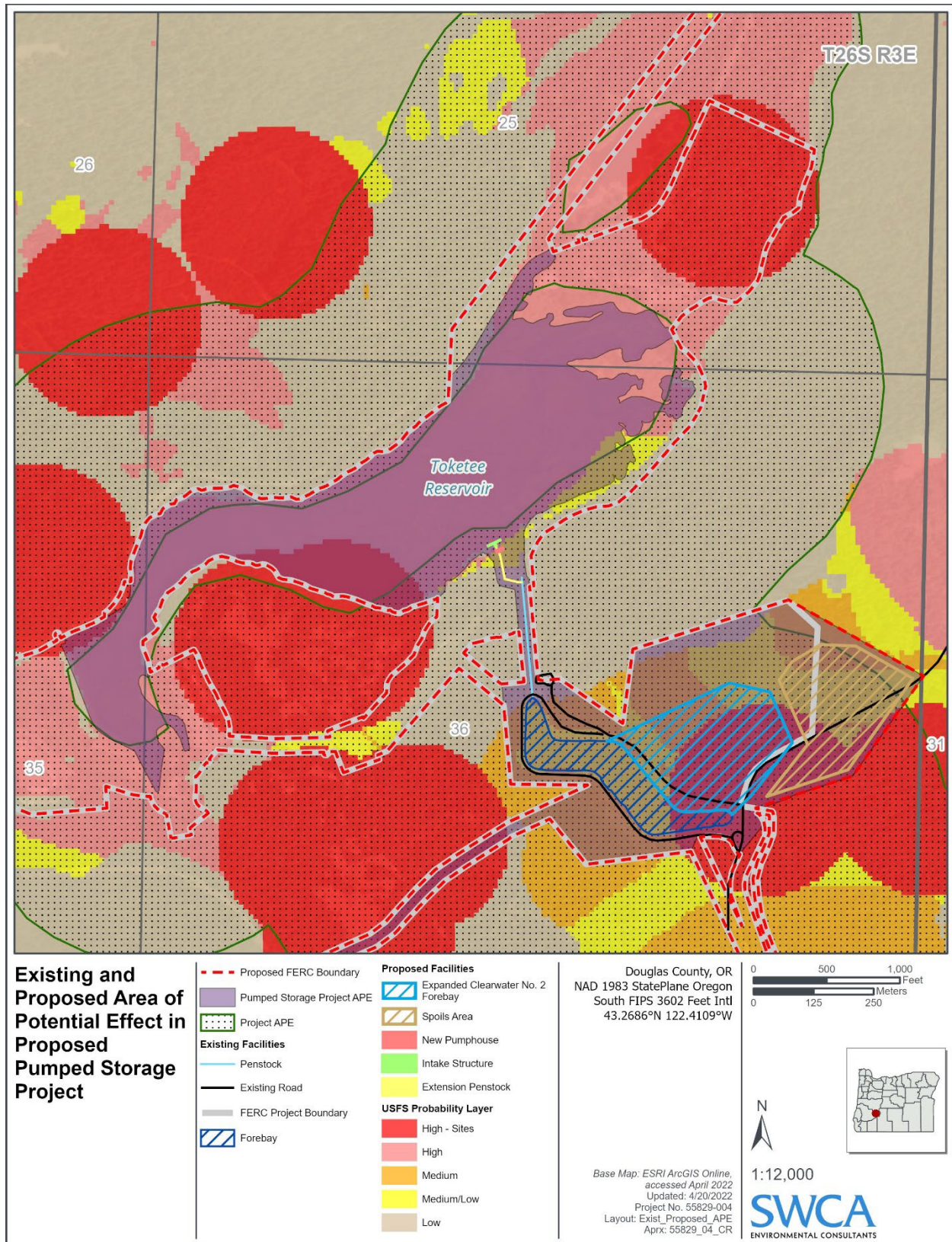
#### **6.7.2 TRIBAL RESOURCES IN THE VICINITY**

The Oregon State Legislative Commission on Indian Services has identified the following Native American Indian Tribes as being associated with the region where the Project is located:

- Confederated Tribes of Grande Ronde
- Confederated Tribes of Siletz Indians
- Cow Creek Band of Umpqua Tribe of Indians



**FIGURE 6-9 EXISTING AND PROPOSED AREA OF POTENTIAL EFFECT**



There are no Tribal lands within or immediately adjacent to the proposed Pumped Storage Project area. PacifiCorp is not currently aware of any Tribal cultural, economic, or resource interests that would be potentially affected by the proposed upgrade.

The proposed Pumped Storage Project would not result in affects to any known Tribal resources, including Traditional Cultural Properties. PacifiCorp will comply with the North Umpqua Project's HPMP for the protection and/or mitigation of known and heretofore undiscovered Tribal resources within the proposed Pumped Storage Project area.

### **6.7.3 HISTORICAL RESOURCES**

The entire North Umpqua Project, consisting of eight developments, two villages, a transmission system, and administrative facilities, is eligible for the NRHP under Criterion A due to its association with events that have made a significant contribution to the broad patterns of history (Table 6-15). Both the Clearwater No. 2 and Toketee Developments contribute to the NRHP-eligibility of the North Umpqua Project. Clearwater No. 2 Development consists of the powerplant, substation, dam, waterways (flumes and canals), forebay and the gate house, penstock, and switchyard, all of which are contributing resources to the Project's NRHP-Eligibility. The only Toketee component relevant to the Pumped Storage Project is the dam, which is a contributing resource to the NRHP-eligibility of the North Umpqua Project.

### **6.7.4 PREVIOUS HISTORIC INVESTIGATIONS IN THE VICINITY**

In 1993, PacifiCorp commissioned the Oregon State Museum of Anthropology at the University of Oregon to conduct a survey of 12 historic "developments," or groups of associated structures, in the North Umpqua Project vicinity (EDAW 2008). The developments consisted of eight hydroelectric power generation facilities, a transmission line system, employee housing, and administration buildings. Each development was recommended eligible for the NRHP under Criterion A for its association with the growth and expansion of the North Umpqua Project, which was of major importance to Douglas County history in the decades immediately following World War II. A list of significant historic buildings and structures in the North Umpqua Project

is provided in Table 6-15. Only the Toketee Development and Clearwater No. 2 Development are in the Pumped Storage Project APE.

**TABLE 6-15 HISTORIC BUILDINGS AND STRUCTURES IN THE NORTH UMPQUA PROJECT VICINITY**

HYDRO FACILITIES	THEME	INTEGRITY/ SIGNIFICANCE	STATUS
Toketee Development	Industry/Manufacturing	High/High	Determination of Eligibility
Slide Creek Development	Industry/Manufacturing	High/High	Determination of Eligibility
Soda Springs Development	Industry/Manufacturing	High/High	Determination of Eligibility
Fish Creek Development	Industry/Manufacturing	High/High	Determination of Eligibility
Clearwater No. 1 Development	Industry/Manufacturing	High/High	Determination of Eligibility
Clearwater No. 2 Development	Industry/Manufacturing	High/High	Determination of Eligibility
Lemolo No. 1 Development	Industry/Manufacturing	High/High	Determination of Eligibility
Lemolo No. 2 Development	Industry/Manufacturing	High/High	Determination of Eligibility
Toketee Village	Industry/Manufacturing	High/High	Determination of Eligibility
Clearwater Village - Housing	Industry/Manufacturing	Medium/Medium	Determination of Eligibility
Clearwater Operations Center and Guest House	Industry/Manufacturing	Medium/Medium	Determination of Eligibility
Transmission Lines	Industry/Manufacturing	Medium/High	Determination of Eligibility

### 6.7.5 ENVIRONMENTAL EFFECTS

The proposed Pumped Storage Project has the potential to affect previously unidentified archaeological resources as a result of ground-disturbing activities. As described in more detail in Section 7.6, PacifiCorp plans to conduct an archaeological survey in the proposed Pumped Storage Project area, including the forebay expansion and spoil disposal areas to determine if archaeological resources are present.

The proposed Pumped Storage Project has the potential to adversely affect the historic character-defining features of the Clearwater No. 2 and Toketee Developments. The proposed Pumped Storage Project would alter the Clearwater No. 2 penstock and forebay, which are contributing resources of the Clearwater No. 2 Development as outlined in the Historic Structures Plan (HSP), a component of the HPMP for the North Umpqua Project (EDAW 2008). The HSP specifies categories of actions that may be considered adverse, and these include proposed actions that would alter primary and supporting facilities to accommodate new equipment and proposed actions that may change the character of the property's physical features and setting, which contribute to its historic significance (EDAW 2008). Using the HPMP and HSP as guidance documents and as described in more detail in Section 7.6, PacifiCorp will conduct an evaluation of the proposed Pumped Storage Project's potential effects to historic structures.

## **6.8 RECREATIONAL RESOURCES**

### **6.8.1 CLEARWATER NO. 2 RECREATION SITES**

The Clearwater No. 2 forebay is above the Clearwater No. 2 powerplant and has a Forest Camp located south of the forebay that provides dispersed camping sites and a recently installed vault toilet for the public (PacifiCorp 2004c). Additionally, a picnic area and viewpoint providing a view of the North Umpqua River valley encompassing Toketee Reservoir is located at the end of Forest Service Road No. 4776201 at the northwest end of the Clearwater No. 2 forebay (PacifiCorp 2004c).

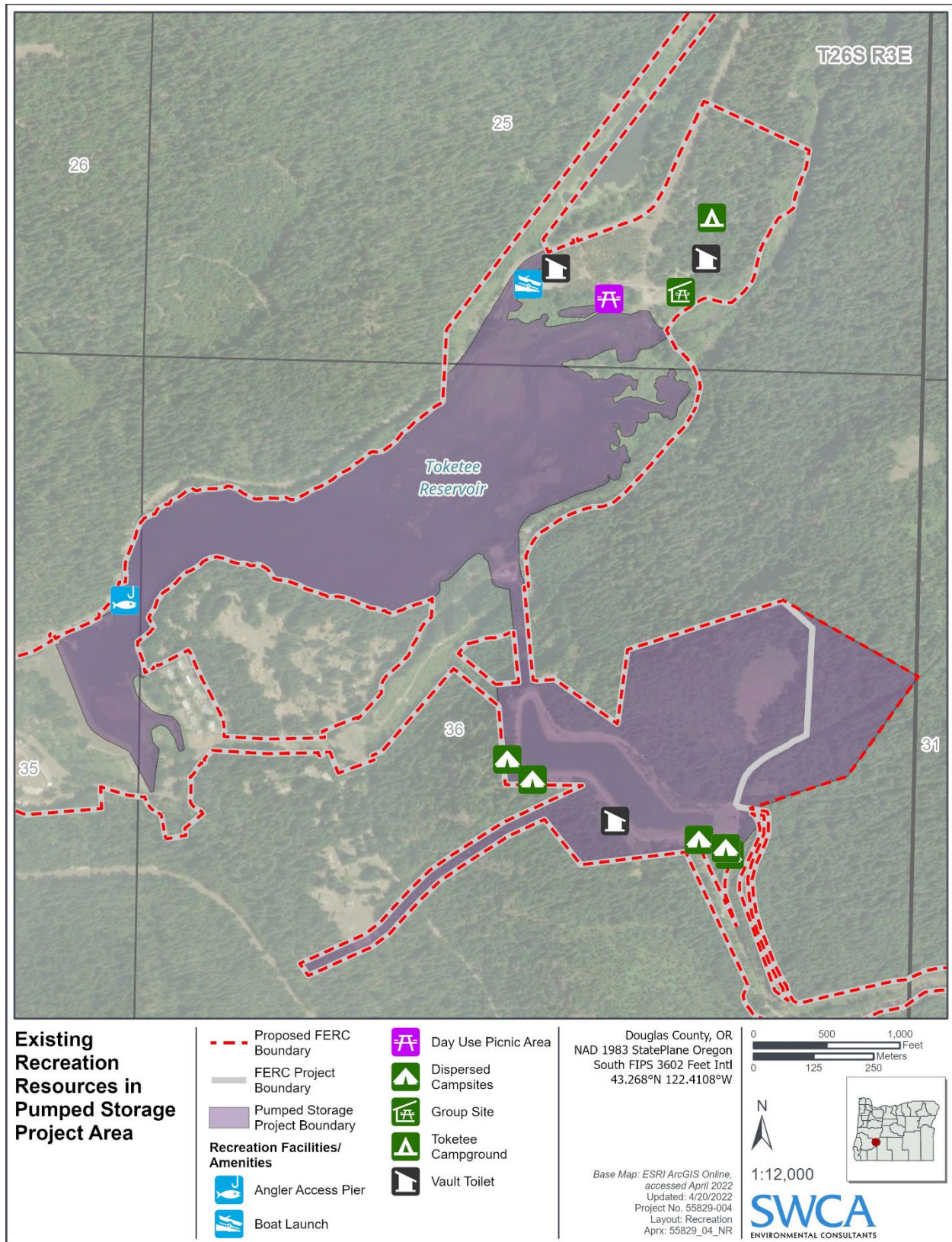
### **6.8.2 TOKETEE RECREATION SITES**

Toketee Reservoir, located on USFS land, provides various recreation opportunities including camping, fishing, boating, canoeing, swimming, hiking, and wildlife viewing (Figure 6-10). Toketee Reservoir receives discharged flows from Clearwater No. 2 powerplant, located on the south bank of the reservoir, and supports a population of game fish, including brown and rainbow trout, which attracts anglers to the reservoir year-round. The reservoir also provides wildlife viewing opportunities, as it attracts a large variety of wildlife, such as beaver, otter, great blue heron, kingfishers, ducks, geese, and bald eagle. The Toketee Lake Campground, which is operated by USFS, is located approximately 0.4 miles to the northwest of Clearwater No. 2 powerplant. The campground includes 33 campsites and one boat ramp. Hiking trails near

Clearwater No. 2 powerplant include the Toketee Lake Trail, the North Umpqua Trail, and the Toketee Falls Trail. The North Umpqua Trail also provides access to biking and horseback riding. A Toketee Lake Trail parking area is located immediately east of the Clearwater No. 2 powerplant. There are also two waterfalls within an approximately 5-minute drive from the campgrounds: Watson Falls and Toketee Falls. Other amenities include Americans with Disabilities Act (ADA) accessible parking, a boat ramp, a day use area, lake access, various trailheads, trash collection, vault toilets, a picnic table, and grills/fire rings.



**FIGURE 6-10 EXISTING RECREATION IN PUMPED STORAGE PROJECT AREA**



### **6.8.3 RECREATION RESOURCE MANAGEMENT PLAN**

In 2001, a Settlement Agreement for the North Umpqua Project (2001) was established between PacifiCorp and the USFS, among other agencies that, in part, stated that PacifiCorp would provide appropriate resources to meet existing and future recreation needs. The USFS was identified to have shared responsibility for the management of recreation resources due to the North Umpqua Project being located within National Forest System lands managed by the Umpqua National Forest. The Settlement Agreement stated that PacifiCorp would fund USFS for recreation operations, maintenance, and capital improvements at recreation sites located on USFS lands, the details of which are found in the Recreation Resource Management Plan (RRMP). PacifiCorp continues to provide funding to the USFS to manage recreation areas associated with the North Umpqua Project.

The RRMP serves as an implementation guide to plan, design, construct, renovate, monitor, fund, operate, and maintain existing and future public recreation facilities and programs (PacifiCorp 2004c). The roles and responsibilities of relevant parties in the execution of the programs identified above are defined in the RRMP. The National Forest System lands occupied by the proposed Pumped Storage Project area are subject to the Land and Resource Management Plan for the Umpqua National Forest (Umpqua LRMP) (USDA 1990). The Umpqua LRMP includes goals, objectives, and management direction that applies to recreational uses of the Umpqua National Forest. The Umpqua LRMP includes a recreation goal to “provide a broad spectrum of dispersed and developed recreation opportunities to all segments of society” (USDA 1990). Because most of the Clearwater No. 2 facilities already exist, the proposed Pumped Storage Project would represent a minor impact to recreation in the National Forest and would be consistent with the Umpqua LRMP’s recreation goal.

### **6.8.4 ENVIRONMENTAL EFFECTS**

Recreational activities on Toketee Reservoir and in the vicinity of Clearwater No. 2 forebay would be affected during construction of the proposed Pumped Storage Project by noise, vehicles, construction activities, and the presence and activities of workers and equipment. Post-construction recreation, including developed and undeveloped sites for non-water-contact opportunities and public access, will remain unchanged in the vicinity of Toketee Reservoir.

The Clearwater No. 2 forebay may be subject to an increase in the number and frequency of ramping events as water is pumped to and drawn from the storage reservoir. Toketee Reservoir may also be subject to an increase in the number and frequency of reservoir elevation changes in a given day as water is exchanged between the two developments for the operation of the proposed Pumped Storage Project. These fluctuations between the two developments may have a minor impact to water-based recreational opportunities (e.g., fishing, boating) on Toketee Reservoir as a result of impediments to access at the boat launch. Water access to and from Toketee boat ramp is currently limited by sedimentation of the channel to the boat ramp. USFS is currently conducting a preliminary evaluation to identify options for relocating the boat ramp to alleviate the impacts of sedimentation in the current boat ramp channel. Water surface elevation fluctuations may also impact aesthetics associated with Toketee Reservoir by exposing the unvegetated banks during drawdown cycles.

Water-contact recreation at the Clearwater No. 2 forebay is rare and is not encouraged because of cold water temperatures and swift currents. There are signs near the outlet of Clearwater waterway and near the inlet of Clearwater penstock that read:

CAUTION  
SWIFT CURRENT NEAR  
THIS STRUCTURE MAY  
TRAP BOATS OR  
SWIMMERS AT ANY TIME  
STAY CLEAR

Clearwater No. 2 forebay supports a minor recreational fishery for brook trout. The forebay has been stocked at times by ODFW with catchable rainbow trout, but such stocking has been discontinued due to limited recreational value and observed mortality of stocked fish that pass through the turbine. Fish residency in the forebay is likely influenced by water level fluctuations (in particular, low water levels), emigration via the upstream waterway or entrainment into the penstock, and mortality, primarily due to recreational harvest and predation. These conditions will remain unchanged or be diminished since the proposed Pumped Storage Project may lead to additional fluctuations and increased amplitudes of water surface elevations resulting in diminished fishery values. The expansion of the forebay at Clearwater No. 2 will additionally



increase fish habitat due to a larger forebay area; however, as noted above, Clearwater No. 2 forebay fluctuations may impact the fishery in general.

There are five identified dispersed camp sites on the south end of the existing Clearwater No. 2 forebay, which could be impacted if the forebay berm is expanded and/or reinforced. Other undeveloped recreational opportunities in the area north of the forebay would be affected by forebay expansion and the placement of excavated material adjacent to the expanded forebay. Dispersed camping in the same area may also be affected by changes in the aesthetics of the area due to the forebay expansion and the placement of excavated material adjacent to the expanded forebay.

## **6.9 LAND USE**

All hydroelectric generation facilities for the North Umpqua Project, as well as the eastern portions of transmission lines 39 and 46, are located on lands administered by the USFS. The western portions of the transmission lines, from the Umpqua National Forest west to the town of Glide, are located on a patchwork of private and BLM-administered public lands. Since the proposed Pumped Storage Project is located exclusively on National Forest System lands, the management of the Project must comply with the standards and guidelines of the National Forest Management Act and the Umpqua National Forest Land and Resource Management Plan.

According to the Umpqua LRMP, the Pumped Storage Project is within lands designated as Management Area 11. The focus of Management Area 11 is to “provide big game winter range habitat and timber production consistent with other resource objectives for wildlife habitat, riparian habitat and water quality, visual quality, and recreation” (USDA 1990).

The Pumped Storage Project is located entirely within Douglas County, Oregon. Clearwater No. 2 forebay is in an area zoned as Timberland Resource (TR) under Douglas County’s Land Use and Development Ordinance (LUDO). As described in LUDO Article 2, Section 3.2.000, the TR zoning classification is intended to conserve and protect lands for continued timber production, harvesting, and related uses; conserve and protect watersheds, wildlife habitats, and other such uses associated with forests; and to provide for the orderly development of both public and private recreational uses as appropriate and not in conflict with the primary intent of the zone, which is sustained production of forest products. The Douglas County Comprehensive

Management Plan acknowledges that hydroelectric power generation in the county occurs on the upper North Umpqua River in the Toketee area (Douglas County Planning Department 2017).

### **6.9.1 ENVIRONMENTAL EFFECTS**

The proposed intake structure, pumphouse, penstock extension, forebay expansion, and spoil placement would constitute an impact to wildlife habitat, visual quality, and recreation. However, the proposed Pumped Storage Project upgrade would be consistent with the management focus of Management Area 11. The proposed modifications to existing Clearwater No. 2 and Toketee facilities would be consistent with the conditional uses allowed in the TR zoning classification and would be consistent with the Douglas County Comprehensive Management Plan's support for hydroelectric energy sources.

### **6.10 AESTHETIC RESOURCES**

PacifiCorp developed and implemented an Aesthetics Management Plan (AMP) in 2004 which addresses aesthetics and visual resources in and around Project-related facilities and sensitive viewpoints. The AMP cites goals for managing aesthetics/visual resources, identifies actions, and describes activities designed for implementation. The activities identified in the AMP have been implemented throughout the current license term. The AMP includes seven program activities:

- Aesthetics Management Guidelines
- Photo-Simulation/Painting
- Landscaping Buffers
- Transmission Line Visibility
- In-stream Flows
- Reservoir Pool Levels
- Reporting

The Umpqua LRMP includes a visual resource goal to “[m]anage Forest landscapes for their scenic values commensurate with other resource values” (USDA 1990). Existing facilities associated with the Pumped Storage Project and affecting aesthetic resources in the Umpqua National Forest landscape include:

- The Toketee embankment dam impounding the 1,051-acre-foot Toketee Reservoir
- The Clearwater No. 2 powerplant, which is a reinforced concrete structure that houses a single turbine generator
- The penstock, which currently extends 1,169 feet from the forebay to the Clearwater No. 2 powerplant
- The forebay, which is an open excavated reservoir with an embankment levee on the downhill side and with a compacted clay liner

#### **6.10.1 ENVIRONMENTAL EFFECTS**

Impacts to aesthetic resources of the Umpqua National Forest landscape from the Pumped Storage Project would include the intake structure, pumphouse, above-ground<sup>8</sup> portions of the penstock extension, expanded forebay, spoils disposal area adjacent to the forebay expansion. Visible Clearwater No. 2 facilities would be in conformance with USFS aesthetic requirements. The forebay expansion would create a larger forebay area and require removal of trees and placement of excavated soils (spoils) in the area adjacent to the forebay. Because the aesthetic resources of the forest landscape are already affected by the Clearwater No. 2 facilities listed above, the proposed upgrade would represent a minor impact to aesthetic resources.

### **6.11 SOCIOECONOMIC RESOURCES**

The Project is located on USFS land in Douglas County, Oregon. In 2020 Douglas County had a population of approximately 111,201 persons and 45,456 households. Median household income in 2020 was \$47,267 and the percentage of persons in poverty was 13.3% (U.S. Census Bureau 2022).

#### **6.11.1 ENVIRONMENTAL EFFECTS**

Construction spending and jobs associated with the Pumped Storage Project would have a short-term influence on the local labor market during construction of the proposed upgrade. Operation

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<sup>8</sup> Most of the penstock extension will be buried below-grade, though the penstock extension will daylight south of the 4776100 road near its connection to the existing penstock behind the Clearwater No. 2 powerplant.

and maintenance of the Pumped Storage Project is unlikely to require additional jobs, as the existing Project staff will be used to operate and maintain the pumped storage facilities.

The fuel (i.e., water) stored and power generated by the proposed upgrade would offset negative impacts associated with non-renewable energy sources and ameliorate the temporal effects of variable fuel supply (e.g., sun, wind) associated with other renewable resource technologies as that are increasingly deployed for generation of electricity.

No unavoidable adverse impacts to socioeconomic resources are anticipated, and PacifiCorp does not propose any measures with respect to these resources.

## 7.0 PROPOSED STUDIES AND PROTECTION, MITIGATION, AND ENHANCEMENT MEASURES

18 CFR § 4.38(b)(2)(vii) requires detailed descriptions of any proposed studies and the proposed methodologies (PM&E) to be employed. PacifiCorp's proposed studies and protection, mitigation, and enhancement measures are outlined in Table 7-1. Unless otherwise noted, PacifiCorp plans to conduct the identified studies in 2022 following additional scoping and study planning pursuant to the three-stage consultation process (see Section 2.1).

**TABLE 7-1 PROPOSED STUDIES AND PM&E MEASURES**

RESOURCE AREA	STUDIES OR PM&Es*
Geology and Soils	Geologic Mapping and Geotechnical Reconnaissance
Geology and Soils	Geophysical Surveys
Geology and Soils	Subsurface Geotechnical Exploration
Geology and Soils	Construction Erosion and Sediment Control Plan*
Geology and Soils	North Umpqua Project Erosion and Sediment Control Plan Implementation*
Water Quality	Water Quality Monitoring
Water Quality	Water Temperature Modelling
Fisheries/Aquatic Resources	Additional Funding of Hatchery Production*
Fisheries/Aquatic Resources	Fish Monitoring
Fisheries/Aquatic Resources	Fish and Macroinvertebrate Sampling
Fisheries/Aquatic Resources	Fish Spawning Surveys
Wildlife	Elk Forage Plot Creation*
Wildlife	North Umpqua Project Sensitive Species Plan Implementation*
Wildlife	ESA Consultation with FWS
Wildlife and Botanical	Sensitive Species Surveys
Botanical	Timber Cruise and Tree Survey
Botanical	Botanical Surveys
Botanical	Wetland Delineation
Botanical	North Umpqua Project Vegetation Management Plan Implementation*
Historic and Archaeological	Archaeological Resources Survey

RESOURCE AREA	STUDIES OR PM&Es*
Historic and Archaeological	Cultural Resources Assessment*
Historic and Archaeological	North Umpqua Project Historic Properties Management Plan Implementation*
Recreation	North Umpqua Project Recreation Resource Management Plan Implementation*
Land Use/Aesthetics	Photo Simulations Study
Land Use/Aesthetics	Use of Approved Color Palette*
Land Use/Aesthetics	North Umpqua Project Aesthetics Management Plan Implementation*

Note: PM&E measures have been identified with a \*.

## 7.1 GEOLOGY AND SOILS

PacifiCorp plans to perform a geotechnical investigation program to inform the design of the proposed upgrade. The subsurface investigations include geotechnical borings and wetland delineation soil pits. Geotechnical investigations are planned to collect subsurface information, including depth to water and the type, depth, stability, strength, and rippability of geologic formations, within the proposed upgrade area. The geotechnical investigation will include three phases, which are further described below:

- Detailed geologic mapping and site reconnaissance
- Non-invasive, geophysical survey along the alignment
- Subsurface drilling

### 7.1.1 DETAILED GEOLOGIC MAPPING AND SITE RECONNAISSANCE

Detailed geologic mapping will be conducted at 1:500 scale for the analysis area. The mapping will focus on determining the qualities (e.g., rock type, weathering, strength, etc.) of rocks exposed at the surface and slope stability (e.g., landslides, rock falls, seepage, etc.). Depending on the results of the mapping, it may be appropriate to recommend instrumentation for landslide identification and mitigation (e.g., shape array accelerometers installed in boreholes).

### 7.1.2 GEOPHYSICAL SURVEYS

A surface geophysical survey will be completed to provide a continuous profile of subsurface conditions within the Pumped Storage Project area. The surveys will be completed with either

Seismic Reflection or Electrical Resistivity methods depending on the results of the site reconnaissance. The geophysical results will be supplemented with the subsurface drilling program, which may be modified depending on the geophysical results.

Electrical resistivity measures subsurface electrical properties related to lithologic variations. Fine-grained materials have lower electrical resistivities than coarse sands and resistant bedrock. This method may be disrupted by nearby utilities and powerlines. Seismic reflection consists of measuring the travel time of compressional or shear wave that are generated at the surface, into the ground, and back up to the surface. The amount of energy reflected is proportional to the contrast in velocity. This method is best to determine depth to bedrock or landslide plane when electrical resistivity is not viable.

### **7.1.3 SUBSURFACE EXPLORATION**

The subsurface exploration program will include, but not be limited to, test pits and borings drilled via hollow stem auger, rotary wash, rock coring, or other method as needed based upon the expected subsurface conditions. Subsurface exploration locations will include conceptual sites of the proposed improvements (a geotechnical plan is currently under development and will be submitted to FERC's Portland Regional Office for review and concurrence).

Each test pit will disturb an approximately 10-foot by 10-foot area inside of an approximately 30-foot by 20-foot work zone. The excavated material will be replaced back into the test pit, tamped with the excavator bucket to limit future settlement, and the area will be returned to near-original condition after the observation.

Each boring will disturb an approximately 1-foot-diameter area within an approximately 20-foot by 20-foot work zone. The boreholes will be tremie-grouted from the bottom of the hole to the ground surface with cement bentonite grout. Grout will be non-shrink to prevent future seepage due to shrinkage or cracking between the cured grout and the borehole. Boreholes will not be grouted until the engineer has given approval for the grouting. If vibrating wire piezometers or shape array accelerometers are to be installed in a borehole, they will be grouted in place as per state and local standards. The work area beneath the drill rig will be covered in plastic if conditions are safe (e.g., not during precipitation, which could contribute to slip hazards) and will be returned to near-original condition after drilling. Cuttings and drilling fluid resulting from

drilling operations will be contained, hauled out, and disposed of at an off-Umpqua National Forest, approved, upland disposal site. The geotechnical drilling will be completed by an as-yet-undetermined contractor with supervision from PacifiCorp's engineering contractor, WSP, Inc.

#### 7.1.4 REPORTING, PERMITTING, AND COMPLIANCE

PacifiCorp will document results of all geotechnical surveys in reports and/or memos. As part of protection, mitigation, and enhancement measures, PacifiCorp will prepare an erosion and sediment control plan for permitting of construction impacts and mitigation of effects on soil resources. The proposed amendments will be subject to the existing Project Erosion Control Plan (2004). The Erosion Control Plan was put in place to manage geologic and soils resources associated with the Project over the term of the current license. The Erosion Control Plan cites goals for managing erosion in the Project vicinity, identifies proposed measures for existing erosion features, and describes programs designed to implement those measures. More specifically, the Erosion Control Plan is an implementation guide to plan, design, construct, monitor, and maintain erosion mitigation measures in the Project vicinity. PacifiCorp has maintained compliance with the terms of the Erosion Control Plan during the current license period. Pursuant to the Project Resource Coordination Plan and Condition No. 6 of the USFS's 4(e) terms and conditions to the Project License (License Appendix B), PacifiCorp will submit a request for NTP with ground- and habitat-disturbing activities. The NTP request will include site-specific construction plans for review, comment, and/or approval.

A summary of the proposed studies and PM&E measures for geology and soils are listed below in Table 7-2:

**TABLE 7-2 GEOLOGY AND SOILS PROPOSED STUDIES AND PM&E MEASURES**

RESOURCE AREA	STUDIES OR PM&Es
Geology and Soils	Geologic Mapping and Geotechnical Reconnaissance
Geology and Soils	Geophysical Surveys
Geology and Soils	Subsurface Geotechnical Exploration
Geology and Soils	Construction Erosion and Sediment Control Plan*

Note: PM&E measures have been identified with a \*.



## 7.2 WATER QUALITY

PacifiCorp will monitor water quality in the pre-action and post-action periods to document baseline conditions, inform water temperature modeling, and evaluate Pumped Storage Project impacts with before/after analysis. As of July 2021, PacifiCorp has initiated periodic water quality monitoring within waters potentially affected by the proposed action. Water quality monitoring is proposed to be expanded and encompass June through September with emphasis on the warmest periods during July through August, when the potential for water quality impacts is greatest. Monitoring is proposed for one year prior to project implementation and will be repeated during the first calendar year following commissioning of the pumped storage system. Protocols and parameters will be consistent during pre-project and post-project monitoring to allow for direct comparisons of results. Pre-project and post-project water quality data, as well as the water temperature model, will be used to assess any direct and indirect impacts of the pumped storage project on water quality. Pending the results of water quality monitoring, PacifiCorp will adaptively manage pumped storage operations to ensure that water quality remains within state criteria.

Water quality monitoring sites will include the Toketee Reservoir upstream from the Clearwater No. 2 tailrace, Clearwater No. 2 forebay, Clearwater No. 2 tailrace, Clearwater No. 2 proposed pump intake on Toketee Reservoir, Toketee Reservoir outlet and downstream of the Project at the Soda Springs water quality monitoring facility.

Monitoring parameters include water temperature (WT), dissolved oxygen (DO), specific conductance (SpC), pH, TDG where appropriate, and turbidity (NTU, at some sites) (Table 7-3). Equipment will be maintained and calibrated per manufacturer's specifications and measurements will be made with a goal of attaining Level A or B Data Quality (DEQ 2009). During spot checks, measurements will be recorded when parameters have stabilized, and typically during the afternoon to document warm conditions. For remote logging deployments, measurements will be recorded hourly and field-audited bi-weekly. Equipment will include TidBit temperature loggers and YSI and Eureka datasondes.

**TABLE 7-3 SUMMARY OF WATER QUALITY MONITORING PLANNED FOR EVALUATION OF IMPACTS RELATED TO THE PUMPED STORAGE PROJECT**

SITE	PURPOSE	DEPTH	PARAMETERS	MONTH	FREQUENCY	PROPOSED METHOD AND DEVICE
<b>Clearwater 2 forebay at the inlet to the forebay</b>	Water quality monitoring	Near bottom	WT, DO, SpC, pH, TDG	JUN, JUL, AUG, SEP	Bi-weekly	Hand-held datasonde
	Water temperature modeling	Near bottom	WT	JUN, JUL, AUG, SEP	Hourly	Remote-logging thermograph
<b>Clearwater 2 forebay outlet to the penstock</b>	Water quality monitoring	vertical profile at 1-meter increments	WT, DO, SpC, pH, TDG	JUN, JUL, AUG, SEP	Bi-weekly	Hand-held datasonde
	Water temperature modeling	Surface, 3 meters, 6 meters	WT	JUN, JUL, AUG, SEP	Hourly	Remote-logging thermographs
<b>Clearwater 2 powerplant tailrace</b>	Water quality monitoring	Near bottom	WT, DO, SpC, pH, TDG, NTU	JUN, JUL, AUG, SEP	Hourly	Remote-logging datasonde
	Field audit	Near bottom	WT, DO, SpC, pH, TDG, NTU	JUN, JUL, AUG, SEP	Bi-weekly	Hand-held datasonde
	Water temperature modeling	Surface, near bottom	WT	JUN, JUL, AUG, SEP	Hourly	Remote-logging thermographs
<b>Clearwater 2 proposed pump intake area of Toketee Reservoir</b>	Water quality monitoring	Near bottom	WT, DO, SpC, pH, TDG	JUN, JUL, AUG, SEP	Hourly	Remote-logging datasonde
	Field audit	Near bottom	WT, DO, SpC, pH, TDG	JUN, JUL, AUG, SEP	Bi-weekly	Hand-held datasonde
	Water temperature modeling	Surface, near bottom	WT	JUN, JUL, AUG, SEP	Hourly	Remote-logging thermographs
<b>Toketee Reservoir outlet</b>	Water quality monitoring	3 meters	WT, DO, SpC, pH, TDG	JUN, JUL, AUG, SEP	Hourly	Remote-logging datasonde
	Field audit	Vertical profile at 1-meter increments	WT, DO, SpC, pH, TDG	JUN, JUL, AUG, SEP	Bi-weekly	Hand-held datasonde

SITE	PURPOSE	DEPTH	PARAMETERS	MONTH	FREQUENCY	PROPOSED METHOD AND DEVICE
	Water temperature modeling	Surface, 3 meters, 6 meters	WT	JUN, JUL, AUG, SEP	Hourly	Remote-logging thermographs
<b>North Umpqua River downstream of the Project at the Soda Springs water quality monitoring station</b>	Water quality monitoring	Near bottom	WT, DO, SpC, pH, NTU	Year-round	30-minutes	Remote-logging datasonde, USGS telemetry

Note: Parameters Include: Water Temperature (WT), Dissolved Oxygen (DO), Specific Conductance (SpC), pH (pH), Total Dissolved Gas Pressure (TDG), and Turbidity (NTU)

At the Toketee outlet site, a remote-logging datasonde will be suspended from the surface at a fixed depth of 6 meters to represent the primary withdrawal depth (which may vary with flow and water level fluctuations). At river sites, datasondes will be deployed near the riverbed where they are more stable. During field audits, independent measurements will be taken near each deployed datasonde, and at sites deeper than 3 meters vertical profiles will be measured at 1-meter depth intervals to document any stratification. At sites monitoring only water temperature, thermographs will be deployed to measure representative conditions in shallow flowing water and the range of conditions (near surface and near bottom) at sites deeper than 3 meters.

PacifiCorp will provide a brief technical report of monitoring methods, results, and trends (if any) to the consulting parties by January 31 following each year of pre-project period monitoring. PacifiCorp may modify the monitoring locations, periods, and/or methods in consultation with the consulting parties.

A summary of the proposed studies and PM&E measures for water quality are listed below in Table 7-4:

**TABLE 7-4 WATER QUALITY PROPOSED STUDIES AND PM&E MEASURES**

RESOURCE AREA	STUDIES OR PM&ES
Water Quality	Water Quality Monitoring
Water Quality	Water Temperature Modelling

Note: PM&E measures have been identified with a \*.

### 7.3 FISHERIES AND AQUATIC RESOURCES

The proposed Pumped Storage Project operations will adhere to existing minimum flow, impoundment operating range, and ramping rate restrictions of the North Umpqua Project license, as those were determined to be protective of fisheries resources. Similarly, the existing fish screen at the Toketee waterway intake and the new fish screen, designed to the same standards as the Toketee waterway intake screen, at the proposed pump intake will be operated and maintained to preclude entrainment of adult fish from Toketee Reservoir.

PacifiCorp proposes to mitigate potential entrainment and mortality of fish in the pumped storage system through funding ODFW for the annual hatchery production of 108 rainbow trout. PacifiCorp currently funds ODFW for the annual hatchery production of 15,000 catchable trout at 3 trout per pound or 5,000 pounds pursuant to SA Section 9.1. Therefore, PacifiCorp will provide funding for an additional 36 pounds (108 trout) of trout to be stocked within Toketee Reservoir for a total annual funding of hatchery production of 5,036 pounds or 15,108 catchable rainbow trout.

PacifiCorp will sample fish and macroinvertebrate populations in the areas potentially affected by the proposed action, to document baseline conditions and evaluate potential impacts. Sampling will occur once each during June and August 2022, and during June and August of the first year following construction and commissioning of the proposed Pumped Storage Project. In addition, PacifiCorp will survey the potentially affected areas bi-weekly for spawning rainbow trout during May and June and for spawning brook and brown trout during October and November of 2022, and during the first year following project commissioning.

Sites will include the Toketee Reservoir upstream from the Clearwater No. 2 tailrace, Clearwater No. 2 forebay inlet, outlet and mid-forebay, Clearwater No. 2 tailrace, Clearwater No. 2 proposed pump intake, and the Toketee Reservoir outlet, and the methods will be tailored to site conditions and consistent with those used in 2021 (Table 7-5).

**TABLE 7-5 SUMMARY OF FISHERY AND AQUATIC HABITAT MONITORING PROPOSED FOR EVALUATION OF IMPACTS RELATED TO PUMPED STORAGE PROJECT AT THE CLEARWATER NO. 2 POWERPLANT**

SITE	PURPOSE	DEPTH	PARAMETERS	MONTH	FREQUENCY	POTENTIAL METHOD(S)
<b>Toketee Reservoir upstream from the Clearwater 2 powerplant tailrace (upper-reservoir)</b>	Describe fish population	All	Fish species and relative abundance	JUN, AUG	Monthly	Boat electroshocking, angling, observation
	Habitat characterization	Bottom	Substrate, macrophytes, benthos	JUN	Once	Observation, raking, Ponar dredge
	Check for spawning use	Bottom	Fish presence	MAY, JUN, OCT, NOV	Bi-weekly	Direct observation (for rainbow trout in spring, brook, and brown trout in fall)
<b>Clearwater 2 forebay (inlet, outlet, representative mid-forebay areas)</b>	Describe fish population	All	Fish species and relative abundance	JUN, AUG	Monthly	Boat electroshocking, angling, observation
	Habitat characterization	Bottom	Substrate, macrophytes, benthos	JUN	Once	Observation, raking, Ponar dredge
	Check for spawning use	Bottom	Fish presence	MAY, JUN, OCT, NOV	Bi-weekly	Direct observation (for rainbow trout in spring, brook, and brown trout in fall)
<b>Clearwater 2 tailrace</b>	Describe fish population	All	Fish species and relative abundance	JUN, AUG	Monthly	Boat electroshocking, angling, observation
	Habitat characterization	Bottom	Substrate, macrophytes, benthos	JUN	Once	Observation, raking, Ponar dredge
	Check for spawning use	Bottom	Fish presence	MAY, JUN, OCT, NOV	Bi-weekly	Direct observation (for rainbow trout in spring, brook, and brown trout in fall)

SITE	PURPOSE	DEPTH	PARAMETERS	MONTH	FREQUENCY	POTENTIAL METHOD(S)
<b>Clearwater 2 proposed pump intake location within Toketee Reservoir</b>	Describe fish population	All	Fish species and relative abundance	JUN, AUG	Monthly	Boat electroshocking, angling, observation
	Habitat characterization	Bottom	Substrate, macrophytes, benthos	JUN	Once	Observation, raking, Ponar dredge
	Check for spawning use	Bottom	Fish presence	MAY, JUN, OCT, NOV	Bi-weekly	Direct observation (for rainbow trout in spring, brook, and brown trout in fall)
<b>Toketee Reservoir outlet</b>	Describe fish population	All	Fish species and relative abundance	JUN, AUG	Monthly	Boat electroshocking, angling, at night
	Habitat characterization	Bottom	Substrate, macrophytes, benthos	JUN	Once	Observation, raking, Ponar dredge
	Check for spawning use	Bottom	Fish presence	MAY, JUN, OCT, NOV	Bi-weekly	Direct observation (for rainbow trout in spring, brook, and brown trout in fall)

PacifiCorp will provide a brief technical report of monitoring methods, results, and trends (if any) to the consulting parties by January 31 following the pre-project monitoring period. PacifiCorp may modify the monitoring locations, periods, and/or methods in consultation with the consulting parties.

Pre-project and post-project results will be compared to evaluate whether the Pumped Storage Project has impacted fishery resources, and to determine whether additional PM&Es are warranted.

A summary of the proposed studies and PM&E measures for fisheries and aquatic resources are listed below in Table 7-6:

**TABLE 7-6 FISHERIES AND AQUATIC RESOURCES PROPOSED STUDIES AND PM&E MEASURES**

RESOURCE AREA	STUDIES OR PM&Es
Fisheries/Aquatic Resources	Additional Funding of Hatchery Production*
Fisheries/Aquatic Resources	Fish Monitoring
Fisheries/Aquatic Resources	Fish and Macroinvertebrate Sampling
Fisheries/Aquatic Resources	Fish Spawning Surveys

Note: PM&E measures have been identified with a \*.

#### **7.4 WILDLIFE RESOURCES**

Per the terms and conditions of the North Umpqua Project's FERC operating license, PacifiCorp must conduct sensitive species surveys prior to ground- or habitat-disturbing activities on National Forest System lands. Pre-disturbance surveys may be required for certain survey and manage species for potential habitat-disturbing actions. PacifiCorp will consult with USFS staff to determine which species have the potential to occur within the proposed Pumped Storage Project area, and surveys will be conducted for these target species if suitable habitat for these species is present. Survey timing and methods will be determined through coordination with USFS staff and will be based on species-specific life history traits.

Five threatened or endangered species have the potential occur in the proposed upgrade area, consisting of NSO, fisher, wolverine, Franklin's bumble bee, and Oregon coast coho salmon. In addition, the Clearwater No. 2 forebay expansion partially intersects designated critical habitat



for NSO. PacifiCorp will request FERC designate PacifiCorp as the non-federal representative for carrying out informal consultation with USFWS pursuant to Section 7 of the ESA. As such, PacifiCorp will consult with USFWS throughout the amendment process regarding the design and implementation of studies. In support of the ESA compliance, site-specific studies would be conducted to determine if suitable habitat is present for these ESA species. For species that are unlikely to occur in the proposed upgrade area, studies would be performed to document the lack of suitable habitat, including any PCEs that have been identified for the species. All surveys would follow USFWS and/or USFS species-specific guidance and protocols, if available. Surveys for NSO would document the presence or absence of PCEs and would characterize the Pumped Storage Project area in terms of suitability for nesting, roosting, or foraging habitat.

Vegetation removal and habitat modifications within the proposed Clearwater No. 2 forebay expansion and spoils disposal area will impact approximately 10.3 acres of existing USFS elk forage habitat; therefore, PacifiCorp will coordinate with USFS to complete or fund a replacement elk forage habitat project on the Diamond Lake Ranger District of the Umpqua National Forest to compensate for these impacts.

A summary of the proposed studies and PM&E measures for fisheries and aquatic resources are listed below in Table 7-7:

**TABLE 7-7 WILDLIFE RESOURCES STUDIES AND PM&E MEASURES**

RESOURCE AREA	STUDIES OR PM&ES
Wildlife	Elk Forage Plot Creation*
Wildlife	North Umpqua Project Sensitive Species Plan Implementation*
Wildlife	ESA Consultation with FWS
Wildlife and Botanical	Sensitive Species Surveys

Note: PM&E measures have been identified with a \*.

## 7.5 BOTANICAL RESOURCES

PacifiCorp has completed a timber cruise and will conduct a tree survey of the forebay expansion and spoils disposal areas to enumerate impacts to Forest Service timber and map potential NSO critical habitat PCEs. PacifiCorp will conduct botanical surveys of the proposed Pumped Storage

Project area to identify the presence and map populations, if found, of rare, threatened, and endangered plant species as well as noxious weeds. The vegetation community map presented in the Final License Application (1995) will be updated with current conditions.

PacifiCorp will complete a wetland delineation within the area of the Pumped Storage Project. Where surface topography, hydrology, and/or vegetation are indicative of potentially jurisdictional wetlands, PacifiCorp will excavate soil pits to determine the presence of hydric soils. The soil pits are typically excavated with a tile spade or auger to a depth of 24 inches within a 12- to 24-inch-diameter hole. The number and location of wetland delineation soil pits is determined by the presence of surface indicators. The pits are back-filled following analysis and documentation of soil horizons and conditions.

PacifiCorp will continue to implement the North Umpqua Project VMP within the Pumped Storage Project area.

A summary of the proposed studies and PM&E measures for botanical resources are listed below in Table 7-8:

**TABLE 7-8 BOTANICAL RESOURCES PROPOSED STUDIES AND PM&E MEASURES**

RESOURCE AREA	STUDIES OR PM&Es
Botanical	Timber Cruise and Tree Survey
Botanical	Botanical Surveys
Botanical	Wetland Delineation
Botanical	North Umpqua Project Vegetation Management Plan Implementation*

Note: PM&E measures have been identified with a \*.

## 7.6 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

The proposed upgrade has the potential to affect previously unidentified archaeological resources as a result of ground-disturbing activities associated with construction of the Pumped Storage Project. While the majority of the Pumped Storage Project vicinity has been previously surveyed, the proposed Clearwater No. 2 forebay expansion and associated spoil area have not been previously surveyed for cultural resources.

An archaeological survey with systematic subsurface testing is planned in areas of new ground-disturbance for the proposed forebay expansion area, as well as within the proposed spoils disposal area. The development of the intake, pumphouse, and penstock extension are in a low probability area for archaeological materials according to the USFS predictive model and have been previously surveyed for cultural resources. However, these cultural resources surveys are more than 15 years old, and a cultural resources survey is recommended for the entire Pumped Storage Project area.

PacifiCorp will consult with the USFS and Oregon State Historic Preservation Office to determine if the proposed project would have an adverse effect on the North Umpqua Project's historic architectural resources and which protection and mitigation measures, as outlined in the HSP, are appropriate for the proposed upgrades. PacifiCorp will follow the guidelines as outlined in Chapter 5 of the HSP, particularly 5.2. Use of Appropriate Material; 5.3, Building Location and Placement; and 5.5, Additions to Historic Structures (EDAW 2008).

The HPMP outlines the "Archaeological Program" designed to provide PacifiCorp staff and other parties with specific determination procedures for identifying the appropriate level of review for PacifiCorp activities and potential monitoring. The Archaeological Program consists of three components: mapped locations of known and potential archaeological sites, list of PacifiCorp activities and their potential effects, and standardized protocol for activities review levels and monitoring. PacifiCorp may meet their Section 106 compliance responsibilities and no further action would be required if one or more of the following criteria are met:

- The proposed PacifiCorp activity is listed in Exhibit A as a low or no effect, as described in the HPMP, and would not occur within a known historic property.
- For activities defined as low or medium effect, as described in the HPMP, the PacifiCorp assigned Cultural Resources Coordinator can define an alternative approach to the activity so that it has no effect.
- The activity would occur on a location that has been surveyed twice or more and no historic property has been located.
- The activity is located within a specific area that has been previously mitigated for the same activity encompassing the same footprint.

If the proposed Pumped Storage Project meets the above criteria, PacifiCorp may conduct project-related activities without need for further action or review. However, if the proposed project does not fall under any of these criteria, PacifiCorp will initiate the agency review process. Proposed activities on public lands are subject to three levels of review: notification, coordination, and consultation, as described in the HPMP.

In general, avoidance of all cultural resources, both NRHP-eligible and unevaluated, is advised according to the HPMP. However, if project effects to an archaeological site cannot be avoided, a plan of either preservation in place or data recovery of that resource must be initiated.

PacifiCorp will send letters to the Tribes identified above and the U.S. Bureau of Indian Affairs requesting review of the draft application for license amendment.

If project effects to a Historic Property cannot be avoided, the HPMP outlines the Historic Structures Program, which follows the Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings as guidance for the protection of PacifiCorp's historic buildings and structures (36 CFR Part 68; July 12, 1995 Federal Register Vol. 60, No. 133). PacifiCorp may meet their Section 106 compliance responsibilities, and no further action would be required, if one or more of the following criteria are met:

- The activity is permitted by the historic structure's Maintenance Plan in HPMP Exhibit I, or
- The PacifiCorp-assigned Cultural Resources Coordinator can define an alternative approach to the activity so that it has no effect.

If the proposed project meets the above criteria, PacifiCorp may conduct project-related activities without need for further action or review. However, in the event that the proposed project does not fall under any of these criteria, PacifiCorp will initiate the agency review process. Proposed activities on public lands are subject to a three-step project activity review process as described in the HPMP to mitigate for potential effects.

A summary of the proposed studies and PM&E measures for historic and archaeological resources are listed below in Table 7-9:

**TABLE 7-9 HISTORIC AND ARCHAEOLOGICAL RESOURCES PROPOSED STUDIES AND PM&E MEASURES**

RESOURCE AREA	STUDIES OR PM&Es
Historic and Archaeological	Archaeological Resources Survey
Historic and Archaeological	Cultural Resources Assessment*
Historic and Archaeological	North Umpqua Project Historic Properties Management Plan Implementation*

Note: PM&E measures have been identified with a \*.

## 7.7 RECREATION, LAND USE, AND AESTHETICS

PacifiCorp will coordinate with the USFS regarding the proposed upgrade, potential effects on recreation, and measures to minimize and avoid potential impacts. PacifiCorp will continue to implement the North Umpqua Project Recreation Resource Management Plan.

PacifiCorp will prepare photo-simulations of proposed facilities to illustrate potential changes to the aesthetics of the area and will coordinate with the USFS regarding compliance with applicable forest plan requirements. PacifiCorp will comply with the Project Aesthetics Management Plan, including use of the approved dark-green color<sup>9</sup> for coating the Clearwater No. 2 penstock on the penstock extension and pumphouse facilities.

A summary of the proposed studies and PM&E measures for recreation, land use and aesthetics resources are listed below in Table 7-10:

**TABLE 7-10 RECREATION, LAND USE & AESTHETICS RESOURCES PROPOSED STUDIES AND PM&E MEASURES**

RESOURCE AREA	STUDIES OR PM&Es
Recreation	North Umpqua Project Recreation Resource Management Plan Implementation*
Land Use/Aesthetics	Photo Simulations Study
Land Use/Aesthetics	Use of Approved Color Palette*
Land Use/Aesthetics	North Umpqua Project Aesthetics Management Plan Implementation*

Note: PM&E measures have been identified with a \*.

<sup>9</sup> ICI Paints No. 1025 Bunker Hill or other manufacturer's closest equivalent

## **8.0 STATEMENT OF PUBLIC UTILITY REGULATORY POLICIES ACT BENEFITS**

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18 CFR § 4.38 (b)(2)(vi)(A) requires a statement (with a copy to FERC) of whether or not the applicant will seek benefits under Section 210 of PURPA (Public Utility Regulatory Policies Act) by satisfying the requirements for qualifying hydroelectric small power production facilities in § 292.203 of this chapter; (B) If benefits under section 210 of PURPA are sought, a statement on whether or not the applicant believes the project is located at a new dam or diversion (as that term is defined in § 292.202(p) of this chapter) and a request for the agencies' view on that belief, if any.

18 CFR § 4.38 (b)(2)(viii) requires any statement required by § 4.301(a).

The Pumped Storage Project is located entirely on National Forest System lands within the Diamond Lake Ranger District of the Umpqua National Forest. PacifiCorp is not reserving the right to seek any benefits under Section 210 of PURPA.

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