Appendix B
Surface and Groundwater Hydrology Resource Analysis Report

December 2022

Proposed Goldendale Energy Storage Project

Surface and Groundwater Hydrology Resource Analysis Report

Prepared for

DEPARTMENT OF ECOLOGY
State of Washington

Prepared by
Aspect Consulting, LLC
710 2nd Avenue, Suite 550
Seattle, WA 98104

Table of Contents

List of Tables

List of Figures

List of Appendices

Acronyms and Abbreviations

AFY	acre-feet per year
Applicant	Free Flow Power Project 101, LLC
BAU	Basalt Aquifer Upper Zone
BiOp	Biological Opinion
BMP	best management practice
cfs	cubic feet per second
CGA	Columbia Gorge Aluminum
CSWGP	Construction Stormwater General Permit
Ecology	Washington Department of Ecology
EIS	Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
HUC	Hydrologic Unit Code
KPUD	Public Utility District No. 1 of Klickitat County
MW	megawatt
NAVD88	North American Vertical Datum of 1988
NHD	National Hydrography Dataset
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetlands Inventory
OHWM	ordinary high water mark
PCBs	polychlorinated biphenyls
RCW	Revised Code of Washington
SEPA	State Environmental Policy Act
SWPPP	Stormwater Pollution Prevention Plan
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
UA	unconsolidated aquifer
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WRIA	Water Resource Inventory Area

Summary

This report describes existing conditions and probable impacts within the study area resulting from the proposed project and the No Action Alternative on groundwaters and surface waters, considering water quantity, water quality, and water uses and rights. The study area for the water resource analysis encompasses the proposed project area as well as downgradient groundwaters and downstream surface waters.

The following water-related topics were analyzed for both construction and long-term operation of the proposed project:

- Impacts on surface water hydrology including flow quantity
- Impacts on groundwater flow systems including areas where groundwater discharges to the surface
- Impacts on water supplies and rights
- Impacts on the quality of stormwater runoff generated within the study area
- Impacts on the quality of receiving surface waters and groundwaters

Table 1 summarizes anticipated impacts on groundwater and surface water resources assuming the requisite permitting processes are completed for the proposed project.

Table 1

Water Resources Impact Summary

TYPE OF IMPACT	SIGNIFICANT ADVERSE IMPACT FINDING	MITIGATION REQUIRED BY PERMIT	ADDITIONAL MITIGATION PROPOSED	SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACT
Proposed Project: Construction				
Alteration of Surface Water Hydrology	No	None	Construction Water Resource Monitoring and Response Plan	No
Alteration of Groundwater Flow Systems	No	None	Construction Water Resource Monitoring and Response Plan	No
Impairment of Water Supplies/Rights	No	None	None	No
Stormwater Quality Compliance	No	Prepare Stormwater Pollution Prevention Plan (SWPPP); Temporary Erosion and Sediment Control Plan; and Spill Prevention, Control, and Countermeasures Plan and monitor and manage stormwater quality as per Administrative Order on Construction Stormwater General Permit (CSWGP) Implement water quality provisions under Section 401 water quality certification Implement best management practices and monitoring under National Pollutant Discharge Elimination System (NPDES) Sand and Gravel Permit	None	No
Water Quality Compliance in Receiving Waters	No	Monitor and manage stormwater quality as per Administrative Order on CSWGP Implement water quality provisions under Section 401 Water Quality Certification.	Construction Water Resource Monitoring and Response Plan	No

TYPE OF IMPACT	SIGNIFICANT ADVERSE IMPACT FINDING	MITIGATION REQUIRED BY PERMIT	ADDITIONAL MITIGATION PROPOSED	SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACT
Proposed Project: Operations				
Alteration of Surface Water Hydrology	No	None	Operations Water Resource Monitoring and Response Plan	No
Alteration of Groundwater Flow Systems	No	None	Operations Water Resource Monitoring and Response Plan	No
Impairment of Water Supplies/Rights	No	None	None	No
Stormwater Quality Compliance	No	Monitor and manage stormwater quality as per Industrial Stormwater General Permit	Operations Water Resource Monitoring and Response Plan	No
Water Quality Compliance in Receiving Waters	No	Implement water quality provisions under Section 401 Water Quality Certification.	Operations Water Resource Monitoring and Response Plan Shade Balls in Reservoirs Reservoir Water Quality Monitoring Plan Vegetation Management and Monitoring Plan	No
No Action Alternative				
Alteration of Surface Water Hydrology	No	None	None	No
Alteration of Groundwater Flow Systems	No	None	None	No
Impairment of Water Supplies/Rights	No	None	None	No
Stormwater Quality Compliance	No	None	None	No
Water Quality Compliance in Receiving Waters	No	None	None	No

1 Introduction

Free Flow Power Project 101, LLC (the Applicant) proposes to build a pumped-water energy storage system that is capable of generating energy through release of water from an upper reservoir down to a lower reservoir. This is referred to as the “proposed project.” This report describes surface and groundwater hydrology resources within the study area and assesses probable impacts on those resources from construction and operation of the proposed project and from a No Action Alternative. Chapter 2 of the State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS) provides a more detailed description of the proposed project and No Action Alternative.

1.1 Resource Description

In this report, the term “water” refers to surface water—including the Columbia River and its tributaries—and groundwater. Water quality, water quantity (flows and levels), and water uses/rights are key elements considered for both surface water and groundwater. The study area for surface and groundwater resources is described in Section 2.1.

Surface water is any body of water above ground, including streams, rivers, lakes, wetlands, reservoirs, and creeks.

Groundwater is water in a saturated zone beneath the ground surface.

1.2 Regulatory Context

Table 2 identifies relevant regulations that contributed to the evaluation of potential impacts to surface and groundwater resources within the study area.

Table 2
Applicable Laws, Plans, and Policies

REGULATION, STATUTE, GUIDELINE	DESCRIPTION
Federal	
Clean Water Act (33 U.S. Code 1251 et seq.)	• Establishes the basic structure for regulating pollutant discharges into waters of the United States and makes it unlawful to discharge any pollutant from a point source into those waters without a permit. • Includes Sections 401, 402, and 303(d), which are relevant to permitting facilities for which construction or operation could result in a discharge into waters of the United States.
Clean Water Act Section 401	• Provides states the authority to ensure that federal agencies do not issue permits or licenses that violate state water quality standards or other protections of the Clean Water Act. • Requires that an applicant for a federal permit obtain a Section 401 Water Quality Certification from the state in which the activity would occur. • Grants the Washington Department of Ecology (Ecology) the authority to administer the Section 401 certification program in Washington.

REGULATION, STATUTE, GUIDELINE	DESCRIPTION
Clean Water Act Section 402	• Establishes the National Pollutant Discharge Elimination System (NPDES) program, requiring that pollutant discharges to surface waters be authorized by a permit. • Grants Ecology the authority to administer the NPDES permitting program in Washington. • Includes Ecology's Construction Stormwater General NPDES Permit and its Sand and Gravel General NPDES Permit, which reference Ecology's Stormwater Management Manual for Eastern Washington (Ecology 2019).
Clean Water Act Section 303(d) (Impaired Waters and Total Maximum Daily Loads)	• Establishes a process to identify and clean up polluted waters. • Requires Ecology, at least every 3 years, to review and, if appropriate, revise or adopt new state water quality standards for U.S. Environmental Protection Agency approval to meet the federal "fishable/ swimmable" goals of the Clean Water Act.
Federal Energy Regulatory Commission, Department of Energy (Code of Federal Regulations 18.I)	• Provides requirements and guidance concerning applications for licenses and the supervision of existing licenses for hydropower projects. • Establishes engineering guidelines for design, construction, and operation, monitoring, and maintenance of hydropower projects.
State	
Public Utility District Powers (Revised Code of Washington [RCW] 54.16)	• Establishes public utility district authority regarding water rights, water supply including for pumped storage projects, electrical energy generation and conversation, sewage systems, and telecommunications.
Construction Projects in State Waters (RCW 77.55)	• Requires people planning hydraulic projects in or near state waters to get a Hydraulic Project Approval (HPA) from the Washington Department of Fish and Wildlife. • The HPA establishes requirements to ensure that construction is done in a manner that protects fish and their aquatic habitats.
Water Code (RCW 90.03)	• Establishes authority for new water rights and water right transfers that are not detrimental to the public interest and do not impair existing water rights.
Water Pollution Control (RCW 90.48)	• Establishes authority to retain and secure high quality for all waters of the state.
Administration of Surface and Groundwater Codes (Washington Administrative Code [WAC] 508.12)	• Establish regulations for Ecology's administration of surface water and groundwater codes, including regulation of water right diversions and withdrawals, surface water and groundwater appropriation procedures, and reservoir permits.
Instream Resource Protection Program for Columbia River (WAC 173.563)	• Creates minimum instream flows on rivers that are water rights with priority dates equal to the date of adoption. • Specifies that Columbia River flows were established in 1980 and water rights issued after that date are curtailed when forecasted runoff is less than 60 million acre-feet at The Dalles, Oregon.
Water Resource Program for John Day-McNary Pools of Columbia River (WAC 173.531A)	• Allows Ecology to create reserves of water for future uses. • Establishes a reservation of water for irrigation and municipal supplies. • Requires that water supplied from this reservation must be mitigated to avoid impacts on Columbia River low flows.

REGULATION, STATUTE, GUIDELINE	DESCRIPTION
Floodplain Management (WAC 173.158)	• Implements RCW Title 86 law (Chapter 86.16–Floodplain Management), establishing regulations for floodplain management to ensure local government compliance with the National Flood Insurance Program.
Water Quality Standards for Groundwaters (WAC 173.200)	• Establishes water quality standards for groundwaters of the state, implementing RCW Title 90 laws including RCW 90.48 (Water Pollution Control Act) and RCW 90.54 (Water Resources Act of 1971).
Water Quality Standards for Surface Waters (WAC 173.201A)	• Establishes water quality standards for surface waters of the state, implementing RCW 90.48. • Establishes freshwater designated uses and associated criteria as specifically identified in WAC 173.201A.200.
Waste Discharge Permit Program (WAC 173.216)	• Implements a state individual permit program for discharge of waste materials to surface waters of the state and into sewer systems.
NPDES Permit Program (WAC 173.220)	• Implements a state permit program for discharge of pollutants and other materials to surface waters of the state.
Waste Discharge General Permit Program (WAC 173.226)	• Implements a state general permit program for discharge of pollutants and other materials to surface waters of the state and into sewer systems.
On-Site Sewage Systems (WAC 246.272A)	• Regulates the use of on-site sewage systems to achieve effective long-term sewage treatment and limit the discharge of contaminants to waters of the state.
Local	
Klickitat County Critical Areas Ordinance	• Regulates land use to protect the County's critical areas (wetlands, aquifer recharge areas, frequently flooded areas, geologically hazardous areas, and fish and wildlife conservation areas) from environmental impacts.
Klickitat County Flood Damage Protection Ordinance	• Regulates development to promote public safety and minimize losses due to flood conditions, including regulating alteration of natural floodplains and other physical conditions that help control flood waters.
Klickitat County On-Site Septic Program	• Establishes minimum standards and recommendations for the construction of on-site wastewater septic systems to meet WAC 246.272A requirements.

2 Methodology

2.1 Study Area

The study area for surface and groundwater hydrology resources encompasses surface waters and groundwaters with the potential to be affected by the construction or operation of the proposed project. It includes water resources in the proposed project area as well as downgradient groundwater, downstream ponds or streams (perennial or ephemeral), and the adjacent and downstream Columbia River (Figures 1 and 2). Determination of the jurisdictional status of waterbodies and wetlands are addressed separately in the *Wetlands and Regulated Waters Resource Analysis Report* (Appendix C of the EIS; Anchor QEA 2022a) and summarized in Section 4.2 of the EIS. The *Wetlands and Regulated Waters Resource Analysis Report* also addresses potential impacts on buffers associated with the wetlands and non-wetland waters (streams).

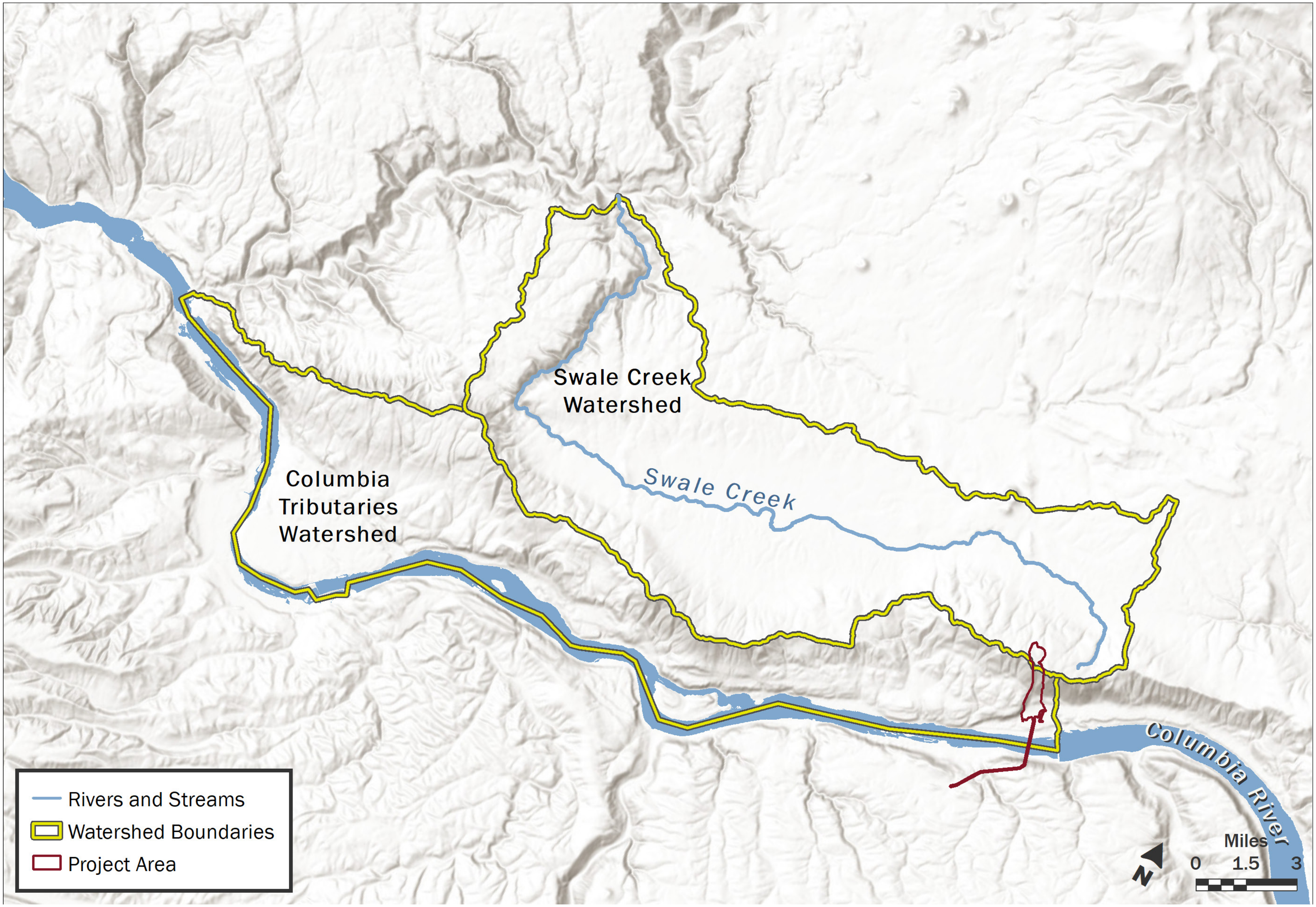
The proposed project would construct and use a pair of concrete lined off-channel surface reservoirs connected by an underground water conveyance and hydropower generation system. Water would be supplied for the proposed project from the Columbia River under an existing water right that has been recognized by the Washington Department of Ecology (Ecology) for municipal use (including manufacturing, industrial, power, landscape, and other governmental uses that are beneficial uses allowed under municipal water supply purposes). The proposed project is for power generation, which is an approved municipal supply purpose of use. The Applicant plans to purchase water from Public Utility District No. 1 of Klickitat County (KPUD). The proposed project's water supply needs include a one-time diversion of 7,640 acre-feet of water, at an estimated rate of 21 cubic feet per second (cfs) continuously for approximately 6 months, to complete the initial fill of the pumped storage system (lower reservoir plus conveyance piping), and then, as needed, periodic recharge of the system (make-up water) to offset evaporative and leakage losses from the system.

The area of the proposed upper reservoir lies within the headwaters of the Swale Creek watershed (tributary) of the Klickitat River subbasin, also referred to as Water Resource Inventory Area 30 (WRIA 30) (WPN and Aspect Consulting 2005). This area constitutes the northern portion of the surface and groundwater resources study area for purposes of this analysis (Figure 1).

The area of the proposed lower reservoir occurs within the Columbia Tributaries watershed of WRIA 30, which discharges to the Columbia River, not the Klickitat River (WPN and Aspect Consulting 2005). This area constitutes the southern portion of the surface and groundwater resources study area for purposes of this analysis (Figure 1). A substation, switchyard, and ancillary structures would be constructed adjacent to the lower reservoir. A portion of this area was previously occupied by the Columbia Gorge Aluminum (CGA) aluminum smelter that operated from 1971 to 2003 under various owners, most recently NSC Smelter. The smelter property is contaminated from historical industrial practices and is currently undergoing Washington State's environmental cleanup process in accordance with the Model Toxics Control Act. The smelter cleanup process and its relationship to the proposed project are addressed in the *Environmental Health Resource Analysis Report* (Appendix I of the EIS; Aspect Consulting and Anchor QEA 2022) and Section 4.10 of the EIS.

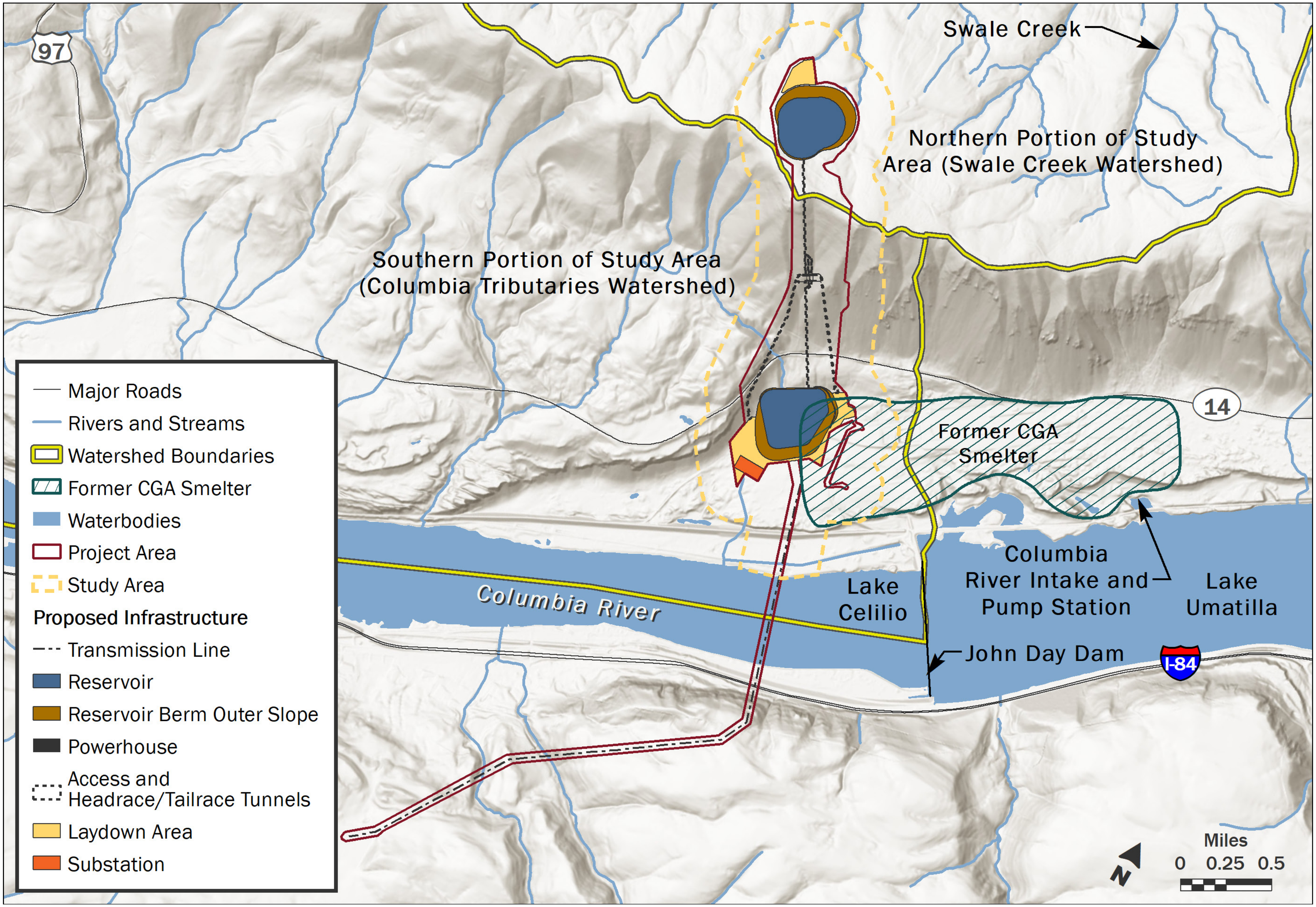
The study area also encompasses underground infrastructure that would be constructed within the bedrock bluff between the two surface reservoirs, including a water conveyance (piping) system, electrical-generation powerhouse, transformer gallery, and two tunnels for accessing the underground infrastructure and housing electrical transmission lines.

Figure 1
Project Location



Data Sources: WDNR 2021; USGS 2021

Figure 2
Surface and Groundwater Hydrology Resources Study Area



Sources: WDNR 2021; USGS 2021

2.2 Technical Approach

Information to describe the affected environment for surface and groundwater resources—existing physical conditions and quality conditions for study area groundwater and surface water—was obtained from documentation provided by the Applicant or generated by the former CGA smelter cleanup process and the WRIA 30 watershed planning process.

The analysis did not include any additional data collection or modeling.

2.3 Impact Assessment

The analysis of potential impacts considered construction- and operation-related effects on water quality, water quantity, and water uses/rights for both surface water and groundwater. The proposed project and No Action Alternative were analyzed to determine the level of impact on surface and groundwater resources in the study area. In general, impacts for surface and groundwater resources are identified based on their potential to conflict with regulatory requirements or otherwise change baseline conditions.

Using the existing information, the technical analysis assesses potential effects on study area surface and groundwater resources from the following:

- Constructing the proposed project, considering construction of the reservoirs (e.g., excavation and material export, excavation dewatering, subgrade preparation, materials import and grading, and concrete placement), underground tunnels and cavern (rock tunneling/blasting including management of any water produced, and materials export), and above-grade structures adjacent to the lower reservoir (e.g., grading, subgrade preparation, and structure fabrication)
- Operating the proposed project, with a focus on the potential effects of the Applicant's predicted evaporation and leakage from the system on the quantity and quality of surface waters and groundwater within the study area as well as the quality of stormwater runoff

Baseline for Technical Review

A key issue in documenting potential impacts of the proposed project on the Columbia River is the baseline condition for comparison. In this report, the pre-project baseline is connected to an Ecology finding in the 1969 water right authorization S3-00845C, now held by KPUD as part of the Cliffs Water System supplying water to the project, that water was available for appropriation from the Columbia River and would not impair existing water rights or water quality. Each element of the affected environment is evaluated with respect to that baseline condition. Conversely, the baseline condition for Swale Creek is the existing environment because no mitigation is proposed by the Applicant for that drainage.

The evaluation of potential effects of the proposed project on study area surface and groundwater resources considered the following potential changes:

- **Alteration of surface water hydrology:** physical changes to the course of flowing water
- **Alteration of groundwater flow systems:** physical changes to groundwater flow or disruptions of groundwater-surface water interactions
- **Impairment of water supplies/rights:** impairment of water rights or water supplies relied upon by others, including those downstream or downgradient
- **Stormwater quality compliance:** compliance of stormwater quality with water quality permit benchmarks and criteria
- **Water quality compliance in receiving waters:** changes to groundwater or surface water quality including potential impacts from the generation of stormwater and domestic wastewater

The analysis distinguished potential effects associated with the upper reservoir, within the Swale Creek hydrologic subbasin, and those associated with the underground infrastructure and lower reservoir within the Columbia Tributaries hydrologic watershed.

Determination of the jurisdictional status of waterbodies within the study area and implications for the proposed project's coverage under Section 404 of the Clean Water Act are addressed in the *Wetlands and Regulated Waters Resource Analysis Report* (Appendix C of the EIS) and Section 4.2 of the EIS.

The potential effects on water quality from the handling of contaminated materials (e.g., proposed removal of West Surface Impoundment) and any potential for releases from other areas of existing contamination within the CGA smelter cleanup site are addressed in the *Environmental Health Resource Analysis Report* (Appendix I of the EIS) and Section 4.10 of the EIS.

Effects to streams can also affect the active and contemporary hunting, gathering, and cultural activities of Tribal members, described in more detail in the *Tribal Resources Analysis Report* (Appendix H of the EIS; Ecology et al. 2022) and Section 4.9 of the EIS.

3 Technical Analysis and Results

3.1 Overview

This section describes the affected environment, or the conditions before any construction begins (Section 3.2), as well as findings of probable impacts on surface and groundwater resources from the proposed project (Section 3.3) and No Action Alternative (Section 3.4). For the proposed project, required permit conditions and planning document requirements that could address the impacts are identified (Section 3.3.3). This report also identifies mitigation measures that could avoid, minimize, or reduce the potential impacts (Section 3.3.4) and determines if there would be significant and unavoidable adverse environmental impacts remaining after mitigation (Section 3.3.5).

3.2 Affected Environment

As outlined in Section 2.1 and depicted in Figure 2, based on the configuration of the proposed project, the surface and groundwater resources study area is separated into southern and northern portions corresponding to distinct hydrologic subbasins both in terms of surface water and groundwater regimes:

> A **Hydrologic Unit Code (HUC)** is a unique code, consisting of two to twelve digits, used to identify drainage basins by the United States Geological Survey.

- The southern portion of the study area encompasses the lower reservoir and associated power production infrastructure and downstream/downgradient areas, as well as about 4 miles of the transmission right-of-way, in the Hells Gate Canyon-Columbia River subwatershed (Hydrologic Unit Code [HUC] 170701050103) that spans the Washington and Oregon sides of the Columbia River. The portion of this area north of the Columbia River lies within the Columbia River Tributaries watershed, which drains directly to the Columbia River.
- The northern portion of the study area encompasses the upper reservoir and upper temporary staging area and downstream/downgradient areas in the Upper Swale Creek subwatershed (HUC 170701060403) of the Swale Creek watershed. Swale Creek flows westward to the Klickitat River, which then flows south and discharges to the Columbia River roughly 35 miles downstream of the proposed project footprint.

Construction and operation of the aerial electrical transmission line portion of the proposed project located within Oregon is not anticipated to involve earthwork or activities that would impact surface and groundwater resources. The Oregon portion of the proposed project is therefore not considered further in this *Surface and Groundwater Hydrology Resource Analysis Report*.

The following sections describe the study area's existing climate, surface water resources, groundwater resources, and water quality conditions.

3.2.1 Topography and Climate

The southern portion of proposed project footprint is on a topographic bench ranging in elevation from approximately 400 to 500 feet relative to North American Vertical Datum of 1988 (NAVD88) about 1,500 feet north of the Columbia River (see Figures 1 and 2). To the south of the proposed project footprint, the topographic bench generally terminates in a line of cliffs above the Columbia River. The Columbia River surface water elevation in the Lake Umatilla pool upstream of John Day Dam ranges from approximately 253 to 264 feet NAVD88, whereas downstream of the dam the Lake Celilo pool elevation ranges from approximately 151 to 156 feet NAVD88. North of the lower project footprint, the Columbia Hills form a steep topographic bluff with about 2,500 feet of relief; the bluff drains to the south and is considered part of the southern portion of the study area. The northern portion of proposed project footprint is at the top of the bedrock bluff with existing grade elevations ranging from approximately 2,800 to 3,000 feet NAVD88 (Figures 1 and 2).

The proposed project area is characterized by hot and dry conditions in the summer (90ºF average daytime high temperature in July) and relatively cold conditions in the winter (40ºF average daytime high temperature in December), with some moderation in temperatures due to proximity to the Columbia River (Tetra Tech et al. 2015). For purposes of preliminary design, using available data from the Western Regional Climate Center's John Day climate station, HDR (2020) estimated an annual average precipitation of approximately 10 inches for the lower reservoir area (southern portion of study area) and 17 inches for the upper reservoir area (northern portion of study area). Most of the precipitation in the area occurs November through February, with the wettest months being December and January (Tetra Tech et al. 2015).

For purposes of estimating evaporative losses from the proposed project reservoirs, HDR (2020) estimated a reference evaporation rate of approximately 65 inches per year for the project area. The estimate was generated using historical reference (1992 to 2017) evapotranspiration data from the U.S. Bureau of Reclamation AgriMet climate station in Goldendale and anticipating greater evapotranspiration in the future resulting from increasing annual air temperatures (i.e., climate change). The potential effects of climate change on seasonal temperature, precipitation, and evaporation are more fully described in Chapter 5 of the EIS.

3.2.2 Surface Water Resources

The Columbia River is the ultimate receiving waterbody for discharges of all surface waters in the project vicinity. John Day Dam is located on the Columbia River immediately upstream of the proposed project footprint, creating John Day Pool (Lake Umatilla) upstream of it. The proposed project footprint is adjacent to and traverses The Dalles Pool (Lake Celilo) that is impounded by The Dalles Dam approximately 24 river miles downstream of John Day Dam. The largest tributary to the Columbia River in the project vicinity is the John Day River, which discharges from Oregon into Lake Umatilla about 1 mile upstream of the proposed project footprint.

Tables 3 and 4 summarize the surface waterbodies identified within and adjacent to the proposed project reservoir footprints and provide their hydrologic classifications from the U.S. Geological Survey (USGS) National Hydrography Dataset (NHD) and the U.S. Fish and Wildlife Service National Wetlands Inventory (NWI). Table 3 includes surface waters and wetlands adjacent to the proposed upper and lower reservoir portions of the footprint as determined from the following sources: a wetland delineation performed to support cleanup of the former CGA smelter cleanup site (PGG 2013); a May 2019 field delineation of waters and wetlands performed by the Applicant's consultant ERM (FFP 2020a) with additional field investigations conducted by ERM in April 2022 (ERM 2022a); and a July 2021 site visit performed by Anchor QEA (Anchor QEA 2022a). The Applicant's 2019 and 2022 field verifications of the surface watercourses included observation and documentation of substrate, water, and

> The U.S. Army Corps of Engineers defines an **ordinary high water mark (OHWM)** as the "line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

vegetative conditions and identification of whether a defined ordinary high water mark (OHWM) was present (FFP 2020a). Table 4 includes surface waters located along the proposed aerial electrical transmission line right-of-way portion of the footprint within Washington State. Those waterbodies were assessed using desktop methods and were not field-verified during the May 2019 field delineation (FFP 2020a) or during the April 2022 additional investigations (ERM 2022a). Figure 3 depicts locations of these features relative to the proposed project footprint with the source reference. The Columbia River and the identified surface waterbodies on the Washington side of the Columbia River are described in sections following Figure 3.

Determination of the potential jurisdictional status of waterbodies within the study area and implications for the proposed project's coverage under Section 404 of the Clean Water Act are analyzed in the *Wetlands and Regulated Waters Resource Analysis Report* (Appendix C of the EIS) and Section 4.2 of the EIS. The *Wetlands and Regulated Waters Resource Analysis Report* also addresses potential impacts to buffers associated with the wetlands and non-wetland waters (streams).

Table 3
Surface Waterbodies within Reservoir Areas of Proposed Project Footprint

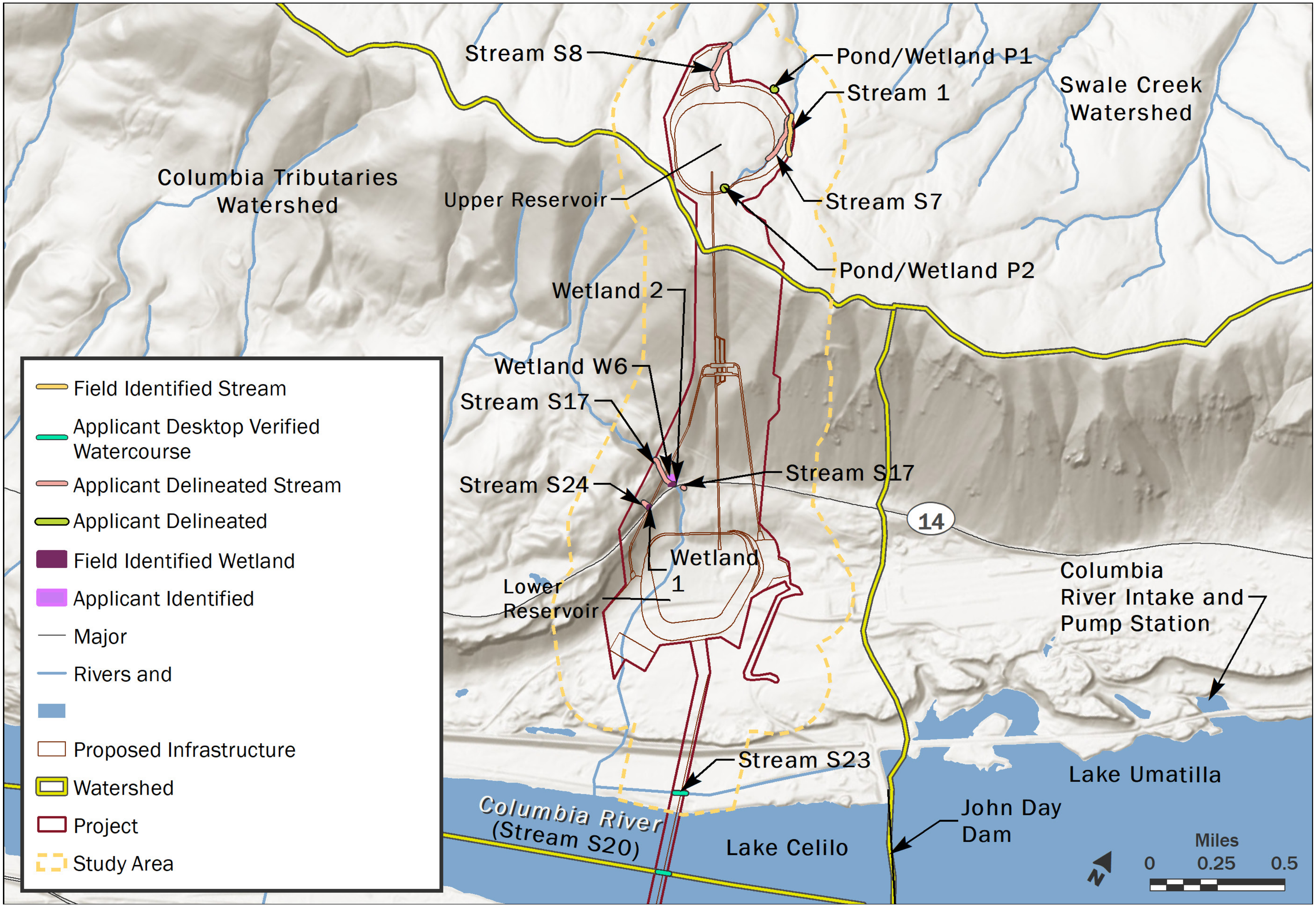
FEATURE ID[1]	FEATURE NAME	NHD CLASSIFICATION	NWI CLASSIFICATION
Northern Portion of the Study Area (Upper Reservoir Area)			
Stream S7	Unnamed stream	Perennial water course	Riverine, Unknown perennial, Unconsolidated bottom, Permanently flooded (R5UBH)
Stream S8	Unnamed stream	Perennial water course	Riverine, Unknown perennial, Unconsolidated bottom, Permanently flooded (R5UBH)
Stream 1	Unnamed stream	Not identified	Not identified
Pond/Wetland P1	Unnamed stock-watering pond	Perennial pond	Palustrine, Unconsolidated bottom, Permanently flooded (PUBHx)
Pond/Wetland P2	Unnamed stock-watering pond	Perennial pond	Not identified
Southern Portion of the Study Area (Lower Reservoir Area)			
Stream S17	Unnamed stream	Intermittent	Riverine, Intermittent, Streambed, Seasonally flooded (R4SBC) and Palustrine, Scrub-shrub, Broad-leaved deciduous, Temporary flooded (PSS1A)
Stream S24	Unnamed seep	Not identified	Not identified
Wetland W6	Unnamed wetland	Not identified	Not identified
Wetland 1	Unnamed wetland	Not identified	Not identified
Wetland 2	Unnamed wetland	Not identified	Not identified

Note:
1. This information is under review by the U.S. Army Corps of Engineers and Ecology and may change. The table uses conservative estimates based on initial field visits and available information.

Table 4
Surface Waterbodies Crossing the Aerial Transmission Lines Portion of Proposed Project Footprint

FEATURE ID	FEATURE NAME	NHD CLASSIFICATION	NWI CLASSIFICATION
North of Columbia River			
Stream S23	Unnamed canal/ditch	Intermittent water course	Riverine, Intermittent, Streambed, Seasonally flooded (R4SBC)
Columbia River			
Stream S20	Columbia River (Lake Celilo)	Perennial lake/pond	Lacustrine Limnetic, Unconsolidated bottom, Permanently flooded, Diked/ Impounded (L1UBHh)

Figure 3
Surface Water Features Crossing the Proposed Project Footprint



Sources: WDNR 2021; USGS 2021; FFP 2020b

3.2.2.1 Columbia River

The Columbia River has been developed into a highly regulated river system, with a variety of federal and state agencies and private utilities operating dams on the river for a variety of uses. The proposed project footprint is adjacent to Lake Celilo, just downstream of John Day Dam, and water supply for the proposed project would be diverted at a pump station adjacent to the Lake Umatilla portion of the Columbia River just upstream of John Day Dam. The existing intake to the pump station is not in direct connection with surface water. It draws water from the bottom of an infiltration gallery that consists of a 28-foot-deep by 93-foot-wide excavated channel filled with clean gravel that prevents fish from becoming entrained. Water is supplied to the infiltration gallery from an intake pool that is physically separated from the main channel of the Columbia River by a rock and gravel-filled embankment to support the BNSF railroad. Water is drawn from the Columbia River to the intake pond, and then into the infiltration gallery, by seepage through the rock embankment (Rye Development 2021).

There are three principal water right considerations that could be affected by the proposed project. First, the Instream Resource Protection Program for the Columbia River (Washington Administrative Code [WAC] 173.563) establishes minimum instream flows for the mainstem of the Columbia River to provide for the preservation of wildlife, fish, scenic, aesthetic, and other environmental and navigational values. The minimum instream flows specify the amount of water needed in a particular place for a defined time, typically following seasonal variations, to protect and preserve instream resources and uses. They effectively serve as a water right for the river and the resources that depend on it. WAC 173.563 establishes minimum instream flows for five management units along the mainstem of the Columbia River, each of which has an associated control station designated for flow monitoring. The USGS gage at The Dalles, Oregon (ID No. 14105700), roughly 24 miles downstream of the proposed project footprint, is used to define Columbia River flows in the vicinity of the proposed project.

Second, Columbia River flows are subject to the Biological Opinion (BiOp) issued most recently in July 2020 by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service for the Federal Columbia River Power System to protect threatened and endangered fish species (NOAA Fisheries 2020). The BiOp represents flows necessary to protect salmonids listed under the Endangered Species Act. Although the BiOp is not a water right itself, some water rights on the Columbia River are conditioned to BiOp flows, and the BiOp is a consideration of the public interest when issuing new water rights and considering water right transfers.

Third, existing water rights, including Tribal water rights, must be considered when evaluating potential impacts on the Columbia River associated with new projects. No project can impair existing water rights. Mitigation can be proposed to properly offset such impacts to avoid impairment.

3.2.2.2 Streams, Ponds, and Seeps

As noted in Tables 3 and 4, the proposed project footprint includes smaller surface water features of streams, ponds, and seeps. Those features are described in the following sections.

3.2.2.2.1 Southern Portion of Study Area (Columbia Tributaries Watershed)

The southern portion of the study area drains to the Columbia River. As noted in Table 3, the Applicant's consultant ERM delineated surface water features within the proposed project footprint during a May 2019 field reconnaissance. Additional surface water features occur surrounding the project footprint as identified during field reconnaissance work by Anchor QEA (2022a), ERM (2022a), and PGG (2013) and as shown in Figure 3. The surface waterbodies identified through these studies in the southern portion of the study area are summarized below.

> An **intermittent** stream flows during some but not all times of the year.
>
> A **perennial** stream flows year-round.
>
> An **ephemeral** stream contains water only following precipitation.

- **Stream S17.** The Stream S17 waterbody drains down the hillside north of SR 14, crosses under the highway in a metal culvert, and emerges north of the lower reservoir. It is identified as an intermittent stream in the NHD and NWI datasets. ERM confirmed the stream to be intermittent during their May 2019 field delineation, documenting a channel about 24 inches wide and 1 to 3 inches deep (FFP 2020a). Flowing water 1 to 3 inches deep was observed entering the culvert above the highway but not exiting the culvert outlet below the highway, although a small grassy swale was observed below the outlet. The observations suggest that most of the flow entering the culvert infiltrates into the subsurface beneath the highway. The NWI identifies the extension of Stream S17 (R4SBC; Table 3) extending southward nearly 0.5 mile from the proposed lower reservoir location where it joins with another unnamed stream, as depicted in Figure 3. However, ERM reported no channel extending southward from the culvert through the project area. The NWI also identifies Stream S17 immediately upslope of the highway as a wetland; however, field observations during the May 2019 field delineation documented that no wetland is present in that location (FFP 2020a). Supplemental field investigations conducted in April 2022 (ERM 2022a) observed the presence of a seasonal wetland (Wetland 2) in this area. Study area wetlands are addressed in greater detail in the *Wetland and Regulated Waters Resource Analysis Report* (Appendix C of the EIS).
- **Stream S24.** The Stream S24 waterbody is an apparent seep (groundwater discharge) emerging along the hillside above SR 14 near the lower reservoir. This feature is not identified in either the NHD or NWI datasets. The discharge was observed to flow into a drainage ditch on the north side of the highway and to the same culvert into which Stream S17 flows.
- **Wetland W6.** W6 is a wetland associated with a seep downslope of Stream S17. It appears to be isolated and does not have a surface connection to S17.
- **Wetland 1.** Wetland 1 was first identified during a July 2021 site visit performed by Anchor QEA and Ecology and consisted of a small potential wetland area located where a small intermittent stream (Stream S24) abuts SR 14. The stream did not appear to cross SR 14, and water collected in a depression formed by the road fill embankment. During the 2022 ERM field investigation, the presence of Wetland 1 (0.0002 acre in size) was confirmed at the toe of the hillslope where Stream S24 terminates. This area showed evidence of wetland hydrology and prevalence of hydrophytic vegetation; however, hydric soil was not observed, and the presence of large, sharp gravels prevented digging to the full depth recommended per delineation methodology. Given the presence of wetland hydrology during a drier precipitation year and prevalence of hydrophytic vegetation, this area was assumed to be a seasonal wetland.
- **Wetland 2.** Wetland 2 was first identified during a July 2021 site visit performed by Anchor QEA and Ecology and consisted of a potential wetland area located where an intermittent stream (Stream S17) flowed to the SR 14 road embankment. The stream did not cross SR 14 due to a damaged culvert. During the 2022 ERM field investigation, the presence of Wetland 2 (0.001 acre in size) was confirmed to be present along Stream S17 where the hillslope levels slightly and the surface flow slows and pools to a limited extent. This area showed evidence of wetland hydrology and prevalence of hydrophytic vegetation; however, hydric soil was not observed, and the presence of large, sharp gravels prevented digging to the full depth

recommended per delineation methodology. Given the presence of wetland hydrology during a drier precipitation year and prevalence of hydrophytic vegetation, this area was assumed to be a seasonal wetland.

- No quantitative data are available to document existing water quantity or quality for these waterbodies.

3.2.2.2.2 Northern Portion of Study Area (Swale Creek Watershed)

The northern portion of the study area drains to Swale Creek. As noted in Table 3, the Applicant's consultant ERM delineated surface water features in this portion of the study area during two delineations (May 2019 and April 2022). In July 2021, Anchor QEA identified one additional surface water feature. The surface waterbodies identified by ERM (FFP 2020a; ERM 2022a) and Anchor QEA (2022a) in the northern portion of the study area are shown in Figure 3 and are summarized below.

- **Stream S7.** The Stream S7 waterbody within the northeast portion of proposed upper reservoir footprint is mapped in the NHD and NWI as a perennial stream. However, based on observations from the May 2019 field delineation, ERM identified Stream S7 as an ephemeral stream channel that is 16 to 24 inches wide, 1 to 3 inches deep, and extends approximately 995 feet into the proposed project footprint. Evidence of an OHWM included an incised bed and bank, sediment sorting, and debris wracking. No flowing water was observed in the channel of Stream S7 at the time of the field visit; however, algal matting covered much of the substrate. Both the NHD and NWI show Stream S7 as connecting to the location of Pond/Wetland P2 approximately 950 feet to the south. However, ERM observed no evidence of an OHWM between Pond/Wetland P2 and the upper extent of Stream S7 that they mapped, which is reproduced in Figure 3.
- **Stream S8.** Similar to Stream S7, the Stream S8 waterbody in the northernmost portion of the proposed project footprint is classified as a perennial stream in both the NHD and NWI datasets but was identified as an ephemeral stream during ERM's May 2019 field delineation. ERM observed Stream S8 to have a channel 12 to 24 inches wide and 1 to 3 inches deep that extends approximately 990 feet into the project footprint, which is approximately 770 feet longer than the extent mapped by the NHD and NWI. Figure 3 depicts ERM's mapped extent of Stream S8 from their May 2019 delineation. Evidence of an OHWM included an incised bed and bank, sediment sorting, and debris wracking. No flowing water was observed, but several pockets of standing water were present and much of the substrate was covered with algal matting.
- **Stream 1.** Stream 1 flows into Stream S7 and is assumed to be an ephemeral stream channel that is 8 to 12 inches wide, 1 to 3 inches deep, and approximately 773 feet long. During Anchor QEA's July 2021 site visit, no flowing water was observed in the channel, but much of the substrate was covered with algal matting.
- **Pond/Wetland P1.** Pond/Wetland P1, at and just outside of the northern project footprint, is identified in both the NHD and NWI datasets as a perennial pond that exhibits some wetland characteristics. Pond/Wetland P1 has no connection to Stream S7 or Stream S8. Based on field observations, FFP concluded it is a manmade stock-watering pond. At the time of the May 2019 field visit, ERM observed Pond/Wetland P1 to be nearly full of water and approximately 0.2 acre in size and, consistent with NWI/NHD, there was no evidence of a channel connecting it to Stream S7.
- **Pond/Wetland P2.** Pond/Wetland P2 along the southern edge of the proposed upper reservoir is identified as a perennial pond in the NHD but is not included in the NWI. The NWI depicts Stream S7 extending south toward the approximate location of Pond/Wetland P2. ERM concluded that Pond/Wetland P2 is a manmade stock-watering pond and not part of a stream or drainage. At the time of the May 2019 field delineation, ERM observed it to be roughly half full of

water and approximately 0.03 acre in size, with no evidence of a channel connecting it to Stream S7.

No quantitative data are available to document existing water quantity or quality for these waterbodies.

The northern portion of the project footprint drains northward to Swale Creek, which flows westward through Swale Valley, a broad alluvial-filled basin, then into Swale Canyon, a deeply incised bedrock canyon, before discharging to the Klickitat River. Within Swale Valley, Swale Creek is an expression of the water table in a surficial alluvial aquifer. Consequently, this portion of Swale Creek flows during the winter and early spring but is commonly dry from early summer until winter precipitation begins as groundwater levels in the alluvium decline.

In Swale Canyon downstream of Swale Valley, creek flows are flashy, with high flows occurring for short durations in response to winter storm events or snowmelt runoff (Aspect Consulting 2010, 2013). For much of the rest of the year, water in Swale Canyon typically exists as a series of discontinuous pools with little connecting flow. Streams S7 and S8, within the footprint of the proposed upper reservoir, are headwater tributaries to Swale Creek and are at least 15 river miles upstream of the fish-bearing portion of Swale Creek within Swale Canyon.

As part of a 2003 water storage assessment for the Swale Creek watershed, stream gaging and visual observations of stream flow were conducted at accessible locations throughout the watershed during both wet season and dry season conditions (April and September 2003, respectively). During the wet season, flows ranging from dry to 0.5 cfs were qualitatively estimated in small headwater tributaries north of the proposed upper reservoir. Downstream of those tributaries and roughly 4 miles west-northwest of the proposed upper reservoir, Swale Creek stream flow was measured at 0.6 cfs where it crosses Highway 97 (river mile 24). Moving farther downstream (westward), the flows in Swale Creek increased to 1.0 cfs at Harms Road near the top of Swale Canyon (river mile 12) and then to 5.1 cfs just upstream from its confluence with the Klickitat River (river mile 0.3). During the dry season, Swale Creek was observed to be dry or occupied by stagnant pools upstream (east) of Harms Road. Similar dry to stagnant conditions were observed downstream of Harms Road in Swale Canyon, with a maximum flow of 0.25 cfs estimated just upstream of the creek mouth (Aspect Consulting 2003a, 2003b).

For the Tribes, streams are also important for the active and contemporary hunting, gathering, and cultural activities of Tribal members. Impacts to Tribes are analyzed more fully in the *Tribal Resources Analysis Report* (Appendix H of the EIS) and Section 4.9 of the EIS.

3.2.3 Groundwater Resources

This section describes groundwater resources within the southern and northern portions of the study area.

3.2.3.1 Southern Portion of Study Area (Columbia Tributaries Watershed)

Groundwater conditions in the southern portion of the study area are separate and distinct from those of the northern portion. The conceptual model developed for the area indicates the presence of a hydraulic divide that separates the southern and northern portions as distinct groundwater basins. Those basins are separated by the Columbia Hills, which comprise a complex collection of geologic folds and faults that are generally interpreted to be a barrier to horizontal groundwater flow (Aspect Consulting 2010; HDR 2020). Information regarding groundwater conditions in the southern area is derived primarily from recent documentation prepared for the former CGA smelter cleanup site (Tetra Tech et al. 2015, 2019; HDR 2020).

In the area of the proposed lower reservoir, a veneer of unconsolidated deposits covers a surface of Grande Ronde basalt that, due to intense scouring by the Missoula floods, has significant topography. The unconsolidated deposits, consisting of naturally deposited sands, gravel, and silts and manmade fill, appear to be 30 to 50 feet thick in the area surrounding the proposed lower reservoir but much thinner or absent to the east. The unconsolidated deposits form the shallowest water-bearing zone, generally referred to as the unconsolidated aquifer (UA), which is an unconfined (water table) zone recharged by direct precipitation and by runoff and groundwater inputs from the bedrock bluff immediately to the north (south slope of the Columbia Hills) as well as historical landslide deposits immediately to the northwest of SR 14.

Groundwater in the UA zone is influenced by the geometry of the underlying bedrock surface and thickness of the unconsolidated deposits. Across the area of the proposed project's lower reservoir, the water table in the UA slopes generally to the southwest from elevations of approximately 470 feet to approximately 400 feet NAVD88. Accordingly, the general groundwater flow direction in the UA is southwest toward the Columbia River as depicted in Figure 4. Groundwater in the UA does not discharge directly to the Columbia River. Rather some UA groundwater may daylight to the surface in the southern portion of the project area, with the majority discharging downward through fractures into the underlying basalt water-bearing zones (Tetra Tech et al. 2015).

Figure 4
Water Table Elevation Contour Map for Lower Reservoir Area

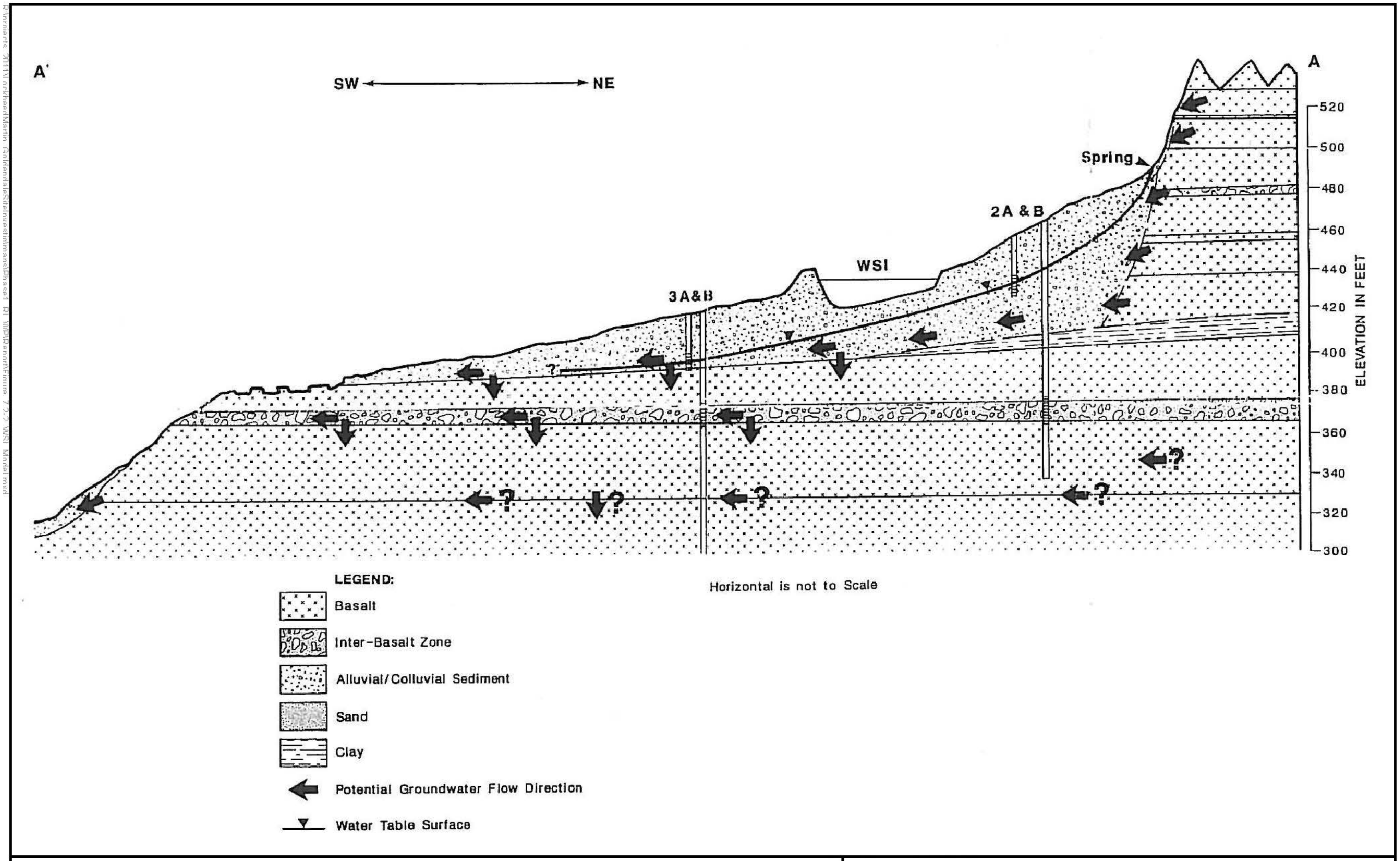
Source: GeoPro 2020

Beneath the UA, the Grande Ronde basalt extends thousands of feet below ground surface and is composed of individual basalt flows ranging in thickness between 50 and 80 feet. The vesicular zones separating individual basalt flows (interflow zones) are the permeable zones within the basalt sequence and constitute the aquifer zones. In the area of the proposed lower reservoir, the smelter cleanup site documentation identifies the shallowest basalt aquifer zone, referred to as the Basalt Aquifer Upper Zone (BAU), at a depth ranging from roughly 30 to 40 feet below ground surface. Like in the UA, the groundwater flow direction in the BAU is primarily southwest toward the Columbia River. A series of confined aquifer zones occur in deeper basalt interflow zones beneath the BAU (Tetra Tech et al. 2015).

A vertical downward gradient occurs from the UA to the underlying BAU. Vertical gradients are also documented within the deeper basalt water-bearing zones down to the surface water elevation of the Columbia River; near this elevation, the gradient becomes significantly less steep as groundwater levels are largely controlled by the lake elevation. The basalt aquifer system flows toward the southwest and, depending on elevation of the interflow aquifer zone, discharges as springs along the bank of Lake Celilo above the lake elevation (151 to 156 feet NAVD88) or directly to Lake Celilo below the waterline.

During an investigation for the smelter cleanup site, no springs were observed draining the basalt cliff faces near the Columbia River south of the project site (Tetra Tech et al. 2015), suggesting the groundwater discharge occurs beneath the lake surface. Figure 5 is a cross-sectional conceptual hydrogeological model, reproduced from Tetra Tech et al. (2015), depicting the UA at the surface (“alluvial/colluvial sediment”) and the underlying basalt with water-bearing interflow (“inter-basalt”) zones extending from the base of the Columbia Hills bluff on the right side of the figure (northeast) to the bank of the Columbia River on the left side (southwest). The figure conceptually illustrates directions of groundwater flow laterally within and vertically between the UA and underlying basalt zones.

Figure 5
Conceptual Hydrogeologic Model for Lower Reservoir Area



Source: Tetra Tech et al. 2015

The 2,400-foot basalt-bedrock bluff separating the northern and southern portions of the study area is part of the Columbia Hills, which is part of the regionally extensive Yakima Fold and Thrust Belt that formed from regional north-south compression that began millions of years ago. This regional compression resulted in the formation of the southwest-northeast trending geologic folds (synclines and anticlines) and thrust faults that form the Columbia Hills. Superimposed upon the regional southwest-northeast trending geologic structures are numerous northwest-southeast trending normal faults and strike-slip faults (Reidel et al. 1989).

An **anticline** is a geologic fold in which the fold's two limbs dip away from each other.

A **syncline** is a geologic fold in which the fold's two limbs dip toward each other.

In a **thrust fault,** the block of rock above the fault moving upward relative to the block below due to compressional forces.

In a **normal fault,** the block of rock above the fault moving downward relative to the block below due to extensional forces.

In a **strike-slip fault,** the two blocks of rock slide laterally past each other.

The exposed basalt bedrock in the bluff is interpreted to be the southern limb of the Columbia Hills Anticline. The Anticline's northern limb, beneath the upper reservoir area, has also undergone low-angle thrust faulting. Attachment 1 includes a figure from HDR (2020) depicting a north-south-trending subsurface cross section through the proposed project area that illustrates the configuration of the proposed underground infrastructure (vertical shaft, headrace tunnels, powerhouse cavern, transformer gallery, and tailrace tunnel) relative to the currently interpreted geologic conditions. Attachment 2 includes a figure from Aspect Consulting (2010) that depicts the locations of regional geologic folds and faults mapped by Washington Department of Natural Resources in the project vicinity and to the west. Section 4.1 of the EIS (Geology and Soils) provides additional detail regarding the proposed project's regional and local geologic setting.

Geologic folds and faults may represent partial or complete barriers to lateral groundwater flow in basalt aquifer systems. This can be caused by a combination of physically offsetting and thus disconnecting permeable zones in which the groundwater flows, and/or by the presence of pulverized folded/fractured rock that forms a fine-grained powder termed "fault gouge" that has low permeability and thus restricts groundwater flow (Newcomb 1969).

Groundwater in the basalt aquifers of the southern portion of the study area flows generally southwestward as described above, and groundwater in the basalt aquifers of the northern portion of the study area flows generally westward as described in the next section. A groundwater divide separating the two areas' southern and western flow directions is inferred based on hydrogeologic principles, but its location is uncertain due to lack of data. The location of a groundwater divide may vary with horizontal location and with depth within the basalt sequence as a result of a potentially complex geometry of the geologic structures comprising the Columbia Hills in the project area.

Given the lack of groundwater flow information along the top of the bluff, it is assumed that, for purposes of this analysis, the proposed project's underground infrastructure would straddle an existing groundwater divide within the basalts. Groundwater to the north of the divide discharges towards the Swale Creek watershed and groundwater to the south of the divide discharges towards the Columbia River. Given the exposed 2,400-foot-tall basalt face and the documented groundwater seepage along it, and the large-scale thrust fault (potential flow barrier) dipping to the north of the bluff, it is inferred that a greater portion of the groundwater within the proposed underground infrastructure area flows south toward the Columbia River.

3.2.3.2 Northern Portion of Study Area (Swale Creek Watershed)

The northern portion of the study area lies within the uppermost headwaters of the Swale Creek watershed. Very limited geologic/hydrogeologic information is available for the upper reservoir area. Ecology's well log database includes well drilling logs for seven resource protection borings located within approximately 1 mile of the upper reservoir (within Township 3, North Range 16 East, Section 13; and Township 3, North Range 17 East, Section 18). Each of the borings, ranging in depth from 10 to 40 feet, reported up to 4 feet of unconsolidated materials (sand, gravel, cobbles) over fractured basalt to the total depth drilled; no groundwater was reported for any of the borings. Given the lack of available subsurface information specific to the upper reservoir area, the description of groundwater conditions for the northern portion of the study area is derived from the Preliminary Engineering Geology Technical Memorandum included as Appendix A to HDR (2020) and hydrologic studies of the Swale Creek watershed conducted as part of the WRIA 30 watershed planning process.

The primary hydrostratigraphic units within the Swale Creek watershed include, from the surface down, the alluvium aquifer, which is composed of unconsolidated alluvial and sedimentary rocks and limited to Swale Valley, and the underlying basalt aquifer system within the combined Wanapum and deeper Grande Ronde formations. Well logs from Swale Valley indicate that the shallowest water-bearing zone of the basalt directly underlies the alluvium. Therefore, the combined alluvium and uppermost basalt water-bearing zone are considered to be one hydrostratigraphic unit (Aspect Consulting 2007). The alluvial aquifer is hydraulically separated from the deeper basalt aquifer zones by massive basalt flow interiors that provide relatively impermeable confining layers between the alluvial and deep basalt aquifer zones. Based on groundwater elevation measurements, flow direction in the alluvial aquifer is generally from east to west with discharge to Swale Creek (Aspect Consulting 2010).

> **A hydrostratigraphic unit** is any water-bearing geologic unit or units hydraulically connected or grouped together based on similar hydraulic characteristics such as the ability to convey or restrict groundwater flow.

Groundwater within the deeper basalt aquifers beneath the Swale Valley also flows generally east to west (see Attachment 2). However, roughly 17 miles west of the proposed project, the north-south-trending Warwick strike-slip fault that forms the transition from Swale Valley into Swale Canyon creates a hydraulic barrier to groundwater flow in the basalts, impounding groundwater upgradient (east) of it as illustrated by the groundwater elevation contours shown in the figure in Attachment 2. As a result of this hydraulic barrier, a negligible amount of groundwater discharges into Swale Canyon from the deeper basalt aquifer beneath Swale Valley. Rather, groundwater from the deeper basalt aquifer is discharged from the Swale Valley in one of two primary ways: flowing to the northwest into the Little Klickitat subbasin, where it generally discharges to the Little Klickitat River, or being withdrawn by wells.

In contrast to the deep basalt aquifer system, the Warwick Fault restricts but does not create a complete barrier to groundwater flow in Swale Valley's alluvial aquifer. In Swale Valley just east of the Warwick Fault, Swale Creek is broad and marshy throughout the year, whereas more channelized, less marshy conditions exist west of the fault. The marshy conditions east (upgradient) of the fault suggest that there is some impoundment of groundwater in the alluvium aquifer, expressing as surface water. However, geologic mapping and cross sections have shown the saturated alluvium to extend across the fault where the creek has eroded down ("notched") the underlying basalt bedrock (Aspect Consulting 2010). Any hydraulic effects of groundwater impoundment from the Warwick Fault do not propagate eastward to the subbasin headwaters in the vicinity of the proposed project.

In addition to the Warwick Fault, other parallel strike-slip faults—the Goldendale Fault immediately west of the proposed upper reservoir and the Snipes-Butte Fault approximately 4 miles west of it—traverse Swale Valley (Attachment 2). Unlike the Warwick Fault, neither the Snipes Butte nor the Goldendale faults appear to act as complete barriers to groundwater flow in the basalts of Swale Valley. In both of these cases, it is inferred that fractures (lineaments) along the base of the Swale Creek Syncline, within which Swale Valley is formed, provide a permeable conduit for groundwater flow across the fault traces (Aspect Consulting 2010).

Water level monitoring information indicates that Swale Creek and the alluvial aquifer are in direct hydraulic continuity with one another across the aquifer's length in Swale Valley west of Highway 97. However, the available information indicates that the basalt aquifers beneath Swale Valley are not in hydraulic continuity with Swale Creek (Aspect Consulting 2010). Based on the lack of groundwater encountered in borings completed to 40 feet near the upper reservoir, and the intermittent/ephemeral nature of the headwater tributaries in that area, there does not appear to be a shallow aquifer (in unconsolidated material) that is in direct hydraulic connection with the tributary surface waters in the upper reservoir area.

3.2.4 Water Quality

3.2.4.1 Columbia River Water Quality

In Washington, WAC 173.201A designates the following uses for the reach of the Columbia River encompassing Lake Umatilla and Lake Celilo: aquatic life uses (spawning/rearing); recreation use (primary contact); domestic, industrial, agricultural, and stock water supply uses; wildlife habitat; harvesting; commercial/navigation; boating; and miscellaneous aesthetics uses. In Oregon, the Oregon Department of Environmental Quality has identified similar designated uses for this portion of the Columbia River including fish and aquatic life (salmon and steelhead migration corridors); wildlife and hunting and fishing water uses; public and private domestic, industrial, irrigation, and livestock water supply uses; and boating, water contact recreation, aesthetic quality, hydropower, and commercial navigation and miscellaneous transportation uses (DEQ 2012).

Ecology's current (2016) U.S. Environmental Protection Agency (USEPA)-approved Water Quality Assessment identifies Lake Umatilla as impaired (Category 5; on 303(d) list) for water temperature, and pesticides and polychlorinated biphenyls (PCBs) in tissue. Lake Celilo is listed as Category 5 for temperature. Lake Umatilla and Lake Celilo are also both impaired and subject to a Total Maximum Daily Load (TMDL) for dioxins in fish tissue, and Lake Celilo is impaired and subject to a TMDL for total dissolved gas in water. Elevated total dissolved gas levels are caused by spill events at hydroelectric projects (dams) on the Lower Columbia River. Ecology made no changes to these listings in their draft 2018 Water Quality Assessment. Ecology recently adopted amendments to WAC 173.201A.200(1)(f)(ii) that deal directly with total dissolved gas levels at hydroelectric dams that became effective on January 30, 2020.

Total Maximum Daily Loads (TMDLs)

A TMDL is a calculation that identifies the amount of a pollutant that a river or other waterbody can receive and still meet specific standards developed by a state or Tribe to protect water quality. A TMDL determines a pollutant reduction target and allocates load reductions necessary to the source(s) of the pollutant.

Waterbodies are put into one of five categories, including Category 4 (impaired water that does not require a TMDL) and Category 5 (polluted water that requires an improvement plan, also called the 303(d) list). Once a TMDL is in place, the listing changes from Category 5 to Category 4A (impaired, TMDL in place).

In August 2021, USEPA reissued a TMDL for water temperature in the Columbia and lower Snake rivers (USEPA 2021). The TMDL determined that the allowable thermal loading capacity of the Columbia and lower Snake rivers is limited, with a total allowable loading capacity of a 0.3°C increase in river temperature allocated to all point and nonpoint sources combined. USEPA divided the 0.3°C allowable loading capacity equally among the river's dam impoundments, National Pollutant Discharge Elimination System (NPDES) point sources, and tributaries. The allowable combined impact of the sources in each category is 0.1°C at any location. USEPA included a reserve allocation for NPDES point sources for each reach of the TMDL study areas to accommodate future growth, new sources, and waste load allocation adjustments for existing facilities.

3.2.4.2 Southern Portion of Study Area (Columbia Tributaries Watershed)

The only available water quality information obtained for the southern portion of the study area is that with respect to toxics/hazardous substances associated with the former CGA smelter cleanup site. Toxics/hazardous substances are addressed in the *Environmental Health Resource Analysis Report* (Appendix I of the EIS). That information is not repeated in this report.

3.2.4.3 Northern Portion of Study Area (Swale Creek Watershed)

3.2.4.3.1 Surface Water Quality

In accordance with WAC 173.201A.600, the designated uses for Swale Creek are as follows: salmonid spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values. However, Ecology designated the approximately 12 miles of Swale Creek from the mouth to nearly Harms Road (i.e., within Swale Canyon) as waters requiring supplemental protection for salmonid spawning and incubation, dictating more stringent water quality standards for water temperature (Ecology 2011).

The lowermost approximately 3 miles of Swale Creek, within Swale Canyon, does not meet applicable water quality standards for temperature—based on supplemental protection for salmonid spawning and incubation—and therefore is on the state 303(d) list (Category 5) for temperature (Ecology 2021).

3.2.4.3.2 Groundwater Quality

During a 2004 study within Swale Valley, groundwater in wells less than 150 feet deep was documented to contain concentrations of nitrate exceeding the state drinking water standard of 10 milligrams per liter (WAC 246.290.310). No samples were collected within approximately 5 miles of the proposed upper reservoir during the study due to the lack of wells in the area as documented in Ecology's well log database. The study documented a strong correlation of nitrate with chloride concentrations that suggest an association to septic systems. No elevated nitrate concentrations were found in Swale Creek surface waters (WPN 2004). No other groundwater quality information was obtained for this portion of the study area.

3.3 Proposed Project

The proposed project would operate as an energy storage project. After the facility is constructed, the initial fill of the pumped-water energy storage system (lower reservoir plus conveyance piping) would be completed through a one-time continuous diversion of an estimated 7,640 acre-feet of water, at an estimated rate of 21 cfs continuously for approximately 6 months. This diversion, when spread between 2 years of water right use, would be compliant with the provisions of the existing water right. Water for the initial fill would be purchased from KPUD using the existing water right and sourced from an existing intake and pump station, off-stream of the Columbia River (see Section 3.2.2.1). KPUD does not currently own the pump station; rather, it holds easements from the U.S. Army Corps of Engineers and has an agreement in place to purchase the pump station and associated infrastructure.

At the initiation of operation, approximately 7,100 acre-feet of water would be pumped from the lower reservoir through a larger-diameter conveyance system to the upper reservoir using three variable-speed, reversible pump-turbines in the underground powerhouse and operating in pump mode. To generate power, water would be released from the upper reservoir and pass through the same three variable-speed, reversible pump-turbine units operating in turbine mode, with each generating up to 400 megawatts (MW) of electricity. In generation mode, the proposed project is designed to generate electricity for up to 12 hours a day, to provide full power generation at a maximum of 1,200 MW and a minimum of 100 MW. Project operations would then pump water from the lower reservoir back to the upper reservoir in about 15 hours. Project operation can alternate between pumping and generating modes quickly and for different lengths of time to respond to market needs, and the operating cycle of pumping and generating would be dictated by market demand (FFP 2020b).

The proposed system's upper reservoir embankment would be 175 feet high and 8,000 feet long with a storage volume capacity of 7,100 acre-feet and a full-pool water surface area of about 61 acres. The top of the upper reservoir embankment would be at elevation 2,950 feet above mean sea level. The lower reservoir embankment would be 205 feet high and 6,100 feet long with a storage volume capacity of 7,100 acre-feet and a full-pool water surface area of about 63 acres. The top of the lower reservoir embankment would be at elevation 590 feet above mean sea level. The two reservoirs would be connected by an underground water conveyance system with powerhouse and penstocks housing the three variable-speed, reversible pump-turbine units.

To the extent practical, materials excavated to construct the two reservoirs would be reused as embankment fill. The preliminary project design assumes that the earthwork cut and fill volumes for both reservoirs would be balanced (12 million cubic yards of cut volume and 12 million cubic yards of fill volume). However, preliminary estimates indicate that approximately 1 million cubic yards of fill (net) would be needed to complete the proposed project (see Chapter 2 of the EIS). To conduct the necessary materials processing and production of concrete, project construction would include set up and operation of an aggregate processing plant and concrete batch plant within the lower reservoir laydown area and a second smaller concrete batch plant located within the upper reservoir laydown area. No new access roads are anticipated, and no upgrades are anticipated to be needed to existing public roads in order to facilitate construction and permanent access to the proposed project's facilities.

Proposed Project Water Use

The Applicant plans to purchase water for construction and operation of the proposed project from KPUD. The water supply would be delivered to the project footprint from an existing pump station east of the proposed project and a subsurface water conveyance system. Water would be supplied to the proposed project via a metered water tap connection to KPUD's Cliffs Water System.

The proposed project's water supply needs include an estimated one-time diversion of 7,640 acre-feet of water, at an estimated rate of 21 cfs continuously for approximately 6 months, to complete the initial fill of the pumped storage system (HDR 2020). This initial volume is the sum of the 7,100 acre–foot operating volume for the lower reservoir, water that would remain in the upper and lower reservoirs beyond the operating volume, and the volume that would fill the water conveyance tunnels (FFP 2020b). HDR estimates an average of 260 acre-feet per year (AFY) of make-up water would subsequently be supplied to the system on an as-needed basis to restore consumptive water loss from evaporation.[1] The quantity of make-up water needed would depend primarily on air temperature throughout the year, with the maximum monthly volume of make-up water needed estimated to be 80 acre-feet in July. As noted in Section 3.2.1, the Applicant's estimate of make-up water demand assumes a future evaporation rate greater than measured in the historical record to account for anticipated future climate change.

For purposes of this analysis, we apply the term **seepage** to water flowing through the liner systems of the two reservoirs. We apply the term **leakage** to water escaping from the water conveyance system piping joints, pumps, power turbines, and related features.

The HDR-estimated quantity of make-up water assumes no leakage/seepage from project infrastructure (HDR 2020). However, the Applicant's Federal Energy Regulatory Commission (FERC) license application includes an assumed additional 100 AFY of water losses from the system as a placeholder value to be confirmed with additional engineering studies, bringing the estimated average make-up water demand to 360 AFY (FFP 2020b). The periodic refill (make-up) water would also be purchased from KPUD using the existing conveyance system and existing water right. KPUD's Cliffs water right authorizes a maximum annual consumptive use quantity of 4,851 AFY, of which 4,226 AFY is available for use by the proposed project.

Although design details have yet to be finalized, the preliminary project design includes measures specifically intended to prevent water seepage/leakage from the system. This includes lining the embankments and base of the upper reservoir with a combination of a geosynthetic liner over concrete, including a sand drainage layer with leak detection system below the liner. The lower reservoir is expected to include a pair of geosynthetic liners (dual-lined) over concrete with a sand drainage layer between the bottom liner and concrete to provide redundancy in preventing seepage (FFP 2020b). For both reservoirs, water collected in the drainage layer would be pumped back into the respective reservoir, and the leak detection system would provide an indication of the approximate location of leaks through the liner. Project tunnels would be lined with concrete, steel, or both, and may include an impermeable synthetic liner to reduce leakage and seepage. The water conveyance tunnels connecting the two reservoirs would be lined with thick (up to 24 inches) concrete plus a geosynthetic liner to limit seepage into the surrounding bedrock. A drainage layer between the concrete and the synthetic liner would collect seepage and pump it into the lower reservoir. Portions of the conveyance tunnels, particularly near the lower reservoir inlet/outlet and the draft tubes and penstocks, are also expected to be lined with steel. The Applicant indicated during early coordination with Ecology that their current assumption is that no leakage or seepage of water would occur from the proposed system.

The Final EIS for a similar project, the 3,001-acre-foot capacity (initial fill volume) Swan Lake North Pumped Storage Project near Klamath Falls, Oregon, estimated annual evaporative losses of 357 AFY and leakage losses of 63 AFY, or 12% and 2%, respectively, of the total system capacity. The Swan Lake system reportedly would include geosynthetic-lined upper and lower reservoirs with leak detection systems, but the lower reservoir would not be dual-lined as is planned for the proposed project. The Swan Lake Final EIS also includes no mention of lining conveyance piping connecting the reservoirs, as is planned for the proposed project (BLM 2019).

Based on the collective information and pending additional design-level information from the Applicant, it is assumed for this analysis that an average annual loss of 100 AFY (1.3% of system capacity) would

[1] Estimated 390 AFY of evaporation minus 130 AFY of precipitation falling within the combined reservoir footprints.

occur from reservoir seepage and conveyance leakage. When added to the estimated 260 AFY of evaporative loss, a total average annual water use of 360 AFY was assumed for project operation. This is consistent with what the Applicant reported in their FERC license application (FFP 2020b). Based on the Applicant's preliminary design information, it is expected that seepage from the lined reservoirs would be negligible, and that the vast majority of water loss would be leakage from the conveyance and pumping systems given the high pressures developed in the system during water conveyance and power generation (HDR 2020). Water lost to evaporation would be a consumptive loss, whereas leakage water from the system would be return flow to the hydrologic system adjacent to the proposed project footprint.

KPUD would provide water to the proposed project under its existing Cliffs municipal use right (S3-00845C), which was originally issued to the CGA Company, with a priority date of March 19, 1969. Ecology's final order following a 2006 water right change processed by the Klickitat County Water Conservancy Board authorizes a maximum annual withdrawal quantity of 15,591 acre-feet at a maximum instantaneous rate of 35.3 cfs, and also limits the annual consumptive use quantity to a maximum 4,851 acre-feet. The Cliffs water right fully covers the proposed project's total and consumptive water needs, assuming the initial fill occurs across a 2-year period to comply with the annual maximum consumptive use quantity constraint. As such, KPUD supplying water for the project would not result in new waters being appropriated from the Columbia River. By statute, a secondary permit is not required for beneficial use of water stored in a reservoir where the water right for the source of the stored water authorizes the beneficial use, in this case being explicitly listed as part of the municipal water right used in an industrial/power generation manner (Revised Code of Washington [RCW] 90.03.370(C)(1)). KPUD's use of the Cliffs water right to supply water to the proposed pumped storage project would also comply with requirements of RCW 54.16.410, which addresses the supply of water to be used in pumped storage energy generating facilities.

Stormwater and Wastewater

During construction, stormwater generated within the project area would be managed in accordance with an NPDES Construction Stormwater General Permit (CSWGP), and domestic wastewater would be managed using temporary portable restrooms with wastewaters hauled off and disposed of by the service provider.

During operations of the proposed project, stormwater generated from the project area would be managed in accordance with NPDES Industrial Stormwater General Permit using sedimentation and infiltration ponds, and domestic wastewater is anticipated to be managed using one or a combination of an existing sewer system (e.g., system serving aluminum smelter facility) or a permitted on-site septic system. The existing domestic wastewater system that serves CGA would require upgrades to serve the proposed project.

3.3.1 Impacts from Construction

This section describes direct and indirect impacts resulting from construction of the proposed project including use of equipment and development of material staging areas.

3.3.1.1 Direct Impacts

3.3.1.1.1 Alteration of Surface Water Hydrology

Southern Portion of Study Area

KPUD's Cliffs Water System would provide all water supply for project construction under its existing municipal water right (certificate S3-00845C) with a priority date of March 19, 1969. That water right authorizes a maximum instantaneous rate of 35.3 cfs and annual total withdrawal quantity of 13,911 AFY, which includes a maximum consumptive use of 4,851 AFY. This includes the very large initial fill of the system that would occur near the end of the construction period (likely between October to March). The Cliffs water right predates and is senior to the adoption of the Columbia River instream flow rule in 1980. Therefore, water supply for project construction would not result in any new impacts on the Columbia River or other surface waters within the southern study area. This assumes that the initial fill of the proposed project system occurs across a 2-year period to comply with the annual maximum consumptive use quantity of the underlying water right as described above.

Ecology has approved multiple changes requested by KPUD to the original certificate, including a 2002 change expanding the place of use (CS3-00845C@1) and a 2006 change from industrial to municipal purpose, both of which were processed by the Klickitat County Water Conservancy Board. In addition, following placement of the right into the State of Washington's Trust Water Right Program by KPUD, Ecology approved its use for mitigation of impacts to the Columbia River associated with new water-budget-neutral water rights. These included S4-35068 issued to the City of White Salmon in 2010, G4-33184 issued to 101 Bar Ranch LLC in 2016, and G4-35220 issued to Klickitat PUD (Roosevelt groundwater right) in 2015. Use of the Cliffs municipal water right for mitigation purposes has been cancelled for the S4-35068 and G4-35220 water rights, but KPUD (2022) indicates there remains a commitment of 625 AFY to water right permit G4-33184 under G4-33184(B). Therefore, 4,226 AFY of the total 4,851 AFY of consumptive water under KPUD's municipal water right is available to meet the water supply needs of the proposed project. During their May 2019 field delineation, ERM identified no surface water features within the footprint of the proposed lower reservoir and associated temporary construction staging area. The NWI maps an extension of intermittent Stream S17 traversing the project area and discharging to the Columbia River, but this feature was not field-verified during the delineation. The field-verified seep Stream S24 immediately north of SR 14 and intermittent Stream S17 flowing within a culvert beneath SR 14 are both within the proposed project footprint but are outside of the identified areas of aboveground disturbance as depicted in Figure 3 (FFP 2020a). Any leakage or seepage from project infrastructure would occur subsurface and the potential release would not alter the hydrology or geomorphology of adjacent surface waters.

Northern Portion of Study Area

As described in the *Wetlands and Regulated Waters Resource Analysis Report* (Appendix C of the EIS) and Section 4.2 of the EIS, construction of the upper reservoir would result in the permanent loss of portions of Stream S7, Stream S8, Stream 1, and all of Pond/Wetland P2. Stream S8 would also be subject to temporary impacts for the duration of the construction period. Stream S7, Stream S8, and Stream 1 all provide either intermittent or ephemeral drainage to Swale Creek. As a result, their loss could reduce the volume of surface flows to Swale Creek. However, given that they drain only a small portion of the 54,200-acre Swale Creek watershed, such impacts would be minimal. Pond/Wetland P2 has no surface outlet and is not connected to any other waterbody. Refer to the *Wetlands and Regulated Waters Resource Analysis Report* and Section 4.2 of the EIS for a complete description.

Conclusion

Apart from permanent and/or temporary impacts on streams and ponds/wetlands within the upper reservoir area that are addressed in the *Wetlands and Regulated Waters Resource Analysis Report* (Appendix C of the EIS), and water supply for the initial fill of the system occurs under an existing municipal water right authorization, no impact on surface water hydrology within the study area is anticipated during construction of the proposed project. There would not be a significant adverse impact on surface water hydrology.

Impacts to streams can also affect the active and contemporary hunting, gathering, and cultural activities of Tribal members. This is especially true for impacts that would result in permanent loss of streams in the upper reservoir areas. Impacts to Tribes are analyzed more fully in the *Tribal Resources Analysis Report* (Appendix H of the EIS) and Section 4.9 of the EIS.

3.3.1.1.2 Alteration of Groundwater Flow Systems

Southern Portion of Study Area

The base of the lower reservoir would be constructed at an elevation of approximately 420 feet, indicating excavation and structure would extend beneath that elevation. Based on available information, the northern portion of the lower reservoir's base would extend beneath the UA water table but would not extend through the full saturated thickness of the UA. As such, temporary dewatering or upgradient cutoff of UA groundwater would be required to complete the excavation, subgrade preparation, concrete placement work, and liner system installation for the lower reservoir.

Within the bedrock bluff north of the lower reservoir, tunneling and excavation to construct the extensive underground water conveyance and power generation infrastructure would need to dewater groundwater from multiple basalt interflow zones across the approximately 2,400-foot elevation interval. It is uncertain what proportion of groundwater in these basalts provides recharge to the UA—by direct discharge at the toe of the slope or by discharge as springs on the bluff that become runoff reaching the UA—versus recharging the deeper basalt zones in the lower reservoir area. The Applicant has not estimated rates/quantities of groundwater to be dewatered during these construction activities but provided a preliminary assumption for tunnel dewatering of 50 gallons per minute per 100 feet of tunnel being constructed. Approximately 10,000 linear feet of tunnel, penstocks, and vertical shaft comprise the conveyance system, but dewatering would occur along a localized portion of the conveyance alignment at any one time as the construction proceeds. The quantity of dewatering is not yet estimated by the Applicant. However, the Applicant noted that they would conduct additional geotechnical/hydrogeologic investigation along the tunnel alignments and reservoir footprints to assess dewatering needs and methods as part of the project design process. The Applicant submitted to Ecology, as part of the proposed project's Section 401 Water Quality Certification application, a draft Dewatering Plan (ERM 2022b) that lists the steps planned to comply with applicable CSWGP requirements for discharge of water generated by dewatering. The draft Dewatering Plan states that it is expected to be updated and finalized during final design in consultation with Ecology and the Washington Department of Fish and Wildlife.

Water generated during dewatering would be conveyed to the lower reservoir construction area where it would be managed and treated to meet permit requirements using settlement and infiltration ponds and mobile treatment equipment as needed.

The planned construction dewatering would create a temporary alteration of the UA groundwater flow system in the immediate area of activity, creating drawdown that diverts the natural flow of groundwater toward the dewatering location. Drawdown effects would dissipate at increasing distance from the dewatering location. The drawdown created would temporarily draw in contaminated groundwater (within that portion of the CGA smelter cleanup site) from an area predominantly northeast (upgradient), and to a lesser extent from the east and west, of the reservoir footprint being excavated (see also Section 3.3.1.1.5). The dewatering would also create a temporary reduction in the quantity of groundwater reaching its existing discharge location that, depending on the location of dewatering relative to the UA flow system, is either springs or Lake Celilo surface water. The effects of the change on the local groundwater-surface water system would depend on how the captured groundwater is managed (e.g., infiltration to the UA versus piped discharge to Lake Celilo). Returning the dewatered groundwater to the UA via infiltration downgradient of the construction footprint could minimize the dewatering's temporary effects on the existing groundwater discharge areas. Water quality implications of construction dewatering are further described in Section 3.3.1.1.5.

Northern Portion of Study Area

The sparse existing subsurface information for the proposed upper reservoir area indicates that no significant groundwater is present to a depth of 40 feet, which suggests that dewatering may not be needed during reservoir construction. However, additional subsurface information is needed to verify the subsurface conditions specific to the upper reservoir footprint. If dewatering is required to construct the upper reservoir, the potential effects on the groundwater flow system are conceptually the same as outlined previously for the lower reservoir area. Any temporary disruption to groundwater flow and discharge quantities from dewatering of the upper reservoir location would occur in the alluvial aquifer. Such impacts would affect the headwater reaches of Swale Creek that are ephemeral or intermittent, non-fish-bearing, and located greater than 15 miles upstream of fish-bearing waters in Swale Canyon. Construction of the proposed project would not be anticipated to result in impacts on the basalt aquifer system of the Swale Creek watershed adjacent to or downgradient of the proposed project footprint.

Conclusion

The currently available information suggests that dewatering will be required during construction of the proposed lower reservoir and underground infrastructure, but not during construction of the proposed upper reservoir. However, the Applicant would further assess dewatering needs and management of that water for the entire proposed project area based on the results of additional subsurface investigations along the tunnel alignments and reservoir footprints during final design of the proposed project. The Applicant has proposed to include hydrologic/groundwater level monitoring as a component of a broader water quality monitoring plan, prepared in coordination with Ecology during the permitting process. Any such program would need to include pre-construction baseline monitoring to have a basis to assess changes. With appropriate water management (e.g., infiltration of the extracted and treated water to minimize loss of the groundwater resource), control measures, and monitoring programs in place and as required by permits, the temporary construction-related alteration to groundwater flow patterns, and potential downgradient effects at corresponding groundwater discharge locations, would not result in a significant adverse impact.

3.3.1.1.3 Impairment of Water Supplies/Rights

Southern Portion of Study Area

Water during construction would be supplied by KPUD's Cliffs Water System under its existing municipal water rights. That water right authorizes a maximum annual consumptive use quantity of 4,851 AFY, of which 4,226 AFY is currently available to supply the proposed project. Water supply demand for the project throughout construction includes aggregate processing, production of concrete, and dust control and then, near the end of the construction period, the large initial fill. The Applicant has estimated an initial fill quantity of 7,640 acre-feet at an estimated rate of 21 cfs continuously over approximately 6 months (spread between 2 years of water right use); the Applicant has not estimated water supply quantity required for the earlier, smaller-demand construction activities. Water demands during construction are largely consumptive uses; however, these quantities are anticipated to be relatively small and can be fully covered under the Cliffs municipal water right. The Applicant would need to coordinate with KPUD to ensure that, during the year that the initial fill begins, the total quantity of water supplied to the project for project construction plus the initial fill does not exceed quantities permitted by their water right. KPUD supplying water for construction would not result in new waters being appropriated from the Columbia River.

Northern Portion of Study Area

Construction of the proposed project would not involve withdrawal or diversion of any water from the northern portion of the study area.

Conclusion

Assuming that the initial fill of the system occurs across a 2-year period to comply with the consumptive use quantity authorized by the KPUD water right, no impact to water supplies/rights including promulgated instream flow minimums would occur during the proposed project construction in either the southern or northern portions of the study area.

3.3.1.1.4 Stormwater Quality Compliance

Southern Portion of Study Area

The large-scale earthwork associated with proposed construction of the lower reservoir and ancillary facilities in the southern portion of the study area would increase the potential for mobilization and transport of suspended sediment (turbidity) into surface waters. The introduction of construction vehicles, equipment, and materials would also increase the potential for pollutants (e.g., oil and grease, hydraulic fluids, and metals) to enter surface waters through stormwater runoff. This includes aboveground tanks to store fuel for equipment and any diesel generators that are used. In addition, establishment and operation of temporary facilities to process excavated aggregate/rock materials and to manufacture concrete would increase the potential for sediment and pollutant entry into surface waters through stormwater runoff and process wastewater discharges. Water that has been in contact with cementitious materials used in concrete production would present a potential for introducing high-pH discharges to surface waters, thereby elevating instream pH levels.

The permits required for the proposed project, including the 401 Water Quality Certification and NPDES CSWGP, would require the permittee to develop, implement, monitor, and maintain a number of construction best management practices (BMPs) to comply with water quality standards and other permit requirements. The planned on-site production of concrete would trigger an NPDES Sand and Gravel Permit issued by Ecology, which would require implementation of BMPs and targeted monitoring to control pH and other pollutants from process water and stormwater.

Because construction of the proposed lower reservoir would involve excavation and handling of contaminated materials from a portion of the former CGA smelter cleanup site, Ecology would issue a site-specific Administrative Order on the CSWGP for the proposed project. In addition to standard requirements of the CSWGP, the Administrative Order would establish indicator levels for known contaminants of concern at the cleanup site and require capture and treatment of all contaminated dewatering water or contaminated stormwater generated prior to discharge. It would also require rigorous monitoring and reporting of the monitoring data to Ecology to ensure that all water discharged to receiving waters complies with the indicator levels. Monitoring of pH in waters discharged would also be required to meet requirements of the Sand and Gravel General Permit. Given the site-specific flexibility afforded under an Administrative Order for the CSWGP, Ecology could potentially incorporate applicable materials management and monitoring requirements of the Sand and Gravel General Permit into the Administrative Order for the CSWGP.

Expected CSWGP-permit-required mitigation measures related to water quality during construction include the following:

- Implementation of a construction Stormwater Pollution Prevention Plan (SWPPP) in accordance with Ecology's Stormwater Management Manual for Eastern Washington (Ecology 2019)

- Implementation of a Temporary Erosion and Sediment Control Plan to limit sediment inputs to receiving waters during and after construction, which would include revegetating temporary disturbance areas after construction to stabilize soils
- Implementation of a Spill Prevention, Control, and Countermeasures Plan to limit the potential for spills of fuels or other hazardous materials and to facilitate containment in the event a spill occurs, to minimize the potential for pollutant releases to groundwater or surface waters
- Managing stormwater and construction dewatering water in a way that allows it to infiltrate on site and/or ensure it is contained and treated to meet applicable permit water quality benchmarks and indicator levels prior to discharge to surface waters
- Implementation of permit-required monitoring during construction to ensure that all discharges to waters of the state comply with water quality benchmarks, that erosion, sediment, and pollution-control measures are regularly inspected and maintained, and that records are kept and submitted to Ecology as appropriate

Northern Portion of Study Area

The stormwater quality concerns identified for the southern portion of the study area also apply for the construction of the proposed upper reservoir and ancillary facilities in the northern portion of the study area. However, the industrial contaminants associated with the former CGA smelter site in the southern portion of the study area are not known to be present in the northern portion of the study area. Therefore, the CSWGP's Administrative Order requirements specific to smelter-site contaminants likely would not apply to that area.

Subject to Ecology discretion regarding applicable requirements of the Administrative Order and the Sand and Gravel General Permit for construction of the upper reservoir, the permit-required water quality measures identified previously for the southern portion of the study area would also apply during construction in the northern portion of the study area.

Conclusion

Mitigation is not required to reduce significant impacts, but appropriate control measures and monitoring programs will be required by permits. The temporary construction-related increases in turbidity and pollutant discharges in stormwater runoff must meet water quality benchmarks, and therefore would not result in a significant adverse impact.

3.3.1.1.5 Water Quality Compliance in Receiving Waters

This section addresses potential water quality impacts associated with construction dewatering, distinct from construction stormwater runoff described in the preceding section.

Southern Portion of Study Area

It is assumed that the Applicant would use settling pond(s) and infiltration pond(s) to manage and discharge water generated during construction dewatering. Infiltration is a BMP that mimics natural processes for treating water discharges. Specific areas for management and infiltration of dewatering water would be defined by the Applicant during the project design process. Dewatering in the lower reservoir area would generate groundwater contaminated with sulfate, fluoride, and possibly cyanide that exists in that portion of the former CGA smelter cleanup site. The dewatering would temporarily draw in groundwater from a broader area predominantly northwest, but also to the east and west, of the reservoir footprint being excavated. As such, the dewatering action would achieve permanent removal of groundwater contaminant mass and thereby accelerate the restoration time frame for groundwater in that immediate area to some degree.

Management of dewatering water would be regulated with construction stormwater under a site-specific Administrative Order on the CSWGP. This is because construction of the proposed lower reservoir would involve handling of contaminated materials including dewatering of contaminated groundwater at the former CGA smelter cleanup site, and infiltration of construction-generated water would occur within or proximal to the cleanup site boundary.

Northern Portion of Study Area

As stated above, it is not known whether dewatering would be required during construction of the upper reservoir. If dewatering is required, requirements for managing and monitoring construction stormwater management would also be applied to dewatering water under the terms of the CSWGP.

Conclusion

With appropriate control measures and monitoring programs in place and as required by permits, the temporary discharge of dewatering water must meet water quality benchmarks, and therefore would not result in a significant adverse impact on water quality in receiving waters. In addition to meeting permit requirements, the Applicant has proposed to prepare and implement a water quality monitoring plan, prepared in coordination with Ecology during the permitting process, that can cover areas where dewatering water would be managed. There would not be a significant adverse impact on water quality.

3.3.1.2 Indirect Impacts

Indirect impacts on surface and groundwater resources during construction of the proposed project may include increased demand on water supplies associated with short-term housing for workers during the construction phase. It is anticipated that much of the demand would be borne by existing municipal supplies in surrounding communities (e.g., City of Goldendale) and therefore would not result in a significant adverse impact. No indirect impacts on other water resource elements are identified.

3.3.2 Impacts from Operation

This section describes direct and indirect impacts resulting from long-term operation of the proposed project.

3.3.2.1 Direct Impacts

3.3.2.1.1 Alteration of Surface Water Hydrology

Southern Portion of Study Area

All water supply for long-term operation of proposed project—estimated at 360 AFY of make-up water to offset evaporative and leakage losses—would be supplied by KPUD’s Cliffs Water System under its existing municipal water right. For reasons described relative to project construction (Section 3.3.1.1.1), water supply for project operations would not result in any new impacts on the Columbia River or other surface waters within the southern study area.

The NWI maps a channel extending downslope of identified watercourse Stream S17 through the lower reservoir footprint area and extending to the bank of the Columbia River (Figure 3). However, ERM’s May 2019 field reconnaissance verified no channel downslope of the culvert through which Stream S17 flows. Consequently, the presence of the proposed lower reservoir or other project features would not change the hydrology of those identified watercourses.

The proposed lower reservoir would capture precipitation falling within its 63-acre footprint and thus permanently reduce current stormwater runoff from the southern portion of the study area. Assuming

10 inches average annual precipitation, this equates to approximately 53 AFY of water captured and is a component of the make-up water for the proposed project's potential losses through evaporation and leakage. Tables 5a through 5c presents a water balance analysis to estimate the changes to hydrology—e.g., runoff to surface water and infiltration to groundwater—created by capture of precipitation by each of the proposed reservoirs.

The water balance analysis is based on a subbasin-scale water balance conducted for Swale Valley in Appendix A by Aspect Consulting (2010) as part of the WRIA 30 watershed planning process. The Swale Valley water balance partitioned the average annual water input to the subbasin (from precipitation) into average annual water outputs in the forms of evapotranspiration (water evaporated from soil, rock, or open water, plus water consumed [transpired] by growing plants), runoff becoming streamflow, and groundwater recharge. The analysis also included irrigation water use that occurs within Swale Valley west of Highway 97, partitioning the estimated irrigation water use into consumptive water use and return flow. The Aspect Consulting (2010) water balance for Swale Valley is presented in Table 5a. Using those results, the estimated average annual quantities (in AFY) of evapotranspiration occurring outside of irrigated areas, recharge, runoff (streamflow), irrigation consumptive use, and irrigation return flow were converted to percentages of precipitation. Because there is no irrigation water use within the reservoir footprints, those percentages were then reapportioned to evapotranspiration occurring outside of irrigated areas (79%), recharge to groundwater (16%), and runoff to streamflow (6%) (Table 5b). Those percentages represent the baseline condition (No Action Alternative).

Table 5a

Subbasin-Scale Water Balance for Swale Valley

	INPUT		OUTPUTS							
								IRRIGATION		
SUBBASIN AREA	PRECIPITATION		EVAPOTRANSPIRATION (NON-IRRIGATION)		RECHARGE TO GROUNDWATER	RUNOFF TO STREAMFLOW		CONSUMPTIVE USE	RETURN FLOW
ACRES	INCHES	AFY	INCHES	AFY	AFY	CFS	AFY	AFY	AFY
54,200	23	103,883	17.8	77,980	15,808	8	5,502	5,186	-593
As % of precipitation:				75%	15%		5%	5%	-0.6%
Reapportioned % with no irrigation:				79%	16%		6%	NA	NA

Source: Aspect Consulting 2010

Table 5b

Baseline Condition for Upper and Lower Reservoir Areas (No Action Alternative)

	RESERVOIR AREA	PRECIPITATION		EVAPOTRANSPIRATION (NON-IRRIGATION)		RECHARGE TO GROUNDWATER		RUNOFF TO STREAMFLOW		RECHARGE PLUS STREAMFLOW
RESERVOIR	ACRES	INCHES	AFY	AS % OF PRECIP	AFY	AS % OF PRECIP	AFY	AS % OF PRECIP	AFY	AFY
Lower	63	10	53	79%	41	16%	8	6%	3	11
Upper	61	17	86	79%	68	16%	14	6%	5	19

Table 5c

Proposed Project Operating Condition

	RESERVOIR AREA	RECHARGE PLUS STREAMFLOW CAPTURED (EVAPORATED)	100 AFY UNDERGROUND LEAKAGE (RETURN FLOW INTO BASALT AQUIFER)		NET GAIN TO/LOSS FROM EACH SUBBASIN
RESERVOIR	ACRES	AFY	ASSUMED % INTO EACH SUBBASIN	AFY	AFY
Lower	63	−11	70%	70	59
Upper	61	−19	30%	30	11
Total	**124**	**−30**		**100**	**70**

The Swale Creek watershed is approximately 54,000 acres in size and the 61-acre upper reservoir occurs within its southeasternmost extent (Figures 1 and 2). The proposed lower reservoir is located within the Columbia Tributaries watershed, not Swale Creek watershed. A similar subbasin-scale water balance for the Columbia Tributaries watershed has not been conducted for the WRIA 30 watershed planning process. Therefore, for purposes of this analysis, the evapotranspiration, recharge, and runoff percentage estimated for Swale Valley were also applied for the lower reservoir area.

The baseline percentages of evapotranspiration, recharge, and runoff were applied to the 53 AFY of precipitation falling within the lower reservoir to estimate the groundwater recharge and runoff to streamflow that would be lost to the hydrologic system by the reservoir's capture of precipitation. By this methodology, the lower reservoir is estimated to capture 8 AFY of groundwater recharge and 3 AFY of streamflow (11 AFY total) as shown in Table 5b. The estimated quantity of evapotranspiration (41 AFY) is lost to the atmosphere in the baseline condition and the proposed project condition, so there is no change.

As described in Section 3.3, it is assumed that, during the proposed project operation, negligible seepage would occur from the lined reservoirs but 100 AFY of leakage would occur from the underground infrastructure (piping, etc.) located within the basalt between the two reservoirs. That underground leakage would represent return flow (artificial recharge) into the basalt aquifer system and, as such, is included in the water balance for the proposed project operating condition presented in Table 5c. As described in Section 3.2.3.1.1, it is inferred that a greater portion of the groundwater within proposed underground infrastructure area flows south into the Columbia Tributaries watershed than flows north into the Swale Creek watershed. For purposes of this analysis, it is assumed that 70% (70 AFY) of the underground leakage enters the Columbia River Tributaries watershed and 30% (30 AFY) enters the Swale Creek watershed. That estimated 70 AFY of artificial recharge would more than offset the 3 AFY of runoff to streamflow (and the full 11 AFY of recharge plus runoff) that would be lost to the Columbia Tributaries watershed from the lower reservoir's capture of precipitation (Table 5c).

Northern Portion of Study Area

The proposed 61-acre upper reservoir would also capture precipitation (average 17 inches per year, 86 AFY), and thus permanently reduce stormwater runoff from the northern portion of the study area, some percentage of which would have otherwise reached the intermittent Streams S7 and S8 that are tributaries to Swale Creek. Applying the same water balance analysis described above to the upper reservoir, the estimated 30 AFY of artificial recharge from underground leakage would more than offset the 5 AFY of runoff to streamflow (and the full 19 AFY of recharge plus runoff) that would be lost to the Swale Creek watershed from the upper reservoir's capture of 86 AFY precipitation (Table 5c). As such, no impacts on surface water hydrology are expected to occur in the northern portion of the study area.

Conclusion

As described in Section 3.3.1.1.2, the Applicant would include hydrologic/groundwater level monitoring as a component of a broader water quality monitoring and response plan to document hydrologic changes to surface waterbodies within and surrounding the proposed project footprint. This plan would be prepared in coordination with Ecology during the permitting process. With appropriate control measures and monitoring programs in place, including measurement of the project's operating water balance with quantification of precipitation capture and leakage losses, the capture of precipitation by the upper and lower reservoirs would not result in a significant adverse impact. Should the project's actual operating water balance indicate that the leakage is less than the estimated 5 AFY of surface water loss to the Swale Creek watershed, or 3 AFY of loss to the Columbia Tributaries watershed, the Applicant will be required to propose alternative mitigation. Mitigation options could include delivering water directly into the impacted watershed to offset the loss (increasing the quantity of makeup water purchased from KPUD) or implementing out-of-kind riparian enhancements in the Swale Creek watershed to satisfy the project mitigation requirements.

3.3.2.1.2 Alteration of Groundwater Flow Systems

The estimated leakage from proposed project operation would increase the quantity of groundwater recharge entering the alluvial aquifers that underly the northern and southern portions of the study area. Operational impacts to groundwater flow are summarized below.

Southern Portion of Study Area

Following construction, a portion of the proposed lower reservoir would permanently remain below the existing water table in the UA but would not extend through the UA's full saturated thickness. Where the reservoir extends below the water table it would be a barrier to groundwater flow, which would likely create some mounding of groundwater along the upgradient (northeast) side of the reservoir. Consequently, shallow UA groundwater upgradient of the reservoir would bifurcate with some flowing eastward and some westward around the reservoir footprint. Once south/southwest of the reservoir footprint, the groundwater should re-establish its existing southwestward flow direction. The UA groundwater beneath the reservoir bottom would be expected to generally maintain its existing southwestward flow direction.

The proposed project includes full removal of contaminated materials within the West Surface Impoundment, and construction of the lower reservoir would remove additional contaminant mass present in dissolved phase, which, combined, could result in an overall improvement to groundwater quality in the area of the lower reservoir. The West Surface Impoundment removal program under the Model Toxics Control Act would involve replacement and repositioning of monitoring wells to accommodate the construction footprint and anticipated changes to groundwater flow direction in order to meet Model Toxics Control Act requirements for post-cleanup confirmation groundwater monitoring. As a result of these combined factors, no significant adverse impacts to groundwater within the former CGA smelter cleanup site are anticipated.

The lower reservoir would capture approximately 53 AFY of precipitation, 8 AFY of which is estimated to infiltrate to recharge the UA under current conditions (Tables 5a through 5c). Negligible seepage out of the dual-lined lower reservoir is expected, but an estimated 70 AFY of leakage from the underground conveyance system would represent artificial recharge to the basalt aquifer zones within the Columbia Hills bluff that, on the subbasin scale, would more than offset the volume of potential recharge captured by the lower reservoir. It is assumed that the leakage water would flow generally south, but its specific flowpath(s) and mechanism(s) for reaching the UA and/or underlying basalt aquifer system warrants further analysis as project design proceeds.

Northern Portion of Study Area

Based on current information, it appears that the proposed upper reservoir would not extend below the water table. If it would, it would be a barrier to groundwater flow and alter existing flow directions similar to what is expected to occur with the lower reservoir. Like the lower reservoir, the upper reservoir would capture precipitation (estimated 86 AFY), 14 AFY of which is estimated to infiltrate and recharge the local groundwater system under current conditions. The estimated 30 AFY of artificial recharge from leakage from the underground infrastructure would more than offset the recharge lost from the upper reservoir footprint.

Conclusion

The estimated leakage from proposed project operation would increase the quantity of groundwater recharge entering each subbasin in which the upper and lower reservoirs are located. The Applicant has proposed to include hydrologic/groundwater level monitoring as a component of a broader water quality monitoring and reporting plan, which would be prepared in coordination with Ecology during the permitting process. With appropriate control measures and monitoring programs in place including measurements of the project's operating water balance with quantification of precipitation capture and leakage losses, the alteration to groundwater flow systems resulting from proposed project operations would not result in a significant adverse impact. Should the project's actual operating water balance indicate that the leakage is less than the estimated 8 AFY of recharge loss to the Swale Creek watershed, or the 14 AFY of recharge loss to the Columbia Tributaries watershed, then the Applicant will be required to propose alternative mitigation. Mitigation options could include delivering water directly into the affected subbasin (increasing the quantity of makeup water purchased from KPUD) or implementing out-of-kind riparian enhancements.

3.3.2.1.3 Impairment of Water Supplies/Rights

Southern Portion of Study Area

The assessment of potential impairment to existing water supplies/water rights for the southern portion of the study area resulting from long-term project operation is detailed by waterbody as follows:

- **Columbia River**: Water for the project would be provided by KPUD under an existing municipal water right that, with a priority date of March 19. 1969, pre-dates the Columbia River instream flow rule (WAC 173.563). All project water would by supplied from the existing pump station on the Columbia River just upstream of the proposed project footprint. The proposed project would not result in any new appropriation from the Columbia River or tributaries, and no impairment to Columbia River instream flows is identified.
- **Streams**: Streams, ponds, and seeps in the southern portion of the study area are not covered by an adopted instream flow rule or BiOp but must be considered in the context of impairment to existing water rights and the public interest. Leakage return flow during proposed project operations would increase recharge to shallow groundwater in the immediate project area, which could express itself as increased flow at springs feeding small surface waterbodies. Accordingly, no impairment to water supplies was identified associated with tributary streams or seeps or water rights in the southern portion of the study area dependent thereon.
- **Groundwater**: No impacts on existing groundwater supplies and/or water rights are anticipated from the project operations. Leakage return flow during proposed project operations would increase recharge to, and thus water quantity within, groundwater in the immediate project area. Accordingly, no impairment to water supplies was identified associated with tributary streams or seeps or water rights dependent thereon.

Northern Portion of Study Area

The estimated leakage from the proposed project's underground infrastructure would offset reductions in groundwater recharge and runoff to streamflow within the northern portion of the study area (see Section 3.3.2.1.2). Therefore, no impairment to water supplies was identified associated with tributary streams or seeps in the northern portion of the study area or water rights dependent thereon.

Conclusion

No impact to water supplies/rights are identified as a result of operation of the proposed project in either the southern or northern portions of the study area.

3.3.2.1.4 Stormwater Quality Compliance

Southern and Northern Portions of Study Areas

The proposed project appears to create little new pollution-generating surfaces for stormwater runoff, although this level of detail is not available in the current preliminary design documentation. The overall design of the proposed project requires only limited paving and impervious surfaces outside of the proposed reservoirs. Stormwater generated throughout operation of the proposed project would be managed in accordance with an applicable permit issued by Ecology (Industrial Stormwater General Permit or other) with corresponding SWPPP prepared in accordance with Ecology's Stormwater Management Manual for Eastern Washington (Ecology 2019).

Conclusion

As required by permits, the proposed project's stormwater quality must meet water quality benchmarks throughout long-term operation, and therefore would represent minor adverse impacts on water quality that would not result in a significant adverse impact.

3.3.2.1.5 Water Quality Compliance in Receiving Waters

Southern Portion of Study Area

> **Total dissolved solids (TDS)** is a non-specific measure of the total concentration of inorganic salts, principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates, and some small amounts of organic matter that are dissolved in water.

During operation of the proposed pumped-storage reservoir system, yearly evaporative cycles would concentrate water quality constituent levels over time (e.g., heat, total dissolved solids [TDS], metals, nutrients, and bacteria), despite the annual addition of fresh make-up water from annual precipitation and purchases of water from the Columbia River from KPUD. Neither the Applicant's Environmental Report for the FERC Application (FFP 2020b) nor the Preliminary Supporting Design Report (HDR 2020) include an analysis to predict water quality changes in the system over time. However, the Final EIS for the Swan Lake North Pumped Storage Project contains a simple predictive analysis to estimate changes in TDS concentrations in the system across a 50-year operational period (BLM 2019). The Swan Lake project analysis assumed a groundwater source of supply containing TDS concentrations with an average concentration of 95 milligrams per liter. The analysis predicted that TDS concentrations in the system would double in approximately 8 years of operation and would increase nearly 700%—from 97 to 730 milligrams per liter after 50 years of operation. That Final EIS anticipated similar trends for other water quality constituents, like nutrients and metals, but provided no specific analysis for constituents other than TDS (BLM 2019).

A similar gradual degradation of water quality is anticipated for the proposed project based on evaporative concentration of constituents in the proposed project reservoirs over time. This can also include the buildup of bacterial contamination introduced by birds or other wildlife that may contact the water surface in the large reservoirs.

An additional water quality concern is the potential for contamination by lubricants, oils, and other materials from the system's large-capacity pump-turbine equipment within the conveyance system. The quantities of these materials are small relative to the quantity of water in the system; however, there is still a potential for them to leak. Depending on where this leakage occurs in the system, these contaminants could become entrained in the water being circulated between the two reservoirs.

The proposed upper and lower reservoirs would be constructed with a synthetic liner system (single-liner system in upper reservoir and double-liner system in lower reservoir) with leak detection capabilities specifically intended to prevent leakage. As such, negligible seepage from the reservoirs is anticipated.

Although a liner system would also be integrated into the conveyance piping systems connecting the reservoirs, up to 100 AFY of leakage losses from the proposed conveyance system is assumed to occur, as described in Section 3.2.5. These losses would occur primarily within the Columbia Hills basalt bluff between the two reservoirs (southern portion of study area), and that groundwater return flow would migrate southward with ultimate discharge to the Columbia River. The migration of the assumed leakage return flow is expected to occur via groundwater although the specific pathway(s) for that migration is not currently defined. Given an expected gradual degradation in water quality within the pumped storage system, this leakage return flow has the potential to impact groundwater quality in the southern portion of the study area as well as the Columbia River, which receives groundwater discharges from that area.

Potential water quality impacts on the Columbia River associated with KPUD's supply of Columbia River water for the proposed project were addressed during Ecology's permitting of the water right (1969 priority date). No additional water quality impacts associated with KPUD exercising the diversion authorized under that right are expected.

Northern Portion of Study Area

Seepage from the lined upper reservoir is expected to be negligible, and any seepage that may occur would enter shallow groundwater discharging to the ephemeral/intermittent headwater tributaries of Swale Creek. The existing groundwater discharge in that area provides insufficient baseflow to sustain flows in those tributaries, and they are at least 15 river miles upstream of the fish-bearing portion of Swale Creek. The potential for water quality impacts in the northern portion of the study area as a result of operating the proposed project is low.

Conclusion

Operation of the proposed project would not result in significant adverse impacts on water quality in receiving waters. Impacts that could occur would be further reduced and minimized by the implementation of appropriate control measures and water quality monitoring programs.

Given the concern for water quality degradation within the pumped storage system, the Applicant has proposed mitigation measures including using shade balls on the reservoir water surface to provide shading and reduce temperature increases. These shade balls would also discourage birds and possibly bats from contacting the water to reduce entry of bacterial contamination to the water. In addition, the Applicant would conduct maintenance in the areas surrounding each reservoir to eliminate vegetation and other features serving as an attraction to wildlife that could degrade water quality. See the *Terrestrial Species and Habitats Resource Analysis Report* (Appendix G of the EIS; Anchor QEA 2022b) for additional description of these measures.

The Applicant has also proposed to prepare and implement, in coordination with Ecology, a reservoir water quality monitoring plan to ensure that dissolved solids, nutrients, and heavy metals in the reservoirs do not rise to concentrations that could adversely affect aquatic life or wildlife. The plan would describe monitoring locations and procedures for water quality parameter monitoring within the proposed system and the immediate vicinity to identify whether water quality conditions warrant additional protective measures and, if so, the specifics regarding those measures including modifications to system operation that could include active water treatment. The monitoring plan could be expanded to be inclusive of all water resource-related monitoring (e.g., including monitoring of groundwater levels and, as applicable, surface water flows) and could be enforced under the Section 401 Water Quality Certification.

With appropriate control measures and monitoring programs in place and as required by permits, the temporary discharge of dewatering water must meet water quality benchmarks, and therefore would not result in a significant adverse impact.

3.3.2.2 Indirect Impacts

No indirect impacts on water resource elements are identified associated with operation of the proposed project.

3.3.3 Required Permits

The following permits applicable to surface and groundwater resources would be required for construction and operation of the proposed project:

- **Clean Water Act Section 401 Water Quality Certification (Ecology):** A Section 401 Water Quality Certification from Ecology will be required. This certification is required for any project that needs a federal permit or license that may result in any discharge into water of the United States. It is intended to provide reasonable assurance that the Applicant's proposed project will comply with state water quality standards and other requirements for protecting aquatic resources. The Section 401 Water Quality Certification would cover both construction and operation of the proposed project. Conditions from the Section 401 Water Quality Certification would become part of the new FERC license and the U.S. Army Corps of Engineers permit.
- **Hydraulic Project Approval (Washington Department of Fish and Wildlife):** The proposed project would use, divert, obstruct, and change the natural flow and bed of freshwaters of the state (intermittent Streams S7 and S8) and therefore would require a Hydraulic Project Approval from the Washington Department of Fish and Wildlife under the state's hydraulic code rules (WAC 220.660). The Hydraulic Project Approval would include conditions intended to minimize impacts on instream and riparian habitat and functions.
- **Reservoir Permit (Ecology):** Reservoir permits are required when filling impoundments that will retain 10 or more acre-feet of water. A reservoir permit under RCW 90.03.370 would be needed to construct and operate the proposed project and would allow the Applicant to fill the reservoir once a year, unless otherwise specified by the permit.
- **NPDES Construction Stormwater General Permit with Administrative Order for Proposed Cleanup Action (Ecology):** The NPDES Construction Stormwater General Permit would be required because construction of the proposed project would result in more than 1 acre of ground disturbance and involve stormwater discharges to surface waters. The NPDES permits would include conditions requiring a SWPPP and appropriate erosion, sediment, and pollution control measures. Because construction of the proposed lower reservoir would involve excavation and handling of contaminated materials from a portion of the former CGA smelter cleanup site, Ecology would issue a site-specific Administrative Order on the CSWGP for the proposed project. The CSWGP with Administrative Order would include conditions requiring the permittee to prepare a SWPPP and implement appropriate materials management (including dewatering water), erosion, sediment, and pollution control measures, and monitoring and reporting for the duration of construction.
- **NPDES Sand and Gravel General Permit (Ecology):** The NPDES Sand and Gravel Permit is required for operations that include sand and gravel operations, concrete batch plants, or asphalt batch

plants. The NPDES Sand and Gravel General Permit would be required for operation of the portable concrete batch plant associated with the proposed project.

- **Potential Local Land Use and Development Permits (Klickitat County):** The proposed project would affect water-related resources regulated by Klickitat County under Critical Areas Ordinances, floodplain and stormwater management codes, and potentially the on-site septic program. Permits from the County may be needed in accordance with their local development codes.

3.3.4 Proposed Mitigation Measures

Although not required to reduce any significant impacts, the following mitigation measures are proposed, in addition to measures imposed by required permits, in order to further facilitate reduction of potential effects from construction and operation of the proposed project.

Applicant-Proposed Mitigation Measures

In addition to the permit-required measures, the following Applicant-proposed water resources mitigation measures are intended to further reduce potential effects from construction and operation of the proposed project. These mitigation measures would be included as articles of the FERC license and would be enforced with other license requirements. The Applicant has proposed preparation of a mitigation plan, to be submitted to and approved by the U.S. Army Corps of Engineers and Ecology as a component of the Clean Water Act Section 404/401 permitting process. Their overall goal is to provide the greatest improvement to ecological and hydrological functions in the broader Klickitat River subbasin, within which Swale Creek is a tributary. To reduce temporary construction impacts, the Applicant proposes to design the staging areas and employ construction BMPs throughout the work to minimize impacts on Stream S8 and facilitate stream restoration to the extent practical following completion of construction.

Applicant-proposed mitigation measures include the following:

- **Shade Balls in Reservoirs.** As part of their proposed Wildlife Management Plan (FFP 2020c), the Applicant proposes to use floating shade balls in each reservoir. In addition to wildlife deterrence, shade balls could mitigate water quality impacts from long-term operation of the proposed project. The use of shade balls would help reduce heating and evaporation of water in the reservoirs, reducing potential impacts on both water temperature and water loss. In combination with vegetation management both in and around the reservoirs, shade balls may also deter birds and other wildlife (e.g., bats) from contacting the water to reduce entry of bacterial contamination to the water. These measures, and their adaptive management over time, would be included as a component of the Operations Water Resource Monitoring and Response Plan (see the Ecology-proposed mitigation measure below).
- **Reservoir Water Quality Monitoring Plan.** The Applicant would develop a water quality monitoring plan in coordination with Ecology to ensure that dissolved solids, nutrients, and heavy metals in the reservoirs do not rise to concentrations that could adversely affect aquatic life or wildlife (FFP 2020b). The water quality monitoring plan would identify monitoring locations and procedures for water quality parameter monitoring within the proposed system and in the nearby vicinity to identify whether water quality conditions warrant additional protective measures. The water quality monitoring plan would include the specifics of any additional protective measures proposed, which could include modifying the system operation to incorporate active water treatment. The water quality monitoring plan could be expanded to be inclusive of all operational water resource-related monitoring (e.g., surface and groundwater level monitoring, wetland hydrology monitoring) and could be enforced under the Section 401 Water Quality Certification.

Ecology-Proposed Mitigation Measures

Ecology-proposed water resources mitigation measures that would be included as conditions in the reservoir permit include the following:

- **Construction Water Resource Monitoring and Response Plan.** To mitigate hydrologic and water quality impacts from construction of the proposed project, the Applicant would prepare a Construction Water Resource Monitoring and Response Plan to be approved by Ecology and then implemented throughout construction of the proposed project. The Construction Water Resource Monitoring and Response Plan would establish an integrated program to monitor both water quantity (hydrology) and water quality for groundwater, surface water, and wetlands and thereby empirically measure the presence and magnitude of adverse impacts during construction with a focus on dewatering. The Construction Water Resource Monitoring and Response Plan would also define metrics for determining the presence and degree of impact (e.g., change from baseline conditions), and include a decision process for identifying the need for, and the type of, response action to implement during construction to mitigate impacts that are observed on water quantity or quality.
- **Operations Water Resource Monitoring and Response Plan.** To mitigate hydrologic and water quality impacts from long-term operation of the proposed project, the Applicant would prepare an Operations Water Resource Monitoring and Response Plan to be approved by Ecology and then implemented throughout operation of the proposed project. The Operations Water Resource Monitoring and Response Plan would establish an integrated program to monitor both water quantity (hydrology) and water quality for groundwater, surface water, and wetlands. This would allow empirical measurement for the presence and magnitude of adverse impacts during operation. The focus of the Operations Water Resource Monitoring and Response Plan would be documenting the quantity and quality of seepage or leakage from the system and any associated impacts on receiving waters and wetlands. The Operations Water Resource Monitoring and Response Plan would also define metrics for determining the presence and degree of impact (e.g., change from baseline conditions), and include a decision process for identifying the need for, and the type of, response action to adaptively implement during proposed project operations to mitigate impacts that are observed on water quantity or quality.

Relevant Mitigation Measures in Other Resource Reports and Sections

In addition to the permit-required, Applicant-proposed, and Ecology-proposed measures, implementation of mitigation proposed in other sections of this EIS would also further reduce potential effects of the proposed project and protect water resources.

The following is a brief summary of an Applicant-proposed mitigation measure to reduce impacts on terrestrial species and habitats; a summary of the Vegetation Management and Monitoring Plan is provided in Section 4.7.2.3 of the EIS and the *Terrestrial Species and Habitats Resource Analysis Report* (Appendix G of the EIS):

- **The Applicant's Draft Vegetation Management and Monitoring Plan.** The Applicant proposed several mitigation measures to reduce impacts on terrestrial habitat and species in their draft Vegetation Management and Monitoring Plan (FFP 2020d) (see Section 4.7 of the EIS). Measures in the Vegetation Management and Monitoring Plan that would also protect water quality include maintenance in the areas surrounding each reservoir to eliminate vegetation and other features that could otherwise serve as an attraction to wildlife that could degrade water quality.

3.3.5 Significant and Unavoidable Adverse Impacts

The analysis found the proposed project would have no significant adverse impacts. There would be no significant and unavoidable adverse impacts related to study area surface and groundwater resources from construction or operation of the proposed project.

3.4 No Action Alternative

The No Action Alternative represents the future water resource conditions within the study area in the absence of implementing the proposed project. KPUD would continue to hold the existing Cliffs water right, which may provide water supply to other customers or be placed in trust. Under the No Action Alternative, there would be no changes to the existing quantity and quality of groundwater and surface water within the study area. Therefore, there would be no impacts related to study area surface and groundwater resources under the No Action Alternative.

4 References

Anchor QEA, LLC, 2022a. *Wetlands and Regulated Waters Resource Analysis Report*. Proposed Goldendale Energy Storage Project. SEPA Environmental Impact Statement Appendix C. December 2022.

Anchor QEA, LLC, 2022b. *Terrestrial Species and Habitats Resource Analysis Report*. Proposed Goldendale Energy Storage Project. SEPA Environmental Impact Statement Appendix G. December 2022.

Aspect Consulting, LLC, 2003a. *Multipurpose Water Storage Screening Assessment Report, WRIA 30*. June 20, 2003. Available at: https://www.klickitatcounty.org/DocumentCenter/View/153/Appendix-B—Multipurpose-Water-Storage-Screening-Assessment-Report—June-2003-PDF.

Aspect Consulting, LLC, 2003b. *Addendum to Multipurpose Water Storage Screening Assessment Report, WRIA 30.* November 25, 2003. Available at: https://www.klickitatcounty.org/DocumentCenter/View/154/Appendix-C—Addendum-to-Multipurpose-Water-Storage-Screening-Assessment—November-2003-PDF.

Aspect Consulting, LLC, 2007. Hydrologic Information Report Supporting Water Availability Assessment, Swale Creek and Little Klickitat Subbasins, WRIA 30. June 29, 2007.

Aspect Consulting, LLC, 2010. *Addendum to 2007 Hydrologic Information Report Supporting Water Availability Assessment for Swale Creek Subbasin, WRIA 30: Evaluation of Swale Valley*. June 30, 2010. Available at: https://www.klickitatcounty.org/DocumentCenter/View/161/Addendum-to-the-2007-Hydrologic-Information-Report—June-2010-PDF.

Aspect Consulting, LLC, 2013. *Water Quality Maintenance and Monitoring Program, Interim Working Draft, Swale Creek Subbasin (WRIA 30).* April 30, 2014.

Aspect Consulting and Anchor QEA (Aspect Consulting, LLC and Anchor QEA, LLC), 2022. *Environmental Health Resource Analysis Report*. Proposed Goldendale Energy Storage Project. SEPA Environmental Impact Statement Appendix I. December 2022.

BLM (Bureau of Land Management), 2019. *Final Environmental Impact Statement for Hydropower License, Swan Lake North Pumped Storage Project, FERC Project No. 13318-003, Oregon*. July 3, 2019.

DEQ (Oregon Department of Environmental Quality), 2012. Water Quality Assessment—Oregon's 2012 Integrated Report Assessment Database and 303(d) list. Available at: http://www.deq.state.or.us/wq/assessment/rpt2012/search.asp.

Ecology (Washington Department of Ecology), 2011. Waters Requiring Supplemental Spawning and Incubation Protection for Salmonid Species. January 2011.

Ecology, 2019. Stormwater Management Manual for Eastern Washington. Ecology Publication No. 18-10-044. August 2019.

Ecology, 2021. Water quality assessment & 303(d) list. Available at: https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d.

Ecology, Anchor QEA, LLC, and White Bluffs Consulting, 2022. *Tribal Resources Analysis Report*. Proposed Goldendale Energy Storage Project. SEPA Environmental Impact Statement Appendix H. December 2022.

ERM, Inc., 2021. Approved Jurisdictional Determination Request. Memorandum to U.S. Army Corps of Engineers, Seattle District. June 1, 2021.

ERM, Inc., 2022a. *Wetlands and Waters Delineation Report Rev. 3, Goldendale Energy Storage Project*. August 2022.

ERM, Inc., 2022b. Draft Dewatering Plan, Goldendale Energy Storage Project. May 2022.

FFP (FFP Project 101, LLC), 2020a. Goldendale Energy Storage Hydroelectric Project: Final License Application for FERC Project No. 14861. Appendix B: Wetlands and Water Delineation Report. June 17, 2020.

FFP, 2020b. Goldendale Energy Storage Hydroelectric Project: Final License Application for FERC Project No. 14861. Includes Exhibits A through G. June 22, 2020.

FFP, 2020c. Goldendale Energy Storage Hydroelectric Project: Final License Application for FERC Project No. 14861. Appendix D: Wildlife Management Plan. June 17, 2020.

FFP, 2020d. Goldendale Energy Storage Hydroelectric Project: Final License Application for FERC Project No. 14861. Appendix E: Vegetation Management and Monitoring Plan. June 17, 2020.

GeoPro LLC, 2020. 2020 Annual Groundwater Monitoring Report, West Surface Impoundment, Columbia Gorge Aluminum Smelter Site. July 10, 2020.

HDR, 2020. *Preliminary Supporting Design Report, Goldendale Energy Storage Project, Near Goldendale, Washington*. June 10, 2020.

KPUD (Public Utility District No. 1 of Klickitat County), 2022. Comments on Draft Environmental Impact Statement for the Proposed Goldendale Energy Storage Project. August 8, 2022.

Newcomb, R.C. ,1969, Effect of Tectonic Structure on the Occurrence of Ground Water in the Basalt of the Columbia River Group of the Dalles Area Oregon and Washington, USGS Professional Paper 383-C.

NOAA Fisheries (National Oceanic and Atmospheric Administration Fisheries), 2020. Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Continued Operation and Maintenance of the Columbia River System. July 24, 2020. Available at: https://www.fisheries.noaa.gov/resource/document/biological-opinion-operation-and-maintenance-fourteen-multiple-use-dam-and.

PGG (Plateau Geoscience Group LLC), 2013. Septic System, Wetlands, Upper Fluoride Area, and Soil Background Investigation Report, Former Columbia Gorge Aluminum Smelter. Prepared by Plateau Geoscience Group LLC under contract to Blue Mountain Environmental and Consulting Company. Prepared for NSC Smelter LLC. March 15.

Reidel, S.P., Fecht, K.R., Hagood, M.C., and Tolan, T.L., 1989. "The Geologic Evolution Of The Central Columbia Plateau." *Volcanism And Tectonism In The Columbia River Flood-Basalt Province*. Editors, S.P. Reidel and P.R. Hooper. Boulder, Colorado: Geological Society of America, Special Paper 239.

Rye Development, 2021. Letter to: Kimberly Bose, Federal Energy Regulatory Commission. Regarding: Goldendale Energy Storage Project, FERC Project No. 14861 – RESPONSE TO THE COMMISSIONS REQUEST FOR ADDITIONAL INFORMATION. October 4, 2021.

Seaber, P.R., F.P. Kapinos, and G.L. Knapp, 1987. Hydrologic Unit Maps. Prepared for the United States Geological Survey. Water-Supply Paper 2294. Available at: https://pubs.usgs.gov/wsp/wsp2294/#pdf.

Tetra Tech, Inc., Blue Mountain Environmental Consulting Inc., and Plateau Geoscience Group LLC, 2015. Final Remedial Investigation Work Plan, Volume 1: Phase 1 Work Plan, Columbia Gorge Aluminum Smelter Site, Agreed Order DE 10483. Prepared on behalf of Lockheed Martin Corporation and NSC Smelter LLC. August 5, 2015.

Tetra Tech, Inc., Blue Mountain Environmental Consulting Inc., and Plateau Geoscience Group LLC, 2019. Draft Remedial Investigation Report, Volume 1: Introduction and Project Framework, Columbia Gorge Aluminum Smelter Site, Agreed Order DE 10483. Prepared on behalf of Lockheed Martin Corporation and NSC Smelter LLC. January 24, 2019.

USEPA (U.S. Environmental Protection Agency), 2015. Streamflow Duration Assessment Method for the Pacific Northwest. EPA 910-K-14-001, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

USEPA, 2021. Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load. U.S. Environmental Protection Agency, Region 10, Seattle, Washington. August 13, 2021. Available at: https://www.epa.gov/columbiariver/tmdl-temperature-columbia-and-lower-snake-rivers.

USGS (U.S. Geological Survey), 2021. National Hydrography Dataset. Available at: https://www.usgs.gov/core-science-systems/ngp/national-hydrography/national-hydrography-dataset?qt-science_support_page_related_con=0#qt-science_support_page_related_con.

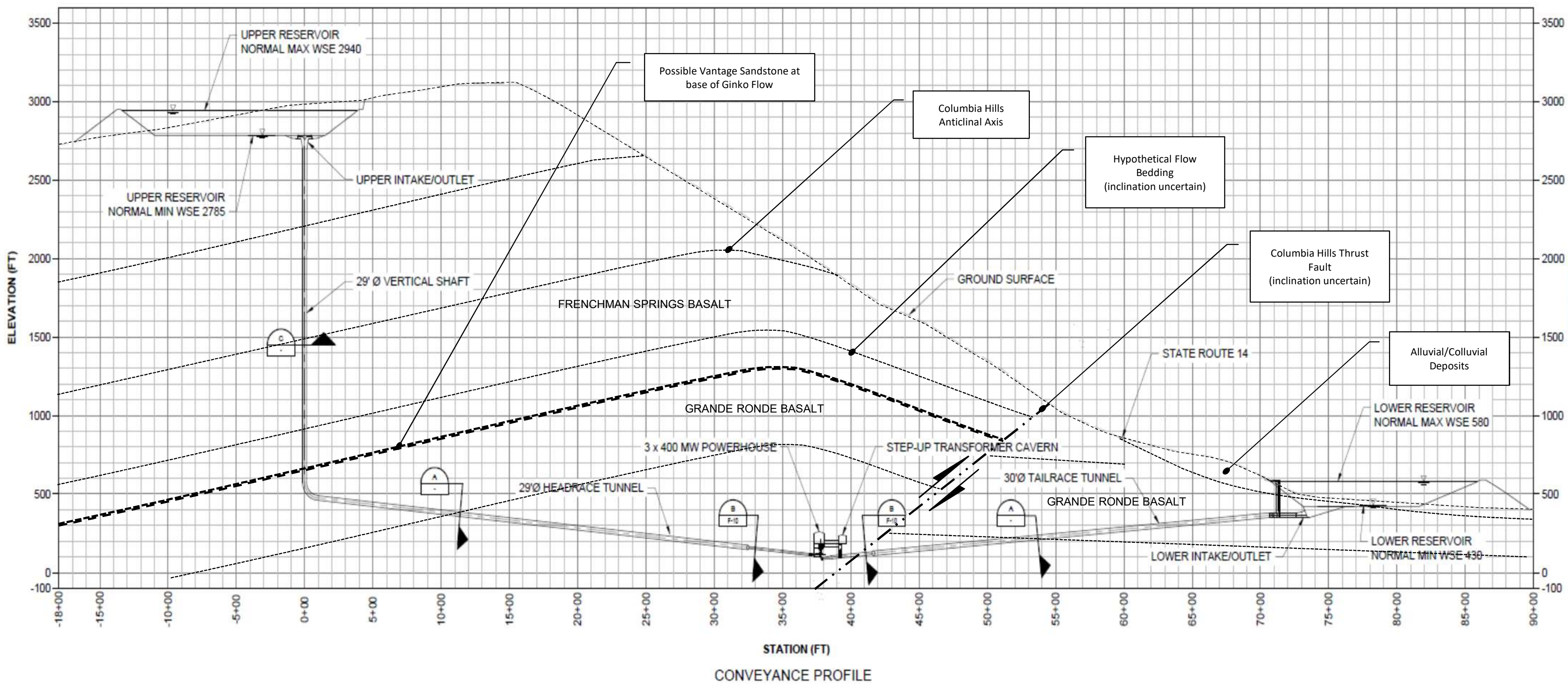
WDNR (Washington Department of Natural Resources), 2021. WA DNR GIS Open Data. Available at: https://data-wadnr.opendata.arcgis.com/.

WPN (Watershed Professionals Network), 2004. *Nitrate Concentration and Distribution Study, Appendix D to WRIA 30 Phase II Watershed Assessment*. February 2004. Available at: https://www.klickitatcounty.org/DocumentCenter/View/155/Appendix-D—Nitrate-Concentration-and-Distribution-Study—February-2004-PDF.

WPN and Aspect (Watershed Professionals Network and Aspect Consulting), 2005. *WRIA 30 Level 1 Watershed Assessment, Appendix A to WRIA 30 Watershed Management Plan*. January 2005. Available at: https://www.klickitatcounty.org/DocumentCenter/View/152/Appendix-A—Level-I-Watershed-Assessment—January-2005-PDF.

Attachment 1
Conceptual Cross Section Depicting Subsurface Geology and Underground Infrastructure

Source: HDR 2020



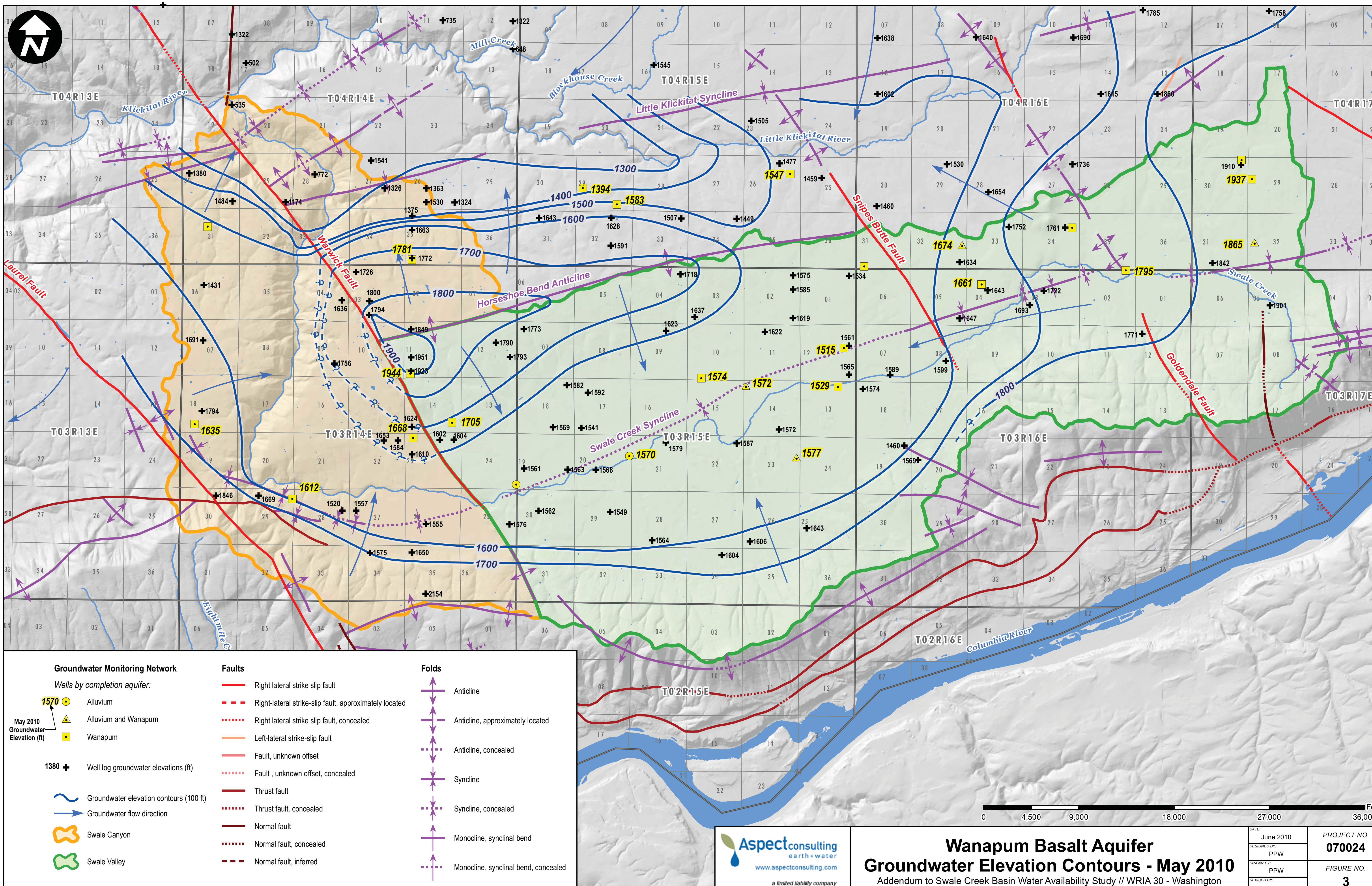
PROJECT PROFILE - CONCEPTUAL
Goldendale Energy Storage Project

Klickitat County, Washington

Figure 2

Attachment 2
Groundwater Elevations and Flow Directions in Basalt Aquifer, Swale Creek Watershed

Source: Aspect 2010



Aspect consulting
earth + water
www.aspectconsulting.com
a limited liability company

Wanapum Basalt Aquifer
Groundwater Elevation Contours - May 2010

Addendum to Swale Creek Basin Water Availability Study // WRIA 30 - Washington

DATE: June 2010	PROJECT NO. 070024
DESIGNED BY: PPW	
DRAWN BY: PPW	FIGURE NO. 3
REVISED BY: -	