BONNEVILLE POWER ADMINISTRATION

In cooperation with the Washington Department of Ecology

Melvin R. Sampson Hatchery Yakima Basin Coho Project

Final Environmental Impact Statement

November 2017

DOE/EIS-0522

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Abstract

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Responsible Agency: U.S. Department of Energy, Bonneville Power Administration

Cooperating Agency: Washington Department of Ecology

Title of Proposed Project: Melvin R. Sampson Hatchery, Yakima Basin Coho Project (DOE/EIS-0522)

States Involved: Washington

Abstract: Bonneville Power Administration (BPA) is proposing to fund the construction and operation of the Melvin R. Sampson (MRS) Hatchery for coho production in the Yakima River Basin in central Washington. The proposed hatchery would be owned and operated by the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation). The project would help support the Yakama Nation's goals to enhance existing anadromous fish stocks, maintain genetic resources, reintroduce stocks formerly present, and provide increased harvest opportunities in the Yakima Basin.

BPA funding for the hatchery would help mitigate for effects of the Federal Columbia River Power System on fish and wildlife consistent with BPA responsibilities under the Northwest Power Act. To operate the hatchery, the Yakama Nation would acquire water rights from the Washington Department of Ecology.

BPA is considering the Proposed Action to fund the coho hatchery and a No Action Alternative not to fund the proposal. The Proposed Action would involve construction and operation the hatchery, release of juvenile and adult coho reared at the hatchery, operation of acclimation sites, and collection of adult coho broodstock. This environmental impact statement (EIS) analyzes potential impacts to land use, recreation, transportation, geology and soils, vegetation, water resources, wetlands and floodplains, fish, wildlife, cultural resources, socioeconomics and environmental justice, air quality and climate change, visual resources, and noise, hazardous waste, public health, and safety.

BPA released the Draft EIS in March 2017 for public review and comment. BPA considered all comments received in preparation of this Final EIS. Changes have been made to the EIS, including additional information related to the purpose and need for the Proposed Action, added detail in the description of water resources and potential impacts from hatchery operations, and updated information related to Endangered Species Act consultation. The comments received and BPA's responses to those comments are in Appendix H of this EIS. BPA expects to issue a Record of Decision for the proposed project in winter 2017/2018.

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For additional copies of the Draft EIS:

- Internet—the EIS is available on the Internet at https://www.bpa.gov/goto/MelvinSampsonHatchery.
- Compact Disc and Hard Copies—complete a request form at www.bpa.gov/Contact/VisitorCenter/Pages/RequestForm.aspx or call the automated recording line at 1-800-622-4520 and leave your name, mailing address, and name of this EIS.

For additional information on U.S. Department of Energy (DOE), National Environmental Policy Act (NEPA) activities, please contact Director, Office of NEPA Policy and Compliance, GC-20, U.S. Department of Energy, 1000 Independence Avenue S.W., Washington D.C. 20585-0103, phone: 1-800-472-2756 or visit the DOE NEPA Web site at www.doe.gov/nepa.

The following changes have been made to the EIS in response to public and internal comments

Acronyms and Abbreviations

- List has been updated to reflect changes in the main text.

Executive Summary

- Changes to the executive Summary reflect changes made throughout the document.

Chapter 1

- Additional information has been added to Section 1.2 *Need for Action.*
- Additional information has been added to Section 1.4 *Background*, including information regarding the Northwest Power Act/Council's Fish and Wildlife Program, Tribal Treaty Fishing and Management Rights under U.S. v. Oregon, and the Hatchery Scientific Review Group.
- Section 1.8 *Draft EIS Public Outreach* was added to describe the draft EIS public involvement outreach process.

Chapter 2

- Additional information was added in Section 2.2 *Proposed Action* to describe compliance with harvest and conservation goals, as well as water quality and pollutant discharge requirements. Additional information was also added to this section to describe how the project has incorporated recommendations of the Hatchery and Scientific Review Group.
- Section 2.2.6 *Monitoring, Research, and Evaluation* has been expanded to include information on ongoing and future monitoring, research, and evaluation activities proposed for the hatchery, including coho spawning surveys, snorkeling surveys, juvenile collection and monitoring, and monitoring reports.
- Information in Section 2.4 *Alternatives Considered but Eliminated from Detailed Study* was further refined.

Chapter 3

- The introduction section for Chapter 3 has been updated to describe the summary impact levels used to describe impacts.
- Section 3.5 *Water Resources* has been updated in a number of ways:
    - Section 3.5.1.1 *Groundwater Hydrology* includes more description of the affected environment for groundwater, including more detailed descriptions of groundwater testing conducted for the project along with nearby existing groundwater wells.
    - Section 3.5.1.4.1 *Groundwater Quality* and Section 3.5.1.4.2 *Surface Water Quality* have been added to describe water quality regulations and data for potentially affected resources.
    - Section 3.5.2.2.1 *Groundwater Hydrology* has been updated to better describe the impacts associated with operation and maintenance of the proposed hatchery facility, including additional rationale for the conclusion of low impacts on groundwater quantity.
    - Section 3.5.2.2.4 *Water Quality* has been updated to include more information on impacts expected from the operation and maintenance of the proposed hatchery

    facility, including on suspended solids and related contaminants, temperature, pH, dissolved oxygen, and nutrients, and the conclusion that the project is not expected to exceed applicable water quality standards.
    - Section 3.5.2.2.5 *Summary of Operational Impacts on Water Resources* was updated to reflect the updated information on anticipated water quality impacts.
    - Figure 3.5-4 was added to show the proposed surface water diversion, groundwater wells, and treated effluent return locations.
- Section 3.6 *Wetlands and Floodplains* has been updated to better reflect the conclusion that groundwater and surface water withdrawals are expected to have a low impact on wetland vegetation. Figure 3.6-1 was added to show wetlands and wells with their zone of influence.
- Section 3.7.2.1.2 *In-Channel Actions* was updated to summarize effects on Essential Fish Habitat for Coho and Chinook salmon.
- Section 3.7.2.1.7 *Construction Impacts on ESA Resources* and Section 3.7.2.2.7 *Operational Impacts on ESA Resources* were updated to clarify the low impact determination for Bull Trout, and to reflect the completed ESA Section 7 consultations on the hatchery project with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS).
- Section 3.9.1.3 *Cultural Resources within the Study Area* was updated to reflect the findings of the cultural resources survey conducted on the property in 2016.
- Section 3.9.2.1 *MRS Hatchery Construction* was updated to reflect that no historic properties, traditional cultural properties, or sacred sites were found on the property.

Chapter 4

- Section 4.1.2 *Heritage Conservation and Cultural Resources Protection* was updated to reflect the completed consultation for the project under Section 106 of the National Historic Preservation Act.
- Section 4.1.4.1 *Endangered Species Act* was updated to reflect the completion of ESA Section 7 consultation on the proposed action with NMFS and USFWS.
- Section 4.1.4.3 *Magnuson-Stevens Fishery Conservation and Management Act* was updated to reference the NMFS's concurrence letter finding that the proposed action would not adversely affect Essential Fish Habitat.

Chapter 7

- References were updated to reflect all cited sources in the document.

Appendix A

- The title of the Appendix was changed to reflect that the ESA consultation was specific to the proposed action and not on the overarching Yakima-Klickitat Fisheries Project.

Appendix G

- Appendix G *Aquifer Pumping Test Reports and Well Drawdown Alternatives Analysis* was added to provide the technical data supporting the description of groundwater resources and analysis of groundwater impacts in Section 3.5 *Water Resources*.

Appendix H

- Appendix H *Comments Received on the Draft EIS and BPA's Responses* contains responses to all comments received during the Draft EIS comment period.

In addition, some typos and editorial changes were made throughout the document to make the document clearer and easier to read.

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Acronyms and Abbreviations

°F	degrees Fahrenheit
1-DMax	1-day maximum temperature
BA	Biological Assessment
BiOp	Biological Opinion
BMP	best management practices
BPA	Bonneville Power Administration
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
Corps	U.S. Army Corps of Engineers
Council	Northwest Power and Conservation Council
CWA	Clean Water Act
DAHP	Department of Archaeology and Historic Preservation
dB	decibel
dBA	A-weighted decibel
dBA L_{eq}	A-weighted decibels at equivalent continuous levels
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
Ecology	Washington State Department of Ecology
EDNA	environmental designations for noise abatements
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FEMA	Federal Emergency Management Agency
FR	Federal Register
ft	feet
FTA	Federal Transit Administration
GHG	greenhouse gas
gpm	gallons per minute
HDPE	high-density polyethylene
HGMP	*Hatchery and Genetic Management Plan*

HSRG	Hatchery Scientific Review Group
HVAC	heating, ventilation, and air conditioning
I-90	Interstate 90
IPaC	Information for Planning and Conservation
ISAB	Independent Scientific Advisory Board
ISRP	Independent Scientific Review Panel
Master Plan	*Yakima Subbasin Summer- and Fall-Run Chinook and Coho Salmon Hatchery Master Plan*
MCR	Middle Columbia River
mg/L	milligram per liter
MIPT	Monitoring Implementation Planning Team
ml	milliliter
MP	milepost
mph	mile(s) per hour
MR&E	monitoring, research, and evaluation
MRS Hatchery	Melvin R Sampson Hatchery
MSA	Magnuson-Stevens Fishery Conservation and Management Act
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
Northwest Power Act	Northwest Electric Power Planning and Conservation Act of 1980
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NTU	nephelometric turbidity unit
O_3	ozone
OHWM	ordinary high water mark
Pb	lead
PCBs	polychlorinated biphenyls
PEMC	freshwater emergent wetland
PIT	passive integrated transponder
$PM_{2.5}$	fine particulate matter
PM_{10}	course particulate matter
PSSC	palustrine scrub shrub wetland
PUBH	freshwater pond
RCW	Revised Code of Washington
Reclamation	U.S. Bureau of Reclamation
RM	river mile
SEPA	State Environmental Policy Act

SMP	Shoreline Master Program
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SR 10	State Route 10
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Loads
US 97	U.S. Highway 97
USC	U.S. Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAAQS	Washington Ambient Air Quality Standards
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WRIA	Water Resource Inventory Area
WSDOT	Washington Department of Transportation
Yakama Nation	Confederated Tribes and Bands of the Yakama Nation
YKFP	Yakima-Klickitat Fisheries Project
YSFWPB	Yakima Subbasin Fish and Wildlife Planning Board

Executive Summary

Chapter 1 Introduction

The Bonneville Power Administration (BPA) is proposing to fund construction and operation of the Melvin R. Sampson Hatchery (MRS Hatchery) in the Yakima Basin in central Washington. Operation of the MRS Hatchery would involve production of coho salmon for release in the Yakima River and its subbasin, the Naches River. The proposed hatchery would be owned and operated by the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation) and would be constructed on land owned by the Yakama Nation northwest of Ellensburg in Kittitas County, Washington. The property borders the Yakima River and is adjacent to Interstate 90 (I-90).

The proposed MRS Hatchery would include a hatchery building (which would include areas for egg incubation, early rearing, water treatment and reuse equipment, as well as an administration area), adult holding and spawning ponds, a shop building, three new employee houses, access roads, and site utilities that include pipes for water intake and discharge (outfall).

The proposed coho hatchery program was identified in the Yakima/Klickitat Fisheries Project (YKFP), which has the goal of enhancing existing stocks of anadromous fish in the Yakima and Klickitat River basins while maintaining genetic resources, reintroducing stocks formerly present in the basins, applying knowledge gained about hatchery supplementation throughout the Columbia River Basin, and providing increased harvest opportunities.

BPA is considering funding the construction of the proposed hatchery through its responsibilities under the Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act, 16 U.S. Code (USC) Sec. 839 et seq.) and the 2008 Memorandum of Agreement among the Umatilla, Warm Springs, and Yakama Tribes, Bonneville Power Administration, U.S. Army Corps of Engineers (Corps), and U.S. Bureau of Reclamation (Reclamation) (2008 Fish Accords). Under this agreement, BPA agreed to make funds available to construct the proposed hatchery subject to Northwest Power and Conservation Council (Council) review and meeting all federal, state, and local compliance requirements. The proposed hatchery would be one element of a continuing effort by BPA, the Yakama Nation, and several other partners and cooperators to protect and manage anadromous fish populations and mitigate for effects of the Federal Columbia River Power System in these waters.

In meeting the need for action, BPA seeks to achieve the following purposes:

- Support efforts to mitigate for effects of the development and operation of the Federal Columbia River Power System on fish and wildlife in the mainstem Columbia River and its tributaries under the Northwest Power Act.
- Assist in carrying out commitments related to proposed hatchery actions that are contained in the 2008 Fish Accords with the Yakama Nation and others.
- Implement BPA's *Fish and Wildlife Implementation Plan Environmental Impact Statement and Record of Decision* policy direction, which calls for protecting weak stocks, while sustaining overall populations for fish for their economic and cultural value.

- Minimize harm to natural and human resources, including species listed under the Endangered Species Act (ESA).

BPA has prepared this Environmental Impact Statement (EIS) pursuant to the regulations implementing the National Environmental Policy Act of 1969 (NEPA) (42 USC 4321 et seq.), which requires federal agencies to assess the impacts its actions may have on the environment. Major federal actions significantly impacting the quality of the human environment must be analyzed in an EIS. The Washington State Department of Ecology (Ecology) is a cooperating agency for this EIS.

Public scoping for the MRS Hatchery EIS was initiated with the publication of the Notice of Intent in the Federal Register (80 Federal Register [FR] 70770) on November 16, 2015. Concurrent with the publication of the Notice of Intent, BPA mailed a letter and map describing the Proposed Action to neighboring landowners; affected tribes; local, state, and federal government officials; and known interested parties requesting comments on the proposal. BPA held a public scoping meeting in Ellensburg, Washington, on December 9, 2015. BPA accepted scoping comments from November 16, 2015, until January 4, 2016. During the scoping comment period, BPA received 10 comment letters. Issues raised during the scoping process were divided into categories and responded to within the EIS. Scoping comment letters can be viewed at: https://www.bpa.gov/goto/MelvinSampsonHatchery.

On March 10, 2017, BPA issued a draft EIS for public comment and accepted comments through May 1, 2017. In addition, BPA held an open-house public meeting to receive comments on April 12, 2017, at the Hal Holmes Community Center in Ellensburg, Washington. This final EIS includes responses to comments on the draft EIS, corrections and clarifications to the analysis presented in the draft EIS, and updated information since the draft EIS was issued, if relevant and available. BPA will document its final decision in a Record of Decision no sooner than 30 days after the release date of the final EIS.

Chapter 2 Alternatives

This EIS evaluates two alternatives: the Proposed Action and a No Action alternative.

Proposed Action

Under the Proposed Action, BPA would fund the Yakama Nation's construction and operation of the MRS Hatchery. The MRS Hatchery would be developed based on the 2012 *Yakima Subbasin Summer- and Fall-Run Chinook and Coho Salmon Hatchery Master Plan* (Master Plan). The Proposed Action would include:

- Construction and operation of a new coho hatchery facility (MRS Hatchery) at the former Holmes Ranch property.
- Release and adaptive management (adjustment of release proportions to meet objectives for survival or adult return) of juvenile and adult coho reared at the MRS Hatchery, throughout the Yakima Basin.
- Operation of proposed and future acclimation sites throughout the Yakima Basin.
- Collection of adult coho broodstock from existing facilities at Roza and Prosser Dams, or at other existing collection sites.

The MRS Hatchery and related facilities would be constructed on an 8-acre developable portion of the Holmes Ranch property situated about 5 miles northwest of Ellensburg, Washington. Project facilities would include a hatchery building (which would include areas for egg incubation, early rearing, water treatment and reuse equipment, as well as an administration area), adult holding and spawning ponds, a shop building, three new employee houses, access roads, and site utilities that would include pipes for water intake and discharge (outfall). Surface water and groundwater would be used throughout the year at the MRS Hatchery for various purposes throughout the juvenile fish life cycle.

Coho eggs would be incubated, then hatched and reared to parr or smolt stage at the MRS Hatchery, with the goal of providing up to 700,000 coho parr and smolts. This release number would be expected to eventually produce enough returning adults to provide for broodstock needs, to meet the goals for treaty and nontreaty harvest in the Yakima and Naches River basins, and to provide for natural spawning.

The MRS Hatchery would initially rear and release up to 500,000 parr and up to 200,000 smolts in the upper Yakima and Naches River watersheds using broodstock collected from existing facilities at Roza and Prosser Dams, or at other existing collection sites. The broodstock goal is to collect 1,000 fish that would be processed over a 4-month period. No more than 400 fish would be held at the adult holding ponds at the MRS Hatchery at any given time. The fish would be held onsite for two to three months, from October through January. Per National Marine Fisheries Service (NMFS) consultation (NWR-2011-06509; NMFS 2016a), up to 200,000 smolts could be released in addition to the 500,000 parr. Conversion to an all-smolt release (i.e., 700,000 smolts) is proposed if the parr/smolt release strategy does not meet adult return objectives, or if drought conditions preclude summer parr releases.

The Yakama Nation would use mobile acclimation units for a small number of coho smolts in the Yakima Basin. The units would consist of portable aluminum raceways and would be placed either on private or U.S. Forest Service lands, with approval from the applicable landowner.

No Action Alternative

Under the No Action alternative, BPA would not fund the construction and operation of the proposed MRS Hatchery. The Yakama Nation would likely continue implementing its coho restoration program using a combination of artificial production, reliance on out-of-basin broodstock, and habitat improvements to meet natural production and harvest goals. Summer parr releases would continue to be the primary method for increasing fish production in upper basin tributaries. In addition, the Yakama Nation would continue to use the existing acclimation ponds at the MRS Hatchery site to acclimate Yakima River hatchery coho.

Chapter 3 Affected Environment and Environmental Consequences

This EIS analyzes potential impacts associated with construction and operation of the Proposed Action and No Action alternative for the following environmental resource areas: land use and recreation; transportation; geology and soils; vegetation; water resources; wetlands and floodplains; fish; wildlife; cultural resources; socioeconomics and environmental justice; air quality and climate change; visual resources; and noise, hazardous waste, public health, and safety.

Table ES-1 summarizes the environmental impacts of the Proposed Action and the No Action alternative. Table ES–2 summarizes potential mitigation measures that would be implemented to avoid or minimize environmental impacts. A more detailed discussion of impacts and mitigation measures is presented in Chapter 3, Affected Environment, Environmental Consequences, and Mitigation Measures*.*

Table ES–1. Summary of Impacts

Potentially Affected Resource	Proposed Action	No Action Alternative
Land Use and Recreation Section 3.1	Construction-related impacts (e.g., noise, dust, traffic) at the MRS Hatchery site would mostly be noticeable within the immediate project site and are not expected to interfere with adjacent and surrounding land uses. Impacts to potential users of the John Wayne Pioneer Trail would be limited to a short segment of the trail and construction activities would not preclude continued use of the trail in a safe manner. The project would be consistent with county plans and zoning. Operation of the MRS Hatchery and activities at acclimation and release sites are not expected to interfere with adjacent and surrounding land uses and recreation.	Current land uses in the study area would continue under the No Action alternative. No new facilities would be constructed and disruptions to adjacent properties, recreational sites, and land uses would not occur. As with the Proposed Action, the acclimation and release sites are not expected to interfere with adjacent and surrounding land uses and recreation.
Transportation Section 3.2	Project-related traffic would utilize major highways (I-90 and U.S. Highway 97 [US 97]) to the maximum extent possible and would have a low impact on transportation and traffic around the Holmes Ranch property. Construction traffic approaching the hatchery site on SR 10 and Klocke Road would likely be noticeable on these low volume roads. Long-term operation of the project would result in low, localized traffic impacts due to increased traffic associated with the new residences and additional employees at the MRS Hatchery, and traffic to setup and monitor the acclimation and release sites.	No change in traffic patterns or volumes would result from the No Action alternative.
Geology and Soils Section 3.3	Site preparation and other construction activities at the MRS Hatchery site would result in approximately 8.3 acres of soil disturbance, temporarily increasing the potential for erosion. Erosion and sedimentation impacts would be minimized by using best management practices (BMPs), and exposed soils would be revegetated or stabilized with gravel following construction. MRS Hatchery operation would permanently replace some of the existing soils with base course or fill. In general, existing slopes and drainage patterns of undisturbed soils would remain intact and erosion and sedimentation would not increase as a result of the project. Operational activities at acclimation and release sites are not expected to affect geology and soils.	The No Action alternative would have no impacts on soils or geologic resources.
Vegetation Section 3.4	Construction activities at the MRS Hatchery site would temporarily impact up to 4.6 acres of vegetation and would permanently remove up to 3.7 acres of pasture and grassland. Areas of temporary disturbance to vegetation would be revegetated with native species after construction. Impacts to vegetation communities would be low because hatchery operations would not require substantial vegetation maintenance on the MRS Hatchery grounds, access roads, or in the New Cascade Canal (see Section 2.2.1). Acclimation and release activities at other sites within the basin would have no long-term impacts and would result in low to no impacts to vegetation. Any vegetation removal required for mobile acclimation units would be minimal and temporary.	No new construction would occur and no vegetation would be removed at the Holmes Ranch property. Any vegetation removal required for mobile acclimation units would be minimal and temporary.

Table ES–1. Summary of Impacts

Potentially Affected Resource	Proposed Action	No Action Alternative
Water Resources Section 3.5	Some in-water work would be required for construction of the MRS Hatchery and low water quality impacts may occur during in-water work. Erosion and transport of pollutants from hatchery construction to surface waters and groundwater is expected to be minimized through erosion control and construction BMPs. The Yakama Nation would obtain an NPDES Construction Stormwater General Permit from Ecology, which would include a Stormwater Pollution Prevention Plan (SWPPP). Groundwater pumping during hatchery operations is expected to cause local aquifer drawdown, especially during the month of November. However, the impacts would be localized. Impacts to surface water hydrology are expected to be low; surface water diversion flows would be low relative to the total flow in the source stream. In addition, surface water use would be nonconsumptive. Water quality impacts are expected to be low or avoided because of the quality of the source water, aeration and gas management of the source water, and removal of solids from fish feed and fish waste with a microstrainer and clarifier. Surface water diversions for mobile acclimation sites would not cause dewatering of any reaches and changes to stream flow and water quality would likely be low. Water quality may be slightly affected by the discharge of fish wastes from mobile acclimation units; however, NPDES permits would not be needed for these sites because rearing levels would be well below permit minimums and the duration would be only 4-6 weeks.	Surface or groundwater resources would not be modified as a result of the No Action alternative. Continued use of existing acclimation and release sites and the implementation of the new sites would have low to no impact on water quantity and quality.
Wetlands and Floodplains Section 3.6	Potential short-term construction impacts to wetlands on the MRS Hatchery site include erosion, human disturbance, sedimentation, or accidental fuel and oil leaks related to construction. The majority of these impacts would be prevented with appropriate BMPs. Discharge water would be treated to meet the requirements of the NPDES General Permit (Ecology 2015a) and would not impact wetland water quality. Groundwater drawdown from hatchery water supply wells is expected to have a low effect on wetlands in the project area. Acclimation and release activities would have low to no impacts to wetlands. The mobile acclimation facilities may be located within the 100-year floodplain and the Yakama Nation would coordinate with the local floodplain administrator (Kittitas County) to minimize impacts from the acclimation and release activities. The impact of the Proposed Action on floodplains would be low.	No new construction would occur at the Holmes Ranch property. Current conditions of wetlands and floodplains would continue. As with the Proposed Action, acclimation and release activities would have low to no impacts to wetlands and low impacts to floodplains.

Table ES–1. Summary of Impacts

Potentially Affected Resource	Proposed Action	No Action Alternative
Fish Section 3.7	Construction impacts on fish or their habitat are anticipated to be localized to the hatchery site and short term. In-water construction may temporarily alter water quality, disturb or displace individuals, or temporarily reduce the amount of available habitat. However, the area impacted for MRS Hatchery construction would be small (less than about 100 linear feet of surface waters) and provides low quality habitat; therefore, impacts on fish are expected to be low. Little, if any, direct mortality is anticipated and construction-related sediment and turbidity is anticipated to be low. MRS Hatchery-related construction is not likely to adversely affect ESA-listed bull trout or Middle Columbia River (MCR) steelhead. Construction of in-water elements for the MRS Hatchery may temporarily displace juvenile individuals from habitat. Operational effects on aquatic habitat and fish species include seasonal disturbance and minor flow reductions associated with surface water diversions, and minor water quality degradation from effluent return to the respective waterbodies. Surface water diversion would not cause dewatering of any reaches, and impacts on bull trout and their critical habitat, if any, would be low to none. By complying with acceptable effluent discharge values in accordance with the 2015 Upland Fin-Fish Hatching and Rearing General NPDES Permit (Ecology 2015a), the impact of effluent on receiving waters, the aquatic environment, and fish is expected to be low. Water quality changes due to discharges from the facilities could disrupt the behavior and distribution of individual fish immediately adjacent to and downstream of the outfall structure, but the overall impact is expected to be low. Off-site operations, including adult and juvenile coho releases throughout the Yakima River basin, are expected to have low impacts on juvenile bull trout because coho are typically released into tributaries downstream of habitat occupied by rearing bull trout. Juvenile coho releases would not negatively affect adult bull trout. Juvenile coho releases could provide forage for adult bull trout near release locations.	Development of a locally-derived, naturally-sustaining in-basin coho population using an integrated facility would not be achieved. Impacts on nontarget fish species from continuing coho reintroduction activities of the YKFP (e.g., ecological interactions from juvenile releases and monitoring, research, and evaluation [MR&E] activities) would remain at current levels.
Wildlife Section 3.8	There are no ESA-listed terrestrial wildlife species or potential suitable habitat for such species on the MRS Hatchery property. Wildlife species typically occurring in the area would likely avoid the hatchery site during construction, although less mobile species could potentially experience mortality. Accidental fuel and oil leaks during construction could also create short-term, local, and low impacts on wildlife. Permanent removal of up to 3.7 acres of vegetated habitat could create long-term, moderate impacts on species that currently use the area. Project operations would result in increases in daily human activity and noise that could impact the ability of local wildlife to forage, roost, or nest. Mitigation measures would be implemented to minimize the impacts of construction and operation on wildlife. For most wildlife species, suitable habitat for breeding, rearing, and foraging would remain available at the proposed site of the MRS Hatchery and at acclimation sites. The overall impact on wildlife would be low.	Habitats at the hatchery site would not be altered, and existing human disturbance would continue. Species adapted to current conditions at the hatchery site and acclimation sites would continue to use them. The use of new acclimation and release sites would have a low impact to wildlife.

Table ES–1. Summary of Impacts

Potentially Affected Resource	Proposed Action	No Action Alternative
Cultural Resources Section 3.9	Temporary visual impacts to the Chicago-Milwaukee-St. Paul-Pacific Railroad line, which is now the John Wayne Pioneer Trail, would occur during construction of the MRS Hatchery. Based on cultural surveys completed in the study area and consultation with the Yakama Nation and Washington State Historic Preservation Office, no historic properties, traditional cultural properties, or sacred sites occur within the study area. As a result, construction and operation of the MRS Hatchery would have a low impact on cultural resources.	No ground disturbance or removal of cultural resources would occur at the Holmes Ranch property. The use of new mobile acclimation and release sites would not result in any ground disturbance.
Socioeconomics and Environmental Justice Section 3.10	Construction of the MRS Hatchery would result in a direct short-term beneficial impact on employment in the region through employment of approximately 30 people for a period of 16.5 months, and their indirect spending in the area. Hiring of permanent hatchery workers would have a low beneficial impact on the regional economy and the Yakama Nation. The availability of fisheries resources for local populations and tribal members would ultimately increase, resulting in long-term beneficial impacts to subsistence fisheries. Construction and operation of the Proposed Action would not have significant environmental impacts that would be disproportionately borne by minority or low income populations.	Economic conditions and opportunities in the region would not change as a result of the No Action alternative.
Air Quality and Climate Change Section 3.11	Construction effects on air quality are expected to be low, short term, local, and would cease when construction is complete. Operational emissions resulting from additional employee and delivery trips and potential use of an emergency power generator would be low and would not significantly reduce the air quality of the surrounding region. Air emissions resulting from additional truck trips and generators at acclimation sites would not reduce the air quality of the surrounding region.	There would be no change in air quality and no change to greenhouse gas (GHG) emissions as a result of this alternative.
Visual Resources Section 3.12	Construction equipment and personnel would be temporarily visible by motorists on Klocke Road and users of the John Wayne Pioneer Trail. New structures associated with the MRS Hatchery and hatchery operation would be visible intermittently and for a short period of time by travelers along the John Wayne Pioneer Trail and motorists on Klocke Road. Although the new structures would be periodically obscured by a partial vegetation screen, the changes in existing views represent a long-term moderate impact to visual resources. Acclimation structures are not expected to create noticeable visual obstructions; their presence would create annual short-term low impacts.	Existing views and viewer groups would not experience a change in visual resources. Existing and new acclimation and release sites under the YKFP would be used and would create annual short-term low impacts.

Table ES–1. Summary of Impacts

Potentially Affected Resource	Proposed Action	No Action Alternative
Noise, Hazardous Waste, Public Health, and Safety Section 3.13	Construction at the MRS Hatchery site would cause moderate short-term noise impacts in areas directly adjacent to construction activity. Noise generated during operation is not expected to occur at levels that would exceed thresholds for nearby receptors. Hazardous materials storage on-site would be limited and consist of designated, enclosed storage areas with full secondary containment provided. During construction, the potential for other public health and safety impacts (e.g., air emissions, hazardous material release) are expected to be short-term, localized, and low. Operational impacts to public health and safety at the hatchery and acclimation sites would be low.	Existing noise levels would continue. Chemicals would not be used and the use of new and existing acclimation and release sites would not generate hazardous waste or materials. Public health and safety impacts would continue to be low.

Table ES–2. Mitigation Measures

Mitigation Measures

Land Use and Recreation

- Because of the low magnitude of impacts on land use and recreation, no mitigation measures are recommended.

Transportation

- Employ traffic control flaggers and post signs warning of construction activity and merging traffic, when necessary for interruptions of traffic.

Geology and Soils

- Minimize the construction disturbance area and removal of vegetation to the greatest extent possible.
- Locate staging areas in previously disturbed or graveled areas, where practicable, to minimize soil and vegetation disturbance.
- Conduct peak construction activities during the dry season (between June 1 and November 1) as much as possible to minimize erosion, sedimentation, and soil compaction.
- Prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) that would include appropriate BMPs, such as delineation of construction limits within 200 feet (ft) of streams and wetlands, and installation of silt fences, straw bales, and jute matting.
    - Erect silt fencing per Ecology’s BMP C233 and along the entire building footprint to the south and along the western perimeter. This fencing area includes all potential areas that slope toward the historic side channel/Bypass to preclude entry of sediment into riparian areas and stream channels.
    - Erect sediment barriers per Ecology BMP C235.
- Inspect erosion and sediment controls weekly, maintain them as needed to ensure their continued effectiveness, and remove them from the proposed hatchery site when vegetation is re-established and the area has been stabilized.
- Minimize the area of soils exposed at any one time and use dust abatement measures when necessary.
- Prepare and implement a fugitive dust control plan, including the use of water trucks or other appropriate methods to control dust during construction, the use of gravel on access road surfaces in areas of sustained wind, and the establishment of a 15-mile-per-hour (mph) speed limit for construction vehicle use on unpaved roads and surfaces.

Vegetation

- Inspect equipment to remove vegetation and dirt clods that may contain noxious weeds.
- Dispose of excavated noxious weeds in a manner that prevents reestablishment in wetlands and adjacent areas.
- Implement a revegetation plan to restore native plant communities, provide wildlife habitat, reduce the risk of weed encroachment, and ensure adequate growth.
    - Reseed disturbed areas after construction and regrading are complete, at the appropriate time period for germination.
    - Monitor germination of seeded areas. If vegetative cover is inadequate, implement contingency measures and reseed to ensure adequate revegetation of disturbed soils.

Water Resources

- Implement measures to control erosion (see mitigation measures in Geology and Soils) to eliminate potential sediment discharge into waterways.
- Implement a revegetation plan (see mitigation measures in Vegetation) to ensure stabilization of disturbed soils.
- Design and construct access roads such that drainage from the road surface directly into surface waters is minimized and direct sediment-laden waters are drained into vegetated areas.
- Review water quality mitigation measures, required BMPs, and permit requirements with construction contractors and inspectors during a preconstruction meeting covering environmental requirements.
- Develop and implement a work area isolation/dewatering plan for instream work that includes provisions for erosion and sediment control.
- Operate machinery primarily from the top of the river/creek bank along adjacent upland areas. Do not operate stationary equipment in the flowing water. It may be necessary to traverse the channel to install the work area isolation structure (cofferdam). Once the cofferdam is constructed, operate all machinery from behind the confines of the cofferdam.
- Stockpile and cover excavated streambed and bank materials away from the stream channel or flank with sediment fencing or fiber wattles to minimize fine sediment being transported into the waterbodies.
- Use a screened diesel or electric sump pumps, if needed, to capture seepage flow from cofferdam areas. Direct all seepage flow to an on-site detention area.
- Wash heavy equipment that may work below the ordinary high water mark (OHWM) elevation before it is delivered to the job site and after it is used to prevent the spread of aquatic invasive species.
- Prepare and implement a Spill Prevention, Control, and Countermeasure (SPCC) plan to address fuel and chemical storage, spill containment and cleanup, construction contractor training, and proper spilled material disposal. The SPCC plan should include provisions to store fuel (and potential pollutants) and refuel construction equipment at least 300 feet away from streams or wetlands, and to use of pumps, funnels, absorbent pads, and drip pans when fueling or servicing vehicles.
- Inspect machinery daily for fuel or lubricant leaks and prior to entering wetlands, waterways, or floodplains, and completely clean off any external petroleum products, hydraulic fluid, coolants, and other pollutants.
- Prohibit discharge of vehicle wash water into any stream, waterbody, or wetland without pretreatment to meet state water quality standards.
- If dust-abatement additives or stabilization chemicals (typically magnesium chloride, calcium chloride salts, or ligninsulfonate) are used, the following additional measures will be implemented:
    - Do not apply dust-abatement additives and stabilization chemicals within at least 25 feet of surface water (distances might be greater where vegetation is sparse) and apply them so as to minimize the likelihood that they would enter the water.
    - Do not use petroleum-based products for dust abatement.
    - Avoid application of dust abatement chemicals during or just before wet weather, and in areas that could result in unfiltered delivery of the dust abatement materials to surface water.
    - Ensure spill containment equipment is available during application of dust abatement chemicals.

- Comply with the NPDES permit for effluent discharge.
- Comply with the Total Maximum Daily Load allocations for the Yakima Basin.
- Minimize the storage of hazardous materials on-site. When stored, storage shall consist of designated, enclosed storage areas with full secondary containment provided to fully contain accidental spills of chemicals stored at the proposed facilities.
- Comply with all chemical handling, application, and disposal regulations by the U.S. Department of Agriculture (USDA) and Center for Veterinary Medicine regulations and other state and federal regulations to protect human and environmental health.
- Train all staff in regard to chemical handling and application safety.
- Conduct a pump test on wells at the Holmes Ranch property once pumps are installed and operational to monitor effects on groundwater during periods of peak groundwater demand for fish rearing (March - November).

Wetlands and Floodplains

- Implement measures to control erosion and fugitive dust (see mitigation measures in Geology and Soils) to eliminate potential for sediment discharge into wetlands.
- Implement a revegetation plan (see mitigation measures in Vegetation) to ensure stabilization of disturbed soils.
- Install signage, fences, and flagging to restrict work areas and confine vehicles and equipment to designated routes that avoid wetlands and waterways.
- When working next to wetlands and waterways, limit disturbance to the minimum necessary to achieve construction objectives, minimize habitat alteration, and limit the effects of erosion and sedimentation.
- Implement an SPCC plan (see mitigation measures in Water Resources).
- Stockpile wetland soils removed from Wetland A during diversion channel construction and use them to re-fill the channel once construction is completed.
- Regrade disturbed wetlands and vegetated areas to preconstruction contours and revegetate with appropriate native species.
- Locate mobile acclimation units outside of regulated floodways, 100-year floodplains, or at the highest elevation practicable. Monitor mobile acclimation units at risk of flooding and relocate as appropriate.

Fish

- Implement measures to control erosion (see mitigation measures in Geology and Soils) and potential spills of hazardous materials (see mitigation measures in Water Resources) to minimize potential for impacting waterbodies.
- Implement an SPCC plan and comply with the NPDES General Permit (see mitigation measures in Water Resources).
- Screen the proposed Bypass intake structure to meet NMFS criteria. Equip the outfall with a bar rack to prevent entry of adult fish.
- Construct all in-water work during the negotiated agency-approved work window of November 1 through December 31.
- Install and remove cofferdams during the appropriate work window for each waterbody.

- In October, place a picket weir downstream of the proposed outfall location to prevent adult fish from entering during the in-water work period. The Yakama Nation would seine the Bypass and historic side channel to herd adult fish from the affected reach prior to installation of the picket barrier.
- Operate equipment in the active channel only if necessary to install and remove cofferdams. Install the cofferdam from the top of bank to the extent possible.
- Experienced fisheries biologists would remove all fish species from the immediate area where the cofferdams would be installed. Fish salvage would adhere to the following protocol:
    - Flush adult fish that do not disperse from the construction area from the area behind the cofferdams. As part of any dewatering process, use beach seines and sanctuary nets to herd all fish from the area(s) of capture or release.
    - Capture by seining juveniles that do not displace voluntarily, and if necessary, use a backpack electrofisher. Once captured, place fish into a 5-gallon bucket using small dip-nets. Captured fish would be released back into the stream channel a safe distance (about 150 feet) upstream of the work area. Qualified Yakama Nation and/or Washington Department of Fish and Wildlife (WDFW) biologists would conduct work by following NMFS guidelines (NMFS 2000).
    - Do not use seining or electrofishing if water temperatures exceed 64 degrees Fahrenheit (°F).
    - Transport fish in aerated buckets or tanks and release as quickly as possible and as near capture sites upstream as possible.
    - Notify U.S. Fish and Wildlife Service (USFWS) and NMFS in the highly unlikely event that an ESA-listed fish is injured or killed during the salvage operation. Fish salvage biologists would prepare a report for the Services that summarizes the number of fish handled, species, and individual lengths.
- To minimize pulses of sediment downstream, remove the cofferdams incrementally.
- Dewater and actively pump in-water work areas prior to pouring concrete forms. Fully cure all poured on-site concrete structures prior to contact with surface waters to prevent concrete leachate from entering live waters.
- Create sumps as necessary within the work area to capture any seepage flow. Pump all seepage flow to an on-site temporary settling pond, Baker tank, or other facility as determined by the contractor. Seepage flow would percolate into the ground or alluvial material prior to entry back into the water.
- Install a fish screen that would meet NMFS screening criteria, on pumps used for cofferdam dewatering.
- Adaptively manage juvenile coho releases based on studies on nontarget fish via MRS Hatchery-specific MR&E activities.
- Conduct all MR&E activities in accordance with the terms and conditions of the existing Section 7 ESA consultation for MCR steelhead (NMFS 2013).
- Comply with all applicable terms and conditions of the existing USFWS Section 10 permit issued for the overall Yakama Nation Fisheries program (TE-05166B-0; incorporated herein by reference), and any future ESA Section 7 consultations terms and conditions.
- Screen all surface water pumps for acclimation units (one per site, to be used for all tanks)

according to NMFS juvenile salmonid criteria.

Wildlife

- Maintain clean work areas with proper litter control and sanitation to prevent wildlife attraction.
- Minimize lighting and use lighting fixtures that direct light downward and not towards off-site areas to minimize disturbance to wildlife.
- Develop and implement a plan to minimize and manage predatory wildlife being attracted to fish and other potential food sources available at the facility.
- Implement measures to control erosion (see mitigation measures in Geology and Soils) and potential spills of hazardous materials (see mitigation measures in Water Resources) to minimize potential for impacting habitat.
- Implement a revegetation plan (see mitigation measures in Vegetation) to ensure stabilization of disturbed soils.

Cultural Resources

- Prepare an Archaeological/Cultural Resource Inadvertent Discovery Plan.
- Protect any unanticipated cultural resources discovered during construction as follows:
  - Stop work in the immediate vicinity of the discovery and protect find in place.
  - Notify Yakama Nation Project Manager, BPA Archaeologist, and BPA Environmental Compliance Lead immediately.
  - Implement mitigation or other measures as instructed by BPA.

Socioeconomics and Environmental Justice

- Because of the low magnitude of impacts on socioeconomic and environmental justice resources, no mitigation measures are recommended.

Air Quality and Climate Change

- Sequence and schedule construction work to minimize the amount of bare soil exposed to wind erosion.
- Implement measures to control fugitive dust (see mitigation measures in Geology and Soils).
- Do not burn vegetation or other debris associated with construction clearing.
- Ensure that all vehicle engines are maintained in good operating condition to minimize exhaust emissions.
- Handle and dispose of all potentially odorous waste during operation in a manner that does not generate odorous emissions.
- Implement vehicle idling restrictions.
- Encourage carpooling and the use of shuttle vans among construction workers to minimize construction-related traffic and associated emissions.
- Encourage the use of the proper size of equipment for each job because larger equipment requires the use of additional fuel.
- Use alternative fuels, such as propane, for stationary equipment at the construction sites or use electrical power where practicable.
- Reduce electricity use in the construction office and during facility operation by using compact fluorescent or LED bulbs and turning off computers and other electronic equipment every night.
- Recycle or salvage nonhazardous construction and demolition debris, as well as waste generated during facility operation, where practicable.

Visual Resources

- Avoid removing vegetation along the John Wayne Pioneer Trail or waterbodies within and around the hatchery site.
- Limit areas of disturbance to those necessary for construction and operation.
- Implement a revegetation plan (see mitigation measures in Vegetation).

Noise, Hazardous Waste, Public Health, and Safety

- Schedule construction work during daylight hours between 7:00 a.m. and 9:00 p.m.
- Locate stationary construction equipment as far away from noise-sensitive receptors as possible.
- Require sound-control devices that are at least as effective as those originally provided by the manufacturer on all construction equipment powered by gasoline or diesel engines.
- Select pumps and backup generators that do not generate excessively high noise levels.
- Implement an SPCC plan (see mitigation measures in Water Resources).

1 Purpose of and Need for Action

1.1 Introduction

The Bonneville Power Administration (BPA) is proposing to fund construction and operation of the Melvin R. Sampson Hatchery (MRS Hatchery) in the Yakima Basin in central Washington. Operation of the MRS Hatchery would involve production of coho salmon for release in the Yakima River, and its subbasin, the Naches River. The proposed hatchery would be owned and operated by the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation) and would be constructed on land owned by the Yakama Nation northwest of Ellensburg in Kittitas County, Washington.

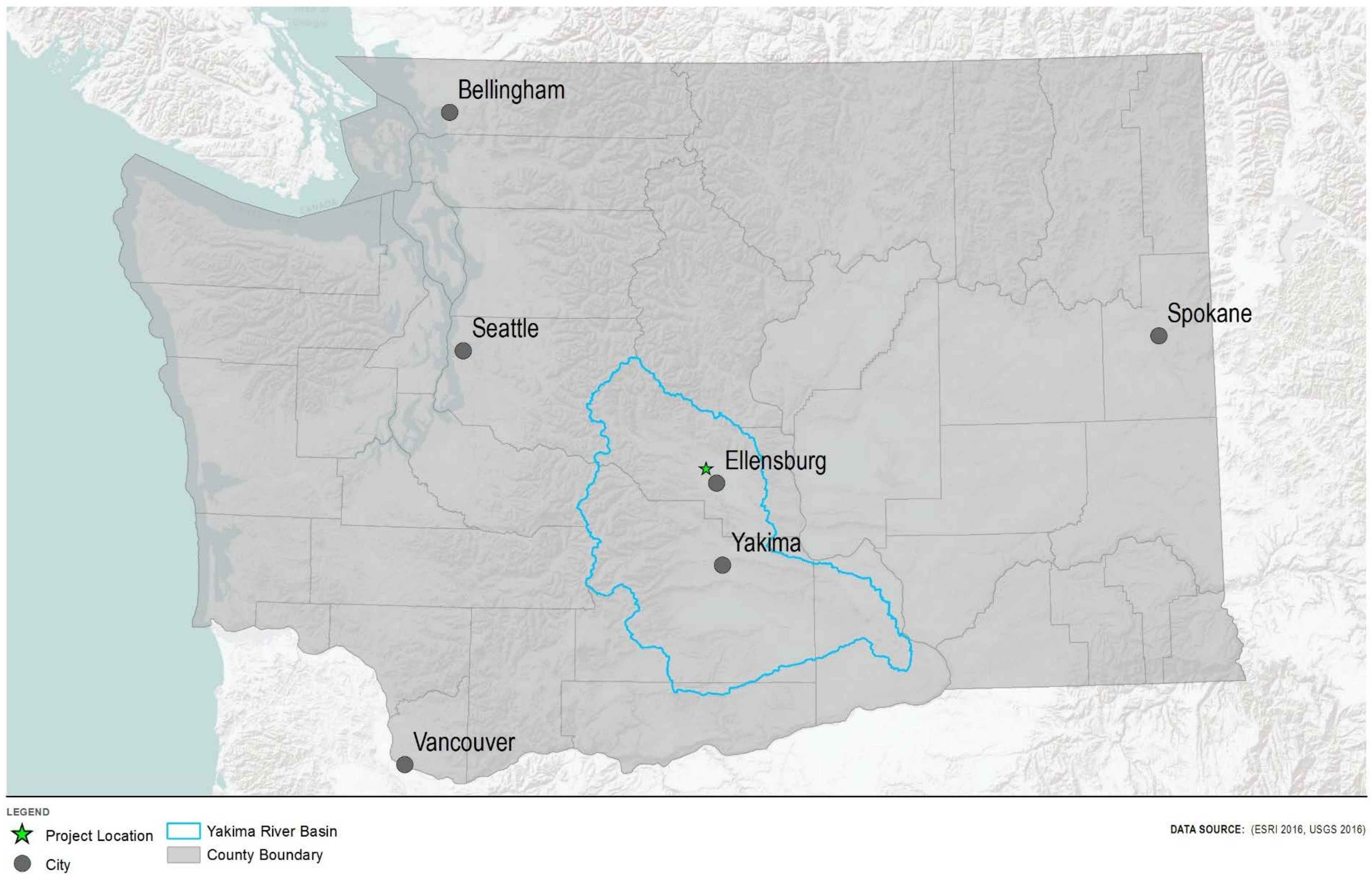
The hatchery would be named after Melvin R. Sampson. Mr. Sampson served as a Yakama tribal councilman for 18 years and was chairman of the Yakama Nation for 4 years. For the past 23 years, he has served as policy advisor and project coordinator for the Yakima-Klickitat Fisheries Project (YKFP).

The goal of the MRS Hatchery would be to produce and release up to 700,000 coho smolts for harvest and for restoration of natural coho spawning in the Yakima Basin. The hatchery would move existing coho production into the same basin in which they are released. The site of the proposed hatchery borders the Yakima River and is adjacent to Interstate 90 (I-90).

BPA is considering funding the construction of the hatchery through its responsibilities under the Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act, 16 U.S. Code (USC) Sec. 839 et seq.) and the 2008 Memorandum of Agreement among the Umatilla, Warm Springs, and Yakama Tribes, BPA, U.S. Army Corps of Engineers (Corps), and U.S. Bureau of Reclamation (Reclamation) (2008 Fish Accords). Under this agreement, BPA agreed to make funds available to construct the proposed hatchery subject to Northwest Power and Conservation Council (Council) review and meeting all legal compliance conditions. The proposed hatchery would be one element of a continuing effort by BPA, the Yakama Nation, and cooperators to protect and manage anadromous fish populations and mitigate for effects of the Federal Columbia River Power System in these waters.

BPA has prepared this Environmental Impact Statement (EIS), pursuant to regulations implementing the National Environmental Policy Act (NEPA), to assess the potential effects of the Proposed Action on the environment.

This chapter further describes BPA’s need to take action and the purposes that BPA seeks to achieve in addressing this need. The chapter also provides project background information, identifies the entities involved in the development of this EIS, and summarizes the public scoping process and comments received.



DATA SOURCE: (ESRI 2016, USGS 2016)

Bonneville Power Administration

PROJECT LOCATION

FIGURE 1.1-1

1.2 Need for Action

BPA needs to respond to the Yakama Nation's request to fund the construction and operation of a coho salmon hatchery in the Yakima Basin; a proposal that has been reviewed and recommended to BPA for funding by the Northwest Power and Conservation Council (Council).

Coho salmon were extirpated from the Yakima Basin by the early 1980s and the Yakama Nation has been working to reintroduce coho into the basin since the mid-1980s. Under the reintroduction efforts, most of the juvenile coho released into the Yakima Basin have been produced or reared in hatcheries that are not in the Klickitat Basin (out-of-basin). Releasing fish that are reared out-of-basin is not consistent with Washington State fish health protocols and standards (WDFW 2010) because transferring these fish from one basin into another may increase the spread of disease between watersheds. In addition, fish reared out-of-basin may return to those basins in which they were reared, thereby reducing the numbers of adults returning to the Yakima Basin.

The Yakama Nation is proposing the MRS Hatchery within the Klickitat Basin in order to produce the coho salmon in the same basin in which they would be released (in-basin), with the eventual phasing out of all out-of-basin production. The production of in-basin coho at the hatchery would help to restore natural spawning and increase harvest opportunities in the Yakima Basin. Restoring natural spawning would also help transition the Yakama Nation's coho program from using only hatchery-raised fish for broodstock (a "segregated" program) to a program that primarily incorporates natural-origin fish in the broodstock (an "integrated" program).

The coho hatchery analyzed in this EIS was identified in the Yakama Nation's YKFP, which has the goal of enhancing existing stocks of anadromous fish in the Yakima and Klickitat River basins while maintaining genetic resources, reintroducing stocks formerly present in the basins, applying knowledge gained about hatchery supplementation throughout the Columbia River basin, and providing harvest opportunities.

The proposed hatchery would be located on property called the Holmes Ranch where Yakama Nation biologists observed naturally spawning coho rearing in the early 2000s. Recognizing the high quality off-channel and overwinter habitat for all types of salmonids, including coho, the Yakama Nation purchased the property in October 2005.

1.3 Purposes

In meeting the need for action, BPA seeks to achieve the following purposes:

- Support efforts to mitigate for effects of the development and operation of the Federal Columbia River Power System on fish and wildlife in the mainstem Columbia River and its tributaries under the Northwest Power Act.
- Assist in carrying out commitments related to proposed hatchery actions that are contained in the 2008 Columbia Basin Fish Accords Memorandum of Agreement with the Yakama Nation and others (2008 Fish Accords).

- Implement BPA's *Fish and Wildlife Implementation Plan EIS and Record of Decision* policy direction, which calls for protecting weak stocks, while sustaining overall populations of fish for their economic and cultural value.
- Minimize harm to natural and human resources, including species listed under the Endangered Species Act (ESA).

1.4 Background

BPA is a federal power marketing agency within the U.S. Department of Energy. BPA's operations are governed by several statutes, including the Northwest Power Act. Under the Act, BPA must protect, mitigate, and enhance fish and wildlife affected by the development and operation of federal hydroelectric facilities on the Columbia River and its tributaries. BPA must fulfill this duty in a manner consistent with the Columbia River Basin Fish and Wildlife Program developed by the Council. The Council in turn gives deference to project proposals developed by state and tribal fishery managers. The Council review process for project proposals is discussed further in Section 1.4.1.

In addition to its responsibilities under the Northwest Power Act, on May 2, 2008, BPA signed the 2008 Fish Accords. The 2008 Fish Accords agreement includes funding for the Yakama Nation's MRS Hatchery. BPA conditioned its funding commitment on securing a favorable recommendation from the Council and on compliance with all its other mandates, including NEPA.

In the Treaty of 1855 (12 Stat. 951) between the Yakama Nation and the United States, the Yakama Nation reserved the right to fish at all usual and accustomed places. These reserved rights were confirmed by a federal district court in *U.S. v. Oregon* in 1969. Today, the Yakama Nation and other Columbia River treaty tribes are recognized as fisheries managers, together with state and federal fisheries agencies. The Yakama Nation's fishing rights and fisheries management authorities are detailed in Section 1.4.2.

Historically, Yakama Nation members fished for Chinook, coho, steelhead, and other species in the Yakima River and throughout the Columbia River Basin. Because of high harvest rates and degraded habitat, the native Yakima River coho population was extirpated. The Yakama Nation is working toward a program that will increase harvest toward historic levels and restore natural production of historic salmon populations in the Yakima Basin. Because this will require decades of work before basin habitat is able to produce coho at sufficient levels to meet harvest and natural production goals as outlined in the 2012 *Yakima Basin Summer- and Fall-Run Chinook and Coho Salmon Hatchery Master Plan* (Master Plan, Yakama Nation 2012a) and subsequent ESA consultation, artificial production is needed in the short term to produce coho for recolonizing stream habitat and to meet harvest needs.

1.4.1 Northwest Power Act/Council's Fish and Wildlife Program

The Northwest Power Act directs BPA to protect, mitigate, and enhance fish and wildlife affected by the development and operation of federal hydroelectric facilities on the Columbia River and its tributaries. To assist in accomplishing this, the Council makes recommendations to BPA concerning which fish and wildlife projects to fund. The Council gives deference to project proposals developed by state and Tribal fishery managers.

The Yakama Nation's proposal is one of the projects recommended to BPA by the Council (Fritsch 2013).

As part of its Fish and Wildlife Program, the Council has a three-step process for review of artificial propagation projects (i.e., hatcheries) proposed for BPA funding (Council 2006). Step 1 is conceptual planning, represented primarily by master plan development and approval. The master plan provides the scientific rationale for the activities proposed as part of a fish production program, and presents initial designs for proposed new facilities. Step 2 provides preliminary designs and cost estimates and environmental review. Step 3 is the final design review. The Council's Independent Scientific Review Panel (ISRP) reviews the proposed projects as they move from one stage of the process to the next.

The Council and the ISRP reviewed the Yakima Nation's 2012 Master Plan, providing feedback and recommendations to the Yakama Nation on scientific goals and methods related to the coho program. On October 1, 2013, the Council and the ISRP determined the proposed Master Plan, as related to activities for the Holmes Ranch component of the coho program (i.e., Proposed Action), sufficiently met scientific review criteria to recommend that BPA and the Yakama Nation move to Step 2 of the Council's process.

In addition to meeting NEPA obligations for BPA, this EIS addresses the environmental review requirements of Step 2. The Master Plan is incorporated by reference in this EIS (Yakama Nation 2012a).[1] It includes biological data, ecological rationale, and environmental and engineering research to support much of the analysis in the EIS.

1.4.2 Tribal Treaty Fishing and Management Rights under U.S. v. Oregon

In the Treaty of 1855 with the United States, the Yakama Nation reserved "the exclusive right of taking fish in the streams, where running through or bordering said reservation" and "at all other usual and accustomed places, in common with the citizens of the Territory." (12 Stat. 951). The treaty recognized the central role salmon played in the life of tribal members.

Beginning in the early 1900s, federal court cases, culminating in the *U.S. v. Oregon* proceeding, clarified the Yakama Nation and other Columbia River treaty tribes' fishing rights. Today, the Columbia River treaty tribes are recognized as fisheries managers together with state and federal fisheries agencies. The tribes have a treaty right to harvest up to half the harvestable surplus of fish.

The Yakama Nation exercises its fisheries management authority in many ways, including as a party to *U.S. v. Oregon*. Through the ongoing *U.S. v. Oregon* process, the parties to the case develop and update the Columbia River harvest and production

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[1] Available at https://www.bpa.gov/efw/Analysis/NEPADocuments/nepa/MelvinSampsonHatchery/REFERENCE-1%20Yakima%20Subbasin%20Summer-%20and%20Fall-Run%20Chinook%20and%20Coho%20Salmon%20Hatchery%20Master%20Plan%20-%20May%202012.pdf

management plans. The current plan, the 2008-2017 *U.S. v. Oregon* Management Agreement, is an order of the Federal District Court for the District of Oregon. It identifies a short-term production goal of 1.0 million coho to be released in the Yakima Basin. BPA is not a party to *U.S. v. Oregon*. BPA is not privy to the parties' deliberations and does not influence the decisions the parties make.

1.4.3 Yakima Basin Summer- and Fall-Run Chinook and Coho Salmon Hatchery Master Plan

In early 1996, the Yakama Nation's coho supplementation project in the Yakima Basin was one of the high priority supplementation projects approved by the Council. The project was expected to progress through four experimental design phases: 1) select and introduce donor stock, 2) test and initiate recolonization of natural habitat, 3) continue colonization and transition to local broodstock, and 4) implement a local adaptation phase. Phases 1 and 2 have been accomplished. In 2007, BPA developed a Supplement Analysis for Phase 2 (SA-13-EIS-0169-YKFP Coho SA), tiering off the 1996 Yakima Fisheries Project Final EIS. The actions needed for implementation of Phases 3 and 4 are described in the Yakama Nation's Master Plan (Yakama Nation 2012a).

The Master Plan identifies new programs to be a part of the ongoing YKFP: two Chinook hatchery programs and two coho hatchery programs. The overall purpose of these programs is to increase harvest levels, natural spawning abundance, and spatial/temporal distribution of Chinook and coho in the Yakima Basin without substantially increasing production.

The two coho programs of the YKFP are: 1) a segregated harvest program in the lower Yakima River that will not include natural-origin coho as broodstock, referred to as the Lower Yakima Segregated Coho Program, and 2) an upper Yakima River reintroduction program, referred to as the Upper Yakima Integrated Coho Program, where natural-origin broodstock are used and returning hatchery-origin adults are allowed to spawn in the wild. The purpose of the Lower Yakima Segregated Coho Program is to provide harvest to meet federal and state commitments regarding reserved fishing rights made in the *U.S. v. Oregon* case. The purpose of the Upper Yakima Integrated Coho Program is to contribute to the harvest, but also to reestablish natural spawning coho in tributaries where they historically spawned.

The Yakama Nation submitted the Master Plan to the Council in May 2012 to initiate Step 1 of the Council's review process (as described in Section 1.4.1). The ISRP reviewed the Master Plan in September 2012, requesting additional information and clarification from the Yakama Nation (Yakama Nation 2012a). Based on the information received, the ISRP approved the conceptual program to proceed to Step 2 of the Council review process in July 2013 (Yakama Nation 2013).

This EIS considers the actions proposed in the Master Plan as part of Phase 3 of the Upper Yakima Integrated Coho Program. These actions include the construction and operation of a coho hatchery, referred to as the MRS Hatchery; the release of juvenile coho reared at the MRS Hatchery into the upper Yakima Basin; the monitoring, research, and evaluation (MR&E) activities associated with the releases; and the transition to using natural-origin fish in the broodstock (an "integrated" program) as natural-origin broodstock become available. The integrated coho program would increase the distribution of coho salmon into the tributaries by outplanting parr, releasing smolts that have been acclimated in temporary acclimation ponds, and outplanting adults. Every 6 years, a series of tributaries would be selected for reintroduction. After 6 years, the tributaries would be monitored for natural production. The integrated program would rear and release up to 500,000 parr (at 100 fish per pound) and up to 200,000 smolts (at 20 fish per pound) in the upper Yakima and Naches Rivers. The program would allow for all hatchery coho rearing to occur in-basin, and would transition to locally-adapted broodstock at ever-increasing rates as natural-origin broodstock become available (NMFS 2013).

The Master Plan is incorporated by reference in this EIS. It includes biological data, ecological rationale, and environmental and engineering research used to support much of the analysis in the EIS.

1.4.4 Hatchery Scientific Review Group

The Hatchery Scientific Review Group (HSRG), a 14-member independent scientific review panel, was charged by Congress with reviewing all state, tribal, and federal hatchery programs in the Columbia River Basin as part of a comprehensive hatchery reform effort to:

- Conserve indigenous salmonid genetic resources.
- Assist with the recovery of naturally spawning salmonid populations.
- Provide sustainable fisheries.
- Improve the quality of hatchery programs.

In February 2009, the HSRG published its final system-wide report. The report recommends that hatchery programs rely on comprehensive monitoring and evaluation to determine how management changes can address factors influencing fisheries. The principles underlying hatchery reform for an integrated conservation approach direct the operation and management of hatchery facilities to achieve proper genetic integration with natural-origin fish. Reform principles also state that efforts should be made to minimize the potential for adverse interactions between hatchery and natural-origin fish, while maximizing survival of hatchery fish. Finally, reform principles promote the local adaptation of natural and hatchery populations. Consistent with the principles of hatchery reform, hatchery programs should include adaptive management to evaluate whether and to what degree they result in a sustainable fishery, and, if needed, address subsequent actions to fully meet conservation and population goals. The alternatives in this EIS are evaluated on how well they would support these recommendations.

HSRG recommendations for Yakima River basin coho include developing local broodstock within the basin for both conservation and harvest programs, and developing in-basin facilities for incubation and rearing. The facility improvements and program modifications included in the MRS Hatchery program would meet both of these recommendations. The proposed program also would follow the HSRG’s recommended coho marking strategy: conservation fish would be marked with a coded wire tag but not adipose fin-clipped to relieve fishing pressure on the population and to distinguish it from the natural population. Fish from the segregated program would be 100 percent adipose clipped, with a portion receiving a coded wire tag to maximize harvest so that broodstock separation could be achieved and straying into the natural population could be evaluated.

1.5 Cooperating Agency

1.5.1 Washington Department of Ecology

The Washington Department of Ecology (Ecology) is a cooperating agency on this EIS. For BPA to proceed with funding the project, the Yakama Nation must acquire sufficient ground and surface water rights to support operation of the MRS Hatchery. Ecology is responsible for granting these water rights. To grant the water rights, Ecology must comply with the Washington State Environmental Policy Act (SEPA). This EIS will help facilitate Ecology's SEPA process.

1.6 Public Scoping and Key Issues

Public scoping for the MRS Hatchery EIS was initiated with the publication of the Notice of Intent in the Federal Register (80 FR 70770) on November 16, 2015. Concurrent with the publication of the Notice of Intent, BPA mailed a letter and map describing the Proposed Action to neighboring landowners, affected tribes, local, state, and federal government officials, and known interested parties. The public letter was posted on a project website established by BPA to provide information about the project and the EIS process: https://www.bpa.gov/goto/MelvinSampsonHatchery.

BPA held a public scoping meeting in Ellensburg, Washington, on December 9, 2015. The purpose of this meeting was to describe the project and to solicit comments. A total of 19 members of the public attended the meeting.

BPA received ten comments, electronically or by mail, from nine individual commenters. The public comment period began on November 16, 2015, and BPA accepted comments until January 4, 2016.

During the scoping period, BPA received written comments from the following individuals/organizations:

Name	Organization
Bangs	Individual
Franks	U.S. Fish and Wildlife Service
Gonseth	Washington State Department of Transportation
Kelly	Individual
Lyyski	City of Ellensburg
Nelson	Washington Department of Fish and Wildlife
Pace (two separate comments)	Individual
Smith	Individual
Somers	U.S. Environmental Protection Agency

Issues raised during the scoping process were divided into categories, as shown below. Responses to the scoping questions or cross references to where responses can be found are shown in *italics* in the following sections.

1.6.1 Water Resources

BPA received numerous comments on the usage of water associated with the MRS Hatchery. Specifically, commenters requested information on how the water to be used for the MRS Hatchery would affect existing public and private wells in the area, ground and surface water rights, or wetlands and floodplain processes. Additional comments requested information on Ecology's role in granting sufficient water rights necessary for hatchery operation. *In general, Section 3.5 includes information responding to these comments*.

1.6.2 Artificial Production

Certain commenters questioned the need for new hatcheries in general as an appropriate method for BPA to support the recovery of endangered fish species and to mitigate for the Federal Columbia River Power System. Commenters also raised concerns about the relationship between hatchery and existing fish in the proposed release locations. Many commenters requested that BPA fully consider the physical, ecological, and economic impacts of the construction and operation of the MRS Hatchery. *In general, Section 3.7 includes information responding to these comments.*

1.6.3 Hatchery Construction

Some commenters requested information on impacts associated with the construction of the MRS Hatchery itself, including incorporating measures to reduce the environmental and ecological impacts of the MRS Hatchery infrastructure. *In general, Section 2.2.4 includes information responding to these comments. Impacts of construction on each specific resource are addressed in the applicable sections of Chapter 3*.

1.6.4 Hatchery Operation

Certain comments requested information on hatchery operations, specifically relating to how hatchery effectiveness would be monitored. *In general, Section 2.2.6 describes the monitoring and evaluation framework for the MRS Hatchery.*

1.6.5 Acclimation and Releases

Many commenters asked for more information and analysis on the acclimation and release sites for the juvenile hatchery fish, including broodstock collection locations, and how to determine the most appropriate tributaries for release. *See Section 2.2.5.2 for descriptions of acclimation; Section 2.2.5.1 for descriptions of broodstock collection; and Section 3.7.2 for analysis of the environmental consequences associated with broodstock collection, acclimation, and release*.

1.6.6 Other Impacts

Other comments included requests to include a cumulative impacts analysis (*see the cumulative impacts analysis for each potentially affected resource within Chapter 3),* impacts on historic or traditional cultural places and treaty rights (*see Section 3.9*), means of access for proposed work activities (*see Section 3.2.2),* impacts on surrounding property values (*see Section 3.10.2)*, impacts of climate change (*see*

Section 3.11.2), and impacts of hazardous waste accidents or clean-ups (*see Section 3.13.2)*.

1.7 Issues beyond the Scope of this EIS

Most of the issues raised during the scoping process are considered to be within the scope of the Proposed Action and are addressed in this EIS. However, some issues are considered to be either beyond the scope of this EIS or are outside the scope of the Proposed Action. The following describes those issues.

- Types, locations, times of year, methods, enforcement, and outreach associated with harvest.
- The effectiveness of individual hatchery programs.
- The survival of naturally occurring coho populations across their life cycle.
- How fish pass through Roza Dam.
- Funding in the MRS Hatchery proposal for additional outreach and enforcement to help educate and inform potential anglers of the coho salmon on how to reduce or minimize impacts on the resident fish.
- Suction dredge mining in streams where coho would be released.

Issues associated with fish restoration, harvest levels, hatchery programs in general, or the relative importance/priorities of other ongoing fish protection programs or projects are more appropriately addressed in other forums. Examples of such forums include the Council's project proposal solicitation process; the processes by which Washington Department of Fish and Wildlife (WDFW) and National Marine Fisheries Service (NMFS) set harvest limits; or the process by which a government agency proposes to adopt a policy relating to these broader, general programs.

1.8 Draft EIS Public Outreach

On March 10, 2017, BPA sent a letter to notify interested parties (federal agencies and officials, Tribes, state agencies and officials, local governments and utilities, nongovernmental organizations, and libraries) and the public that the draft EIS was available for review and comment. A Notice of Availability for the draft EIS was published in the Federal Register on March 17, 2017 (Volume 82, Number 51). The Notice of Availability initiated a 45-day public comment period extending to May 1, 2017. BPA invited the public to review the EIS on the project website at www.bpa.gov/goto/MelvinSampsonHatchery and requested comments by mail to BPA, Public Affairs – DKE-7, P.O. Box 14428, Portland, Oregon 97293-4428; by phone at 800-622-4519; online at www.bpa.gov/comment; and by fax at 503-230-4019. Comments could also be made at an open-house public meeting, which was held April 12, 2017, from 5:00 p.m. to 8:00 p.m. at the Hal Holmes Community Center in Ellensburg, Washington.

After the formal public comment period on the draft EIS, this final EIS was prepared to include responses to comments on the draft EIS, corrections and clarifications to the analysis presented in the draft EIS, and updated information, if relevant and available. Appendix H provides all comments submitted and BPA's responses to them.

2 Proposed Action and Alternatives

This chapter describes the existing coho program, the Proposed Action, the No Action alternative, and alternatives considered but eliminated from detailed study. It also compares the alternatives by project purpose and potential environmental consequences.

2.1 Existing Coho Program

The Yakama Nation is currently implementing Phase 2 of the coho restoration program described in the Master Plan, using a combination of artificial production and habitat improvements to meet natural production and harvest goals. The goals of Phase 2 are to increase coho spawning in tributaries, phase out imported releases of coho in the Yakima Basin, and test and monitor new acclimation techniques.

Currently, a portion of the juvenile coho released into the Yakima River as part of the overall YKFP coho reintroduction program have been reared out-of-basin at the Eagle Creek National Fish Hatchery, located outside of Estacada, Oregon. On a small scale, smolts and parr are released into several tributaries. Smolts are acclimated before release using existing or mobile acclimation units.

The current program includes reintroducing juveniles and adults into select tributaries to monitor and assess current rearing and spawning conditions. Phase 2 also includes monitoring and assessing the feasibility of small-scale mobile acclimation units that seeded individual tributaries with coho, creating self-sustaining populations.

2.2 Proposed Action

Under the Proposed Action, BPA would fund the Yakama Nation for the construction and operation of the MRS Hatchery as described in the integrated coho program in the Master Plan[2]. The Proposed Action would involve:

- Construction and operation of a new coho hatchery facility, known as the MRS Hatchery, at the former Holmes Ranch property.
- In-basin rearing of coho juveniles at the MRS Hatchery with a goal to phase out all out-of-basin production.
- Release and adaptive management (adjustment of release proportions to meet objectives for survival or adult return) of juvenile and adult coho reared at the MRS Hatchery.
- Operation of proposed and future juvenile acclimation sites.
- Collection of adult coho broodstock and transitioning to an integrated program of using locally-adapted broodstock at ever-increasing rates as natural-origin broodstock become available (NMFS 2013).

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[2] The 2012 Master Plan also includes actions not being proposed at this time or evaluated in this EIS, including the segregated coho program and the Chinook programs

- Monitoring, research, and evaluation.

Hatchery operations would include spawning, incubation, and juvenile coho rearing using both surface and groundwater (see Section 2.2.3.2). Coho eggs would be incubated, then hatched and reared to parr or smolt stage at the MRS Hatchery, with the goal of providing up to 700,000 coho parr and smolts. This release number would be expected to eventually produce enough returning adults to provide for in-basin broodstock needs, to meet the goals for treaty and nontreaty harvest in the Yakima and Naches River basins, and to provide for natural spawning.

The MRS Hatchery would initially rear and release up to 500,000 parr (at 100 fish per pound) and up to 200,000 smolts (at 20 fish per pound) in the upper Yakima and Naches River watersheds using broodstock collected from existing facilities at Roza and Prosser Dams, or at other existing collection sites. Per existing ESA consultation with NMFS (NMFS consultation [NWR-2011-06509; NMFS 2016a]), up to 200,000 smolts could be released in addition to the 500,000 parr. The proposed rearing of parr and smolts at the MRS Hatchery would support the Yakama Nation's priority release strategy, which is based on 7 years of data collected during Phase 2 of the Yakama Nation's coho program (i.e., recolonization of natural habitat with donor stock), which showed higher adult returns from parr releases. However, this strategy could be converted to a full smolt release strategy (i.e., 700,000 smolts) if adult return objectives are not being met (NMFS 2016b). Because parr are released in the summer (mid to late July), if conditions within the basin (including circumstances such as climate change or drought) prove unsuitable for releasing parr, increased rearing and releases of smolts may better meet adult return objectives.

Recent HSRG reviews of hatchery programs in Washington State include general recommendations for programs to shift toward using localized broodstock to improve survival (HSRG 2014). The Proposed Action would implement HSRG recommendations and shift to locally-adapted coho broodstock and in-basin rearing; the use of out-of-basin broodstock would be phased out (Yakama Nation 2012a). The use of a localized broodstock is required to meet the goal of providing a self-sustaining coho run throughout the species' historic range in the Yakima Basin. This goal requires the use of a localized broodstock, which would eventually become a natural-origin-only broodstock program. This means that all first generation hatchery fish would be left to spawn in the wild and their off-spring would be considered wild, one generation removed from domestication.

The Yakama Nation observed that out-of-basin returning coho from the Little White Salmon Hatchery stock did not complete their journey to spawning tributaries and therefore did not complete spawning or the construction of redds. Their lack of spawning was attributed to reduced endurance and an inability to sustain their journey from the ocean to natal spawning streams. In addition to reduced fitness, a salmons' imprinting to a watershed begins at the egg stage and becomes stronger as fish mature to the smolt stage. Using localized wild broodstock and rearing juveniles in the Yakima Basin is anticipated to reduce straying rates and improve successful return and spawn, which would boost the overall ecosystem of the basin through increased introduction of marine-derived nutrients (Temple and Pearsons 2012; NMFS 2013; Yakama Nation 2014). Further, hatchery releases from the local brood source (Yakima River returns) have resulted in higher smolt-to-adult survival than releases from out-of-basin (non-Yakima

River origin) hatchery broodstock. The higher return rate for the local broodstock supports the goal to convert the program to a locally adapted broodstock and to conduct all fish culture activities in-basin (Yakama Nation 2012a). The HSRG recommendation of collecting local broodstock (HSRG 2009) is an action that would increase fish survival and, therefore, the likelihood of meeting harvest and conservation goals.

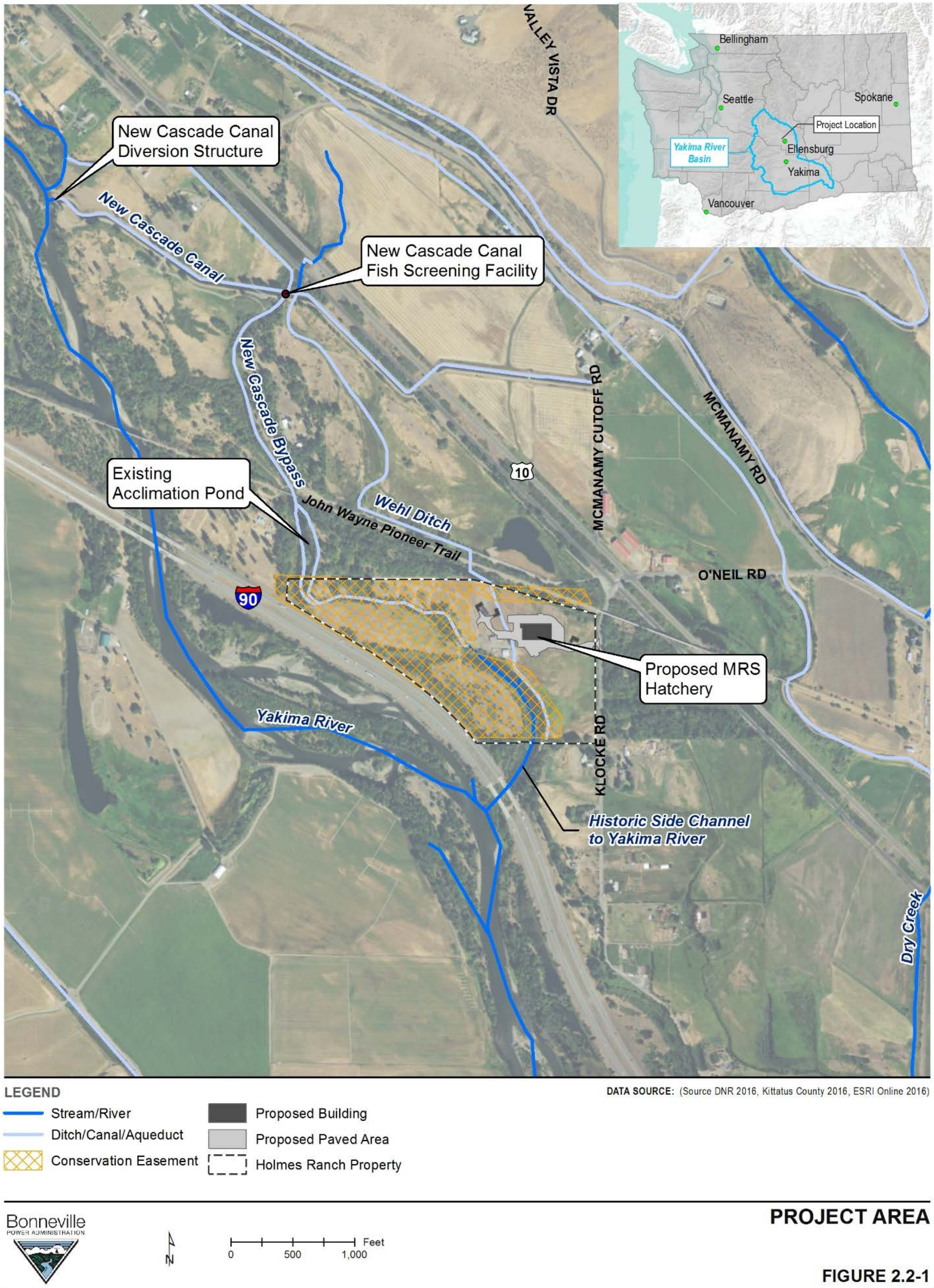
In addition to broodstock management, other HSRG principles would be incorporated into operation of the MRS Hatchery as described in the Master Plan (Yakama Nation 2012a). The facility intake structure would comply with current NMFS fish passage and screening requirements for juvenile salmonids (NMFS 2011). The MRS Hatchery would not create fish passage barriers; would comply with state water quality standards; and, if applicable, would abide by water quality monitoring conditions that are established in the National Pollutant Discharge Elimination System (NPDES) Upland Fin-Fish Hatching and Rearing General Permit to be obtained for the project.

Although the Proposed Action is focused on in-basin coho production and evaluation, in the long term it is expected that ongoing habitat actions (under separate projects) would increase natural fish population productivity, abundance, and diversity to the point where it is self-sustaining.

2.2.1 Project Area

The MRS Hatchery would be located on the Yakama Nation’s Holmes Ranch property, totaling approximately 50 acres. It is situated about 5 miles northwest of Ellensburg, Washington. The property is bordered by I-90 to the south, Klocke Road to the east, John Wayne Pioneer Trail (a National Recreation Trail) to the north, and private property to the west (Figure 2.2-1). The property is near the Yakima River. A canal, called the New Cascade Canal, diverts water from the Yakima River about 1 mile northwest (and upstream) of the property. Some of that water is used for irrigation, while some flows into the New Cascade Bypass channel that runs through the property, then drains into a historic side channel of the Yakima River, and then drains into the Yakima River (see Figure 2.2-1). Bypass water from the canal, in addition to groundwater, supports a series of large, deep ponds that are currently used to acclimate coho from mid-March to May.

Most of the property is subject to a conservation easement that protects its habitat value. The MRS Hatchery and related facilities would be constructed on an 8-acre portion of the Holmes Ranch property reserved for hatchery development.



DATA SOURCE: (Source DNR 2016, Kittatus County 2016, ESRI Online 2016)

PROJECT AREA

FIGURE 2.2-1

2.2.2 Hatchery Facilities

The MRS Hatchery would include the following components:

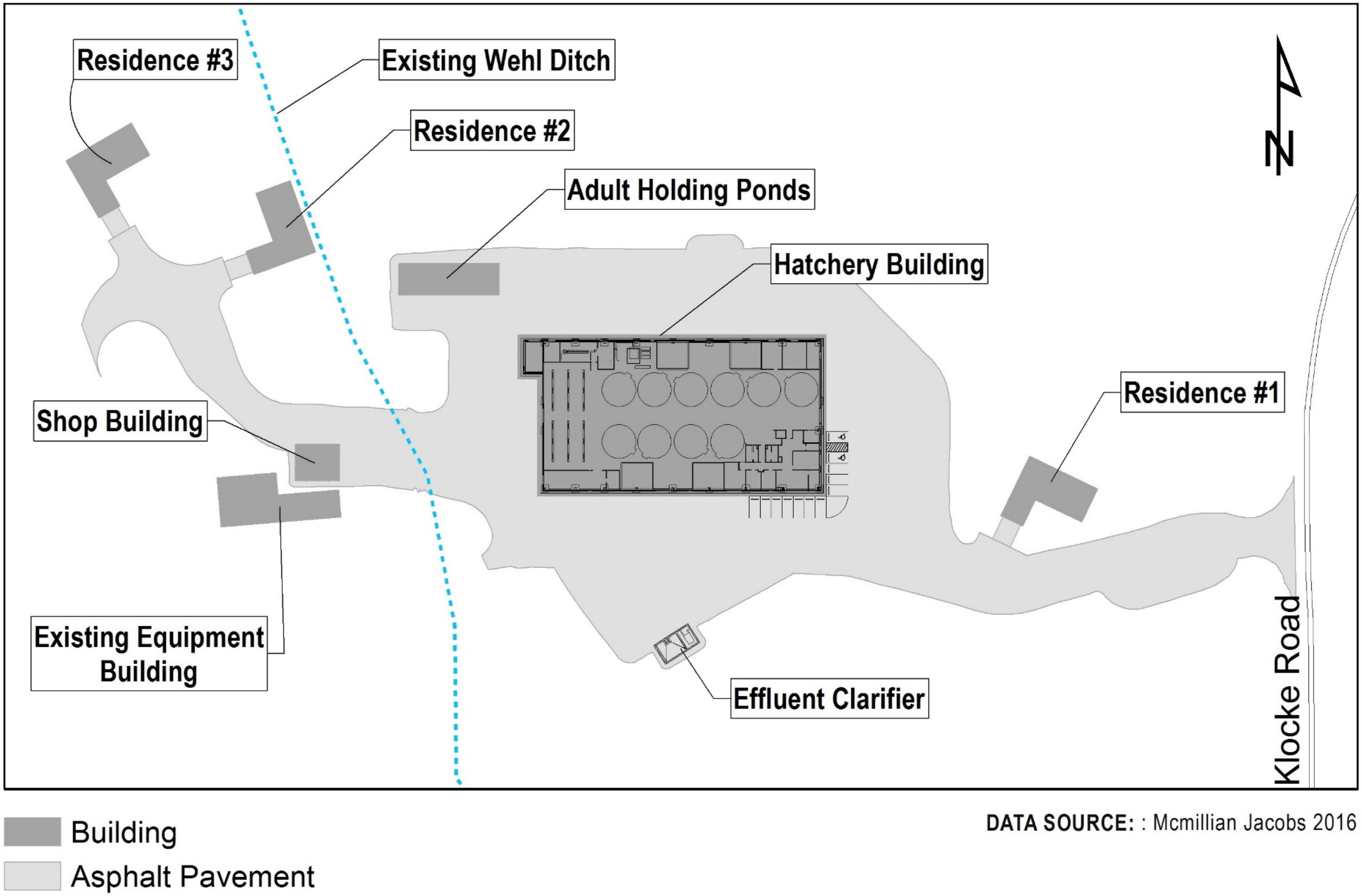
- Hatchery building (including areas for egg incubation, early rearing, water treatment and reuse equipment, administration area, and parking lot)
- Adult holding and spawning ponds
- Shop building
- Three employee houses
- Intake screens and a surface water pump station to provide Yakima River water via the existing New Cascade Canal diversion to the MRS Hatchery
- Stoplog supports to allow surface water to be diverted
- One existing groundwater well and, based on preliminary design, eight new wells for hatchery supply
- Centralized degassing headbox for groundwater treatment and supply
- Site utilities, including pipes for water intake and discharge (outfall)
- Waste treatment pond
- Acclimation ponds and tanks
- Access roads

These components are described in more detail in the sections below; building features are shown in Figure 2.2-2.

2.2.2.1 Hatchery Building

The MRS Hatchery building would be a pre-engineered metal building measuring approximately 228 feet (ft) by 124 ft, located roughly in the center of the 8-acre developable portion of the project site. The building would have a central drive-through beneath the roof ridgeline that would provide vehicular access to all the grow-out tanks. The drive-through would be accessible from either the west- or east-end of the building, through one of two 12-foot-wide by 14-foot-high roller doors.

The overall layout of the building would include distinct areas for egg preparation, incubation, early rearing, grow-out, and administration as well as miscellaneous areas for storage and other purposes.



DATA SOURCE: : Mcmillian Jacobs 2016

Bonneville
POWER ADMINISTRATION

SIMPLIFIED SITE PLAN

FIGURE 2.2-2

2.2.2.1.1 Administration

The administration area would be located in the southeast corner of the MRS Hatchery building and would total approximately 2,880 square feet. Dedicated parking spaces for 11 vehicles, including 2 handicapped spaces, and 2 bus or RV spaces, would be available directly outside the entrances to the administration area. The administration area within the MRS Hatchery building would include dedicated spaces for reception, office spaces, restrooms with showers, a conference/break room, vestibule/mud room, mechanical and electrical control room, large viewing room for visitors and staff, laboratory area, storage area, and closet.

2.2.2.2 Adult Holding and Spawning Ponds

Two adult holding ponds, measuring 8 feet wide by 64 feet long, would be located off the northwest corner of the MRS Hatchery building. The holding ponds would be covered by a shed roof. The two ponds would be adjacent and parallel with each other, separated by a recessed walkway that would allow hatchery operators to manually move crowders, an instrument that would be used to move fish to smaller areas of the holding ponds. The South Pond would be equipped with a pump and piping to accommodate reuse of the water during months when groundwater is in short supply. The piping would route the holding pond discharge to a gas control tower located on a large slab area to the east of the pond entrances. The gas control tower would provide gas stabilization of surface water and reuse water before returning the flow to the ponds through the up-well area. At times when water is plentiful, water from the adult holding ponds would be discharged at a rate of up to 0.5 cubic feet per second (cfs) to the North Pond, up gradient of the MRS Hatchery facilities.

In addition to the gas control tower, the concrete slab located to the east of the holding pond entrances would include an area for spawning and monitoring adult fish. The slab area would also include a recessed spawning area immediately adjacent to the adult holding pond entrances. This area would be dedicated to collecting and harvesting adults and discharging biological waste through a floor drain to a nearby holding tank. Access to the adults in the ponds from the recessed spawning area would be facilitated by removable stoplogs (hydraulic control elements that would adjust the water level in the holding ponds) located in the east walls of the holding ponds.

2.2.2.3 Shop Building

A shop building would be constructed for vehicle maintenance, storage of equipment, and other uses required for facility operations and maintenance. The new shop would measure 30 feet wide by 36 feet long (1,080 square feet). The shop would be located on the west side of the existing irrigation ditch, just north of the existing equipment building, garage, and shop. Vehicular access to the shop would be via a new access road from the east.

2.2.2.4 Residences

Three new residences would be constructed at the MRS Hatchery. One residence would be located near the site entrance off Klocke Road, while the other two would be located west of the existing irrigation ditch. Each residence would include approximately

2,000 square feet of living space, in addition to an attached two-car garage with approximately 480 square feet of space. Each unit would have three bedrooms, two bathrooms, and sanitary sewer and potable water service. The residences would be heated with electric furnaces. An irrigation system would also be provided.

The residences would be accessible via the new access road off Klocke Road and would include a concrete pad in front of the garage, measuring approximately 15 feet by 18 feet.

2.2.2.5 Access Roads

Access to the MRS Hatchery would be from Klocke Road, which borders the project site on the east. A new paved road would provide access to, and circulation around, the MRS Hatchery building. The new road, measuring approximately 250 feet long, would also provide access to the east side residence and the adult holding ponds. Access to the west side residences, the effluent clarifier, and the new shop building would be via gravel road connected to the paved road.

2.2.2.6 Site Utilities

Site utilities would include a water supply for fire suppression, sanitary sewer and potable water service for the MRS Hatchery building and residences; electrical service; and an irrigation system.

Electrical upgrades would include a new 3-phase overhead power service, which would be extended to the site from approximately 0.5 mile away.

A screened fire suppression water intake would be installed near the outfall structure in the side channel. The pipe would be routed to a pumper connection near the effluent clarifier. In the event of fire, pumped water would flow to two hydrants located on either side of the hatchery building.

The location of the proposed septic drain field is not known at this time, and would be contingent on the final layout of the groundwater wells and on the results of the geotechnical investigation. Groundwater would be used to supply potable water to the residences and the MRS Hatchery facility. The existing potable well on site would be used; however, if test pumps determine that capacity is inadequate for the increased use, additional potable wells and sanitary systems would be necessary. Such wells would be sited after the locations of process water wells are determined, contingent on the final location of the groundwater wells, and on the water quality tests and other results from the geotechnical investigation. The potable water system would be sized to provide enough water for peak demands in the morning and evenings in the residences, along with demands occurring at the MRS Hatchery building.

The residences would each have a septic tank, which would drain by gravity to the drain field.

2.2.2.7 Storm Drainage

Storm drainage has been accommodated in the site design through the civil site layout, ensuring that the direction of sloping surfaces routes stormwater to designated infiltration areas. A formal piping system with catch basins would not be utilized; instead, stormwater would sheet flow across graded surfaces to a vegetated filter strip. The filter strip would consist of vegetated areas, both undisturbed and re-seeded, immediately adjacent to the impermeable surface. The vegetated filter strip would be wide enough to slow sheet flow, protect against erosion, and allow biological treatment prior to infiltration of stormwater within the surrounding pastureland.

2.2.2.8 Monitoring and Alarm System

A programmable logic controller-based monitoring and alarm system would be provided to assist hatchery staff with facility operations. Monitoring points would include water supply flows from each well and pump station, makeup (newly supplied) water flows to reuse modules, water levels in each tank, and dissolved oxygen levels and water temperatures in each reuse module. Adjustable setpoints for alarm notifications would be programmed into the system based on input from hatchery staff.

2.2.3 Water Rights, Supply, and Effluent

The MRS Hatchery would use a combination of surface water and groundwater, for which the Yakama Nation would obtain water rights. Treated effluent would be discharged back into the Yakima River. The following sections provide more detail about water rights, water supply, and effluent.

2.2.3.1 Water Rights

Under the proposal, a surface water right would be obtained for 10 cfs of water to be diverted from the New Cascade Canal fish screening facility into the New Cascade Bypass. There is an existing water right of 4.5 cfs for the project site. The existing water right, which is for irrigation (consumptive use), would be put into trust permanently[3] with the granting of the new water right. Up to 6 to 7 cfs of the 10 cfs would be pumped into the MRS Hatchery, with the remaining 3 to 4 cfs providing sweeping velocity and fish passage flow at the intake screen. No surface water would be used at the MRS Hatchery during the April 1 to October 31 irrigation season.

In addition, a groundwater right of 2.5 cfs would be obtained for the MRS Hatchery for continuous year-round use.

2.2.3.2 Water Supply

Surface water and groundwater would be used throughout the year at the MRS Hatchery for various purposes throughout the juvenile fish life cycle, as summarized in Table 2.2-1. The requirements for the total supply flow and the water supply source are described in Table 2.2-2.

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[3] Through the Washington State Trust Water Rights program, a trust holds the water right for future uses without relinquishing the right. Water held in trust stays in the river to benefit groundwater and instream flows, as well as other beneficial uses (see http://www.ecy.wa.gov/programs/wr/market/trust.html).

Table 2.2-1. Proposed Groundwater and Surface Water Use (cfs)

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Groundwater												
Proposed Groundwater Right	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Groundwater Withdrawal	1.93	1.93	1.80	1.80	1.80	1.80	2.06	1.66	0.16	0.16	0.16	1.12
MRS Hatchery Use	1.93	1.93	1.80	1.80	1.80	1.80	2.06	1.66	0.16	0.16	0.16	1.12
Groundwater Return from MRS Hatchery (Side Channel)	1.93	1.93	1.80	1.80	1.80	1.80	2.06	1.66	0.16	0.16	0.16	1.12
Surface Water												
Proposed Surface Water Right	0	0	0	0	0	0	0	10	10	10	10	10
Surface Water Diversion to New Cascade Bypass	0	0	0	0	0	0	0	10	10	10	10	10
Intake for MRS Hatchery Use and Outflow to Side Channel	0	0	0	0	0	0	0	4.53	6.04	4.79	3.01	3.01
Continued Flow from New Cascade Bypass to Side Channel (0.1 mi)	0	0	0	0	0	0	0	5.47	3.96	5.21	6.99	6.99
Side Channel Downstream of MRS Hatchery Outfall	0	0	0	0	0	0	0	10	10	10	10	10

Table 2.2-2. Hydraulic Systems Requirements

System	Flow/Unit	Units	Total Supply Flow	Water Supply
Incubation	4 gpm/stack	15 stacks + 3 spares	72 gpm	Groundwater
Early Rearing	48 gpm/tank	18 tanks	864 gpm	Groundwater
Grow-Out Tanks	135 gpm/pond	10 tanks	1350 gpm make up water	Groundwater/Surface Water
Effluent Treatment Facilities	1,500 gpm to micro strainer	1 cell	15 gpm to clarifier	Groundwater/Surface Water
Adult Holding Facilities	680 gpm	2 cells	1360 gpm max flow	Groundwater/Surface Water

gpm = gallons per minute

2.2.3.2.1 Groundwater Supply

The groundwater supply system would be developed and designed to provide continuous year-round flow of up to 2.5 cfs to the MRS Hatchery, consistent with the water right application for the MRS Hatchery. A portion of the groundwater supply system would be chilled for use in regulating process water temperature for adult holding, incubation, and grow-out tanks. Groundwater would also be used as potable water for the residences and administrative portion of the MRS Hatchery.

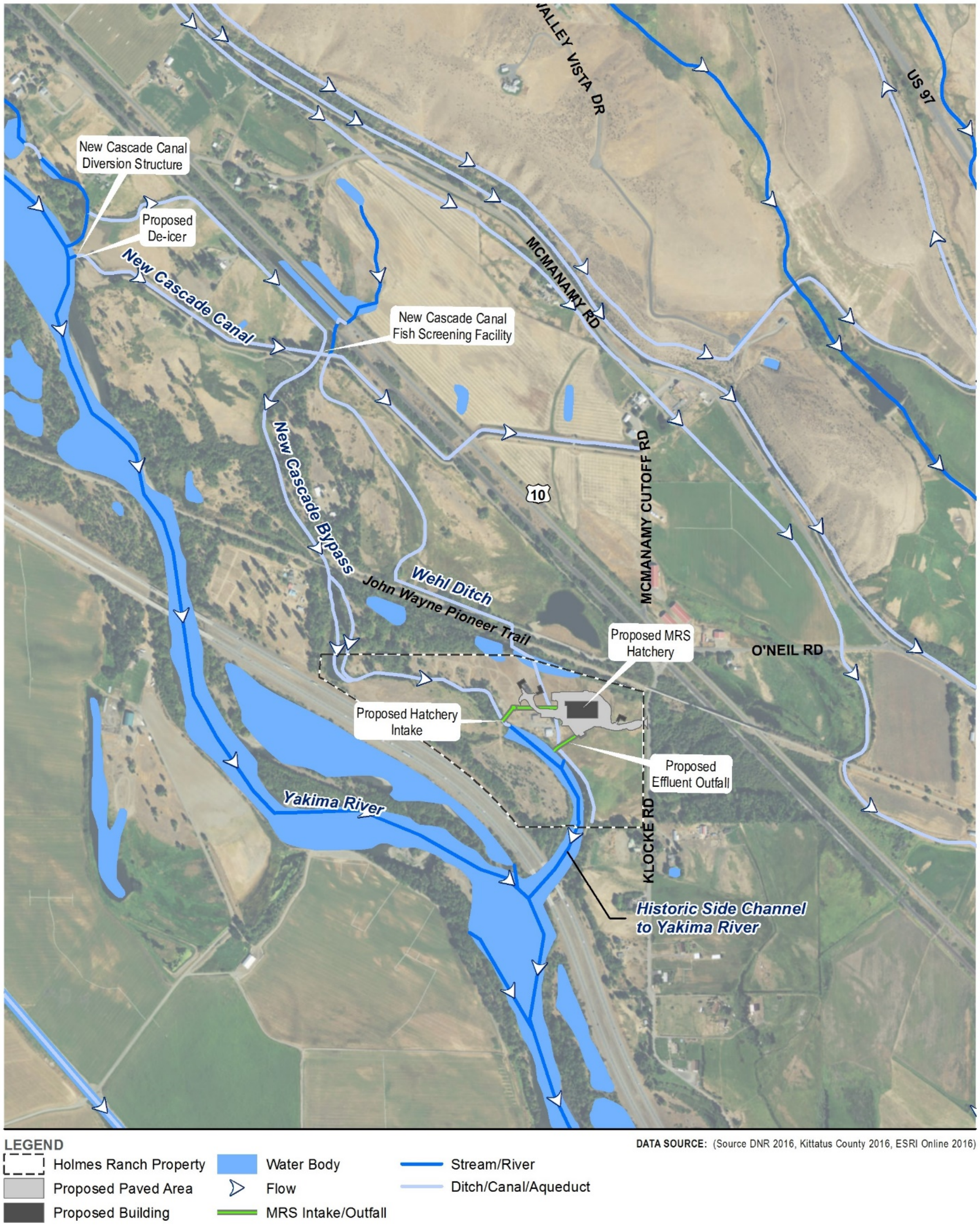
Groundwater investigations and testing will help determine well development strategies. The preliminary design indicates that groundwater would be supplied to hatchery operations by pumping from nine submersible groundwater pumps located in shallow wells throughout the project site: one existing 30-foot-deep well located near the east entrance to the site and eight new wells at other locations on the Holmes Ranch Property. Any new wells would be positioned in the buildable area, outside of wetlands and at a distance from wetlands to avoid effects of pumping on wetland hydrology. A shallow aquifer would provide the groundwater source to the pumps. Separate groundwater transmission pipelines would be routed underground from each well to the central gas stabilization headbox in the MRS Hatchery building.

Groundwater supply would be available year-round, according to the groundwater right application; however, the full 2.5-cfs groundwater right is not expected to be utilized throughout the year. When fully utilized, the estimated maximum groundwater flow required for the ambient supply is 2.34 cfs, while the remaining 0.16 cfs of the 2.5 cfs total water right would supply the chilled water. The highest demand for groundwater would occur between April and October, when the surface water right is not available. During the November through March period, when surface water is available, the MRS Hatchery operators would have the option to minimize groundwater use to allow the aquifer to recharge. The MRS Hatchery operators would develop guidelines for water source selection over time once the facility is up and running. Wells would be located to minimize interferences between aquifer drawdown cones of depression.

The groundwater treatment system would have two primary components: ambient and chilled water supply systems. Both systems would utilize a degassing/aeration process that would be accomplished via degassing columns located at a headbox inside the MRS Hatchery building. Individual pipes from each well would enter the MRS Hatchery building below grade, along the north wall of the water treatment area. Each supply pipe would rise up through the floor slab and route flow through flowmeters and isolation valves prior to being collected into an overhead pipe manifold. A tee with a valved branch and quick-connect would be provided on each well line upstream of the flowmeter to allow operators to blow off sediment and flush individual well lines prior to using the water in the MRS Hatchery.

2.2.3.2.2 Surface Water Supply

The Proposed Action would require surface water from November through March. This water would be diverted from the Yakima River through the existing New Cascade Canal Diversion. This diversion is located on the east bank of the Yakima River approximately 7 miles northwest of Ellensburg, Washington (Figure 2.2-3). The diversion, which is owned and operated by Reclamation, provides about 150 cfs of irrigation water from April through October. One element of the diversion structure, the trash rack, would be subject to ice formation if operated in the winter. Under the Proposed Action, the trash rack would be converted to a high-density polyethylene (HDPE) structure with fiberglass reinforcement to minimize the formation of ice. Construction would occur during the in-water work period and dewatering would not be necessary.



DATA SOURCE: (Source DNR 2016, Kittatus County 2016, ESRI Online 2016)

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SURFACE WATER NEAR THE HOLMES RANCH PROPERTY

FIGURE 2.2-3

Water diverted into the New Cascade Bypass flows south through the channel for approximately 0.8 mile before passing under a small bridge located on the west side of the Holmes Ranch property. A surface water intake structure would be constructed approximately 20 feet upstream of this bridge. This intake would supply up to 6 to 7 cfs of surface water to the MRS Hatchery facility from November through March, when irrigation water flows are shut off. The remaining 3 to 4 cfs of surface water right would continue to flow through the side channel, providing instream flows for fish.

The surface water intake structure would consist of two small, sheet pile walls in series to provide a diversion backwater, and a cone screen to filter water, exclude fish, and bypass flow to an off-stream surface water sump (or wet well). The sheet piles would be buried and backfilled in the channel. Water filtered through the cone screen would be routed to a sump. Water pumped from the sump would then be routed to a flow splitter that diverts a portion of the surface water flow directly to the adult holding ponds degasser, while the remainder of the surface water continues on to the MRS Hatchery building filtration sump.

The surface water treatment system for the MRS Hatchery building would provide filtered and disinfected makeup water to resupply the grow-out tanks. This surface water makeup supply would enter the MRS Hatchery building below grade, along the north wall of the water treatment area. A supply pipe would deliver up to 3 cfs of flow into a precast concrete sump containing a microstrainer. The microstrainer would be rated to remove entrained particulate down to a 54-micron size. Booster pumps would pull filtered water out of the sump, and lift it through an ultraviolet disinfection process. The disinfected surface water would then be distributed via overhead piping to the top of four reuse system gas towers for aeration prior to use in the grow-out tanks. A normally closed bypass valve would allow the surface water to be used as a backup supply to the early rearing tanks.

2.2.3.2.3 Chilled Water Supply System

A chiller would be utilized to cool incubation water to facilitate the raising of fish at the MRS Hatchery. The size of the chiller is still under consideration. To ensure reliable operation during critical fish development periods, the chiller would include some backup capacity, which could double as available capacity should significant increases in ambient or water temperatures occur.

2.2.3.3 Water Effluent

The process water effluent from adult holding ponds and the MRS Hatchery building would be collected in a drain system and conveyed to an outfall in the side channel, downstream from the surface water intake. Drain pipes would be sized to accommodate flows into the drain system during power outages and vessel draining, particularly from the grow-out tank reuse systems, which would exceed typical supply flows.

The effluent treatment system would actively remove solids and associated biological oxygen demand from the effluent in accordance with best management practices (BMPs) and statewide hatchery NPDES General Permit requirements (Ecology 2015a). Solids would be concentrated in a small backwash side stream.

Filtered water and clarified backwash water would then be routed, combined into a single 18-inch-diameter pipe, and routed toward a single 24-inch-diameter outfall pipe where it would be discharged into the side channel.

The overall size of the clarifier would be 30 feet by 16 feet. Solids accumulated in the clarifier would periodically be pumped out to either a tank truck for haul-off or land-applied on site at the discretion of the Yakama Nation.

2.2.3.4 Process Water Reuse Systems

Process water reuse systems would be designed to treat and reuse approximately 75 percent of the effluent flow from the grow-out tanks to minimize overall water demand. Provisions for 95 percent recirculation are included in reuse pipe and equipment sizing to mitigate risks associated with groundwater abundance.

2.2.4 Construction Activities

2.2.4.1 Facility Construction

Construction of the MRS Hatchery would require approximately 16.5 months, using standard construction industry methods and equipment. Mobilization and staging would occur on upland areas of the site. If required, temporary access roads would be graded within the site footprint to facilitate safe and efficient movement of equipment throughout the site. No riparian, wetland, or other aquatic resources would be disturbed, and no trees would be removed from the site to accommodate staging.

The work effort would include clearing and grubbing; demolition of the existing residence, barn, and other outbuildings; excavation for pipe installation and structure foundations, building erection, road construction; and final site grading and planting. The existing concrete ditch (or Wehl ditch) would be removed and replaced with a 24-inch-diameter pipe. The anticipated equipment that would be used during the construction is shown in Table 2.2-3.

Table 2.2-3. Construction Equipment

Item No.	Description	Number on Site	Comment
1	Superintendent and Foreman Pickups	4	
2	100-ton Crane	1	Used for building erection
3	Mini Trac Excavator	1	
4	50,000-pound Excavator	2	
5	80,000-pound Excavator	1	
6	Vibratory Roller	1	
7	Dump Truck – Onsite	1	Used onsite for miscellaneous work tasks
8	Rock Delivery Dump Truck with Trailer	4	Will make material delivery, would be onsite briefly during construction
9	Well Drill Rig	1	Onsite to drill water supply wells
10	Grader	1	Used for road and parking area subgrade and final grading
11	D-6 Bulldozer	1	
12	All Terrain Forklift	1	
13	Dewatering Pumps	4 to 6	2-inch through 6-inch size, electric powered
14	Diesel Generators	2	50 to 100 kilowatts
15	Air Compressor	1	Industrial trailer mounted
16	Jumping Jack Plate Compactor	2	
17	HDPE Pipe Welder	1	
18	Boom Truck	1	

Vehicle usage during construction is estimated as follows:

- Employee vehicles – up to 30 per day.
- Material delivery trucks – up to 10 per day.
- Dump trucks – up to 20 per day during import of fill material.
- Total vehicles during construction would range from a minimum of 20 per day to as high as 60 per day.

Noise during construction would include the following:

- Employee vehicles arriving for work in the morning and departing in the evening.
- Construction operating equipment such as dozers, excavators, and dump trucks.
- Electric pumps used for construction dewatering.
- Air wrenches used to install the pre-engineering metal building, fabricated steel materials, and equipment.
- Hammers, circular saws, and other small tools used in construction.

- Vibrator rollers, jumping jacks, and plate compactors used to compact the soil subgrade during construction.
- Concrete pump truck.
- Portable diesel generators.
- Air conditioner used for the temporary construction office trailer.

2.2.4.2 In-Water Work

The recommended in-water work window for Yakima River tributaries is July 15 to August 31; however, the New Cascade Canal diversion operates to provide irrigation water from April through October. Considering this and onsite conditions, the proposed in-water work at both the New Cascade Canal fish screen and the MRS Hatchery intake facility would occur immediately following the irrigation season completion and shutdown of the canal. Specifically, the in-water work window would be November through March. Specific details for each in-water work element are provided in the following sections.

2.2.4.2.1 New Cascade Canal Fish Screening Facility Modifications

The work effort would require concrete forming and placement, so completing this work prior to freezing conditions would be preferred. Total duration of the work effort would be approximately 4 to -6 weeks.

Dewatering would consist of placement of gravel- or water-filled sacks with a plastic tarp across the canal immediately upstream from the work area. Any seepage would be directed toward a trash pump and pumped around the screen structure back into the canal. A properly sized settling tank would be used to treat the water prior to discharge back into the canal. It is anticipated that the groundwater or seepage flows would be less than 1 cfs during the construction period.

2.2.4.2.2 MRS Hatchery Intake Structure (in Bypass)

The intake screen structure would be constructed by bypassing the groundwater seepage flows around the intake construction area. Super sacks would be placed on the upstream and downstream side of the intake area. A corrugated metal pipe would then be installed in a vertical orientation on the downstream side of the intake. This pipe would be used as a sump, allowing the groundwater level to be pumped down below the bottom of the intake excavation area. The water collected in the sump would be routed to a constructed settling pond located south of the intake. It is anticipated that the groundwater or seepage flows would be in the 3 to 4 cfs range during the construction period. The discharge from the settling pond would then be discharged into a vegetative strip to provide natural filtering prior to flowing back into the channel. The treated water would be reintroduced back into the channel immediately downstream from the cofferdam.

Coho adults have recently started to spawn in the work area during the proposed in-water window. A temporary picket fish barrier would be erected across the mouth of the channel prior to initiation of the construction work to prevent coho adults from moving up the channel and spawning.

2.2.4.2.3 MRS Hatchery Outfall Structure (in Historic Side Channel)

The outfall structure would be constructed by placing a small gravel- or water-filled sack cofferdam into the side channel prior to in-water work to isolate the outfall construction area. The cofferdam would be placed in a semi-circle to allow groundwater seepage to flow past the construction area. The outfall would be armored with large rock upstream and downstream of the pipe, and quarry spalls or rounded river rock would be placed on the channel bottom to dissipate energy at the return location. To prevent fish from swimming up the outfall, it would be equipped with a bar rack.

A screened fire suppression water intake would be installed near the outfall structure.

2.2.5 Operation and Maintenance

Occasional maintenance may be necessary throughout the life of the MRS Hatchery to remove debris from screens/outfall bars, check or replace stoplogs at the New Cascade Canal fish screen, and check or perform minor repairs on sills/screens at the proposed bypass intake. Minor replacement of armoring adjacent to the new intake and outfall structures may be necessary. Periodic dewatering of infrastructure could be required to conduct inspections or minor maintenance for the life of the MRS Hatchery. All in-water maintenance activities would occur during the standard in-water work window for Yakima River tributaries, July 15 to August 31.

Hatchery production would involve artificial propagation of coho salmon as described in the 2010 *Yakima Basin Coho Reintroduction Project Hatchery and Genetic Management Plan* (HGMP) and the 2013 NMFS Biological Opinion (BiOp). Specific methods of production would include: 1) collection of eggs from adult fish (broodstock) caught at the fish trapping facilities and transport of eggs to the proposed MRS Hatchery, and 2) egg incubation and rearing of fish within the MRS Hatchery to a release ready stage, transport of fish to acclimation sites, and release of juvenile and adult fish into the wild.

2.2.5.1 Adult Coho Broodstock Collection

Up to 1,000 coho adults, including natural- and hatchery-origin, would be collected at Roza Dam for broodstock for the proposed MRS Hatchery. Adults may also be collected at Prosser Dam as a backup source, and possibly in the future at the Cowiche or Wapatox Dams. The broodstock goal is to collect 1,000 fish that would be processed over a 4-month period. No more than 400 fish would be held at the adult holding ponds at the MRS Hatchery at any given time. The fish would be held and spawned onsite for 2 to 3 months, from October through January. The collection of adult coho at Roza and Prosser Dams has been the subject of ESA consultation for both bull trout (USFWS 2007a) and steelhead (NMFS 2013).

2.2.5.2 Acclimation and Release

Under the Proposed Action, coho parr, smolts, and adults would be released into tributaries of the Yakima River. The smolts would be acclimated before release in a combination of existing ponds and mobile acclimation units. The following sections provide more detail about coho acclimation and release.

2.2.5.2.1 Parr and Smolt Releases

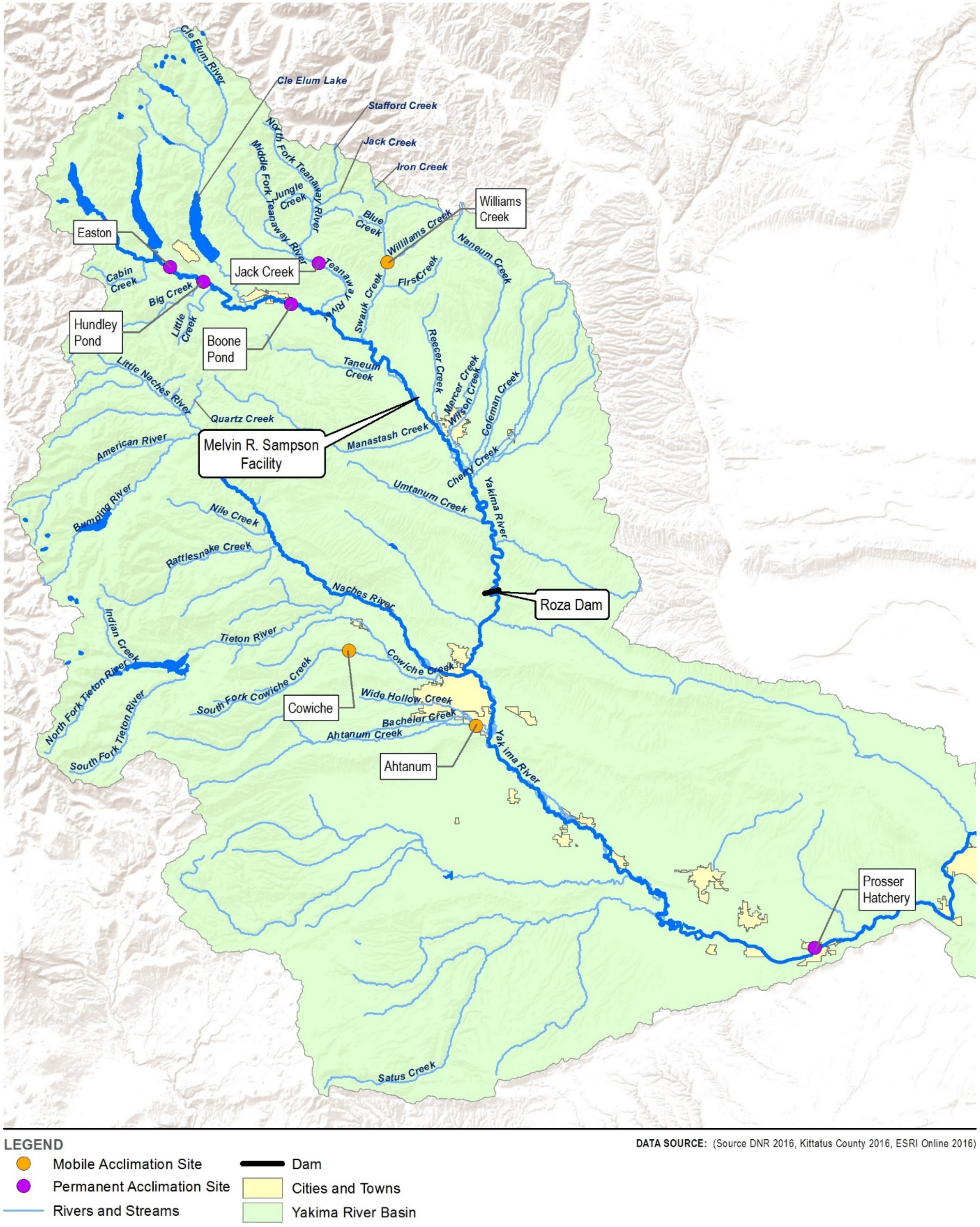
Under the Proposed Action, the MRS Hatchery would produce and release up to 500,000 coho parr and up to 200,000 coho smolts as part of the overall coho reintroduction program. Per NMFS consultation (NWR-2011-06509; NMFS 2016a), the production of up to 200,000 smolts and 500,000 parr is authorized. Conversion to an all-smolt release (i.e., 700,000 smolts) is proposed if the parr/smolt release strategy does not meet adult return objectives, or if drought conditions preclude summer parr releases.

All fish from the integrated program would be coded wire-tagged, but not adipose fin-clipped. Coho juveniles reared at the MRS Hatchery would be released into many tributaries that are currently outplanted with hatchery coho brought in from hatcheries outside of the Yakima Basin, along with several additional waterbodies (Figure 2.2-4; Table 2.2-4). Juvenile releases would continue to focus on tributaries where bull trout and steelhead are not present or occur at low abundance. In tributaries that support spawning and rearing habitat for bull trout, coho adult outplantings would be well downstream of known bull trout spawning and rearing habitat to minimize the risk of coho adults preying on bull trout. In the future, additional tributaries could be subject to juvenile acclimation and release, in consultation with the U.S. Fish and Wildlife Service (USFWS) and NMFS. The number and life stage of coho salmon released would depend on a number of factors that include habitat conditions and presence of sensitive species within the tributaries. The Yakama Nation would review drought reports on an annual basis and focus releases of coho into streams that are not expected to experience dewatering during summer months.

Prior to release, smolts would be acclimated in ponds adjacent to tributaries in which they would be released to help encourage their return as adults to these locations. A number of existing ponds, including Jack Creek, Hundley, Boone, and Easton would continue to be used to acclimate coho smolts from the MRS Hatchery. Under the Proposed Action, mobile acclimation units would be used for a small number of coho smolts in the basin. Similar to the mobile acclimation units currently being used by the Yakama Nation, these units would consist of portable aluminum raceways that are 20 feet long, 5 feet wide, and 4 feet tall.

The mobile acclimation units would be placed either on private or U.S. Forest Service lands, with approval from the applicable landowner. The units would be placed on level ground requiring minimal grading and vegetation removal. No mechanical clearing would occur and no trees would be removed. The mobile acclimation units would be placed adjacent to each subject tributary in upland areas that have existing disturbance (such as spur roads). The Yakama Nation would not place acclimation units in sensitive areas (e.g., wetlands). A single screened surface water pump with aboveground piping would be installed to deliver surface water from subject tributary(ies) to up to three tanks at each location. Water would be returned to the tributary using a single outlet hose placed below the water’s surface. The surface water intake and outlet would be removed following each acclimation season. Installation of the intake and outlet would not require any disturbance to the riverbank or bed, and would be completed in less than a few hours.

Following the acclimation season, if desired by the landowner, the Yakama Nation would remove each mobile acclimation unit from the riverbank. The Yakama Nation would acquire a 5-year temporary water right from Ecology for the tributary in question. Sites would begin acclimation in late February and fish would be released in early to mid-April. The goal would be to acclimate the fish for a minimum of 4 weeks.



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EXISTING PONDS AND PROPOSED MOBILE COHO ACCLIMATION SITES

FIGURE 2.2-4

Table 2.2-4. Prioritized List of Tributaries Identified for Coho Reintroduction Under the Proposed Action

Location	Activity			Priority
	Parr Releases	Adult Outplanting	Smolt Acclimation and Release	
Naches River				
Cowiche Creek, including South Fork	X	X	X	First
Rattlesnake Creek		X	Existing (may be decommissioned)	First
Little Naches	X	X		First
Quartz Creek	X			First
Nile Creek	X			First
Tieton River		X		First
South Fork Tieton River[a]		X		Second
North Fork Tieton River[a]		X		Second
Rock Creek	X			Second
North Fork Little Naches	X	X		Second
Bumping River		X		Second
American River	X	X		Second
Upper Yakima River				
Wilson Creek	X	X		First
Reecer Creek	X	X		First
Swauk Creek	X	X		First
Iron Creek	X			First
First Creek	X			First
Blue Creek	X			Second
Williams Creek			X	First
Taneum Creek		X		First
Big Creek		X		First
Mainstem Upper Yakima (including acclimation sites)	X	X	X (four existing sites)	First
Upper Cle Elum River	X	X		First
Cabin Creek	X			First
Lower Cle Elum River (below dam)	X			First
Manastash	X	X		Second
Cherry Creek	X			Second
Mercer Creek	X			Second
Coleman Creek	X	X		Second

Table 2.2-4. Prioritized List of Tributaries Identified for Coho Reintroduction Under the Proposed Action

Location	Activity			Priority
	Parr Releases	Adult Outplanting	Smolt Acclimation and Release	
Nanuem Creek	X			Second
Little Creek	X	X		Second
Teanaway River, including mainstem, South, Middle, and North Forks	X	X		Second
Jack Creek			X (existing)	Second
Indian Creek	X			First
Stafford Creek	X			Second
Jungle Creek	X			Second
Mainstem Yakima River				
Ahtanum Creek	X	X	X (smolt release)	First

[a] Coho releases are proposed following construction of fish passage facilities at Tieton Dam, and in coordination with Reclamation (Newsome 2016a).

Existing ponds that may be used for acclimatizing smolts include the Stiles Pond, Lost Creek Pond, Easton Pond, Prosser Hatchery, and Boone Pond.

In summary, the Proposed Action would result in the following changes to ongoing juvenile release strategies currently being conducted in accordance with the Master Plan:

- **Increase in the number of parr releases, and decrease in the number of smolt releases.** The Proposed Action would increase the number of coho parr released from 27,000 up to 500,000 annually and the number of coho smolt releases would be reduced. While the total number of releases associated with the MRS Hatchery would remain approximately 700,000 fish, an additional 300,000 to 600,000 fish would be released under other programs not addressed in this EIS. As a result, the total release of coho juveniles (parr and smolt) would be 1 to 1.3 million fish.
- **Acclimation and release of MRS Hatchery-propagated coho into new tributaries.** Juvenile coho propagated at the MRS Hatchery would be released into tributaries that are not currently subject to coho releases, with a goal of seeding more habitats throughout the basin. It should be noted that, under the No Action alternative, the YKFP also calls for the expansion of juvenile release tributaries (see Section 2.3). Under the Proposed Action, however, these tributaries would be seeded with MRS Hatchery coho. In the future, additional tributaries could be subject to juvenile acclimation and release, in consultation with the USFWS and NMFS.

2.2.5.2.2 Adult Releases

Currently, and as described in Phase 2 of the Master Plan (see Section 1.4.2), the Yakama Nation initiated outplanting coho adults that had returned to the Prosser

Hatchery into numerous tributaries throughout the basin. Under the Proposed Action (Phase 3), the Yakama Nation would continue adult outplanting. Potential impacts of adult outplanting are considered under the Proposed Action because MRS Hatchery-reared juveniles released into the Yakima Basin would return as adults, and could be selected for outplanting.

2.2.5.2.3 Adaptive Management of MRS Hatchery Juvenile Releases

The Yakama Nation would adjust its release numbers in the YKFP with the addition of MRS Hatchery juvenile releases, but the overall release numbers would remain static. Over time, such adjustments may include releasing more smolts and less parr, or switching to a full smolt-release protocol, which is similar to existing protocols. The Yakama Nation has developed MR&E objectives and tasks through the Monitoring Implementation Planning Team (MIPT), a joint process between the Yakama Nation and WDFW. As part of the MIPT review process, the Yakama Nation and WDFW would continue to monitor competitive interactions between released coho juveniles and nontarget fish species. Monitoring would include a Type 1 analysis, which examines the spatial and temporal overlap between nontarget fish and hatchery-released coho, residuals, and returning adults. Monitoring would also include a Type 2 analysis, which examines the spatial and temporal overlap between nontarget fish and all life history stages (fry, parr, smolt, adult) of naturally produced offspring of returning hatchery adults.

Modifications to the coho releases associated with the MRS Hatchery would be determined by management criteria determined through the MIPT and would be reported to NMFS. Depending on the scale of the modification, NMFS would either write a letter to the file explaining how the change in impacts does not rise to the level requiring re-initiation of ESA consultation, or would require an updated Biological Assessment (BA).

2.2.5.3 Facility Operations and Maintenance

During operation, the estimated vehicle trips would be as follows:

- Employee personal vehicles – 5 per day.
- Delivery trucks – 1 per day.
- Maintenance and general support vehicles – 1 per day.
- Total average trips per day – 7 to 10.

The noise during operation would include the following:

- Employee vehicles exiting and entering the MRS Hatchery site.
- Trucks delivering fish feed, supplies, and fuel to the MRS Hatchery site.
- Visitor vehicles and buses.
- Heating, ventilation, and air conditioning (HVAC) system outdoor equipment (heat pumps, etc.) for the MRS Hatchery building, residences, and shop building.
- Transport trucks entering the MRS Hatchery site to delivery adults to the onsite holding raceways or to load and transport juvenile fish.

Energy use associated with the process water systems would vary significantly depending on fish life stage. Lighting and HVAC loads would vary seasonally as well. The total connected load for the MRS Hatchery is presently shown to be 625 kilovolt amps (if all potential loads are “ON” at the same time). Actual peak energy usage would typically be 30 to 40 percent lower than connected load. There are pending decisions on the amount of water chilling that would occur in the late summer that could increase energy use by 60 to 160 kilovolt amps for a 3- to 4-month period.

2.2.6 Monitoring, Research, and Evaluation

Monitoring, research, and evaluation of the overall YKFP coho reintroduction program is ongoing and would continue under the Proposed Action. As described in the Yakima Fisheries Project Final EIS (BPA 1996), the monitoring plan for Yakima River coho salmon emphasizes two major areas of interest to address the following objectives and risks:

- Coho salmon survival in various life stages, and
- The rates of predation by released coho smolts on nontarget fish species.

The purpose of MR&E activities is to gather baseline information to characterize habitat and salmonid populations prior to and during the coho reintroduction effort.

As part of ongoing MR&E activities for artificial propagation programs in the Yakima Basin, the Yakama Nation has developed monitoring and evaluation objectives and tasks through the MIPT, a joint process between the Yakama Nation and WDFW. As part of the MIPT review process, the Yakama Nation and WDFW monitor tributaries for coho redds and juveniles. In addition, they monitor competitive interactions between released coho juveniles and nontarget fish species. Monitoring includes a Type 1 analysis, which examines the spatial and temporal overlap between nontarget fish and hatchery-released coho, residuals, and returning adults, as well as a Type 2 analysis, which examines the spatial and temporal overlap between nontarget fish and all life history stages (fry, parr, smolt, adult) of naturally produced offspring of returning hatchery adults..

The monitoring and evaluation framework is described in detail in the Master Plan. The Master Plan identifies a set of Decision Rules that are the strategy for achieving program and biological objectives. The purpose of the MR&E plan is to:

- Evaluate performance relative to goals and expectations and adjust hatchery and harvest management operations according to the Decision Rules. Indicators of program success include benefits to fisheries as well as abundance, productivity, distribution, and composition of naturally produced populations.
- Test key assumptions and adjust the Decision Rules accordingly.

Future studies to determine whether the MRS Hatchery activities are achieving program and biological objectives, consistent with the Master Plan, would occur under the Proposed Action. All terms and conditions of the existing USFWS Section 10 permit issued for bull trout for the overall YKFP MR&E program would be followed (TE-05166B-0). However, the existing USFWS Section 10 permit will expire in March 2019, which is likely prior to the initiation of MR&E activities associated with the MRS Hatchery. BPA and the Yakama Nation therefore would request consultation for future

MR&E activities that are specific to the proposed MRS Hatchery until a period when a future ESA Section 7 consultation is completed for the overall YKFP fisheries program.

Ongoing and future MR&E activities would take place in all tributaries proposed for acclimation and/or release of juvenile coho reared at the MRS Hatchery (see Section 2.2.5.2). The following MR&E activities would encompass fish reared at the MRS Hatchery and would include the following:

- Coho Spawning Surveys
    - Continuation of annual coho spawning surveys that are currently conducted in the Yakima basin. Annual coho spawning surveys are currently conducted to estimate adult escapement to the basin and would continue to be conducted under the Proposed Action. Coho spawning surveys would be conducted from October through December. Data would be collected from spawned out carcasses to assess length and condition of adults. Surveys would be conducted on all mid- to low-elevation tributaries in the upper Yakima and Naches Rivers. They would also be conducted in the mainstem Naches River from river mile (RM) 50 down to Cowiche Dam and to the confluence with the Yakima River and in the Yakima River from Easton to Union Gap.
    - Migration timing, habitat utilization, and spawning distribution would continue to be monitored for up to 100 adult coho radio-tagged at Prosser Dam using a combination of fixed and mobile radio telemetry gear located throughout the Yakima River basin from mid-September through November. Weekly jet boat and automobile surveys are conducted, in addition to fixed monitoring sites that may include Roza, Cowiche, and Wapatox Dams.
    - Ongoing surveys would be expanded to include all waterbodies proposed for coho release (Table 2.2-4). Creek surveys would be conducted on foot, whereas the mainstem surveys would be conducted by raft and power boat. Data that includes length, sex, and scales for age analysis would be collected from spawned-out carcasses.
    - Visual surveys would also be conducted in the upper Yakima River and Naches River subbasins near existing and proposed acclimation sites from mid-September through mid-December. Surveys would consist of either walking stream margins or floating stream reaches to count and record the spatial distribution of coho redds in these areas.
- Snorkel Surveys
    - Snorkeling spot checks would be conducted near acclimation release sites and throughout all waterbodies planned for juvenile release from spring through fall. These checks would determine whether coho have residualized, and if so, to what extent. The presence of coho would allow fisheries managers to identify waterbodies for the collection and passive integrated transponder (PIT) tagging of natural-origin coho.
    - During surveys, snorkelers would observe individuals and would not touch, capture, or intentionally harass any fish.

- Juvenile Collection at Roza and Prosser Dams (and in the future Cowiche and Wapatox Dams)
    - The juvenile fish trap at Roza Dam is currently operated all winter and into spring. This trap is used to document coho parr and smolt outmigration, and determine the survival of smolts from the time of their release to the time they pass Roza and Prosser dams. Operation of the traps is intended to collect juvenile wild and hatchery coho smolts. Once collected, natural-origin coho are PIT tagged and released directly back into the river. These activities are designed to determine the overall survival of hatchery fish as compared to wild fish and those migrating hatchery fish as compared to those fish migrating later.
    - The Yakama Nation would continue to operate the Chandler Juvenile Monitoring Facility at Prosser Dam. MRS Hatchery-reared juveniles would be monitored during downstream passage at the sites.
- Tributary Juvenile Monitoring – Seining, Electrofishing, and PIT Tagging
    - Such surveys are conducted to determine juvenile abundance in spawning streams. Surveys are typically conducted from July through September. PIT tagging is conducted to track juvenile coho passage timing and survival during smolt outmigration. The Yakama Nation would PIT tag hatchery coho parr and smolts at the MRS Hatchery. In addition, the Yakama Nation would collect and PIT tag naturally spawned coho juveniles in areas where MRS Hatchery-reared adults are either planted or return to spawn. Natural-origin coho would be tagged in late summer. PIT tagging would facilitate analysis of parr and smolt to adult return survival in all waterbodies proposed for adult and juvenile outplanting.
    - The Yakama Nation would use backpack electrofishers or net seining to collect juveniles for tagging. Electrofishing would be conducted by experienced fish biologists in compliance with NMFS electrofishing guidelines (NMFS 2000).

The Yakama Nation would collect a minimum of 3,000 parr and 2,500 smolts from each waterbody planned for coho release (see Table 2.2-4). The Yakama Nation publishes annual monitoring reports, which are available for public review online at http://ykfp.org/publications/pubjumpmenu.htm. The Yakama Nation endorses an adaptive management policy, which allows for production objectives and strategies to change as new information becomes available from monitoring and evaluation. For the coho program, biologists from Yakama Nation and WDFW identified Non-Target Taxa of Concern and impact containment levels for those species. Risk containment levels vary with the sensitivity of each species to impact, its importance in the region, and other factors. When monitoring and evaluation suggest that Non-Target Taxa of Concern populations are declining in areas of coho concentration, studies are implemented to determine whether coho might be the cause of the decline as part of the overall monitoring and evaluation program.

2.3 No Action Alternative

Under the No Action alternative, BPA would not fund the construction and operation of the proposed MRS Hatchery. However, the Yakama Nation would still expand juvenile release and acclimation locations, but would not convert to complete in-basin rearing as proposed under Phase 3 of the Master Plan. The Yakama Nation would likely continue Phase 2 of the coho restoration program described in the Master Plan as currently implemented, using a combination of artificial production and habitat improvements to meet natural production and harvest goals. The goals of Phase 2 were to increase coho spawning in tributaries, phase out imported releases of coho in the Yakima Basin, and test and monitor new acclimation techniques.

Under the No Action alternative, a portion of the juvenile coho released into the Yakima River as part of the overall YKFP coho reintroduction program would continue to be reared out-of-basin. The release of out-of-basin juveniles is expected to result in reduced survival and adult returns and would not meet the goal of providing a self-sustaining coho run throughout its historic range (see Section 2.1).

Because the No Action alternative would continue to use out-of-basin broodstock, collection would continue to occur at Prosser Dam, supplemented with production from the Eagle Creek National Fish Hatchery, located outside of Estacada, Oregon. Summer parr plants would continue to be the primary method for increasing fish production in upper basin tributaries. These fish would continue to be released into tributaries or acclimated using ponds or a mobile acclimation system.

Summer parr plants and adult coho plants have been used to increase fish abundance in multiple tributaries. In addition, the Yakama Nation has initiated the use of mobile acclimation sites for the release of smolts in several tributaries throughout the basin, and continued the volitional release of smolts from mainstem, permanent acclimation sites. Releases of coho smolts, which have occurred in the upper Yakima and Naches Rivers since 1997, would continue. The total number of smolts has typically ranged from 650,000 to 1,000,000 each year depending on brood success (Table 2.3-1).

Table 2.3-1. Total Number of Hatchery-reared Coho Smolts Released into the Yakima Basin, 1997-2016

Brood year	Total Release[a]	Brood year	Total Release[a]
1997	1,467,000	2007	1,018,293
1998	1,004,394	2008	899,172
1999	928,190	2009	980,053
2000	567,563	2010	765,838
2001	620,818	2011	1,022,269
2002	810,002	2012	822,390
2003	604,701	2013	966,392
2004	654,872	2014	865,798
2005	942,911	2015	1,093,591
2006	1,024,499	2016	974,561

[a] Smolts have comprised the majority of releases.

Source: Yakama Nation, unpublished data (Newsome 2016a)

Release of coho parr, which the Yakama Nation began in 2007, would continue under the No Action alternative, likely increasing in number in tributaries. On average, the Yakama Nation has released about 27,000 parr annually into numerous tributaries of the Yakima Basin, including Nile Creek, North Fork Little Naches River, Little Naches River, South Fork Cowiche Creek, Rattlesnake Creek, Quartz Creek, Big Creek, Reecer Creek, Hundley Creek, and Wilson Creek.

2.4 Alternatives Considered but Eliminated from Detailed Study

Two alternatives to the MRS Hatchery were considered during the development of the Yakama Nation's Master Plan. These alternatives were not carried through Master Plan development because they either did not meet legal requirements, failed to achieve biological objectives, or were inconsistent with study findings from Phase 1 and Phase 2 of the Yakima coho program. The two alternatives are described as follows:

- **Eliminate Hatchery Production and Improve Habitat** – Under this alternative, production of hatchery coho would have been eliminated and actions would have been implemented in the Yakima Basin to increase habitat quantity. This alternative was eliminated from detailed study in the Master Plan process as it would have relied on adult stray coho from other basins or hatchery programs, and would not have achieved the long-term objective of creating sustainable runs of coho.
- **Implement a One Million Smolt Segregated Program at Prosser** – Under this alternative, the Yakama Nation would have produced one million smolts at the Prosser Hatchery and would have released smolts below Prosser Dam. This alternative was eliminated from detailed study as it would not have achieved long-term conservation objectives of restoring natural production to the Naches and upper Yakima Rivers, and it would have required substantial capital improvements to the existing facilities at Prosser Hatchery.

No additional alternatives were identified for consideration during the EIS scoping process for this EIS.

2.5 Comparison of the Alternatives

Table 2.5-1 compares the project alternatives by the project purposes identified in Chapter 1. Table 2.5-2 summarizes and compares the potential environmental consequences of the alternatives. See Chapter 3 for a full discussion of environmental consequences.

Table 2.5-1. Comparison of Alternatives by Project Purposes

Purposes of Action	Proposed Action	No Action Alternative
Support efforts to mitigate for effects of the development and operation of the Federal Columbia River Power System on fish and wildlife in the mainstem Columbia River and its tributaries under the Northwest Power Act.	Would support mitigation efforts for coho in the Yakima Basin, using locally-adapted broodstock, in compliance with HSRG principles. Over time, use of out-of-basin broodstock would be phased out entirely.	Would support mitigation efforts for coho in the Yakima Basin, using both locally-adapted and out-of-basin broodstock.
Assist in carrying out commitments related to proposed hatchery actions that are contained in the 2008 Fish Accords with the Yakama Nation and others.	The 2008 Fish Accords identify funding a Yakama Nation coho program. BPA funding for the Proposed Action would meet the commitments made to the Yakama Nation in the 2008 Fish Accords.	Would not further the commitments made in the 2008 Fish Accords.
Implement BPA's *Fish and Wildlife Implementation Plan Environmental Impact Statement and Record of Decision* policy direction, which calls for protecting weak stocks while sustaining overall populations for fish for their economic and cultural value.	Would reintroduce a naturally spawning population of coho in the Yakima Basin.	Would not support an increase in naturally spawning coho in the Yakima Basin.
Minimize harm to natural and human resources, including species listed under the ESA.	A number of minimization measures or construction techniques would be employed to minimize effects on natural and human resources and listed species and designated critical habitat. (See Table 2.5-2 for a summary of environmental impacts.)	No change to current practices. (See Table 2.5-2 for a summary of environmental impacts.)

Table 2.5-2. Summary of Impacts for the Proposed Action and No Action Alternative

Potentially Affected Resource	Proposed Action	No Action Alternative
Land Use and Recreation Section 3.1	Construction-related impacts (e.g., noise, dust, traffic) at the MRS Hatchery site would mostly only be noticeable within the immediate project site and are not expected to interfere with adjacent and surrounding land uses. Impacts to potential users of the John Wayne Pioneer Trail would be limited to a short segment of the trail and construction activities would not preclude continued use of the trail in a safe manner. The project would be consistent with county plans and zoning. Operation of the MRS Hatchery and activities at acclimation and release sites are not expected to interfere with adjacent and surrounding land uses and recreation.	Current land uses in the study area would continue under the No Action alternative. No new facilities would be constructed and disruptions to adjacent properties, recreational sites, and land uses would not occur. As with the Proposed Action, the acclimation and release sites are not expected to interfere with adjacent and surrounding land uses and recreation.
Transportation Section 3.2	Project-related traffic would utilize major highways (I-90 and US 97) to the maximum extent possible and would have a low impact on transportation and traffic around the Holmes Ranch property. Construction traffic approaching the hatchery site on SR 10 and Klocke Road would likely be noticeable on these low volume roads. Long-term operation of the project would result in low, localized traffic impacts due to increased traffic associated with the new residences and additional employees at the MRS Hatchery, and traffic to setup and monitor the acclimation and release sites.	No change in traffic patterns or volumes would result from the No Action alternative.
Geology and Soils Section 3.3	Site preparation and other construction activities at the MRS Hatchery site would result in approximately 8.3 acres of soil disturbance, temporarily increasing the potential for erosion. Erosion and sedimentation impacts would be minimized by using BMPs, and exposed soils would be revegetated or stabilized with gravel following construction. MRS Hatchery operation would permanently replace some of the existing soils with base course or fill. In general, existing slopes and drainage patterns of undisturbed soils would remain intact and erosion and sedimentation would not increase as a result of the project. Operational activities at acclimation and release sites are not expected to affect geology and soils.	The No Action alternative would have no impacts on soils or geologic resources.
Vegetation Section 3.4	Construction activities at the MRS Hatchery site would temporarily impact up to 4.6 acres of vegetation and would permanently remove up to 3.7 acres of pasture and grassland. Areas of temporary disturbance to vegetation would be revegetated with native species after construction. Impacts to vegetation communities would be low because hatchery operations would not require substantial vegetation maintenance on the MRS Hatchery grounds, access roads, or in the New Cascade Canal. Acclimation and release activities at other sites within the basin would have no long-term impacts and would result in low to no impacts to vegetation. Any vegetation removal required for mobile acclimation units would be minimal and temporary.	No new construction would occur and no vegetation would be removed at the Holmes Ranch property. Any vegetation removal required for mobile acclimation units would be minimal and temporary.

Table 2.5-2. Summary of Impacts for the Proposed Action and No Action Alternative

Potentially Affected Resource	Proposed Action	No Action Alternative
Water Resources Section 3.5	Some in-water work would be required for construction of the MRS Hatchery and low water quality impacts may occur during in-water work. Erosion and transport of pollutants from hatchery construction to surface waters and groundwater is expected to be minimized through erosion control and construction BMPs. The Yakama Nation would obtain an NPDES Construction Stormwater General Permit from Ecology, which would include a Stormwater Pollution Prevention Plan (SWPPP). Groundwater pumping during hatchery operations is expected to cause local aquifer drawdown, especially during the month of November. However, the impacts would be localized. Impacts to surface water hydrology are expected to be low; surface water diversion flows would be low relative to the total flow in the source stream. In addition, surface water use would be nonconsumptive. Water quality impacts are expected to be low or avoided because of the quality of the source water, aeration and gas management of the source water, and removal of solids from fish feed and fish waste with a microstrainer and clarifier. Surface water diversions for mobile acclimation sites would not cause dewatering of any reaches and changes to stream flow and water quality would likely be low. Water quality may be slightly affected by the discharge of fish wastes from mobile acclimation units; however, NPDES permits would not be needed for these sites because rearing levels would be well below permit minimums and the duration would be only 4 to 6 weeks.	Surface or groundwater resources would not be modified as a result of the No Action alternative. Continued use of existing acclimation and release sites and the implementation of the new sites would have low to no impact on water quantity and quality.
Wetlands and Floodplains Section 3.6	Potential short-term construction impacts to wetlands on the MRS Hatchery site include erosion, human disturbance, sedimentation, or accidental fuel and oil leaks related to construction. The majority of these impacts would be prevented with appropriate BMPs. Discharge water would be treated to meet the requirements of the NPDES General Permit (Ecology 2015a) and would not impact wetland water quality. Groundwater drawdown from hatchery water supply wells is expected to have a low effect on wetlands in the project area. Acclimation and release activities would have low to no impacts to wetlands. The mobile acclimation facilities may be located within the 100-year floodplain and the Yakama Nation would coordinate with the local floodplain administrator (Kittitas County) to minimize impacts from the acclimation and release activities. The impact of the Proposed Action on floodplains would be low.	No new construction would occur at the Holmes Ranch property. Current conditions of wetlands and floodplains would continue. As with the Proposed Action, acclimation and release activities would have low to no impacts to wetlands and low impacts to floodplains.

Table 2.5-2. Summary of Impacts for the Proposed Action and No Action Alternative

Potentially Affected Resource	Proposed Action	No Action Alternative
Fish **Section 3.7**	Construction impacts on fish or their habitat are anticipated to be localized to the hatchery site and short term. In-water construction may temporarily alter water quality, disturb or displace individuals, or temporarily reduce the amount of available habitat. However, the area impacted for MRS Hatchery construction would be small (less than about 100 linear feet of surface waters) and provides low quality habitat; therefore, impacts on fish are expected to be low. Little, if any, direct mortality is anticipated and construction-related sediment and turbidity is anticipated to be low. MRS Hatchery-related construction is not likely to adversely affect ESA-listed bull trout or MCR steelhead. Construction of in-water elements for the MRS Hatchery may temporarily displace juvenile individuals from habitat. Operational effects on aquatic habitat and fish species include seasonal disturbance and minor flow reductions associated with surface water diversions, and minor water quality degradation from effluent return to the respective waterbodies. Surface water diversion would not cause dewatering of any reaches, and impacts on bull trout and their critical habitat, if any, would be low to none. By complying with acceptable effluent discharge values in accordance with the 2015 Upland Fin-Fish Hatching and Rearing General NPDES Permit (Ecology 2015a), the impact of effluent on receiving waters, the aquatic environment, and fish is expected to be low. Water quality changes due to discharges from the facilities could disrupt the behavior and distribution of individual fish immediately adjacent to and downstream of the outfall structure, but the overall impact is expected to be low. Off-site operations, including adult and juvenile coho releases throughout the Yakima River basin, are expected to have low impacts on juvenile bull trout because coho are typically released into tributaries downstream of habitat occupied by rearing bull trout. Juvenile coho releases would not negatively affect adult bull trout. Juvenile coho releases could provide forage for adult bull trout near release locations.	Development of a locally-derived, naturally-sustaining in-basin coho population using an integrated facility would not be achieved. Impacts on nontarget fish species from continuing coho reintroduction activities of the YKFP (e.g., ecological interactions from juvenile releases, MR&E activities) would remain at current levels.
Wildlife **Section 3.8**	There are no ESA-listed terrestrial wildlife species or potential suitable habitat for such species in the MRS Hatchery property. Wildlife species typically occurring in the area would likely avoid the hatchery site during construction, although less mobile species could potentially experience mortality. Accidental fuel and oil leaks during construction could also create short-term, local, and low impacts on wildlife. Permanent removal of up to 3.7 acres of vegetated habitat could create long-term, moderate impacts on species that currently use the area. Project operations would result in increases in daily human activity and noise that could impact the ability of local wildlife to forage, roost, or nest. Mitigation measures would be implemented to minimize the impacts of construction and operation on wildlife. For most wildlife species, suitable habitat for breeding, rearing, and foraging would remain available at the proposed site of the MRS Hatchery and at acclimation sites. The overall impact on wildlife would be low.	Habitats at the hatchery site would not be altered, and existing human disturbance would continue. Species adapted to current conditions at the hatchery site and acclimation sites would continue to use them. The use of new acclimation and release sites would have a low impact to wildlife.

Table 2.5-2. Summary of Impacts for the Proposed Action and No Action Alternative

Potentially Affected Resource	Proposed Action	No Action Alternative
Cultural Resources Section 3.9	Temporary visual impacts to the Chicago-Milwaukee-St. Paul-Pacific Railroad line, which is now the John Wayne Pioneer Trail, would occur during construction of the MRS Hatchery. Based on cultural surveys completed in the study area and consultation with the Yakama Nation and Washington State Historic Preservation Office, no historic properties, traditional cultural properties, or sacred sites occur within the study area. As a result, construction and operation of the MRS Hatchery would have a low impact on cultural resources.	No ground disturbance or removal of cultural resources would occur at the Holmes Ranch property. The use of new mobile acclimation and release sites would not result in any ground disturbance.
Socioeconomics and Environmental Justice Section 3.10	Construction of the MRS Hatchery would result in a direct short-term beneficial impact on employment in the region through employment of approximately 30 people for a period of 16.5 months, and their indirect spending in the area. Hiring of permanent hatchery workers would have a low beneficial impact on the regional economy and the Yakama Nation. The availability of fisheries resources for local populations and tribal members would ultimately increase, resulting in long-term beneficial impacts to subsistence fisheries. Construction and operation of the Proposed Action would not have significant environmental impacts that would be disproportionately borne by minority or low income populations.	Economic conditions and opportunities in the region would not change as a result of the No Action alternative.
Air Quality and Climate Change Section 3.11	Construction effects on air quality are expected to be low, short term, and local, and would cease when construction is complete. Operational emissions resulting from additional employee and delivery trips and potential use of an emergency power generator would be low and would not significantly reduce the air quality of the surrounding region. Air emissions resulting from additional truck trips and generators at acclimation sites would not reduce the air quality of the surrounding region.	There would be no change in air quality and no change to greenhouse gas (GHG) emissions as a result of this alternative.
Visual Resources Section 3.12	Construction equipment and personnel would be temporarily visible by motorists on Klocke Road and users of the John Wayne Pioneer Trail. New structures associated with the MRS Hatchery and hatchery operation would be visible intermittently and for a short period of time by users of the John Wayne Pioneer Trail and motorists on Klocke Road. Although the new structures would be periodically obscured by a partial vegetation screen, the changes in existing views represent a long-term moderate impact to visual resources. Acclimation structures are not expected to create noticeable visual obstructions; their presence would create annual short-term low impacts.	Existing views and viewer groups would not experience a change in visual resources. Existing and new acclimation and release sites under the YKFP would be used and would create annual short-term low impacts.

Table 2.5-2. Summary of Impacts for the Proposed Action and No Action Alternative

Potentially Affected Resource	Proposed Action	No Action Alternative
Noise, Hazardous Waste, Public Health, and Safety Section 3.13	Construction at the MRS Hatchery site would cause moderate short-term noise impacts in areas directly adjacent to construction activity. Noise generated during operation is not expected to generate noise levels that would exceed thresholds for nearby receptors. Hazardous materials storage would be limited on-site and consist of designated, enclosed storage areas with full secondary containment provided. During construction, the potential for other public health and safety impacts (e.g., air emissions, hazardous material release) are expected to be short term, localized, and low. Operational impacts to public health and safety at the hatchery and acclimation sites would be low.	Existing noise levels would continue. Chemicals would not be used and the use of new and existing acclimation and release sites would not generate hazardous waste or materials. Public health and safety impacts would continue to be low.

3 Affected Environment, Environmental Consequences, and Mitigation Measures

This chapter includes an analysis of the potential impacts of the Proposed Action and the No Action alternative on the human and natural environment. Each section of this chapter includes a description of the affected environment for a specific resource; an analysis of the impacts on that resource, including cumulative impacts; and a list of mitigation measures that would help lessen or avoid impacts.

Along with the detailed descriptions of the impacts described in this chapter, the overall impacts to each resource are generally summarized into four summary impact levels—high, moderate, low, and no impact— to help recap the effects. The impact levels are based on the reasoned analysis provided, which incorporates the considerations of context and intensity defined in Council of Environmental Quality Regulations (40 CFR 1508.27).

3.1 Land Use and Recreation

3.1.1 Affected Environment

The study area for land use and recreation includes the Holmes Ranch property and surrounding properties within 0.5 mile of the property site. This distance represents a reasonable maximum distance within which project-related noise, air quality, and traffic impacts could cause disturbance to land uses or recreational users. The study area also includes properties that share a common source of water as the proposed project. The acclimation and release sites for coho from the MRS Hatchery are also included in the study area. The project study area is predominantly in Kittitas County; however, some release sites are located in Yakima County, Washington.

Land use is characterized by land ownership, functional land use classifications (e.g., agricultural, commercial, residential), county zoning, and comprehensive plan designations, as well as local, state, or regional land use planning documents that establish long-term development goals and policies. Recreational resources in the project area include public spaces that are used for recreational activities such as hiking, biking, swimming, fishing, and/or boating.

3.1.1.1 Land Ownership

The Yakama Nation Land Enterprise owns the 50-acre Holmes Ranch property where the project site for the MRS Hatchery is located. Surrounding properties within the study area are in private ownership or owned by the Yakama Nation, BPA, Burlington Northern Santa Fe railroad, WDFW, Washington Department of Transportation (WSDOT), and Kittitas County.

3.1.1.2 Land Use Types

Land use types were identified throughout the study area using the U.S. Geological Survey (USGS) National Land Cover Database (USGS 2011). Land use types in the project study area include pastureland; cropland; forestland; wetland; herbaceous and shrub land; and developed areas, including rural residential, rights-of-way, and recreation areas. The current land use types on the Holmes Ranch property include agricultural, forestland, wetland, and developed areas. In addition, a portion of the Holmes Ranch property is covered by a conservation easement, which can only be used for salmon recovery or salmon enhancement. The conservation easement exists because the Salmon Recovery Board provided financial assistance to the Yakama Nation for purchase of the property; the conservation easement was included as a condition for financial assistance. Figure 3.1-1 shows land use within the study area.

3.1.1.2.1 Agriculture

In Kittitas County, the main crops are hay, grain, and vegetables. Additionally, livestock is a main agricultural commodity. About half of the hatchery site that would be developed is classified by the Natural Resource Conservation Council (NRCS) as prime farmland or farmland of statewide importance, as defined under the Farmland Protection Policy Act (7 USC 4201 *et seq*.). These farmland classifications indicate that about half of the hatchery development area has physical and chemical properties that are suitable and conducive to farming. For more information on soils that comprise prime farmland see section 3.3.2.2 in Geology and Soils.

3.1.1.2.2 Forestland, Wetland, Herbaceous, and Shrub Land

Vegetated areas near the hatchery site consist of forestland, wetlands, and herbaceous and shrub land. Specific habitat types observed within the immediate project site include ponderosa pine forest, willow-dominated riparian habitat, Aspen groves, woody wetlands, and emergent wetlands. The acclimation sites have primarily herbaceous and shrub cover.

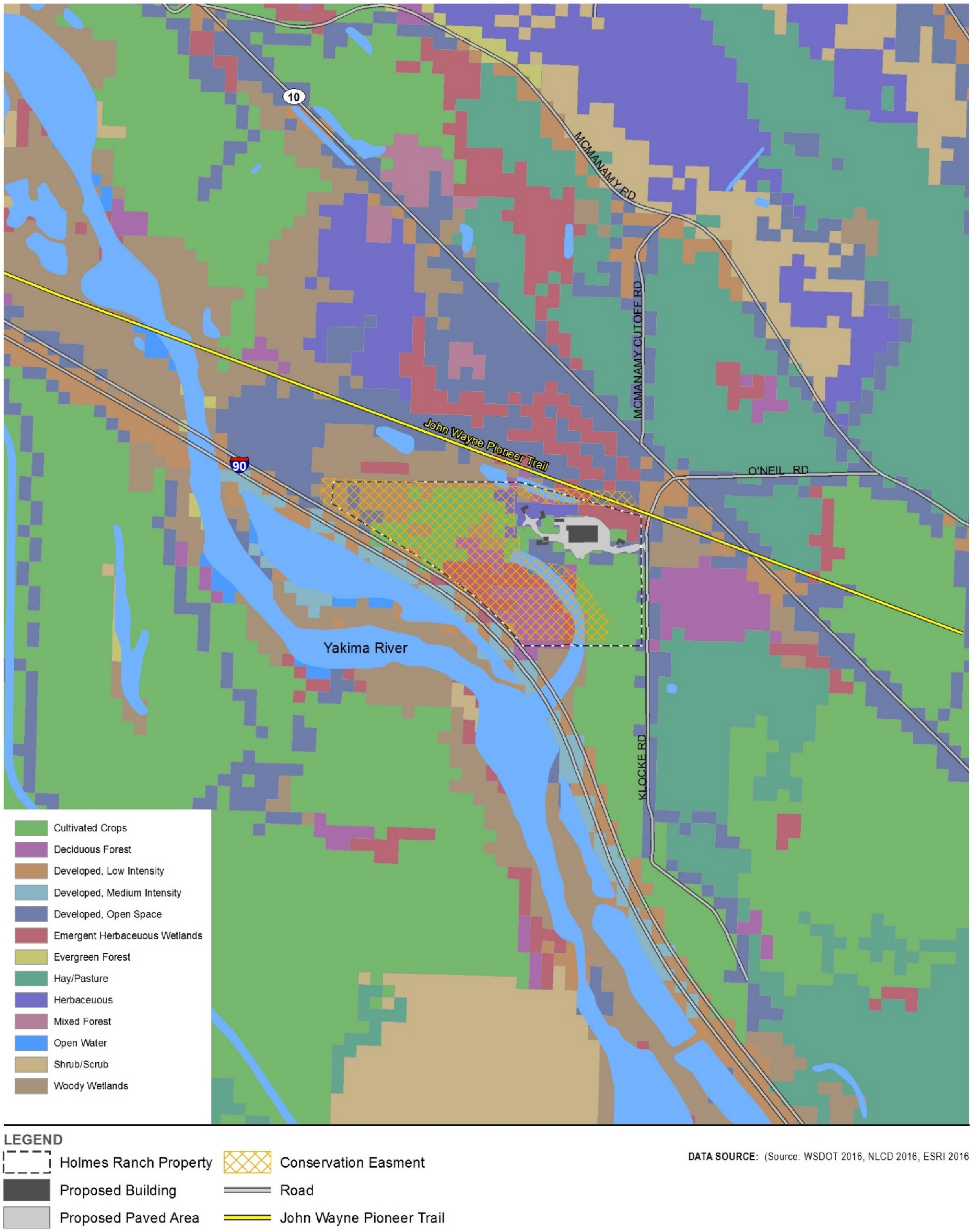
3.1.1.2.3 Developed

Developed land near the Holmes Ranch property includes rural residential, transportation right-of-way, and recreation.

Rural residential properties are concentrated along Klocke Road, Oneil Road, and McManamy Road.

Right-of-way uses include a Burlington Northern Santa Fe railroad corridor, WSDOT highways and properties, and Kittitas County roads and properties.

Designated recreational land includes the John Wayne Pioneer Trail and Yakima River, which are further described below.



DATA SOURCE: (Source: WSDOT 2016, NLCD 2016, ESRI 2016)

Bonneville
POWER ADMINISTRATION

N

0 1,000 2,000 Feet

USGS NATIONAL LAND COVER DATABASE – LAND USE

FIGURE 3.1-1

3.1.1.3 Zoning

The hatchery site is zoned Agriculture 20 (A-20 per the Kittitas County Zoning Ordinance (KCC Title 17; 2016b). The intent of this zoning classification is to preserve fertile farmland from encroachment by nonagricultural land uses, and protect the rights and traditions of those engaged in agriculture (KCC Section 17.29.010; 2016b). A-20 is Resource land, which allows resource-based industries, including but not limited to recreation-related tourism, agriculture, fisheries, forestry, and mining. Properties surrounding the hatchery site are zoned A-20, with the exception of an adjacent parcel, which is zoned Agriculture 5 (A-5).

The Yakima River is considered a shoreline of the state, as defined under the Washington State Shoreline Management Act (Revised Code of Washington [RCW] 90.58) and its associated rules (Washington Administrative Code (WAC) 173-18) and as designated under the Kittitas County Shoreline Master Program (Kittitas County 2016a). The shoreline and upland areas within 200 feet of the Yakima River's ordinary high water mark are also included in the shoreline jurisdiction. Shoreline types in the area include Rural Conservancy and Aquatic shorelines. Shoreline uses are regulated under the Kittitas County Shoreline Master Program (Kittitas County 2016a) and are generally limited to water-dependent uses that do not result in a loss of shoreline ecological functions and are substantially consistent with the Shoreline Master Program (SMP). Under the Kittitas County SMP (2016a), aquaculture is an allowed use in the shoreline area. The Holmes Ranch property includes land within the shoreline jurisdiction of Kittitas County (SMP Chapter 1.2).

3.1.1.4 Comprehensive Plan Designation

Most properties around the Holmes Ranch property are designated Rural Working under Kittitas County's Comprehensive Plan (2016c), which generally encourages farming, ranching, and storage of agriculture products, and some commercial and industrial uses compatible with rural environment and supporting agriculture and/or forest activities. The hatchery site is designated Rural Working. An adjacent parcel is designated Rural Residential and a parcel approximately 2,000 feet to the south of the hatchery site is designated Mineral Lands.

3.1.1.5 Recreation

3.1.1.5.1 John Wayne Pioneer Trail

The John Wayne Pioneer Trail is a National Recreational Trail that is approximately 285 miles long, following a former rail line from the western slopes of the Cascade Mountains to the Idaho border. Horseback riders, bicyclists, and hikers use the western part of the trail that extends eastward from the Cascade Mountain foothills, through tunnels underneath Snoqualmie Pass, and along the banks of the Columbia River. West of the Columbia River, the trail is developed with amenities such as trailhead parking, signage, and restrooms, and the trail itself is maintained to a smooth surface. The trail continues east of the Columbia River but with minimal amenities and lesser use. The portion of the trail that crosses through the project study area occurs in the western segment, between mile points 71 and 72.

3.1.1.5.2 Yakima River and Tributaries

Recreational activities along the Yakima River include fishing, boating, swimming, camping, picnicking, wildlife viewing, scenic viewing, hiking, biking, and horseback riding. Designated recreational sites are concentrated southeast of the study area between Ellensburg and Yakima in the Yakima River Canyon, and in forested areas northwest of the study area. The study area occurs in what is known as the “farmlands stretch” of the river, which extends from Thorp to the Yakima River Canyon and flows through mostly private lands. This section is considered dangerous for floating due to the Yakima running high in the summer and strainers, side channels, and a spillover dam. A historic, low-gradient side channel of the Yakima River is located within the hatchery site.

3.1.2 Environmental Consequences of Proposed Action

3.1.2.1 MRS Hatchery Construction

Development of the proposed project would add a new resource-based land use (a hatchery) to the hatchery site and would expand the area of residential land uses. While construction of hatchery facilities is an allowed use within the A-20 zoning district, development of the hatchery would require a Conditional Use Permit and Floodplain Permit from Kittitas County. Construction of facilities within the shoreline jurisdiction would require a Shoreline Substantial Development Permit under the Kittitas County Shoreline Master Plan. Because the impact would be limited to the hatchery site and the project would be consistent with county plans and zoning, this would be considered a low impact to land use. Construction activities associated with the proposed project would not change land use or zoning.

Construction of the hatchery would result in short-term increases in truck traffic, air emissions, and noise (see Sections 3.2, 3.11, and 3.13). However, these impacts would be temporary, intermittent, and would mostly be noticeable within the immediate hatchery site. Therefore, construction impacts would be low on adjacent and surrounding land uses.

Construction activities would cause short-term impacts to recreational users on the John Wayne Pioneer Trail. During construction, potential trail users could experience increased noise, traffic, and air emissions as they pass along the northern project boundary. In addition, views in this area would be affected by the presence of construction equipment and personnel. However, impacts to potential trail users would be limited to a short segment of the trail and construction activities would not preclude continued use of the trail in a safe manner. The trail crosses over Klocke Road (a main construction entrance) via a pedestrian bridge; therefore, trail users would not be required to encounter road crossings with high levels of construction traffic.

3.1.2.2 MRS Hatchery Operation and Maintenance

The proposed development at the hatchery site is an allowed use under the Kittitas County Zoning Ordinance. Land use at the site would be a mix of resource-based and residential. Because both residential and resource-based uses are approved in areas zoned as A-20, the area would not need to be rezoned.

Development of the hatchery site would result in permanent impacts to approximately 4 acres of farmland soils. However, when considered at the county scale, the magnitude of this impact is low, representing less than 0.001 percent decrease in the amount of farmland soils available in Kittitas County. See Section 3.3.2.2 for additional information on impacts to agricultural soils.

Operation of the hatchery would be low impact in terms of truck traffic, air emissions, and noise and is therefore expected to have a low impact on adjacent and surrounding land uses (see Sections 3.2, 3.11, and 3.13).

The only operational impacts to recreational users on the John Wayne Pioneer Trail relate to visual resources (see Section 3.12). The MRS Hatchery would impact views along the portion of trail that is adjacent to the hatchery site; however, the number of visible structures and duration of visibility would depend on the viewer’s location and the extent of vegetative screening. New structures would be intermittently visible to trail users, and for only a short period of time as they pass along the northern project boundary (approximately 1,600 feet).

3.1.2.3 Acclimation and Release

Acclimation and release sites would be located on either private or U.S. Forest Service lands, with approval from the applicable landowner. Sites would be chosen where acclimation and release structures and operations would be compatible with existing land uses and zoning designations and would not require zone changes or conditional use permits. The acclimation and release sites would be low impact in terms of truck traffic, air emissions, and noise and therefore would have a low impact on adjacent and surrounding land uses or recreational sites and users (see Sections 3.2, 3.11, and 3.13).

3.1.2.4 Cumulative Effects

Based on development trends in Kittitas County, current land use in the study area is not expected to change significantly over the next 50 years. There are no major commercial or residential developments planned in Kittitas County in the foreseeable future. In addition, there are no transportation or recreational projects planned within the study area in the foreseeable future. The proposed project would result in the development of the hatchery site, but would not convert existing zoning designations or preclude existing land uses from continuing on adjacent and surrounding properties. Therefore, the incremental impact of the project to past, present, and reasonably foreseeable future land use and recreation impacts would be low.

3.1.2.5 Mitigation Measures

Because of the low magnitude of impacts on land use and recreation, no mitigation measures are recommended.

3.1.3 Environmental Consequences of No Action Alternative

Current land uses in the study area would remain under the No Action alternative. No new facilities would be constructed, and temporary disruptions to adjacent properties, recreational sites and activities, and land uses would not occur. Under the No Action alternative, the three new acclimation and release sites as part of the YKFP would be used and use of current acclimation and release sites would continue. As with the Proposed Action, the acclimation and release sites would be low impact in terms of truck traffic, air emissions, and noise and therefore would have a low impact on adjacent and surrounding land uses or recreational sites and users.

3.2 Transportation

3.2.1 Affected Environment

The study area for transportation includes the road network surrounding the hatchery site, as well as the roads used to access acclimation sites. Roads and highways that are currently used to access the hatchery site include I-90, U.S. Highway 97 (US 97), State Route 10 (SR 10) and Klocke Road. Acclimation and release sites are located on private and public lands accessed primarily by low volume state local roads.

I-90, located south of the hatchery site, is a 4-lane, divided paved highway with a speed limit of 70 mph. This Interstate highway travels through the Washington cities of Spokane, Vantage, and Seattle. The highway is owned and maintained by WSDOT. Average daily traffic volume on I-90 near the project (milepost [MP] 101 to 106) was 28,000 vehicles in 2015 (WSDOT 2015).

US 97, located north of the project, is a 2-lane undivided paved road with a speed limit of 65 mph. US 97 begins in north-central California and ends in north-central Washington, traveling though the Washington cities of Yakima, Ellensburg, and Wenatchee. The highway is owned and maintained by WSDOT. Average daily traffic volumes on US 97 near the project (MP 136 to 137) was 2,600 vehicles in 2015 (WSDOT 2015).

SR 10, located north of the hatchery site, is a 2-lane, undivided paved road with a speed limit of 55 mph. SR 10 is owned by WSDOT and maintained by Kittitas County. It begins north of Ellensburg (south of the hatchery site) and continues approximately 20 miles north until it terminates just south of the city of Cle Elum. The route generally runs parallel to US 97. Average daily traffic volume on SR 10 near Klocke Road (MP 103 to 105) was 1,300 vehicles in 2015 (WSDOT 2015).

Klocke Road is a 2-lane, undivided paved road with a speed limit of 25 mph. The road, which would serve as the main access for the hatchery site, runs along the eastern boundary of the Holmes Ranch property and terminates at the intersection with SR 10. The road dead ends in a rural residential neighborhood and is therefore only used by residents to access their homes. The road is owned and maintained by Kittitas County Public Works. The road currently has no existing maintenance or operational issues. Average daily traffic on Klocke Road was 211 vehicles in 2015 (Kittitas County Public Works 2016).

3.2.2 Environmental Consequences of Proposed Action

3.2.2.1 MRS Hatchery Construction

Construction would cause a short-term (16.5 month) increase in local traffic due to employees, material delivery trucks, and dump trucks traveling to and from the hatchery site every day. The total number of vehicle round-trips during construction would range from a minimum of 20 per day to a maximum of 60 per day. This construction traffic would have a low impact on transportation and traffic in the study area because it would be of short duration and would involve short segments of local and regional roads. Most construction traffic arriving at the site would approach from I-90 using Exit 106 and turning onto US 97. The route would be approximately 2.5 miles on US 97, then approximately 1 mile on SR 10 to Klocke Road. The hatchery site is approximately 0.1 mile south on Klocke Road from the SR 10/Klocke Road intersection. The increased traffic would be relatively unnoticeable by local residents and travelers on I-90 and US 97, and major traffic delays or road closures are not anticipated on these highways.

Daily construction traffic on SR 10 and Klocke Road would likely be noticeable to other travelers on that road because trucks would be slowing to turn into the construction site where there is currently minimal traffic. Construction workers would likely access the site in the morning and depart in the evening, limiting the presence of most construction vehicles on SR 10 and Klocke Road to two short periods during work days. Other travelers on the road would likely adjust to the presence of construction-related vehicles by timing trips accordingly or adjusting to short delays. Although existing users may experience delays, depending on whether or not their timing of use coincides with that of construction vehicles, the use of Klocke Road during construction is not expected to result in roadway maintenance, safety, or operational issues.

Construction of the proposed access road off Klocke Road would involve work activities within, or connected to, Kittitas County right-of-way, and would therefore require an access permit from Kittitas County Public Works Department. Work activities would need to comply with Kittitas County road standards and access permit conditions.

3.2.2.2 MRS Hatchery Operation and Maintenance

Long-term operation of the project would result in low localized traffic impacts due to increased traffic associated with the new residences and additional employees at the hatchery. Residents, employees, and delivery trucks are estimated to generate between 7 and 10 vehicle trips per day during operation of the hatchery. However, roads in the project area would remain unchanged and traffic would not noticeably increase as a result of the project. There would be no transportation impacts detectable at the regional (Kittitas County) level and no impacts to regional transportation facilities in the study area would be anticipated.

3.2.2.3 Acclimation and Release

Trucks would be used to transport parr and smolts to various acclimation and release sites throughout the upper Yakima and Naches River basins. Approximately one truck per day would travel from the hatchery to the acclimation and release sites between late-February and mid-April. The infrequent and low numbers of vehicle trips to acclimation sites would not result in noticeable traffic increases at the local or regional levels. Impacts to existing transportation facilities are not anticipated.

3.2.2.4 Cumulative Effects

Only one transportation improvement project was identified as currently occurring within the study area road network (WSDOT 2016): WSDOT's US 97/Old Highway 10 Railroad Crossing Improvements Project. This project proposes to upgrade existing signals with

LEDs and install illumination. The project is located approximately 0.8 mile southeast of the hatchery site. Construction began in 2016 and will continue through 2017.

In addition, there are other future transportation improvement projects that are planned for construction between 2016 and 2018 that would affect roads that traverse the study area (WSDOT 2016):

- **US 97/Dolarway Intersection Improvements (WSDOT).** Located approximately 3 miles southeast of the hatchery site, this project would provide several intersection improvements, including a new roundabout at the US 97/Dolarway intersection, adding a right turn lane to the westbound I-90 off ramp, and adding a lane on northbound US 97 between the I-90 off ramp and Dolarway. Construction is planned for 2017.
- **SR 10/SR 970 to US 97 Chip Seal (WSDOT).** This project proposes to chip seal the road along this approximately 16-mile segment, including the segment that would be used by project-related traffic, to repair normal wear and tear and extend the life of the pavement. Construction is planned for 2017.
- **I-90/Thorp Highway Interchange Paving (WSDOT).** This project, located approximately 1.5 miles northwest of the hatchery site, proposes to repave the roadway to repair normal wear and tear. Construction is planned for 2018.
- **McManamy Road Bridge Replacement over Dry Creek (Kittitas County).** This project proposes to replace the McManamy Bridge over Dry Creek. The project is located approximately 0.6 mile east of the hatchery site and construction is planned for 2018.
- **I-90/Yakima River Bridge Deck Rehabilitation West of Ellensburg WB/EB (WSDOT).** This project proposes to repair and resurface the existing bridge deck for the I-90 Bridge over Yakima River. The project is located approximately 0.4 mile west of the hatchery site, and construction is generally planned to begin between 2018 and 2020.
- **I-90/US 97 Interchange Paving (WSDOT).** This project proposes to repave the roadway to repair normal wear and tear. Construction is planned for 2018.

Construction of the hatchery is expected to begin in 2017 and would last approximately 16.5 months; therefore, construction schedules for the Proposed Action and the projects listed above could potentially overlap. Having multiple construction projects occurring simultaneously within a short distance of each other could potentially result in cumulative traffic impacts. However, WSDOT and Kittitas County Public Works would be notified by the construction contractor in advance to determine if construction schedules would overlap, and if so, efforts to avoid and minimize traffic impacts would be coordinated with the agencies. Potential solutions might include shifting construction schedules to accommodate one another, or changing planned access routes to construction sites to distribute the construction traffic and prevent congestion on main roads.

Long-term operation of the project would not result in noticeable increases in traffic to and from the site, and continued rural development in the study area is expected to have a minimal impact on transportation and traffic given the low housing and population densities that are characteristic of rural areas. There are no reasonably foreseeable actions that, when combined with the proposed project’s operations, would contribute to a cumulative adverse effect on transportation in the study area. Therefore, the impact of the Proposed Action, when added to other past, present, and reasonably foreseeable future actions, would be low.

3.2.2.5 Mitigation Measures

The following mitigation measure would be implemented to avoid or minimize impacts to transportation during construction at the hatchery site:

- Employ traffic control flaggers and post signs warning of construction activity and merging traffic, when necessary, for interruptions of traffic.

3.2.3 Environmental Consequences of No Action Alternative

Under the No Action Alternative, there would be no construction-related traffic, and existing transportation facilities would remain unchanged. No change in traffic patterns or access for local transportation corridors is expected. Trucks would continue to be used to transport parr and smolts to various acclimation and release sites throughout the upper Yakima and Naches basins, including the three new acclimation and release sites.

3.3 Geology and Soils

3.3.1 Affected Environment

The study area for geology and soils encompasses the Holmes Ranch property and the area of soil disturbance during construction (i.e., the hatchery site), as well as the surrounding geological landscape that may influence, or indicate onsite conditions at the hatchery site and the acclimation sites.

The study area is within the Columbia Basin geologic province, near its western boundary. The Columbia Basin province is an arid, lowland area characterized by steep river canyons, extensive plateaus, and in places, tall and sinuous ridges (WDNR 2016a). The land surface is covered by loess, which consists of fine sediments deposited by the wind, and deposits from cataclysmic glacial floods that occurred 14,000 to 1 million years ago. These deposits are underlain by thousands of feet of Columbia River Basalt Group, which was formed by lava flows between 6 and 16 million years ago. These flows and most of the sediment above them have been deformed by the regional Yakima fold and thrust belt, which is a series of giant folds and faults created by compression forces in the region over the last 3 million years (WDNR 2016a). Many of the faults in the Yakima fold and thrust belt are still active today, creating an earthquake hazard for the region. The study area is located within the northern extent of the Yakima fold and thrust belt; however, the nearest faults occur more than 5 miles from the hatchery site (WDNR 2016b).

Geotechnical investigations were performed at the hatchery site in May 2016 to determine existing subsurface conditions and to inform the design of hatchery facilities (e.g., foundations, retaining walls, drainage, etc.). Results of investigations indicate a relatively thin organic topsoil layer and shallow silty- to clayey-sand strata underlain by native, alluvial sandy-gravel soils at the site (Wallace Group Inc. 2016b). Some areas near existing building and structures have been filled with silty-sand substrate containing gravel and cobbles. Groundwater occurs at 2.5 to 5.5 feet below ground surface.

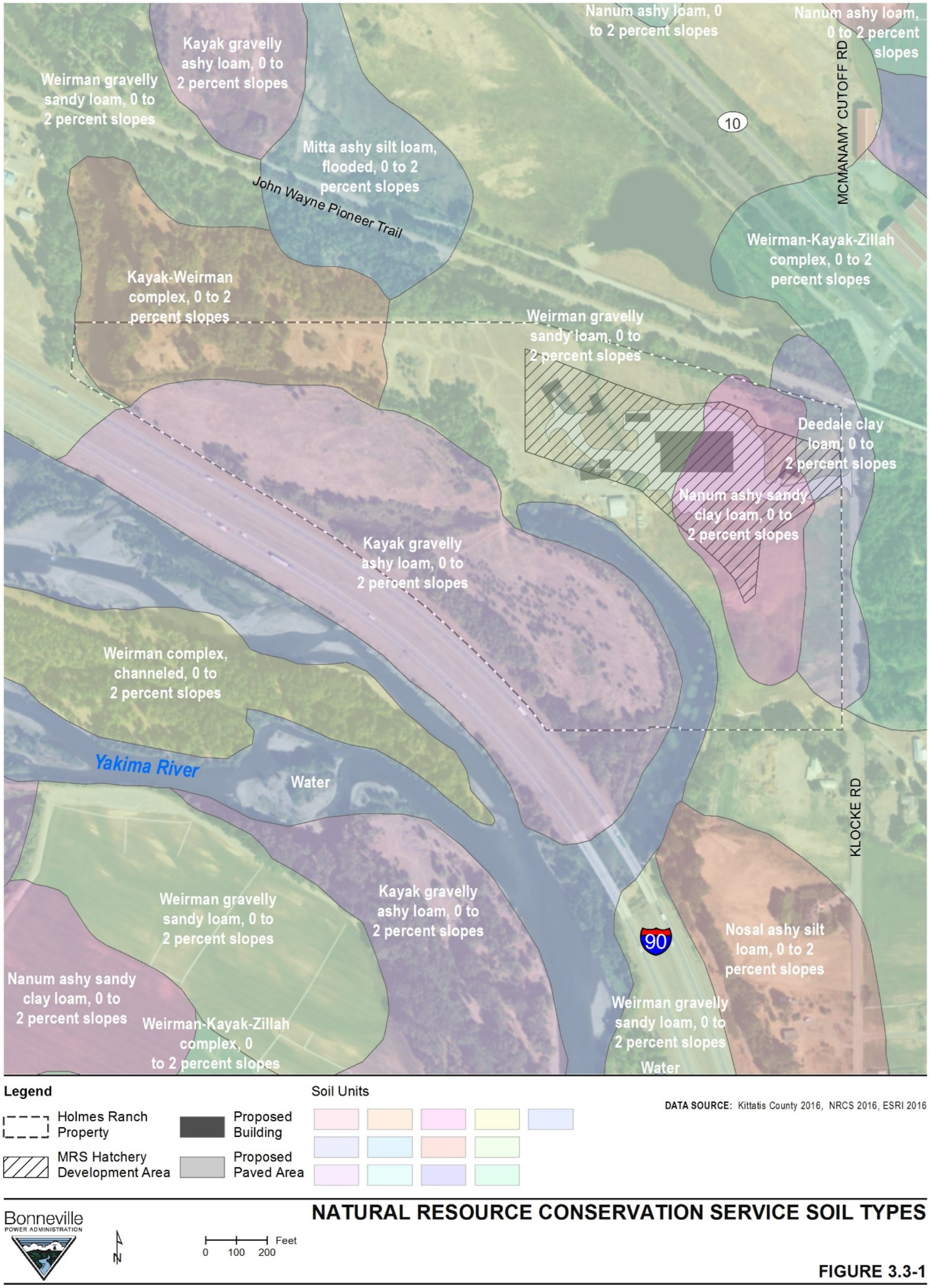
With seismic activity from the Yakima fault and thrust zone (Wallace Group Inc. 2016b), the hatchery site is mapped as having a moderate to high susceptibility for liquefaction, and a National Earthquake Hazard Reduction Program seismic rating of class D or E, which indicates softer soil conditions and an increased risk of ground shaking amplification. Similarly, Kittitas County critical area maps, which are based off Uniform Building Code seismic risk zone maps, classifies the hatchery site as a seismic category C or D, depending on the parcel, which indicates a moderate to high level of seismic risk (Kittitas County 2016b).

Because the Holmes Ranch property is located within a valley and floodplain area, the site is relatively flat (slopes less than 5 percent) and gently slopes southeast toward the Yakima River (USGS 2016; Wallace Group Inc. 2016a and 2016b). According to Kittitas County critical area maps, neither steep slopes (slopes >35 percent) or landslide hazards are mapped within the study area (Kittitas County 2013a).

NRCS mapping shows five soil types within the Holmes Ranch property (Figure 3.3-1). Only three soil types are located within the smaller “development area” shown in Figure 3.3-1, which is the area where direct soil disturbance would occur due to earth moving activities (e.g., excavation or grading) and staging of construction equipment. Characteristics of these soils are included in Table 3.3-1.

About half of the hatchery site that would be developed is classified by NRCS as prime farmland or farmland of statewide importance. NRCS defines prime farmland as land that has the best combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops. Farmland of statewide importance includes areas that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. The remainder of the hatchery site that would be developed is not classified as farmland, meaning it is not considered suitable land for farming.

NRCS mapping shows soil types at mobile acclimation and release sites to include: Patnish-Mippon-Myzel complex, 0 to 3 percent slopes (Williams Creek), Toppenish silt loam (Ahtanum Creek), and Yakima silt loam (Cowiche Creek).



DATA SOURCE: Kittatis County 2016, NRCS 2016, ESRI 2016

NATURAL RESOURCE CONSERVATION SERVICE SOIL TYPES

FIGURE 3.3-1

Table 3.3-1. NRCS Soil Types within the Hatchery Site

Map Unit	Acres on Hatchery Site (Development Area)	Name	Surface Texture	Drainage Class	Parent Material	Erosion Hazard on Roads and Trails	Rutting Hazard	Farmland Classification [a]
715	4.0	Weirman gravelly sandy loam, 0 to 2 percent slopes	Gravelly sandy loam	Moderately well drained	Alluvium	Slight	Moderate	Not prime farmland
720	3.8	Nanum ashy sandy clay loam, 0 to 2 percent slopes	Ashy sandy clay loam	Somewhat poorly drained	Alluvium with an influence of volcanic ash in the upper part	Slight	Severe	Prime farmland if irrigated
789	0.5	Deedale clay loam, 0 to 2 percent slopes	Clay loam	Somewhat poorly drained	Alluvium	Slight	Severe	Farmland of statewide importance

[a] Soils associated with prime farmland as defined under the Farmland Protection Policy Act (7 USC 4201 et seq.) and as designated by NRCS state soil scientists as prime, important, or unique.

3.3.2 Environmental Consequences of Proposed Action

3.3.2.1 MRS Hatchery Construction

Construction of the hatchery would involve the disturbance of approximately 8.3 acres to support the development of the hatchery building, groundwater wells, access roads, holding ponds, residential facilities, water pump, and effluent treatment systems. The permanent footprint of project elements would cover 3.7 acres of the 8.3-acre development area that would be disturbed during construction. Site preparation would require clearing and grubbing of existing vegetation and grading to create a level surface. Some existing structures, such as the existing residence, barn, and other outbuildings, would be removed or demolished.

During the construction period, soils that would be exposed, disturbed, or stockpiled could erode and lead to sedimentation in adjacent waterbodies (i.e., Yakima River and historic side channel, New Cascade Canal, and Bypass) or wetlands. Vibrations from construction equipment could also cause soil movement at the site, having a low, short-term impact on soils. Erosion and sedimentation impacts would be minimized by using BMPs during the construction period, including but not limited to, the use of silt fences, stabilized construction entrances, sediment barriers, and sandbag check dams. Following construction, remaining exposed soils would be revegetated or stabilized with gravel.

The proposed hydraulic structures and piping and surface diversion structures on the New Cascade Canal would be located on medium dense to very dense sandy alluvial material, which would provide adequate subgrade support for the structures. Excavation and dewatering would be required to construct these structures, resulting in a low loss of riverbed. Erosion and sedimentation could occur in the surrounding area; however, this effect would be minimized by implementation of erosion and sediment control BMPs, including, but not limited to, use of silt fence, cofferdams, and sandbag walls. In addition, the construction contractor would be required to implement a dewatering plan that would include additional erosion and sedimentation control measures.

The study area has moderate to high seismic risk (Kittitas County 2016b); however, as noted in the geotechnical report for the project (Wallace Group Inc. 2016b), seismically-related hazards, including lateral spreading, landslides, and fault rupture, are not a concern for this project. Results of the liquefaction analysis indicate that seismic-induced subsidence potential from liquefaction is generally less than 0.5 inch (Wallace Group Inc. 2016b). As required by the 2016 International Building Code, the hatchery has been designed to sustain the maximum considered earthquake using seismic design criteria for Site Class C areas.

Long-term effects to soils and geology would result from soil and rock excavation and removal, and placement and compaction of fill. These activities would have site-specific minor adverse impacts on soils and geology by permanently altering the natural condition of these resources through human activity. The magnitude and intensity of the effect would be minor because it would occur only within the construction disturbance area and would not directly affect geology and soils outside of that area.

3.3.2.2 MRS Hatchery Operation and Maintenance

The project would not result in long-term impacts to geologic resources. In general, existing slopes and drainage patterns of undisturbed soils would remain intact and erosion and sedimentation would not increase as a result of the project. Some of the existing soils would be permanently replaced with base course, structural fill, or other types of fill.

Farmland soil types are defined under the Farmland Protection Policy Act (7 USC 4201 *et seq*.) and are designated by NRCS soil scientists to include prime farmland, unique farmland, and land of statewide or local importance. Approximately 3.8 acres of prime farmland (if irrigated and drained) and 0.5 acre of farmland of statewide importance would be disturbed during construction, and 1.8 acre and 0.2 acre, respectively, would permanently be unavailable for agricultural use.

According to NRCS Web Soil Survey data for Kittitas County, the Holmes Ranch property owned by the Yakama Nation contains 7.0 acres of prime farmland and 5.3 acres of farmland of statewide importance. Therefore, the project's permanent removal of 1.8 acres of prime farmland represents a 26 percent decrease in prime farmland on the Holmes Ranch property and removal of 0.2 acre of farmland of statewide importance represents a 4 percent decrease on the Holmes Ranch property. The county contains approximately 13,754 acres of prime farmland (if irrigated and drained) and 92,684 acres of farmland of statewide importance (NRCS 2016). On the county scale, the removal would be less than a 0.001 percent decrease in each of these categories.

Seismic hazards would remain a threat during operation of the hatchery; however, the project would not increase the project's seismic risk and all new structures would be designed to comply with the International Building Code seismic design criteria. In the event of an earthquake, some of the structures at the hatchery may withstand some damage, depending on the intensity and duration of the earthquake. The risk of fires, explosions, or hazardous material spills resulting from an earthquake would be minimal as the flammable or hazardous materials stored on-site would be limited to common place maintenance/shop materials such as motor oil, and diesel and gas for vehicles.

Hatchery workers would be made aware of the potential for seismic hazards and trained in proper earthquake response, including how to check for spills, leaks, and broken equipment in the aftermath. All equipment would be kept as far away from the shoreline area as possible, and storage areas would be fully contained to prevent the potential for spills and leaks into the Yakima River. Thus, operation and maintenance of the MRS Hatchery would have a low impact on geology and soils.

3.3.2.3 Acclimation and Release

No grading and minimal vegetation removal would be required at acclimation sites to provide a level surface for mobile acclimation tanks. The short-term duration of these tanks at acclimation sites would have a low to no impact on geology or soils.

3.3.2.4 Cumulative Effects

The primary activities that affect soils in the project vicinity are related to farming, grazing, and farmland conversion. According to the U.S. Department of Agriculture's (USDA) 2012 Census of Agriculture, the total acreage of farmland in Kittitas County decreased by approximately 4 percent between 2007 and 2012 (USDA 2012), which is higher than the national average for the same time period, a 0.8 percent reduction (USDA 2014). Although farmland conversion is likely to continue in Kittitas County as a result of ongoing urban growth and development, the project's contribution to farmland conversion would be low. In addition, seasonal wildfires can contribute to reduced vegetative cover and an increased risk of erosion. Implementation of erosion control BMPs and stabilization of disturbed areas following construction would ensure that the project would not contribute significantly to cumulative soil impacts. Therefore, the contribution of the project to cumulative soil and geology effects would be minor.

3.3.2.5 Mitigation Measures

To further minimize and mitigate for impacts to geology and soils, the project would incorporate the following measures:

- Minimize the construction disturbance area and removal of vegetation to the greatest extent possible.
- Locate staging areas in previously disturbed or graveled areas, where practicable, to minimize soil and vegetation disturbance.
- Conduct peak construction activities during the dry season (between June 1 and November 1) as much as possible to minimize erosion, sedimentation, and soil compaction.
- Prepare and implement an SWPPP as part of an NPDES Construction Stormwater General Permit obtained from Ecology that would include appropriate BMPs such as delineation of construction limits within 200 feet of streams and wetlands and installation of silt fences, straw bales, and jute matting.
  - Erect silt fencing per Ecology's BMP C233. Erect silt fencing along the entire building footprint to the south and along the western perimeter. This fencing area includes all potential areas that slope toward the historic side channel/Bypass to preclude entry of sediment into riparian areas and stream channels.
  - Erect sediment barriers per Ecology BMP C235.
- Inspect erosion and sediment controls weekly, maintain them as needed to ensure their continued effectiveness, and remove them from the proposed hatchery site when vegetation is re-established and the area has been stabilized.
- Minimize the area of soils exposed at any one time and use dust abatement measures when necessary
- Prepare and implement a fugitive dust control plan, including the use of water trucks or other appropriate methods to control dust during construction, the use of gravel on access road surfaces in areas of sustained wind, and the establishment of a 15-mph speed limit for construction vehicle use on unpaved roads and surfaces.

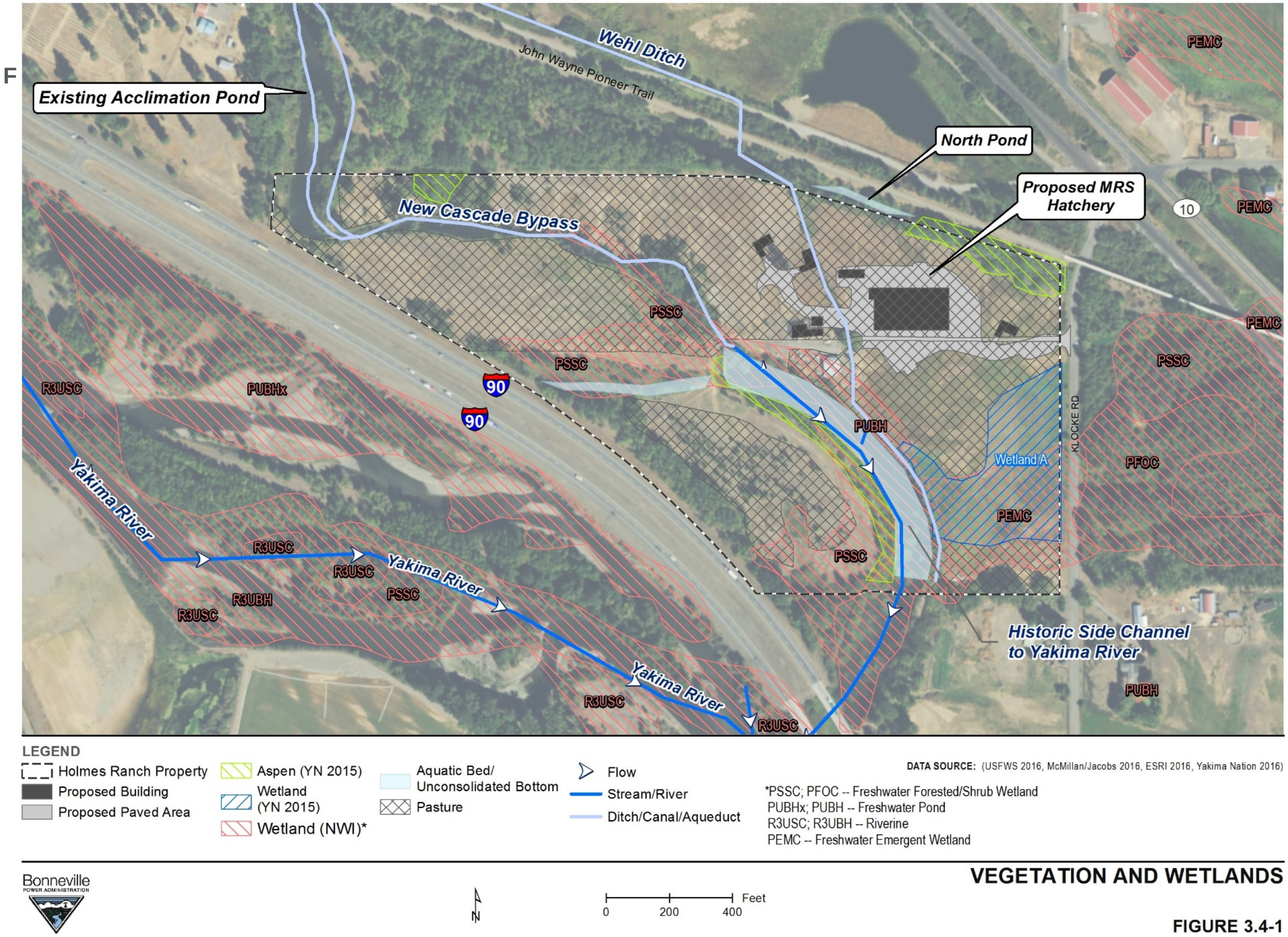
3.3.3 Environmental Consequences of No Action Alternative

The No Action alternative would not involve any construction or other ground-disturbing activities; therefore, no disturbance to geologic resources in the study area would occur. Natural geologic processes would continue unaffected, no special topographic features or rare soil types would be affected, and there would be no increased risk of erosion or landslide. No direct or indirect effects to soils or geologic resources would result from this alternative. In addition to the continued use of current acclimation and release sites, the use of the three new sites would be implemented under the larger YKFP. No ground disturbance would be expected.

3.4 Vegetation

3.4.1 Affected Environment

The study area for the assessment of potential impacts on vegetation includes all vegetation that could be impacted during construction and operation of the proposed project. For the Proposed Action, the study area for vegetation includes lands within 200 feet of the construction limits of the proposed MRS Hatchery, the New Cascade Canal Diversion Structure, and the New Cascade Canal Fish Screening Facility (Figure 3.4-1 and Figure 3.4-2). The study area also includes the area around the acclimation sites.

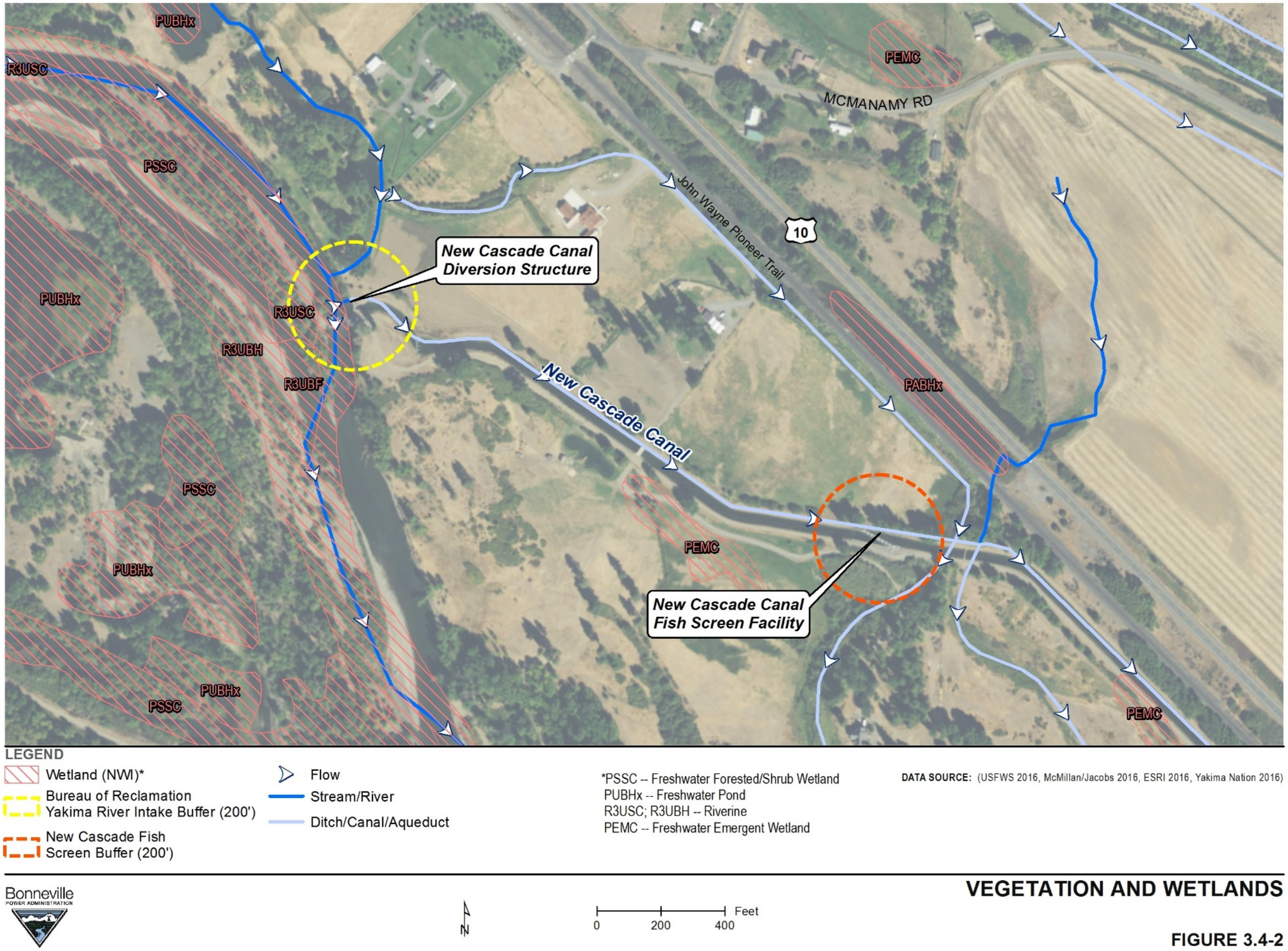


DATA SOURCE: (USFWS 2016, McMillan/Jacobs 2016, ESRI 2016, Yakima Nation 2016)

*PSSC; PFOC -- Freshwater Forested/Shrub Wetland
PUBHx; PUBH -- Freshwater Pond
R3USC; R3UBH -- Riverine
PEMC -- Freshwater Emergent Wetland

VEGETATION AND WETLANDS

FIGURE 3.4-1



DATA SOURCE: (USFWS 2016, McMillan/Jacobs 2016, ESRI 2016, Yakima Nation 2016)

VEGETATION AND WETLANDS

FIGURE 3.4-2

3.4.1.1 Existing Vegetation Communities

The Yakima Basin is part of the larger Columbia River Basin ecological province (Franklin and Dyrness 1988). The basin consists of the slopes of the forested East Cascades down to the dry channeled scablands of the Columbia Plateau ecoregions (Camp et al. 2011). Typical vegetation consists of eastside mixed conifer forest dominated by Douglas-fir and ponderosa pine woodland in the lower elevations. In the shrub steppe lowlands, big sagebrush dominates along stream channels, valley bottoms, and flatlands. Along the Yakima River, conifer-riparian habitat includes stands of willow, quaking aspen, and ponderosa pine/Douglas-fir (Johnson and O’Neil 2001).

The study area for the MRS Hatchery site consists of developed agriculture, pasture, and some riparian and herbaceous wetlands along the Yakima River (Johnson and O’Neil 2001). Vegetation on the hatchery site mainly consists of fallow pasture that has not been grazed for approximately 12 years (Figure 3.4-1). Grass and herbaceous species observed in May 2016 included cheatgrass, tansymustard, orchardgrass, common teasel, tall fescue, barley, timothy, bulbous bluegrass, bentgrass, and ryegrass.

Riparian vegetation is present along the New Cascade Bypass and the historic side channel to the Yakima River in the southwest portion of the study area. These riparian corridors have been altered by the bypass diversion and other historic agricultural practices and water resource development. Willow species, black cottonwood, quaking aspen, and other deciduous trees are the dominant species near the New Cascade Bypass. The understory of the New Cascade Bypass riparian area is dominated by reed canarygrass, coyote willow, and common horsetail. Second-growth ponderosa pine trees are located in the transition zone between riparian and pasture communities. Vegetation along the historic side channel to the Yakima River consists of a narrow band of willows and roses on the north side and a narrow band of aspen on the south side of the channel. Another aspen stand is located in the northeast portion of the site, adjacent to the John Wayne Pioneer Trail.

The study area for the New Cascade Canal facilities is comprised predominantly of agriculture, pasture, and small inclusions of remnant native vegetation (Johnson and O’Neil 2001), along with limited riparian and herbaceous wetlands (Figure 3.4-2). Lands immediately adjoining the New Cascade Canal are the dirt access roads with limited vegetative cover. Further along the unvegetated canal to the fish bypass, there are a limited number of trees and understory vegetation. In the rest of the extent of the study area, there are patches of riparian vegetation along the New Cascade Bypass as well as agricultural, developed, or pasture lands. The Yakima River riparian corridor west of the canal consists of a large, intact stand of second-growth to mature black cottonwood trees.

The acclimation and release sites are predominantly herbaceous and shrub with limited riparian vegetation along adjacent creeks.

3.4.1.2 Priority Habitats

The WDFW Priority Habitats and Species Program designate individual plant species and/or vegetative composition areas that provide unique or significant value to the state. Priority habitats in the MRS Hatchery study area are wetlands and riparian habitats.

WDFW requires that impacts to priority habitats from the proposed project be avoided, minimized, or mitigated. Wetlands are discussed in Section 3.6.

Riparian areas are defined as “the area adjacent to aquatic systems with flowing water (e.g., rivers, perennial or intermittent streams, seeps, springs) that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other” (Knutson and Naef 1997). Riparian habitats are even more important in dry areas such as the Columbia Plateau, which typically only gets between 8 and 14 inches of rain per year (Camp et al. 2011).

As described above, riparian habitat in the MRS Hatchery study area occurs along the New Cascade Bypass and historic side channel to the Yakima River located to the southwest of the proposed facility. Historic disturbance to the Yakima River and its floodplains and tributaries has reduced the extent and function of riparian communities over time; however, remnant riparian corridors can still provide critical water quality, wildlife, and fish habitat functions (Knutson and Naef 1997).

Riparian habitat in the immediate vicinity of the New Cascade Canal is very limited and fragmented by bare ground that was likely disturbed during creation of the canal or other infrastructure for nearby agriculture. Riparian habitat occurs along the New Cascade Bypass to the south of the fish screening facility and the large intact riparian corridor along the Yakima River to the west.

3.4.1.3 Rare Plants

Washington Department of Natural Resources (WDNR) maintains a state list of plants that meet unique criteria as sensitive, threatened, or endangered within Washington State and are designated under the Washington Natural Heritage Program. These are provided different protection than federally-listed species, but still need to be taken into consideration for state and local planning. Appendix B has a list of all rare plant species that occur in Kittitas County.

No rare plants were observed or documented to be in the MRS Hatchery study area, although there is suitable habitat for many of the state-listed plants (WDNR 2014, WDFW 2016c). A list of potential rare plants that could occur in the project site is provided in Appendix B. This list was created by matching WDNR state- and federally-listed plant species with the existing habitat conditions in the area.

3.4.1.4 Noxious Weeds

The Washington State Noxious Weed Control Board defines noxious weeds as nonnative species that contribute to the loss of agricultural production or ecological diversity (Washington State Noxious Weed Control Board 2016). Kittitas County maintains a list of plant species considered to be noxious and classifies them as A, B, or C (Appendix C).

- Class A weeds are nonnative species that are limited in distribution in some portions of the state but very abundant in others. State law (Chapter 17.10 RCW and WAC Chapter 16-750) requires these plants be eradicated.

- Class B weeds are either absent or limited in distribution to some portion of the state but abundant in others. These plants should be contained and not allowed to spread to new areas.
- Class C weeds are widespread through Washington State. Counties can choose to enforce control or educate residents about controlling Class C noxious weeds.

Common teasel, which is a class C noxious weed according to Kittitas County (2015), was noted on the MRS Hatchery site during the May 25, 2016, site visit. No other noxious weeds were observed on the MRS Hatchery site or in the vicinity of the New Cascade Canal facilities, although there is a large amount of habitat that could be at risk to be colonized by invasive plant species.

3.4.2 Environmental Consequences of Proposed Action

3.4.2.1 MRS Hatchery Construction

The Proposed Action would require up to 3.7 acres of permanent vegetation removal for the new MRS Hatchery and appurtenant features. Construction activities would temporarily impact vegetation on up to 4.8 additional acres. Temporary impacts are defined as clearing of vegetation for the duration of construction, after which time disturbed areas would be revegetated. Pasture and grassland is the predominant vegetation group that would be impacted; the removal of a few trees would also occur. Temporarily disturbed areas would be replanted with native vegetation. Temporary impacts would be short term and could be prevented with appropriate BMPs (see Section 3.4.2.5).There would be no impacts to federal- or state-listed plants because no such designated species or suitable habitat occur on the MRS Hatchery site.

3.4.2.1.1 New Cascade Canal Diversion and Fish Passage Facility

Construction activities at the canal diversion and fish passage facility would only result in temporary loss of sparse grasses and forbs. Areas that are disturbed during construction would be revegetated after construction with appropriate native vegetation. The impact on vegetation would be low.

3.4.2.2 MRS Hatchery Operation and Maintenance

Routine maintenance of the MRS Hatchery site would include mowing grass; maintaining trees and shrubs; and removing hazard trees, dead trees, or branches. This process would remove plant materials that would otherwise be mineralized and provide nutrients into surrounding habitats. In addition, vehicles and other human movement into the area could carry invasive species into the study area, which could affect plant community composition. This impact would be low.

3.4.2.2.1 New Cascade Canal Diversion and Fish Screening Facility

Operation and maintenance of the modified New Cascade Canal facilities would have no effect on vegetation communities as operations would be passive and not require substantial vegetation maintenance on the access roads or in the New Cascade Canal.

The project proposes a diversion of up to 10 cfs during the nonirrigation season (November-March) from the Yakima River to the New Cascade Canal, which would be returned to the river at the historic side channel of the Yakima River, adjacent to the proposed hatchery. This would reduce flows to a 6,900-foot-long reach of the Yakima River by up to 10 cfs. This operation is not anticipated to have a significant impact on riparian vegetation communities on the Yakima River because the surface water diversions are relatively small compared to overall flows on the river (Section 3.5.2.2), and the operation would largely occur outside of the growing season.

3.4.2.3 Acclimation and Release

Acclimation and release activities at other sites within the basin would have no long-term impacts and would result in low to no impacts to vegetation. Any vegetation removal required for mobile acclimation units would be minimal and temporary.

3.4.2.4 Cumulative Effects

The Proposed Action would permanently remove up to 3.7 acres of pasture vegetation. Considered with past, present, and reasonably foreseeable future actions that have resulted in the loss of vegetation in the region, the proposed project would have a low incremental impact loss of pasture vegetation.

3.4.2.5 Mitigation Measures

To further minimize and mitigate for impacts to vegetation and wetlands, the project would incorporate the following measures:

- Inspect equipment to remove vegetation and dirt clods that may contain noxious weeds.
- Dispose of excavated noxious weeds in a manner that prevents reestablishment in wetlands and adjacent areas.
- Implement a revegetation plan to restore native plant communities, provide wildlife habitat, reduce the risk of weed encroachment, and ensure adequate growth.
    - Reseed disturbed areas after construction and regrading are complete, at the appropriate time period for germination.
    - Monitor germination of seeded areas; if vegetative cover is inadequate, implement contingency measures and reseed to ensure adequate revegetation of disturbed soils.

3.4.3 Environmental Consequences of No Action Alternative

Under the No Action alternative, no new construction would occur in the project sites, and no vegetation would be removed. Plant composition may change over time due to flood events, natural succession, and fire suppression. Noxious weeds, if not managed, could spread and lower the overall diversity of plant species within the study areas. Continued use of existing acclimation and release sites would have low to no impact on vegetation communities. Any vegetation removal required for mobile acclimation units would be minimal and temporary.

3.5 Water Resources

3.5.1 Affected Environment

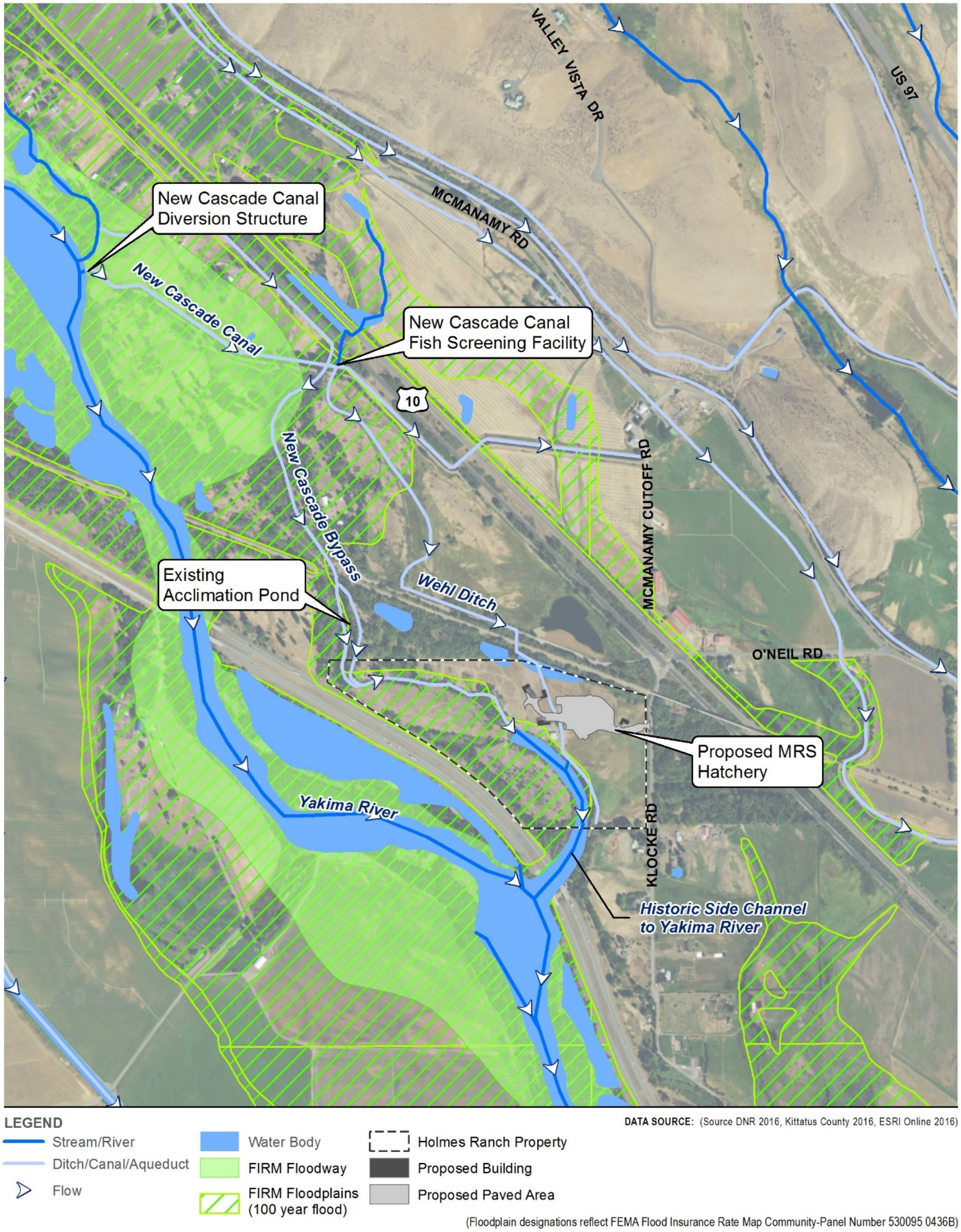
This section describes the groundwater, hydrology, water rights, and water quality potentially affected by the MRS Hatchery. The proposed MRS Hatchery is located on a historic side channel of the Yakima River near RM 60 (Figure 2.2-1; Figure 3.5-1). The study area for water resources includes all surface waterbodies and groundwater that would be directly or indirectly affected by facility construction and operation. The surface waterbodies include:

- The reach of the Yakima River that begins just upstream of Reclamation’s existing New Cascade Canal diversion, and ends approximately 300 feet downstream of the existing side channel confluence with the Yakima River.
- The New Cascade Canal from Reclamation’s diversion to the fish screening structure.
- The New Cascade Bypass from the New Cascade Canal fish screen to the historic side channel.
- The historic side channel from the New Cascade Bypass to its confluence with the Yakima River.
- Wehl ditch from the project property boundary to the historic side channel.

Groundwater potentially affected by the project is associated with the alluvial aquifer that underlies the proposed hatchery site.

3.5.1.1 Groundwater Hydrology

The hatchery site is underlain by an alluvial aquifer composed of alluvial silty-sand and clayey-gravel soil strata. The primary water-bearing zone is composed of these two strata. Brown clay with sand and gravel occurs beneath this water-bearing zone and likely functions as an aquitard (a zone of the earth restricting the flow of groundwater from one aquifer to another). The aquifer is less than 30 feet deep, highly transmissive, and is heavily influenced by the Yakima River and irrigation water (Wallace Group Inc. 2012 and Wallace Group 2016c; see Appendix G).



DATA SOURCE: (Source DNR 2016, Kittatus County 2016, ESRI Online 2016)

(Floodplain designations reflect FEMA Flood Insurance Rate Map Community-Panel Number 530095 0436B)

Bonneville POWER ADMINISTRATION

SURFACE WATERBODIES NEAR THE HATCHERY SITE

FIGURE 3.5-1

Based on well data available from Ecology, static water levels in monitoring wells on the hatchery site indicate typical groundwater depths range from a few to several feet below the ground surface (Table 3.5-1; Ecology 2016a). Nearby emergent wetland plant species (outside the buildable area near the southern portion of the property) and standing water to the north of the property also indicate the presence of shallow groundwater levels.

Table 3.5-1. Attributes of Groundwater Wells at the Hatchery Site

Well Number	Completion Date	Well Type	Total Well Depth[a] (feet)	Static Water Level[a] (feet)
AEM547	10/20/1999	Water supply (domestic use)	180	60
BHJ063	9/29/2011	Monitoring	31	8
BHJ062	9/28/2011	Monitoring	80	8[b]
BHJ060	9/27/2011	Water supply	26	9
BIY880	5/11/2016	Monitoring	28	2.4
BJN473	7/12/2016	Water Supply	36	2.5

[a] Well depth and water levels are relative to the ground surface (i.e., feet below ground surface) or the top of the well.

[b] Depth indicates the top of the water bearing zone, as indicated on the well log.

Source: Ecology 2016a

Groundwater temperatures are similar to surface water temperatures during the irrigation season (Table 3.5-2), indicating that the alluvial aquifer materials are hydraulically conductive and are connected with the river and irrigation canals. Results of geophysical investigations performed at the hatchery site indicate that hydraulic conductivity is highest in the eastern portion of the site, where subsurface water-bearing features (e.g., buried stream channels) are more prominent (Wallace Group Inc. 2016b).

Table 3.5-2. Groundwater (Study Area) and Surface Water Temperature (Yakima River near Horlick)

Month	Groundwater Temperature (°F)	Surface Water Temperature (°F)
January		35.6
February	48.5	37.2
March		40.1
April		44
May		48.8
June		51.8
July		56
August		62.4
September	58.5	59.2
October		51.7

Table 3.5-2. Groundwater (Study Area) and Surface Water Temperature (Yakima River near Horlick)

Month	Groundwater Temperature (°F)	Surface Water Temperature (°F)
November		41.5
December		36.6

Source: Surface water temperatures: Reclamation 2015a
Groundwater temperatures: Wallace Group, Inc. 2012; see Appendix G

Because the alluvial aquifer is relatively thin (30 feet) and hydraulically conductive, it is sensitive to recharge and storage. This was confirmed by aquifer pump tests performed during the irrigation season (April-October) and nonirrigation season (November-March). In these tests, rapid aquifer recharge occurred during both the irrigation and nonirrigation seasons (Wallace Group Inc. 2012 and Wallace Group Inc. 2016c; see Appendix G).

In 2011, the pump test during the irrigation season involved pumping groundwater at one well for 10 hours at a maximum rate of 0.27 cfs. This resulted in aquifer drawdown of 2.7 feet at the pumping well and 0.4-foot in observation wells 50 feet and 20 feet away. Water levels recovered to pre-pumping elevations within 3 minutes of pump shutdown. During the nonirrigation season, groundwater pumping over 72 hours from one well at a maximum rate of 0.25 cfs resulted in a maximum aquifer drawdown of 13.5 feet at the pumping well (maximum drawdown occurred within the first 22 hours; there was no additional drawdown during the last 50 hours of pumping) and 0.5-foot at the observation wells 50 feet and 20 feet away. Water levels recovered to pre-pumping levels within 1 minute of pump shutdown. These pump tests indicate that upgradient irrigation water infiltrates the aquifer. Nonirrigation season drawdown is greater because of the lack of hydrologic contribution from upgradient irrigation canal seepage. Alluvial groundwater flow direction has not been modeled locally, but is assumed to flow towards the historic side channel and Yakima River. (Wallace Group Inc. 2012; see Appendix G).

An additional pump test was performed during the irrigation season in August 2016 (Wallace Group Inc. 2016c) using a new pumping well and observation well. The 2016 test included pumping from two wells simultaneously at withdrawal rates of 0.28 and 0.31 cfs for 42 hours and 24 minutes. The results of the test indicate initial drawdown within the pumping wells, and then recovery of the wells during the remainder of the test. The most drawdown in observation wells during the test was less than 0.3 foot after more than 42 hours of pumping. These results indicate the aquifer is highly-transmissive (i.e., the rate of groundwater flow through the aquifer is high).

Groundwater supply wells within 0.25 mile and downgradient (south and west) of the project site produce groundwater for domestic (i.e., residential) use, stock watering, and irrigation (Table 3.5-3). The City of Ellensburg has ten source water wells for its water supply. The three closest source water wells are Hayward Well, City Well, and Route 10 Well, all of which are upgradient and more than 0.25 mile from the proposed MRS Hatchery (City of Ellensburg 2014). The Hayward and Route 10 wells are deep wells (1,028 and 818 feet, respectively) that produce groundwater from the Ellensburg

Formation. The City Well is an infiltration gallery[4] that is in connection with the Yakima River alluvial aquifer, but it is located upgradient of the MRS Hatchery and diversion.

Table 3.5-3. Attributes of Groundwater Supply Wells within 0.25 Mile and Downgradient of the Hatchery Site

Parcel(s)	Approximate Distance to Nearest Proposed Hatchery Site Well	Quantity (cfs)	Season	Use
59433	450 feet	0.6	Year-round	Irrigation
59433	450 feet	Not Reported	Year-round	Domestic, stock watering
336233	1,800 feet	0.02	6 months per year	Irrigation
336233	1,800 feet	0.02	Year-round	Domestic

Source: https://fortress.wa.gov/ecy/waterresources/map/WCLSWebMap/default.aspx

3.5.1.2 Surface Water Hydrology

The nearest gauge recording Yakima River flow is operated by Reclamation and is located near Horlick, Washington, 11 RMs upstream of the project site. Flow during 2001 through 2015 ranged between 417 and 9,951 cfs and averaged 1,853 cfs (Figure 3.5-2). Typical winter flows are between 800 and 2,000 cfs. Flow levels in the upper Yakima River are managed for multiple uses, with three surface storage reservoirs upstream from the project area (Kachess, Keechelus, and Cle Elum Reservoirs). Runoff is stored in reservoirs in spring and released in early to mid-summer. During late summer and fall, reservoir releases are much reduced and the upper Yakima River is managed in a low flow condition.

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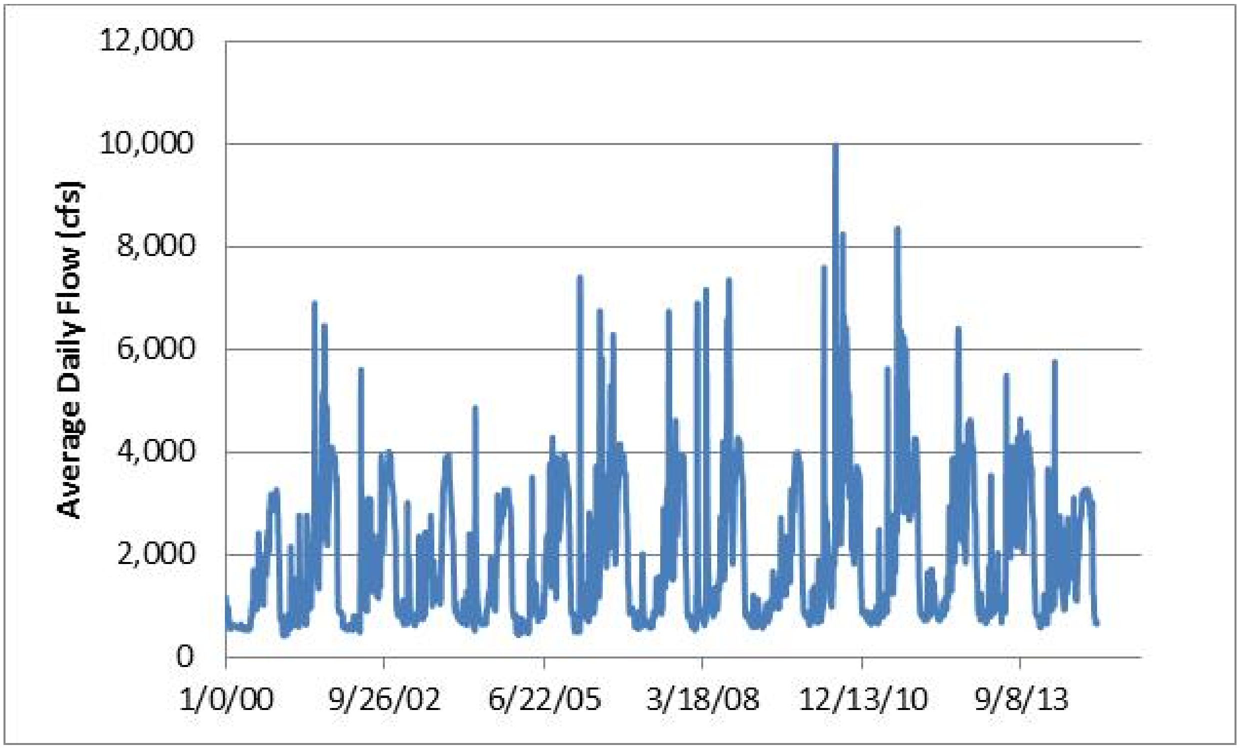
[4] Gallery systems harvest river water through a network of collection pipes installed under or beside the river bed.

Figure 3.5-2. Average Daily Flow on the Yakima River near Horlick, Washington – 2001 through 2015



Source: Reclamation 2015a

There are no instream flow requirements for the upper Yakima River; however, target flows (enacted by Congress) are in place in the Yakima Basin. Both target and instream flows are managed by Reclamation. Target winter flows for the reach of the Yakima River adjacent to the hatchery site (The Ellensburg Reach) are 980 cfs in November and increase to 1,982 cfs in March (Reclamation 2008). The *Yakima River Basin Integrated Water Resource Management Plan* objectives are to reduce flow by 1,000 cfs beginning July 1, and reach a flow of 1,000 cfs by August 31 (Reclamation 2012). The *Yakima River Basin Integrated Water Resource Management Plan* does not include objectives for winter flows.

Additional surface waterbodies associated with the project area include the New Cascade Canal, the New Cascade Bypass, and the historical side channel. Descriptions of these waterbodies, including their managed hydrology are provided in Section 3.7.1.1.

3.5.1.3 Water Rights

Surface water rights in the Yakima Basin are currently under adjudication, indicating that available water has already been allocated to existing uses (Ecology 1977 and 2014a). Adjudication is intended to review all claimed water rights and rule on their validity, quantification, and priority. The adjudication has affirmed very early priority date water rights held by the Yakama Nation for both on-reservation irrigation uses and on- and off-reservation instream flows. Ecology has not issued any new surface water rights for several years in the Yakima Basin, unless full mitigation has been provided by retiring an equivalent amount of suitable water rights (Ecology 2014a).

Groundwater wells for domestic use, stock watering, and irrigation have associated water rights claims. Issuance of new water right permits for groundwater use has been on hold for several years. The USGS has concluded that existing groundwater pumping and consumption reduces flows in the Yakima River and tributaries by up to 200 cfs at the mouth of the Yakima River (Ely et al. 2011).

Existing water rights near the project are associated with irrigation districts, but also individual domestic, stock watering, and irrigation uses. According to Ecology's water resources database, no surface water diversions or pumps occur adjacent to the project in the mainstem Yakima River (Ecology 2016b).

3.5.1.4 Water Quality

This section provides water quality regulations for groundwater and surface water in Washington and water quality data for water resources potentially affected by the MRS Hatchery.

3.5.1.4.1 Groundwater Quality

As promulgated by the Washington State Water Pollution Control Act (Chapter 90.48 RCW), Washington's groundwater quality standards are the basis to maintain the highest quality of the state's groundwaters. These standards are intended to protect existing and future beneficial uses of the groundwater through the reduction or elimination of the discharge of contaminants to the state's groundwaters (WAC Chapter 173-200).

Groundwater quality samples were collected at the hatchery site in September 2011, February 2012, and August 2016 and tested for temperature, pH, conductivity, nitrate-N, and metals (Wallace Group Inc. 2012 and Wallace Group Inc. 2016; see Appendix G). All results met state groundwater quality standards. Groundwater from shallow aquifers typically have background levels of organochlorine pesticides, which are associated with agricultural practices (Ecology 2017); however, groundwater samples from the hatchery site were not tested for these compounds.

3.5.1.4.2 Surface Water Quality

As promulgated by the federal Clean Water Act (CWA; 33 USC §1251 et seq. (1972)) and the Washington State Water Pollution Control Act (Chapter 90.48 RCW), Washington's surface water quality standards are the basis for protecting and regulating the quality of the state's surface waters (WAC Chapter 173-201A). The standards: identify designated and potential uses of waterbodies such as aquatic life, swimming, fishing, domestic and agricultural water supplies, etc.; set water quality criteria to protect those uses; contain anti-degradation policies to protect high quality waters; and, in many cases, specify how criteria are to be implemented, such as in permits (Ecology website: http://www.ecy.wa.gov/water.html). Ecology's designated and potential uses for the Yakima River (per WAC Chapter 173-201A) are provided in Table 3.5-4. The water quality criteria that support these designated uses are listed in Table 3.5-5 (Chapter 173-201A WAC; Ecology 2016e).

Table 3.5-4. Use Designations for the Yakima River

	Aquatic Life Uses						Recreation Uses			Water Supply Uses				Misc. Uses				
	Char Spawning/ Rearing	Core Summer Habitat	Spawning/Rearing	Rearing/Migration Only	Redband Trout	Warm Water Species	Ex Primary Contact	Primary Contact	Secondary Contact	Domestic Water	Industrial Water	Agricultural Water	Stock Water	Wildlife Habitat	Harvesting	Commerce/Navigation	Boating	Aesthetics
Yakima River mainstem from mouth to Cle Elum River (RM 185.6)			X					X		X	X	X	X	X	X	X	X	X

Source: Chapter 173-201A WAC (Ecology 2016e).

Table 3.5-5. State Water Quality Standards for the Yakima River

Parameter	Ecology Standards
	Spawning/Rearing
Temperature	Not to exceed a 1-day maximum temperature (1-DMax) of 70°F due to human activities.
Total Dissolved Gas	Not to exceed 110 percent of saturation at any point of sample collection.
Turbidity	Not to exceed 5 nephelometric turbidity units (NTU) over background when the background is 50 NTU or less; not to exceed a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Dissolved oxygen	Must exceed 8.0 milligrams per liter (mg/L).
pH	Within 6.5 to 8.5; human-caused variation within the range must be less than 0.5 units.
	Primary Contact Recreation
Bacteria	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/100 milliliter (ml), with not more than 10 percent of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies/100 ml
	Water Supply Uses
Toxics Radioactive Deleterious Materials	Toxic, radioactive, or deleterious material concentrations must be below those that have the potential, either singularly or cumulatively, to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent on those waters, or adversely affect public health.

Table 3.5-5. State Water Quality Standards for the Yakima River

Parameter	Ecology Standards
Miscellaneous Uses	
Toxics Radioactive Deleterious Materials	Toxic, radioactive, or deleterious material concentrations must be below those that have the potential, either singularly or cumulatively, to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent on those waters, or adversely affect public health.
Aesthetics	Aesthetic values must not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

Source: Chapter 173-201A WAC (Ecology 2016e).

The state's anti-degradation policy (WAC Chapter 173-201A-300) includes three levels of protection for surface waters: Tier I protection extends to all waterbodies and maintains the current and designated uses for a given waterbody and prevents any further pollution; Tier II does not allow degradation of surface waters that are of exceptional quality (that exceed the water quality standards) through new or proposed actions unless such degradation is necessary and in the overriding public interest; and Tier III protection applies to waterbodies classified as outstanding resource waters. Tier I and II protections apply to the upper Yakima River.

Washington State also provides protection for public drinking water systems in accordance with the 1996 Safe Water Drinking Act. Under Washington State regulations (Chapter 246-290 WAC), all public water supply systems (i.e., serving 25 or more residents, or 15 or more service connections) are required to develop and implement a Source Water Protection Program as part of their overall system plan. Source water protection is a process that focuses on maintaining, safeguarding, and improving the quality and quantity of source water. There are no public drinking water supply intakes on the Yakima River downstream of the hatchery site. The closest downstream water supply system is on the Columbia River for the City of Kennewick, which is not an area that would be affected by the proposed action.

Under section 303(d) of the CWA, states, territories, and authorized tribes are required to develop lists of impaired waters. Impaired waters that do not meet water quality standards that regulatory entities have set for them are placed on the "303(d) list." Section 303(d) of the CWA requires that these jurisdictions establish priority rankings for waters on the 303(d) list and develop Total Maximum Daily Loads (TMDLs) for them. TMDLs determine the amounts of pollutants that a given waterbody (river, marine water, wetland, stream, or lake) can receive and still meet water quality standards (Environmental Protection Agency [EPA] website: http://www.epa.gov/lawsregs/laws/cwa.html).

The upper Yakima Basin is a 303(d) listed waterbody because several toxic parameters have been detected in fish tissue at concentrations that exceed surface water quality standards (Table 3.5-6). Ecology has developed a TMDL water quality improvement plan for the upper Yakima River watershed that focuses on reducing suspended sediment, turbidity, and organochlorine pesticides (Ecology 2002). Turbidity and suspended sediment were included in the plan as transport mechanisms for the pesticides and as pollutants themselves. The TMDL water quality improvement plan (Ecology 2003) identified actions for implementing the plan that fall into three categories: 1) voluntary stewardship actions; 2) actions that are taken in accordance with a pre-existing law, legal agreement, or land management plan; and 3) monitoring activities.

The mainstem Yakima River is a 303(d) listed waterbody because it exceeds surface water quality standards for temperature, dissolved oxygen, and pH. Ecology has not developed TMDLs to address these parameters in the upper Yakima River for the mainstem Yakima Basin. None of these 303(d) listings are for the reach of the Yakima River adjacent to the proposed MRS Hatchery.

Table 3.5-6. Impaired Waterbody Listings in the Upper Yakima River

Medium	Parameter[a]	Waterbody ID
Tissue	4,4'-DDE	No Data
Tissue	4,4'-DDT	No Data
Tissue	Dieldrin	No Data
Tissue	Dioxin	No Data
Tissue	Polychlorinated biphenyls (PCBs)	No Data
Water	Dissolved Oxygen	No Data
Water	pH	WA-37-1010
Water	Temperature	WA-39-1070

Source: Ecology 2014a

Aquatic organisms are very sensitive to reductions in dissolved oxygen levels in the water; the health of aquatic species depends on maintaining an adequate supply of oxygen dissolved in the water. Oxygen levels affect growth rates, swimming ability, susceptibility to disease, and the relative ability to endure other environmental stressors and pollutants (Carroll and Anderson 2009).

The pH value is a measure of the relative acidity or alkalinity of water (hydrogen ion concentration); it both directly and indirectly affects the ability of waters to have healthy populations of fish and other aquatic species. A lower pH (below 7) indicates that an acidic condition is present, while a higher pH (above 7) indicates a basic or alkaline condition. A pH of 7 is considered to be neutral. Because the pH scale is logarithmic, a water sample with a pH of 8 is 10 times more basic than one with a pH of 7 (Carroll and Anderson 2009).

High pH stresses aquatic organisms by impairing their salt and water balancing processes and increasing the toxicity of some contaminants. Anadromous species of fish encounter this stress in their adult upstream migration, and as juveniles in rearing areas and during downstream migration. In addition, salmonid eggs in the substrate are exposed to the high pH as surface water flows through spawning gravels (Carroll and Anderson 2009).

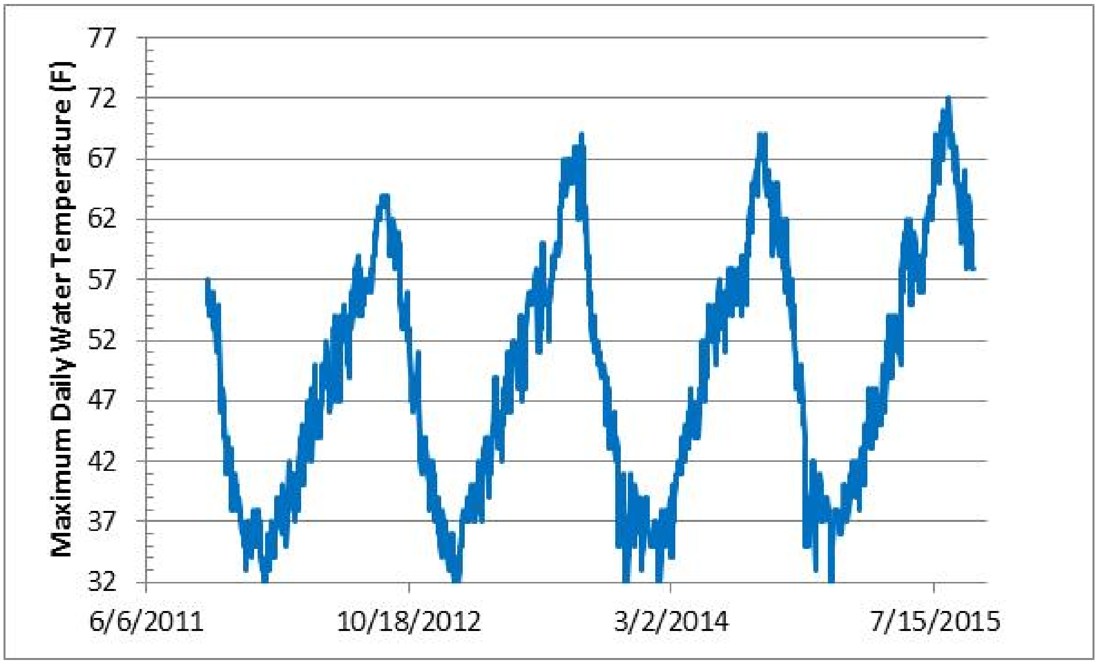
Nutrients such as phosphorus and nitrogen are essential for plant growth and aquatic community health. However, too much of one or both of these nutrients can cause excessive aquatic plant growth (Carroll and Anderson 2009).

In streams affected by eutrophication, natural re-aeration processes cannot compensate for plant and bacterial respiration, and DO levels become too low at night. Additionally, pH becomes high at night and too low during the day. These 24-hour (day to night) swings in DO and pH can be harmful, and even fatal, to fish and aquatic insects (Carroll and Anderson 2009).

Nutrients can also create nuisance conditions in streams by choking them with excessive plant and algae growth. These conditions may interfere with water intake structures, water conveyance in irrigation canals, and fishing, boating, and swimming (Carroll and Anderson 2009).

Most recent temperature data for the Yakima River closest to the hatchery site is available from Reclamation from the gauge near Horlick, 11 RMs upstream (Figure 3.5-3). Water flowing through the side channel at the hatchery site contains some groundwater seepage that may moderate water temperatures in the winter (McMillan Jacobs Associates 2016). Measurements of pH and dissolved oxygen in the side channel were taken in August 2016: the pH ranged from 6.9 to 7.8 and dissolved oxygen levels ranged from 6.0 to 6.8 mg/l (McMillan Jacobs Associates 2017). No other local surface water quality data were identified in the study area. No surface water quality data from the project area are in Ecology's Environmental Information Management database (Ecology 2016c).

Figure 3.5-3. Maximum Daily Water Temperature in the Yakima River near Horlick, Washington – Water Year 2012 through 2015



Source: http://www.usbr.gov/pn/hydromet/yakima/yakwebarcread.html

3.5.2 Environmental Consequences of Proposed Action

3.5.2.1 MRS Hatchery Construction

This section analyzes potential impacts to groundwater, surface water hydrology, floodplains, water rights, and water quality that could occur during construction of the MRS Hatchery.

3.5.2.1.1 Groundwater Hydrology

Hatchery construction would include the installation of eight new groundwater supply wells, based on preliminary design. The construction process to install these wells would not impact groundwater elevations, movement, or quality.

3.5.2.1.2 Surface Water Hydrology

Construction activities would require minimal use of surface water, and would therefore have a low impact on surface water hydrology.

3.5.2.1.3 Water Rights

Construction would not require the use of new water rights, and would therefore have no impact on water rights.

3.5.2.1.4 Groundwater and Surface Water Quality

In-water work would be required to construct the New Cascade Canal fish screen facility modifications, MRS Hatchery intake structure (in the bypass), and outfall structure (in the historic side channel). (See Figure 2.2-3 for facilities locations.) These in-water construction activities have the potential to have a low impact on turbidity and pH, and introduce hydrocarbons to surface waters. Turbidity could be increased by soil and sediment being disturbed and entrained into the water column. The use of concrete could increase pH if it were in contact with surface waters. Hydrocarbons could be introduced into surface waters from equipment leaking fuel or lubricants. The proposed in-water work at both the New Cascade Canal fish screen and the MRS Hatchery intake structure would occur immediately following the irrigation season shutdown; however, 5 cfs of river water would still be flowing through the bypass for fish attraction flows in the bypass. Water quality impacts from construction would be low with the use of in-water work area isolation, treatment of seepage water prior to discharge to surface waters, and the use of construction equipment BMPs.

The existing Wehl irrigation ditch that bisects the property would be partly replaced with a covered culvert. The work would occur when there is no flow through the ditch and therefore, would not affect water quality. If construction equipment were to leak fuel or lubricants in the ditch construction area during construction, then hydrocarbons could be introduced into surface waters later, after flow is restored to the Wehl irrigation ditch. This potential impact is low and would be minimized by implementing BMPs for construction activities and equipment.

Facility construction would require clearing, grubbing, and grading that would expose soils to stormwater erosion and transport to the historic side channel and the Yakima

River. Hydrocarbons and construction-related contaminants such as solvents and concrete could be transported to surface waters through stormwater runoff, and to groundwater through infiltration. These potential water quality impacts would be avoided and minimized by using temporary erosion and sediment control, construction equipment, and construction material BMPs. These measures would be fully described in the SWPPP, which the Yakama Nation would prepare and implement in accordance with the NPDES Construction Stormwater General Permit it would obtain from Ecology.

Construction and grading activities would disturb upland areas at the site. The majority of construction would occur in areas that are either previously disturbed or dominated by grasses, and have limited riparian vegetation (shrubs and trees adjacent to waterbodies). Most construction activity would occur away from the New Cascade Canal or Bypass and impacts would be further limited through the implementation of erosion control BMPs, removal of the least amount of vegetation possible, and revegetation of disturbed areas with native grasses, shrubs, and trees following disturbance. Impacts on water quality are anticipated to be short term, localized, and low. Demolition of existing upland structures (e.g., existing residence) would not result in any effects on water quality. The permanent project footprint would increase impervious surface areas by approximately 3.7 acres and could result in increased or rerouted runoff and sediment carried into the New Cascade Canal or Bypass, which could impair water quality. Stormwater would be routed, using grading and curbing, to vegetated filter strips placed around the project site. Stormwater would infiltrate the ground through the vegetated filter strips to reduce the runoff directly entering surface waterbodies. In addition, rock splash pads would be placed at specific locations to dissipate stormwater flow and reduce energy.

3.5.2.1.5 Summary of Construction Impacts on Water Resources

Impacts to groundwater, surface water hydrology, floodplains, or water rights are expected to be low during project construction. Minor water quality impacts may occur during in-water work, but are expected to be avoided or minimized by BMPs. The transport of sediment and other construction-related pollutants to surface waters and groundwater would be minimized through implementation of erosion control and construction BMPs.

3.5.2.2 MRS Hatchery Operation and Maintenance

This section analyzes potential impacts to groundwater, surface water hydrology, floodplains, water rights, and water quality that could occur during operation and maintenance of the project.

3.5.2.2.1 Groundwater Hydrology

The project proposes pumping between 1.80 – 2.06 cfs of groundwater during the irrigation season (April through October), and between 0.16 – 1.66 cfs during the nonirrigation season (November through March) (Section 2.2.3.2). Multiple wells distributed throughout the property (eight new wells anticipated in preliminary design and one existing well) are proposed to pump continuously to meet groundwater needs during the higher use period. Groundwater pumping is expected to cause localized groundwater drawdown near the wells being pumped. Based on data from aquifer pumping tests (Wallace Group Inc. 2012 and Wallace Group 2016c; see Appendix G) and subsequent modeling (McMIllen 2017; see Appendix G), impacts of these project operations on groundwater quantity would be limited to the area within 75 feet of the pumping wells. Beyond this 75-foot zone of influence around each of the pumping wells, the drawdown in the alluvial aquifer is expected to be low (McMillen 2017).

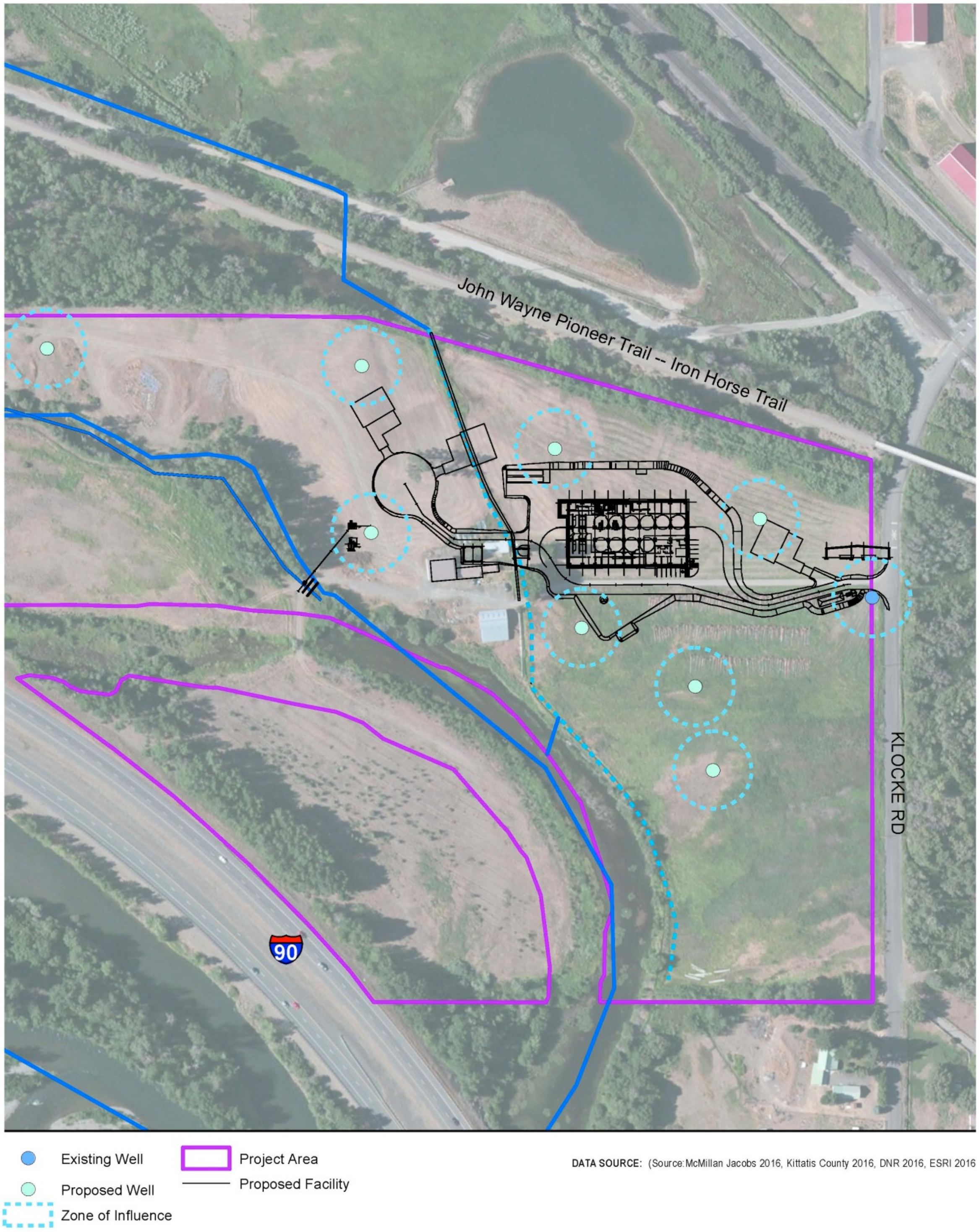
The proposed new well locations, based on preliminary design, are anticipated to be at least 75 feet inside of the property boundary and the existing domestic supply well is on the property line (Figure 3.5-4). All proposed production wells are greater than 75 feet from wells on adjacent properties. Because pump test results showed negligible change in groundwater elevations more than 75 feet from the pumped well, pumping from the proposed production wells would have a low impact on wells downgradient of the hatchery site.

Furthermore, there is no potential for contaminants from the hatchery to affect groundwater quality for drinking water or other uses because the hatchery is not discharging effluent to the ground. The City of Ellensburg wells would not be affected by the proposed MRS Hatchery wells because they are located upgradient and more than 0.25 mile (1,320 feet) from the proposed MRS Hatchery wells.

The three new residences that would be built as part of the proposed project would obtain their potable water through the existing water well that is located on site. The demand for the three residences is expected to be 1,200 gallons per day, assuming an average of 400 gallons per day per home (EPA 2016a). This water demand equates to 0.002 cfs, or 0.1 percent of the hatchery water demand. Therefore, the residential water demand would have a low impact on groundwater.

3.5.2.2.2 Surface Water Hydrology

During the nonirrigation season, a combination of groundwater and river water would be used at the hatchery, with the surface water input ranging between 3.01 to 6.04 cfs (Section 2.2.3.2). Surface water would primarily be used for adult holding and grow-out tank makeup water supply, which is a nonconsumptive use. An additional 3 to 4 cfs would be diverted through the bypass channel during the nonirrigation season to compensate for the project’s surface diversions and maintain minimum passage flows for the side channel. The water diverted from the Yakima River at the New Cascade Canal diversion structure would be returned to the river at the historic side channel, adjacent to the proposed hatchery. This proposed diversion and return would result in a 6,900-foot (1.3-mile) reach of the Yakima River with 6 to 10 cfs less flow during the nonirrigation season. The 6 to 10 cfs would be diverted for nonconsumptive uses and would be returned to the river at the historical side channel (6,900 feet downstream on the Yakima River, from the New Cascade Canal diversion structure). The instream flow in this 6,900-foot reach of the Yakima River would be reduced by 6 to 10 cfs, however, considering total flow in the Yakima River (average of 1,853 cfs), the impact would be low.



DATA SOURCE: (Source:McMillan Jacobs 2016, Kittatis County 2016, DNR 2016, ESRI 2016)

9/21/2017

Bonneville POWER ADMINISTRATION

0 100 200 Feet

PROPOSED SURFACE WATER DIVERSION,GROUNDWATER WELLS, AND TREATED EFFLUENT RETURN LOCATIONS

FIGURE 3.5-4

3.5.2.2.3 Water Rights

The project would require new water rights, as described in Section 2.2.3.1, for proposed surface and groundwater diversions. Groundwater rights downgradient of the project (Table 3.5-3) would not likely be affected by the project, because of the localized impact to groundwater resources described in Section 3.5.2.2.1.

Proposed surface diversions from the river bypass reach during the November through March nonirrigation season would not affect any adjudicated senior water rights because the diverted water would be returned to the river with no consumptive use. There is an existing water right of 4.5 cfs for use during the irrigation season for the hatchery site. Once the new water rights are issued, the Yakama Nation would put the existing water right into permanent trust. The new water rights would be nonconsumptive and no adjudicated senior water rights would be affected in the 6,900-foot reach of the Yakima River. In addition, no surface water diversions or pumps are located in this 6,900-foot reach of the Yakima River, according to Ecology’s Water Resources database (2016d). Therefore, no impact to surface water rights would be anticipated to occur.

3.5.2.2.4 Water Quality

Potential impacts on the water quality of the Yakima River due to hatchery effluent will be a function of source water quality (i.e., river and groundwater), hatchery operations (e.g., feed quantity), and wastewater treatment technology.

Surface and groundwater coming into the hatchery would be screened to reduce solids, aerated, and chilled as necessary before being directed to the adult holding ponds, incubation tanks, and grow-out tanks. Water exiting the adult holding pond (up to 3 cfs) would not require treatment as these fish would not be fed and would not generate any waste products. This water would be routed directly to outfalls at both the historic side channel and the upgradient wetlands. The flow to the wetlands would occur only during the adult holding period, mid-October through February, and is anticipated to be less than 0.5 cfs. The actual flow to the wetlands would be adaptively managed to maintain wetland water levels. Water from the adult holding ponds.

As described in Section 2.2.3.3, water exiting the incubation and grow-out tanks would be conveyed to a microstrainer sized for 54-micron particle removal. Concentrated backwash from the microstrainer would be routed to a settling clarifier. Filtered water and supernatant from the settling clarifier would then be discharged into the side channel. Solids accumulated in the settling clarifier would periodically be removed from the waste stream and would be removed from the site and land-applied or otherwise disposed in accordance with state, federal, and local laws. The treatment of wastewater is discussed by specific parameter in the following paragraphs.

Suspended Solids and Related Contaminants

Operation of the MRS Hatchery would likely have low to no impact on suspended solids and related contaminants. The proposed treatment technology meets the prevention, control, and treatment requirements defined by the wastewater discharge standards and effluent limitations for upland finfish facilities (WAC Chapter 173-221A-100) and the 2015 Upland Fin-Fish Hatching and Rearing General NPDES Permit requirements (Ecology 2015a). Treatment requires an average monthly solids removal of 85 percent. The microstrainer and settling clarifier technology proposed in the project is expected to meet or exceed this requirement. The corresponding effluent limits associated with these general NPDES permit treatment requirements include the following:

- Net total suspended solids maximum concentration of 5 milligrams per liter
- Net total suspended solids monthly average concentration of 15 milligrams per liter
- Net settleable solids monthly average concentration of 0.1 milliliters per liter

Facilities that were permitted to discharge treated effluent under the Upland Fin-Fish Hatching and Rearing General NPDES Permit have been effective at meeting NPDES General Permit limits for total suspended solids (Ecology 2015b). In addition, minimizing discharge of solids will also minimize pollutants that have an affinity for solids, such as organochlorine pesticides and nutrients. While organochlorine pesticides would not be generated at the MRS Hatchery, these compounds may be present in groundwater pumped from the shallow aquifer for use in the facility. If these compounds were present in the groundwater source, the concentrations in the effluent would be minimized by removing suspended solids prior to discharge of treated effluent.

The permit also requires the use of BMPs such as management of disinfectants, and procedures to avoid or minimize the release of PCBs from any known sources in the hatchery, including feed. These prescribed wastewater treatment technology and discharge limits make it unlikely that the hatchery discharges would impair surface water quality standards.

Temperature

The Proposed Action would likely have a low to no impact on water temperature. During the months of November through March, surface water withdrawn from the irrigation bypass side channel would be the primary water source for the hatchery. During this period, effluent water temperatures would closely mimic Yakima River water temperatures (32 to 47°F). Effluent water temperature is expected to be slightly warmer than river water in the winter due to groundwater seepage into the side channel and blending of 1 to 2 cfs of groundwater from the incubation and early rearing tanks (McMillan Jacobs Associates 2017). Based on personal communication with Marcia Porter at Ecology, discharge of the slightly warmer water during the winter would have no impact because the river water temperatures are much cooler than the surface water quality standards (Ecology 2017). For the months of April through October, groundwater would be the primary water source for the hatchery, and effluent temperatures would be 47 to 56°F, which at times would be lower than ambient river water temperatures (47 to 65°F) (McMillan Jacobs Associates 2017).

pH

The Proposed Action would likely have a low to no impact on pH of the Yakima River, near the point of discharge. During the months of November through March, surface water withdrawn from the irrigation bypass side channel would be the primary water source for the hatchery. During this period, effluent pH would closely mimic Yakima River pH (6.9 to 7.8) (McMillan Jacobs Associates 2017).

For the months of April through October, groundwater would be the primary water source for the hatchery. Initial testing indicates that the groundwater would have a lower pH than the surface water. However, the gas management towers that would treat all process water in the hatchery would increase the pH of groundwater from 6.6 to approximately 7.0. Effluent pH is expected to be in the 6.8 to 7.4 range throughout the year, which is within the ambient pH range of the Yakima River (McMillan Jacobs Associates 2017).

Dissolved Oxygen

The Proposed Action would likely have a low to no impact on dissolved oxygen of the Yakima River, near the point of discharge. Dissolved oxygen concentrations in the groundwater are less than 2 mg/L and would be elevated to near full saturation by the gas management towers in the hatchery prior to use. Dissolved oxygen levels at full saturation would be in the 10.5 to 13.0 mg/L range under most operating conditions (McMillan Jacobs Associates 2017). These concentrations meet the water quality standard for dissolved oxygen concentrations within the Yakima River (i.e., >8 mg/L; see Table 3.5-5).

Nutrients

Wastes in the effluent from fish feeding include nutrients such as nitrogen and phosphorus, which could cause eutrophication in the receiving waters. Eutrophication is an excessive increase in nutrient loading that can result in dense algal growth and a reduction in dissolved oxygen, high pH, high ammonia, excess turbidity, and reduced aesthetics. The proposed treatment system for the facility includes an effluent micro-strainer that is projected to remove 80 to 90 percent of the nutrients occurring as settleable and suspended solids (McMillan Jacobs Associates 2017). The quantity of nutrients to be discharged to the Yakima River was estimated using established relationships between the amount of feed used and residual pollutants from the unused feed and fish waste. Table 3.5-7 shows projected amounts of waste in the pre-treatment and post treatment scenarios based on 90 percent treatment efficiency of settleable and suspended components.

Table 3.5-7. Annual Waste Production Estimate

Component	Factor (per pound of feed)	Annual Waste Pre-Treatment (lbs.)	Annual Waste Post Treatment Discharged (lbs.)
Settleable and Total Suspended Solids	0.300	11,754	1,175
Settleable and Suspended Phosphorous	0.0054	212	21
Dissolved Phosphorous	0.0022	86	86
Total Phosphorous	0.0076	298	107
Settleable and Suspended Nitrogen	0.0064	251	25
Dissolved Nitrogen	0.0317	1242	1242
Ammonia	0.0383	1501	1501

Source: McMillan Jacobs Associates 2017

As indicated in Table 3.5-7, settleable solids, total suspended solids, and components of nitrogen and phosphorus associated with solids (i.e., total phosphorus and settleable and suspended nitrogen) are predicted to be reduced by the effluent treatment system, while the dissolved components (i.e., dissolved phosphorous, dissolved nitrogen, and ammonia) are not expected to be reduced.

The settleable and suspended solids loads in Table 3.5-7 would be allowed because there is load allocation remaining under the TMDL to delegate to the facility (Ecology 2017). The dissolved phosphorus, total phosphorous, settleable and suspended nitrogen, dissolved nitrogen, and ammonia are not expected to cause impacts to dissolved oxygen downstream, based on the overall finding that facilities with comparable operations and treatment systems do not have a reasonable potential to exceed dissolved oxygen or water temperature (Ecology 1988; Ecology 2015). Ecology may require an effluent characterization study during early project operation to mitigate risks of unanticipated pollutant quantities in the effluent.

Project monitoring would include settleable solids and total suspended solids monitoring as specified in the Upland Fin-Fish Hatching and Rearing General NPDES Permit. Ecology may require additional monitoring under the NPDES General Permit. Turbidity and temperature monitoring and limitations may be incorporated into the NPDES permit. Ecology may require an effluent characterization study after MRS Hatchery operations begin. The study could include quarterly monitoring for 1 year for toxic substances,[5] total inorganic nitrogen, and total phosphorus. Monitoring for PCBs may also be included in the effluent characterization study.

The MRS Hatchery has been designed to route stormwater to designated infiltration areas, and the majority of the site would be graded to slope toward vegetative buffers for infiltration. Runoff from areas that would not infiltrate would be routed to discharge into an existing drainage channel via a culvert under Klocke Road. Stormwater would not be expected to impact groundwater or surface water quality.

Operations would require storage and handling of hazardous materials on-site, which could affect groundwater or surface water quality if accidently spilled. Proper storage would involve spill containment to minimize the risk of accidental release. Hatchery staff would be trained in the proper handling of hazardous materials to avoid spills.

3.5.2.2.5 Summary of Operational Impacts on Water Resources

Groundwater pumping is expected to cause local aquifer drawdown, especially during the month of November. However, operational impacts to groundwater quantity would be low because the drawdown would be localized to within approximately 75 feet of proposed well locations and the amount of drawdown would be relatively small. In addition, there would be no impacts to existing downgradient supply wells. Impacts to surface water hydrology are expected to be low because surface water diversions are small compared to river flow and are nonconsumptive, being returned to the river

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[5] Toxic substances include DDT (dichlorodiphenyltrichloroethane), a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria; DDE (dichlorodiphenyldichloroethylene) and DDD (dichlorodiphenyldichloroethane), which are chemicals similar to DDT that contaminate commercial DDT preparations; and dieldrin, an insecticide.

6,900 feet downstream of the diversion. No floodplain impacts are expected to occur. The proposed water rights would not impact any existing water rights.

Water quality impacts would be low because 1) the use of cold groundwater and chillers minimizes warm water discharge, 2) aeration of source water in the facility result in high dissolved oxygen and neutral pH effluent in the discharge, 3) the effluent subject to pollution from feed use will be treated with a microstrainer and settling clarifier, resulting in at least an 85 percentreduction in solids and nutrients. The potential for PCB introduction due to contaminated fish feed would be minimized by removing solids from the effluent as PCBs have an affinity for attaching to solids. Effluent would contribute a small nutrient load to receiving waters. Compliance with the 2015 Upland Fin-Fish Hatching and Rearing General NPDES Permit and additional monitoring potentially requested by Ecology would provide reasonable assurance that surface water quality standards would be met. The Yakama Nation would follow NPDES Permit monitoring requirements for settleable solids and total suspended solids and other monitoring provisions that Ecology defines in the permit. These additional monitoring requirements may include turbidity, temperature, and a 1-year effluent characterization study focused on toxic substances and nutrients.

3.5.2.3 Acclimation and Release

Since 2007, the YKFP has been using small-scale mobile acclimation units to reintroduce coho parr and smolts into tributaries of the Naches and upper Yakima Rivers. The operation of new acclimation sites under the Proposed Action would result in similar effects to water resources as those from existing mobile acclimation sites. Tributaries selected for acclimation and release can support coho spawning and rearing and were historically used by native coho.

Potential effects on water resources include temporary disturbance, minor flow reductions associated with surface water diversions to operate the mobile acclimation units, and minor water quality degradation from effluent return to the respective waterbodies, as discussed below.

3.5.2.3.1 Groundwater

No groundwater would be used during mobile acclimation and release activities. Generator fuel used to run the acclimation facility pumps would be contained and managed to minimize the risk of spill and groundwater contamination. Therefore, no impacts to groundwater are expected from mobile acclimation and release activities.

3.5.2.3.2 Surface Water Hydrology

As described in Chapter 2, mobile acclimation units would continue to be used on Cowiche and Ahtanum Creeks and, in the near term, a new site would be established on Williams Creek. In the future, acclimation units could be established on other tributaries (Newsome 2016a). Acclimation tanks would use up to 90 gpm (0.20 cfs) of surface water and the intake pumps would be screened to NMFS criteria for the protection of juvenile salmon. Diverted surface water would be returned to the subject tributary stream a short distance, typically about 50 feet, from the intake. Due to this limited diversion reach, potential effects on surface water hydrology would be low because only a small quantity of water would be removed for a short duration (about 4 to 6 weeks) during high flow periods in the spring and the water would be returned immediately downstream. For these same reasons, the spatial distribution of fish rearing in the vicinity of the intake and outfall hoses is unlikely to be affected by operation of the mobile acclimation units.

3.5.2.3.3 Water Rights

The surface water diversion for mobile acclimation units would require temporary (5-year) use permits from Ecology. The diversions would not affect the rights of any other water users as water used would be returned to the river in the same vicinity within approximately 50 feet of the acclimation activity. All pertinent permits would be acquired by the Yakama Nation prior to this activity.

3.5.2.3.4 Water Quality

Water quality may be slightly affected by the discharge of fish wastes from mobile acclimation units. However, the number of fish in each acclimation unit (10,000 smolts for each of two to three tanks per site) would be low, and the fish would be present for only 4 to 6 weeks in spring, when flows are high. The proposed mobile acclimation units would not need NPDES General Permits because rearing levels would be well below permit minimums for upland finfish rearing.

At the request of Ecology, the Yakama Nation collected effluent samples for 2 years at the existing Cowiche Creek mobile acclimation unit and for 1 year at the Rattlesnake Creek mobile acclimation unit; the results showed no measurable impacts on water quality (NMFS 2013; Yakama Nation 2016, unpublished data). Similarly, low to no effects on water quality are expected at any new acclimation sites (NMFS 2013).

Measurable impacts on surface water temperature are unlikely to result from the short-term diversion of 0.2 cfs (90 gpm) of water from creeks proposed for placement of mobile acclimation units. The diversion would occur during spring run-off (April to mid-May), when water temperatures are naturally low and flows are typically high. Minimum instream flows would be maintained due to the limited (less than 50 feet, typically) diversion reach. The diversion would not affect fish passage and would be screened to prevent fish from swimming or being drawn into the diversion.

3.5.2.3.5 Summary of Acclimation and Release Impacts on Water Resources

Acclimation activities would take place during the winter and spring when stream flows are relatively high. Therefore, surface water diversion would not cause dewatering of any reaches and would not likely be measurable (USFWS 2007a). Similarly, low impacts on water quality are expected at any new acclimation sites (NMFS 2013). Therefore, the project would have low impacts on water resources and fish rearing habitat at acclimation sites.

3.5.2.4 Cumulative Effects

The analysis of cumulative effects on water resources considers the entire Yakima Basin.

Currently, ongoing actions in the basin that are reasonably certain to continue in the future include land management, water development, and irrigation activities. Land management and water development activities have increased and may continue to increase solar heating and pollutant loading in streams. Irrigation diversions and mainstem dams have altered natural flow patterns. The return of irrigation water from agricultural lands back to the Yakima River has reduced water quality in river reaches affected by return flows.

Ongoing water resources planning by the Yakima River Basin Water Enhancement Project Workgroup may result in projects that cause altered surface or groundwater storage, enhanced water conservation, and market reallocations. All of these elements have the potential to affect water quantity and quality in the study area. Water quality pollutants from existing point and nonpoint sources are likely to continue, and are likely to incrementally increase over time, with new development in the watershed. In addition, increased air temperatures from climate change may reduce the winter snowpack and alter winter/spring runoff cycles and quantities. A decreased snowpack may result in lower stream flows from June through September (Independent Scientific Advisory Board [ISAB] 2007), which can cause increased stream temperatures and decreased dissolved oxygen.

When combined with ongoing and reasonably certain foreseeable future activities in the basin, the Proposed Action may have a low incremental contribution to a cumulative adverse effect on surface water hydrology and quality. The MRS Hatchery would divert surface water from the Yakima River from November through March, reducing flow in 6,900 feet of the Yakima River. This diversion would not occur during the irrigation season, so it would not be cumulative with existing irrigation withdrawals in this part of the Yakima River. No surface withdrawals currently occur in this 6,900-foot reach of the Yakima River. Furthermore, the relatively small diversion is nonconsumptive and would occur during months when instream flows are not generally limited and temperatures are typically low. Water quality impacts of the Proposed Action would be low and would meet requirements of NPDES discharge permit and the existing TMDL implementation plan, which are used to control cumulative impacts in the affected waterbody.

The project would have low cumulative impact on groundwater quantity (i.e., water table elevation), because the groundwater table draw-downs are localized (< 75 feet). Groundwater elevations at adjacent and downgradient wells are not expected to be affected past this 75-foot zone of influence. Therefore, the effects of project wells and other existing wells are somewhat independent of each other. Cumulatively, intercepted groundwater would be treated and returned to surface water that is hydraulically connected to groundwater in the alluvial aquifer.

3.5.2.5 Mitigation Measures

If the Proposed Action is implemented, the Yakama Nation would implement the following measures to avoid or minimize impacts on water resources at the hatchery site:

- Implement measures to control erosion (see mitigation measures in Geology and Soils) to eliminate potential sediment discharge into waterways in accordance with an NPDES Construction Stormwater General Permit from Ecology.
- Implement a revegetation plan (see mitigation measures in Vegetation) to ensure stabilization of disturbed soils.

- Design and construct access roads such that drainage running directly from the road surface into surface waters is minimized and drainage of sediment-laden waters is directed into vegetated areas to the maximum extent possible.
- Review water quality mitigation measures, required BMPs, and permit requirements with construction contractors and inspectors during a preconstruction meeting covering environmental requirements.
- Develop and implement a work area isolation/dewatering plan for instream work that includes provisions for erosion and sediment control.
- Operate machinery primarily from the top of the river/creek bank along adjacent upland areas. Do not operate stationary equipment in the flowing water. It may be necessary to traverse the channel to install the work area isolation structure (cofferdam). Once the cofferdam is constructed, operate all machinery from behind the confines of the cofferdam.
- Stockpile and cover excavated streambed and bank materials away from the stream channel or flank with sediment fencing or fiber wattles to minimize fine sediment being transported into the waterbodies.
- Use a screened diesel or electric sump pump, if needed, to capture seepage flow from cofferdam areas. Direct all seepage flow to an on-site detention area.
- Wash heavy equipment that may work below the ordinary high water mark (OHWM) elevation before it is delivered to the jobsite and after it is used to prevent the spread of aquatic invasive species.
- Prepare and implement a Spill Prevention, Control, and Countermeasure (SPCC) plan to address fuel and chemical storage, spill containment and cleanup, construction contractor training, and proper spilled material disposal. The SPCC plan should include provisions to store fuel (and potential pollutants) and refuel construction equipment at least 300 feet away from streams or wetlands, and to always use pumps, funnels, absorbent pads, and drip pans when fueling or servicing vehicles.
- Inspect machinery daily for fuel or lubricant leaks and prior to entering wetlands, waterways, or floodplains. Completely clean off any external petroleum products, hydraulic fluid, coolants, and other pollutants.
- Prohibit discharge of vehicle wash water into any stream, waterbody, or wetland without pretreatment to meet state water quality standards.
- If dust-abatement additives or stabilization chemicals (typically magnesium chloride, calcium chloride salts, or ligninsulfonate) are used, the following additional measures will be implemented:
    - Do not apply dust-abatement additives and stabilization chemicals within at least 25 feet of surface water (distances might be greater where vegetation is sparse) and apply them so as to minimize the likelihood that they would enter the water.
    - Do not use petroleum-based products for dust abatement.

  - Avoid application of dust abatement chemicals during or just before wet weather, and in areas that could result in unfiltered delivery of the dust abatement materials to surface water.
  - Ensure spill containment equipment is available during application of dust abatement chemicals.
- Comply with the NPDES General Permit for effluent discharge.
- Comply with the TMDL allocations for the Yakima Basin.
- Minimize the storage of hazardous materials on-site. When stored, storage should consist of designated, enclosed storage areas with full secondary containment provided to fully contain accidental spills of chemicals stored at the proposed facilities.
- Comply with all chemical handling, application, and disposal regulations by USDA and Center for Veterinary Medicine regulations, and other state and federal regulations to protect human and environmental health.
- Train all staff in regard to chemical handling and application safety.
- Conduct a pump test on wells at the Holmes Ranch property once pumps are installed and operational to monitor effects on groundwater during periods of peak groundwater demand for fish rearing (March through November).

3.5.3 Environmental Consequences of No Action Alternative

Under the No Action alternative, no surface or groundwater resources would be modified. The proposed 10 cfs diversion would not occur, and the 4.5 cfs supplied to the bypass channel by groundwater infiltration during the nonirrigation months would likely continue. Flow in the Yakima River between the proposed point of diversion and return would remain at current levels and under current management. Continued use of existing acclimation and release sites, and the implementation of the new sites under the larger YKFP, would have low to no impact on water quantity and quality.

3.6 Wetlands and Floodplains

3.6.1 Affected Environment

The study area for the assessment of potential impacts on wetlands and floodplains includes all wetlands and floodplains that could be affected by construction and operation of the Proposed Action.

3.6.1.1 Wetlands

For this Proposed Action, the study area for wetlands includes lands within 200 feet of the construction limits of the proposed MRS Hatchery, the New Cascade Canal Diversion Structure, and the New Cascade Canal Fish Screening Facility (Figure 3.4-1 and Figure 3.4-2). The study area also includes the area around the acclimation sites. The study area encompasses Kittitas County’s maximum prescribed wetland buffer width for off-site wetlands that may be affected by the project.

The USFWS National Wetland Inventory identified three wetland features within the MRS Hatchery study area (USFWS 2010). These are identified as freshwater pond (PUBH), which generally corresponds to the historic side channel of the Yakima River; freshwater emergent wetland (PEMC); and palustrine scrub shrub wetland (PSSC) (Figure 3.4-1).

The *Wetland Delineation Report* (Yakama Nation Fisheries 2015) mapped Wetland A as a palustrine, emergent, persistent wetland of approximately 6 acres (Figure 3.4-1). The hydrogeomorphic classification of Wetland A is riverine, as wetland hydrology is supplied by creeks and tributaries that outflow into the historic side channel to the Yakima River on the southwest side of the wetland. Alluvial soils on the MRS Hatchery property allow for the exchange of subsurface water between the river, irrigation seepage, and the aquifer under the site (see Section 3.5, Water Resources). This interaction contributes to shallow groundwater in Wetland A. Dominant plant species are reed canarygrass and Baltic rush. Wetland A was classified as a Category III wetland in the *Wetland Delineation Report* (Yakama Nation Fisheries 2015). Wetland A provides moderate water quality, hydrologic, and habitat functions.

The *Wetland Delineation Report* (Yakama Nation Fisheries 2015) also identified two aquatic bed/unconsolidated bottom wetlands on the hatchery site. One of these features is the historic side channel of Yakima River, which generally corresponds to the PUBH wetland feature mapped by National Wetland Inventory ("Historic Side Channel to Yakima River," Figure 3.4-1). The other is a pond on the north MRS Hatchery property boundary, adjoining the south side of John Wayne Trail ("North Pond," Figure 3.4-1). The North Pond likely is a relict excavated feature from gravel mining that frequently occurred in the Yakima River floodplain in the early 20th Century (Kittitas County 2013b). The *Wetland Delineation Report* (Yakama Nation Fisheries 2015) did not formally delineate or rate these two wetlands as they are not within the MRS Hatchery development area. The Historic Side Channel is comprised of aquatic bed vegetation such as pond lily. Common cattails, pond lilies, and willows are dominant in the North Pond. Other wetlands inventoried by National Wetland Inventory were determined to be nonwetland areas in the *Wetland Delineation Report* (Yakama Nation Fisheries 2015) and during the May 25, 2016, site visit.

The Kittitas County Critical Areas Ordinance prescribes wetland buffers and allowable activities within these buffers. Because Wetland A is a Category III wetland, the proposed ordinance update of 2015 requires a buffer of 50 feet. Yakama Nation (Yakama Nation Fisheries 2015) designated 150-foot buffers around the North Pond and the Historic Side Channel.

The National Wetland Inventory does not map any wetlands in the immediate vicinity of the New Cascade Canal facilities, and no wetlands were observed during the May 25, 2016, site visit. The National Wetland Inventory identified one freshwater emergent wetland 150 feet to the southwest of the fish screening facility (Figure 3.4-2). There are no wetlands within 200 feet of the New Cascade Canal diversion.

3.6.1.2 Floodplains

The Yakima River is located west of the MRS Hatchery property (Figure 3.5-1). The regulated floodway and floodplain is defined in the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map Community-Panel Number 530095 0436 B.

The regulatory floodway means the channel of a river or other watercourse and the adjacent land areas that must be reserved to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. The floodway does not contain any of the project features other than the New Cascade Canal diversion structure that is not being modified by the project. The 100-year floodplain of the Yakima River (FEMA Zone A) extends into small portions of the hatchery site, including the historic side channel and areas to the west and northwest of the historic side channel. Base flood elevations and flood hazard factors have not been determined for this area. The areas to the north and east of the historic side channel are outside of the 100-year floodplain (FEMA Zone C).

3.6.2 Environmental Consequences of Proposed Action

3.6.2.1 MRS Hatchery Construction

Construction of the MRS Hatchery would have no direct permanent impacts to any wetlands on the hatchery site. Wetland A could be temporarily impacted to install a well and associated pipes for transmission of groundwater to the MRS Hatchery. Any temporarily disturbed areas of Wetland A would be restored to preconstruction elevations and revegetated with native vegetation. Potential impacts to Wetland A, the North Pond, and the Historic Channel to the Yakima River would be from possible erosion, contractor traffic during construction, or accidental fuel and oil leaks from construction equipment. These wetland impacts would be short term and could be minimized with appropriate BMPs.

The development area of the MRS Hatchery is not located within the floodplain; therefore, the development would not impact the floodplain or floodway.

3.6.2.1.1 New Cascade Canal Diversion and Fish Screening Facility

There would be low to no impacts to wetlands due to fish bypass construction work at the New Cascade Canal—the nearest wetland is over 150 feet from the site. Implementation of BMPs would ensure potential erosion/sedimentation type impacts would not occur.

The New Cascade Canal fish screen facility modifications, MRS Hatchery intake structure (in the bypass), and outfall structure (in the historic side channel) would be constructed within the floodplain. No impact is anticipated to the floodplain because of the short construction duration and small footprint of these structures. In addition, surface water flows through and adjacent to these structures is regulated by the existing New Cascade Canal diversion structure. Flooding through and adjacent to these structures would not be impacted because the fish screen modifications do not further constrict existing facilities. The intake structure and outfall structure would not constrict the existing channel and would not be expected to be large enough to modify local channel hydraulics.

No impacts to the floodplain are anticipated to occur due to occupancy and modification of floodplains (per Executive Order 11988) and flood storage capacity is not expected to be reduced. Flooding during construction may result in the temporary interruption of construction and dewatering activities, but is not anticipated to change flood rise or local hydraulics.

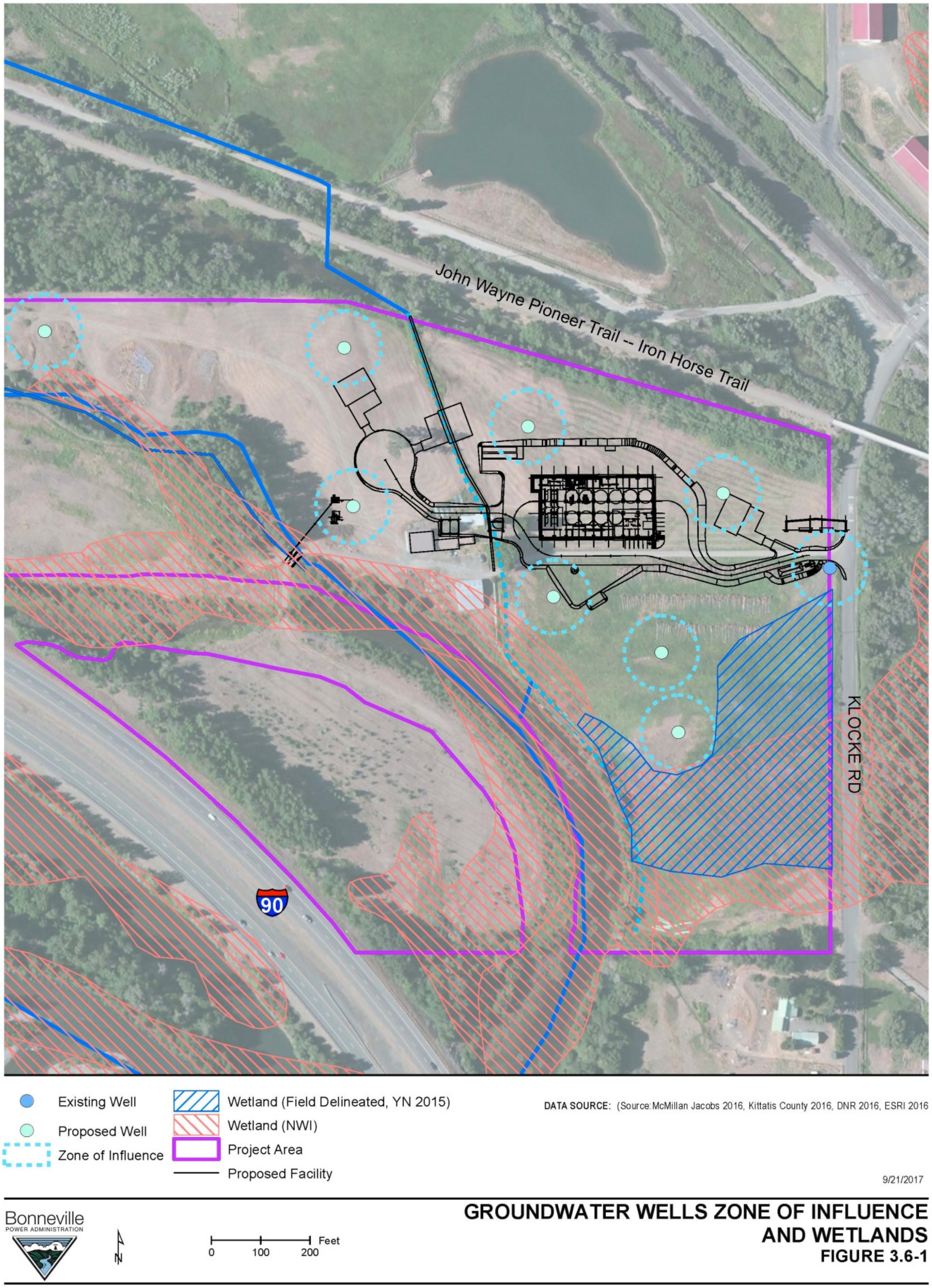
3.6.2.2 MRS Hatchery Operation and Maintenance

The groundwater withdrawals for the MRS Hatchery were investigated for a potential effect on seasonal patterns of groundwater levels in Wetland A on the hatchery site. As described in Section 2.2.3.2, the project proposes pumping between 1.80 – 2.06 cfs of groundwater during the irrigation season months of April through October; and between 0.16 and 1.66 cfs during nonirrigation season of November through March using multiple wells throughout the property. Proposed well sites and drawdown areas relative to wetlands are shown on Figure 3.6-1. As described in Section 3.5.2.2.1, the zone of influence of groundwater drawdown from the proposed wells would be limited to approximately 75 feet from the wells. Beyond 75 feet from each of the wells, the drawdown is expected to be low. Any new wells would be sited at least 75 feet away from any wetland, including Wetland A (McMillen 2017), and would have a low impact on wetland hydrology.

Water from the new adult holding ponds would be discharged at a rate of up to 0.5 cfs to the North Pond, upgradient from the MRS Hatchery facilities. Discharges would only occur mid-October through February, and would not require water quality treatment because adult fish would not be fed and would not generate any waste products. Adult holding pond discharges would have a low impact on the North Pond because the activity would occur outside of the regular growing season; the pond already supports an obligate wetland plant community adapted to prolonged inundation.

The project would also discharge incubation drain and grow-out tank water to the historic side channel of the Yakima River. This operation is anticipated to have a low impact on the historic side channel and vegetation within it because discharge water would be treated to meet the requirements of the NPDES General Permit (see Chapter 3.5, Water Resources) and BMPs would be implemented to reduce water quality impacts. The withdrawal of surface water from the New Cascade Bypass to supply the hatchery from November through March would not affect vegetation in the historic side channel because the flow reduction would occur outside of the growing season.

The project proposes a diversion of up to 10 cfs during the nonirrigation season (November-March) from the Yakima River to the New Cascade Canal, which would be returned to the river at the historic side channel of the Yakima River, adjacent to the proposed hatchery. This would reduce flows to a 6,900-foot-long reach of the Yakima River by up to 10 cfs. This operation is not anticipated to have a significant impact on wetlands adjacent to the Yakima River because the surface water diversions are relatively small compared to overall flows on the river (Section 3.5.2.2), and the operation would largely occur outside of the growing season.



DATA SOURCE: (Source:McMillan Jacobs 2016, Kittatis County 2016, DNR 2016, ESRI 2016

9/21/2017

GROUNDWATER WELLS ZONE OF INFLUENCE AND WETLANDS
FIGURE 3.6-1

The fish screen modifications at the New Cascade Canal, the MRS intake structure in the bypass, and the outfall structure in the historic side channel would all operate within the floodplain. In addition, between 6 and 10 cfs would be diverted through the New Cascade Canal and Bypass during the nonirrigation season. Because the flows would be managed through the canal and bypass, no additional flood risk would occur in these watercourses. The slight reduction in flow in Yakima River flows between the New Cascade Canal diversion and the historic side channel would result in a low to no change to floodplain inundation. No change to flow or the floodplain would occur downstream of the outfall at the historic side channel.

3.6.2.3 Acclimation and Release

Acclimation and release activities at other sites within the basin would have no long-term impacts and would result in low to no impacts to wetlands. Typical site requirements and conditions for mobile acclimation facilities and their operations are not anticipated to result in temporary or permanent wetland impacts. Any vegetation removal required for mobile acclimation units would be minimal and temporary.

As described in Section 2.2.5.2, coho smolts would be acclimated before release to tributaries in a combination of existing ponds and mobile acclimation units. Acclimation ponds are within regulated floodway and floodplains, but are already features in the landscape and would therefore not impact floodplain processes. The mobile acclimation units would be placed adjacent to each subject stream in upland areas that have existing disturbance (such as spur roads). The specific locations of these acclimation units are not defined, but would only be located in the floodplain if no other upland locations were feasible. The units are mobile and could be moved to a higher elevation in anticipation of impacts to the floodplain.

Because the mobile acclimation sites would be in operation during the high flow periods in the spring, there is a risk that the units may impact the floodway or floodplain. The mobile acclimation facilities would be located outside of the floodway, but may be located within the 100-year floodplain. The Yakama Nation would coordinate with the local floodplain administrator (Kittitas County) to minimize impacts from the acclimation and release activities. Therefore, low impacts to floodplains are anticipated from mobile acclimation and release activities.

3.6.2.4 Cumulative Effects

Past development in the Yakima Basin has resulted in wetland losses and modifications due to agricultural, water development, and resource extraction practices. However, recent and continuing efforts by local, state, and federal regulatory agencies are designed to preserve and protect wetlands and ensure no net loss of total wetland acres within a watershed. The Proposed Action would not result in a permanent loss of wetlands and, therefore, would not contribute incrementally to wetland losses in the basin.

Past development in the Yakima Basin has resulted in floodplain modifications and floodplain loss. Current floodplain management practices minimize new development in the floodplain and hydraulic effects, such as flood rise. The Proposed Action would not result in floodplain impacts, and, therefore, would not contribute incrementally to floodplain modifications and loss in the basin.

3.6.2.5 Mitigation Measures

The following mitigation measures would be used to avoid or minimize potential impacts on wetlands and floodplains.

- Implement measures to control erosion and fugitive dust (see mitigation measures in Geology and Soils) to eliminate potential for sediment discharge into wetlands.
- Implement a revegetation plan (see mitigation measures in Vegetation) to ensure stabilization of disturbed soils.
- Install signage, fences, and flagging to restrict work areas and confine vehicles and equipment to designated routes that avoid wetlands and waterways.
- Limit disturbance to the minimum necessary to achieve construction objectives, minimize habitat alteration, and limit the effects of erosion and sedimentation when working next to wetlands and waterways.
- Implement an SPCC plan (see mitigation measures in Water Resources).
- Stockpile wetland soils removed from Wetland A during diversion channel construction and use them to refill the channel once construction is completed.
- Regrade disturbed wetlands and vegetated areas to preconstruction contours and revegetate with appropriate native species.
- Locate mobile acclimation units outside of regulated floodways, 100-year floodplains, or at the highest elevation practicable. Monitor mobile acclimation units at risk of flooding and relocate as appropriate.

3.6.3 Environmental Consequences of No Action Alternative

No structures (e.g., effluent discharge structure) would be placed within wetlands, the Yakima River regulated floodway, or the 100-year floodplain. Continued use of existing acclimation and release sites as well as the use of the new sites under the larger YKFP would have low to no impact on wetlands and floodplains. As with the Proposed Action, the Yakama Nation would coordinate with the local floodplain administrator (Kittitas County) to minimize impacts from the mobile acclimation and release activities.

3.7 Fish

3.7.1 Affected Environment

The proposed MRS Hatchery site is located on a historic side channel of the Yakima River near RM 160 (Figure 2.2-1). Relative to the hatchery site, the study area for fish resources includes all aquatic habitats that would be affected by MRS Hatchery construction and operation, as well as areas of release and use by fish reared at the hatchery. Specifically, these habitats include:

- The reach of the Yakima River just upstream of the existing Reclamation mainstem diversion to an area approximately 300 feet downstream of the existing side channel confluence with the Yakima River.
- The New Cascade Canal and fish screening structure.
- The New Cascade Bypass from the canal fish screen to the confluence with the Yakima River.
- Shoreline habitat along all waterbodies subject to construction.
- All waterbodies in the Yakima Basin that would be accessible to juvenile coho reared at the MRS Hatchery.
- Areas where returning MRS-origin adults could be outplanted.
- Existing acclimation sites and adult broodstock collection facilities (e.g., Roza, Prosser, Cowiche, and Wapatox Dams).

3.7.1.1 Aquatic Habitat

3.7.1.1.1 Yakima Basin Overview

The headwaters of the Yakima River emerge from the crest of the Cascade Mountains above Keechelus Lake and flow 215 miles to the confluence with the Columbia River near Richland, Washington. Along its path, numerous tributaries enter the Yakima River, including the Cle Elum and Teanaway Rivers, and the Swauk, Taneum, Naneum, Wilson, Manastash, and Umtanum Creeks above Roza Dam. The Naches River enters the Yakima River below Roza Dam. Major tributaries to the Naches River include the Little Naches, American, Bumping, and Tieton Rivers, and Rattlesnake and Cowiche Creeks. Major tributaries to the Yakima River below the Naches River confluence include Ahtanum, Toppenish, and Satus Creeks (NMFS 2013). The Yakama Nation proposes to release coho juveniles into many of these waterbodies over the life of Phase 3 of the coho reintroduction program with a goal of achieving natural, self-sustained runs in the basin.

Although many smaller tributaries in the Yakima Basin display relatively natural flow patterns, the mainstem Yakima River and larger tributaries, including the Naches and Cle Elum Rivers, display altered flows due in part to the operation of numerous small dams and irrigation diversions. These facilities, as well as road crossings and culverts, farming practices, riparian habitat removal, and development, have resulted in degraded water quality, altered flows in spring and summer, and degraded channel conditions.

The Yakima River provides habitat for two fish species that are listed as threatened under the ESA: bull trout (64 FR 58910-58933) and MCR steelhead (79 FR 20802). NMFS and the USFWS designate critical habitat for species listed under the ESA. Both NMFS and USFWS determine the range-wide status of critical habitat by examining the physical and biological features needed for life and successful reproduction of each species. The Yakima River mainstem in the vicinity of the proposed MRS Hatchery is designated as critical habitat for both species, and many proposed juvenile and adult release streams are also designated as critical habitat.

The Yakima River and its tributaries below impassable barriers, which defines the study area, has also been designated as Essential Fish Habitat (EFH) for coho and Chinook salmon under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267). EFH for coho and Chinook salmon is defined as the bodies of water and substrate required for fish spawning, breeding, and feeding, and habitat where they can grow to maturity. EFH includes all freshwater habitats used by spring-run Chinook salmon in the Yakima Basin.

An assessment of existing conditions and anticipated project-related effects on designated critical habitat and EFH has been developed as part of the BA (Section 7 ESA consultation document) prepared for this project.

3.7.1.1.2 New Cascade Canal and Diversion

The New Cascade Canal Diversion (Figure 2.2-1) is located on the left bank of the Yakima River approximately 7 miles northwest of Ellensburg, Washington. The diversion is owned and operated by Reclamation and diverts about 150 cfs of surface water into the canal, which is operated for irrigation. About 0.4 mile downstream of the diversion, the canal’s fish screen facility currently bypasses 8 cfs of surface water, as well as fish, into the bypass during the irrigation season (April through October). The bypass flows south through the proposed MRS Hatchery project site (see next section) before discharging to a historic side channel of the Yakima River (Figure 2.2-1). Bypass water from the canal, in addition to groundwater, supports a series of large, deep ponds that are currently used to acclimate coho from mid-March to May. From the ponds, the bypass flows for about 1,400 feet along the southwest portion of the proposed MRS Hatchery property and discharges into the historic side channel of the Yakima River (Figure 2.2-1).

About 2,000 feet upstream of the New Cascade Canal Diversion structure, the Yakima River splits into two channels and flows around a vegetated island. The diversion is on the east (left) bank of the eastern channel, which is about 100 feet wide (WDNR 2016c). The split channels converge into one single channel about 200 feet downstream of the diversion (Figure 2.2-1). At the diversion, large boulders armor the left bank upstream of the intake. Substrates near the diversion consist mostly of large cobbles and gravels; both Chinook salmon (limited) and coho have been observed spawning just upstream of the diversion (Newsome 2016b). A constructed boulder rock weir spans the channel immediately downstream of the diversion. The weir slows the river and slightly backwaters the channel upstream to help route water into the diversion structure during lower flow periods. Yakima River flow is not gaged directly adjacent to the proposed MRS Hatchery site, but is approximated by the Reclamation gage at Horlick, 11 RM upstream. Flow during water year 2001 through 2015 ranged between 417 and 9,951 cfs and averaged 1,853 cfs (Reclamation 2015a) at the Horlick gage. Typical winter flows are between 800-2,000 cfs, but flow has been as low at 500 cfs in some months.

The diversion structure contains trash racks that would prevent water-borne debris from blocking or entering the structure, but is not screened. Instead, during the irrigation season, water diverted from the Yakima River flows into the canal for about 0.4 mile before being screened at the canal’s fish screening structure. Fish screened from the canal are routed into the bypass, which eventually discharges to the historic side channel of the Yakima River.

The predominantly silty canal provides off-channel fish-rearing habitat during the irrigation season. The canal lacks instream habitat features (e.g., large wood, vegetation) and, with the exception of grasses, its banks are devoid of riparian vegetation. No salmonid spawning has been observed in the canal, which contains water year-round due to groundwater seepage. The canal reportedly conveys about 3 to 5 cfs of flow (groundwater seepage) from November through March, following closure of the diversion after the irrigation season (Newsome 2016b).

As described in Section 3.5.1.4, the only specific 303(d) listing for water quality impairment is for elevated pH in the canal (listing 50704). The reach of the Yakima River at the diversion is not currently 303(d)-listed for any pollutant (Ecology 2012).

The historic side channel of the Yakima River is designated as critical habitat for both bull trout and MCR steelhead; the canal and bypass are not designated as critical habitat for MCR steelhead (Turner 2016) or bull trout (Halupka 2016a). Neither the canal nor the bypass are considered EFH for coho or Chinook salmon (Turner 2016).

3.7.1.1.3 Proposed Hatchery Site

The proposed MRS Hatchery would be located along a historic, low-gradient side channel of the Yakima River. During the irrigation season, the side channel receives water from the bypass, which connects to a historic side channel of the Yakima River. From November through March, the canal is closed and flow in the bypass is limited to that provided by groundwater seepage. During the irrigation season (April through October), the bypass receives surface water routed from the canal’s fish screen.

The proposed MRS Hatchery would require a surface water intake, which would be constructed on the east (left) bank of the bypass. In the vicinity of the proposed intake, the bypass is about 13 feet wide; the width decreases slightly from November through April when flow is limited to about 5 cfs of groundwater seepage. Substrates in the bypass near the proposed intake location consist of clean gravels and cobbles that have recently provided spawning habitat for adult coho. Both banks are relatively stable, and support deciduous riparian shrubs and trees along the majority of the bypass reach. Habitat in the bypass and its riparian corridor has been enhanced over the past decade through the addition of large woody debris, gravel augmentation, and riparian plantings. Habitat is similar downstream in the historic side channel, where the facility outfall is proposed.

The WDNR (2016a) indicates that the bypass is non-fish-bearing; however, it currently supports spawning and rearing coho salmon (Newsome 2016b). In addition, resident species (e.g., sculpin) occupy the bypass, and “very few” spring Chinook salmon and juvenile *Oncorhynchus mykiss* (likely rainbow trout) have been collected from smolt traps installed in the acclimation ponds near the proposed hatchery site (NMFS 2013).

3.7.1.1.4 Wehl Ditch

In addition to the bypass and side channel, a small irrigation ditch bisects the proposed MRS Hatchery site just west of an existing ranch house. This ditch, called the Wehl ditch, is permitted to convey 4.62 cfs of flow during the irrigation season from a small pond north of the canal through a series of pipes and concrete-lined ditches. The ditch is piped under the canal near the fish screening structure. It has no flow from November through March, and does not provide aquatic habitat for fish.

The Wehl ditch is mapped as non-fish-bearing (WDNR 2016c); no fish have been observed in the portion of the concrete ditch that traverses through the proposed hatchery site (Newsome 2016b).

3.7.1.2 Fish Populations

The Yakima Basin supports anadromous and resident fish populations. Currently, the basin provides habitat for 38 fish species, including 24 that are native and 14 that were introduced (Table 3.7-1). Because of their declining numbers, several native fish are state- or federally-listed under the ESA.

Table 3.7-1. Fish Species in the Yakima Basin

Common Name	Scientific Name	Federal Status	State Status	Native (N) or Introduced (I)
Pacific lamprey	*Entosphenus tridentatus*	Species of Concern		N
Western brook lamprey	*Lampetra richardsoni*			N
Cutthroat trout	*Oncorhynchus clarkii*			N[a]
Coho	*Oncorhynchus kisutch*			N[a]
Rainbow trout	*Oncorhynchus mykiss*			N
MCR steelhead (winter and summer)	*Oncorhynchus mykiss*	Threatened	Candidate	N
Kokanee/Sockeye salmon	*Oncorhynchus nerka*			N[a]
Chinook salmon (fall and spring)	*Oncorhynchus tshawytscha*			N
Mountain whitefish	*Prosopium williamsoni*			N
Bull trout	*Salvelinus confluentus*	Threatened	Candidate	N
Brook trout	*Salvelinus fontinalis*			I
Brown trout	*Salmo trutta*			I
Carp	*Cyprinus carpio*			I
Chiselmouth	*Acrocheilus alutaceus*			N
Peamouth	*Mylocheilus caurinus*			N
Northern pikeminnow	*Ptychocheilus oregonensis*			N
Longnose dace	*Rhinichthys cataractae*			N
Leopard dace	*Rhinichthys falcatus*		Candidate	N
Speckled dace	*Rhinichthys osculus*			N
Redside shiner	*Richardsonius balteatus*			N
Bridgelip sucker	*Catostomus columbianus*			N
Largescale sucker	*Catostomus macrocheilus*			N
Mountain sucker	*Catostomus platyrhynchus*		Candidate	N
Channel catfish	*Ictalurus punctatus*			I
Brown bullhead	*Ictalurus nebulosus*			I
Black bullhead	*Ictalurus melas*			I
Mosquitofish	*Gambusia affinis*			I
Three-spine stickleback	*Gasterosteus aculeatus*			N
Largemouth bass	*Micropterus salmoides*			I
Smallmouth bass	*Micropterus dolomieui*			I
Black crappie	*Pomoxis nigromaculatus*			I
Bluegill	*Lepomis macrochirus*			I
Pumpkinseed	*Lepomis gibbosus*			I
Walleye	*Stizostedion vitreum*			I
Yellow perch	*Iperca flavescens*			I
Piute sculpin	*Cottus beldingi*			N
Torrent sculpin	*Cottus rhotheus*			N
Mottled sculpin	*Cottus bairdi*			N

[a] Previously extirpated (eliminated) native species currently undergoing reintroduction

Sources: Yakama Nation 2012a; Tri-County Water Resource Agency 2003; WDFW 2016a

3.7.1.2.1 Anadromous Fish

As presented above (Table 3.7-1), the Yakima Basin supports several important anadromous fish stocks, including fall and spring Chinook salmon, coho, steelhead, and Pacific lamprey. Native Yakima River sockeye salmon were extirpated from the basin (BPA 1996); however, sockeye reintroduction efforts are currently underway and adults are returning to the basin (WDFW 2016d). The typical timing of adult migration, holding, spawning, juvenile rearing, and migration varies among the anadromous salmonids in the Yakima Basin (Table 3.7-2).

Table 3.7-2. Typical and Approximate Timing of Anadromous Salmonid Life Stages in the Yakima Basin

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Summer Steelhead (native)	Adult Migration [a]						■	■	■	■	■	■	
	Holding [b]	■	■	■	■	■						■	■
	Spawning [c]		▐	■	■	■	▌						
	Juvenile Migration			■	■	■	■						
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
Spring Chinook (native)	Adult Migration			■	■	■	▌						
	Holding						■	■					
	Spawning							▐	■	■	▌		
	Juvenile Migration			▐	■	■	■						
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
Fall Chinook (native)	Adult Migration								■	■			
	Holding										■		
	Spawning											■	■
	Juvenile Migration			▐	■	■	■	■					
	Juvenile Rearing			■	■	■	■	■					
Coho (re-introduced)	Adult Migration									■	■	■	
	Holding									■	■		
	Spawning									▐	■	■	
	Juvenile Migration			■	■	■							
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
Sockeye Salmon(re-introduced)	Adult Migration					■	■	■					
	Holding							■	■				
	Spawning									■	■	■	
	Juvenile Migration			■	■	■							
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■

[a] Adult summer steelhead may move upstream during any month of the year; run timing is extensive.

[b] Holding is the stage when adults are waiting for the right conditions for movement up to the spawning area.

[c] Summer steelhead spawn timing is dependent on water temperature and elevation of spawning tributary.

Source: Yakama Nation 2012a; YSFWPB 2005; NMFS 2013; BPA 1996; BPA 2007

3.7.1.2.1.1 Coho Salmon

Coho salmon were once native to the Yakima Basin (Wydoski and Whitney 2003), and historic returns of adults are estimated to have ranged from 44,000 (Yakama Nation 2012b) to more than 100,000 fish annually. Virtually all major upper Yakima River tributaries, the mainstem Yakima River upstream of the Teanaway River confluence, and the Naches River and its tributaries, are believed to have once supported native coho (BPA 1996). Due in large part to overfishing, instream flow reductions, habitat degradation, and the presence of fish passage barriers, natural-origin coho were extirpated from the basin in the early 1980s (Dunnigan et al. 2002). However, because of ongoing reintroduction efforts initiated in the mid-1980s, hatchery-produced coho are now naturally reproducing in the basin.

Over 90 percent of coho redds are located in the mainstem Naches and Yakima Rivers (BPA 2007). The upper Yakima River tends to have relatively stable flows in the fall, but the Naches River has unregulated fall flows that tend to scour coho redds. In the middle and upper reaches of the Yakima River, coho typically spawn near groundwater seepages (Newsome 2016b) that may act to flush fine sediment from substrates and provide more consistent incubation temperatures (Lorenz and Eiler 1989).

Coho salmon currently use the reach of the Yakima River adjacent to the proposed hatchery site solely for migration (WDFW 2016b, Streamnet 2016). However, coho have been observed spawning along the stream margins in the mainstem Yakima River near the canal diversion, just north of the proposed MRS Hatchery site. Since the initiation of coho acclimation at the proposed hatchery site, coho adults have returned regularly to spawn throughout the bypass (Newsome 2016b).

From 2000 to 2012, annual abundance estimates of juvenile smolts migrating downstream at Prosser Dam averaged 25,390 wild/natural-origin coho, and 264,000 hatchery-origin coho (Sampson et al. 2013). Since the Yakama Nation began outplanting hatchery coho smolts in the 1990s, the number of adults returning to the Yakima River basin has steadily increased. In 2014, a record 21,000 coho passed above Prosser Dam, and adult coho returns to Prosser Dam averaged about 4,800 fish from 1997-2014, including estimated returns of natural coho averaging about 1,000 fish since 2001 (Sampson et al. 2015). Less than 1 percent of returning adults are estimated to be harvested in the basin (Yakama Nation 2012a).

3.7.1.2.1.2 Summer-Run Steelhead

Steelhead are the anadromous form of the species *Oncorhynchus mykiss*; rainbow trout are the resident form. Anadromous *O. mykiss* in the Yakima Basin are part of the ESA-threatened MCR Distinct Population Segment of steelhead, but resident rainbow trout are not listed and are managed separately (NMFS 2013). The Yakima Basin supports four populations of summer steelhead: Satus Creek, Toppenish Creek, Naches River, and upper Yakima River. Although the historical steelhead run size is believed to have ranged from 20,800 to 100,000 fish (HSRG 2009), numerous factors have contributed to the decline of steelhead in the Yakima Basin, including damming of spawning tributaries, habitat degradation, and the construction of mainstem dams. Despite these factors, all four populations of Yakima River summer steelhead have increased in abundance since 2000 (Yakama Nation 2012a).

In the fish resources study area, summer steelhead from the MCR Distinct Population Segment are reported to spawn in the mainstem Yakima River adjacent to the proposed MRS Hatchery site (WDFW 2016c, Streamnet 2016); however, Yakama Nation biologists have not observed steelhead spawning in the vicinity of the diversion and spawning is believed to be limited (Newsome 2016b). Individuals from the upper Yakima population spawn in most of the accessible tributaries in the upper Yakima River, particularly the Teanaway River and its tributaries: Taneum, Swauk, and Umtanum Creeks. The Naches

River population spawns in nearly all accessible tributaries in the Naches watershed, though spawning in the Tieton and American Rivers is very limited. The Toppenish Creek population currently spawns in the upper watershed in Simcoe and Toppenish Creeks above the Simcoe Creek confluence. Satus Creek steelhead spawn in almost all reaches and tributaries of Satus Creek, including intermittent tributaries (Yakama Nation 2012a). Coho juveniles from the Yakima Basin reintroduction program currently are, or are planned to be, released into many of these tributaries.

Summer-run steelhead spawn timing varies throughout the basin. In the lower elevations like Satus Creek, spawning begins in February and may continue into June at higher elevations like the Naches and upper Yakima watersheds (Yakima Subbasin Fish and Wildlife Planning Board [YSFWPB] 2004; Yakama Nation 2012a). In Satus Creek, the lowest and warmest watershed in the basin, summer steelhead spawning begins in February. Steelhead fry typically emerge from April through mid-June. After spending 2 to 3 years rearing in freshwater, steelhead smolts out-migrate from the basin from early spring through June.

The Yakima Basin is currently closed to steelhead harvest; however, illegal and/or inadvertent harvest is likely (Yakama Nation 2012a). The estimated in-basin harvest rate is 8 percent (HSRG 2009).

3.7.1.2.1.3 Spring Chinook Salmon

Yakima River spring Chinook salmon are part of the MCR spring Chinook Evolutionarily Significant Unit (ESU), which includes all naturally spawning spring-run Chinook from the Klickitat River upstream to, and including, the Yakima River. The spring Chinook MCR ESU is not listed under the ESA.

The Yakima Basin supports three distinct stocks of spring Chinook salmon: American River, Naches River, and upper Yakima River. The proposed MRS Hatchery would be located adjacent to a reach of the Yakima River that is used by migrating upper Yakima River spring Chinook. Although WDFW (2016a) and Streamnet (2016) report that the reach is used for spawning and rearing, Yakama Nation biologists have observed very few spring Chinook spawning in the immediate vicinity of the diversion (Newsome 2016b). The upper Yakima River stock spawns in the mainstem from just below Roza Dam (RM 128) to Keechelus Dam (RM 214), though most spawning takes place between the Cle Elum River confluence (RM 186) and Easton Dam (RM 202). Some spawning also occurs in the Teanaway and Cle Elum Rivers. The Naches River stock spawns in the mainstem Naches River from the confluence of the Tieton River (RM 17.5) to the confluence of the Little Naches and Bumping Rivers (RM 44.6). Additional spawning occurs in Rattlesnake Creek, the Little Naches River, and in the Bumping River downstream of Bumping Lake Reservoir. The American River stock spawns almost exclusively in the American River, primarily between RM 1 and 15 (Yakama Nation 2012a). Coho juveniles from the Yakama Nation’s coho reintroduction program under Phase 3 are, or are planned to be, released into many of these tributaries.

Spring Chinook migrate past Prosser Dam from late April through July (BPA 1996). The American River stock begins spawning in late July, and the Naches River stock begins spawning in late August/early September. The upper Yakima River stock begins spawning in early September. All stocks typically complete spawning by mid-October. Fry emerge from late March to early June and rear in freshwater for 1 year before migrating to the ocean as smolts. Smolts typically out-migrate from late March through early June, peaking in late April (BPA 1996).

From 2000 to 2012, annual abundance estimates of juvenile smolts migrating downstream at Prosser Dam averaged 202,550 wild/natural spring Chinook and 305,130 hatchery-origin spring Chinook (Sampson et al. 2013). From 1984 to 2012, the estimated mean number of adults that returned to the upper Yakima River to spawn was 4,114. During that same period, the average number of adults returning to the Naches River was 1,825 (Sampson et al. 2013). From 2000 to 2007, an average of 869 adults returned to the American River to spawn. In-basin harvest of natural-origin (i.e., nonhatchery) fish ranged from 25 to 2,806 adults from 1982 to 2007. Since 2001, harvest of hatchery origin spring Chinook ranged from 12 to 1,865 fish (Yakama Nation 2012a).

3.7.1.2.1.4 Fall Chinook Salmon

Yakima River fall Chinook salmon are part of the upper Columbia River summer/fall Chinook ESU, which is not listed under the ESA. Fall Chinook were once abundant in the basin, but the population has declined significantly from historic levels. Summer Chinook salmon were extirpated from the Yakima Basin in the 1970s (Yakama Nation 2012a).

In the Yakima River mainstem, fall Chinook salmon spawn from Sunnyside Dam (RM 103.8) downstream to about the confluence with the Columbia River. Spawning upstream of Prosser Dam (RM 47) begins in mid-October, peaks in the first week of November, and ends by the third week of November. Fish in the lower mainstem may continue spawning into December, and spawning has been observed as late as early January (Yakama Nation 2012a). Fry emerge from late March through April.

The number of adult fall Chinook salmon that returned to the mainstem Yakima River to spawn from 1998 to 2006 ranged from 1,940 to 13,846 (HSRG 2009). Prior to 1999, there was little, if any harvest of fall Chinook salmon in the Yakima Basin. From 1999 through 2012, in-basin harvest ranged from 34 to 2,300 fall Chinook (Yakama Nation 2012a).

3.7.1.2.1.5 Sockeye

Four lakes in the Yakima Basin historically supported sockeye salmon production. However, the lakes were no longer accessible following the construction of irrigation storage dams, and native sockeye were extirpated from the basin in the 1990s (Yakama Nation 2012a). Recent sockeye reintroduction efforts have proven successful, and sockeye juveniles released into the basin since 2009 are now returning as adults (Brownlee 2016). The reintroduced population is not listed under the ESA (WDFW 2016d).

Sockeye salmon restoration feasibility studies conducted by NMFS concluded that sockeye salmon reintroduction was likely to be successful if passage improvements were made at Cle Elum Dam. Following the installation of temporary downstream passage facilities, in 2009, the Yakama Nation began transferring adult sockeye salmon collected at Priest Rapids Dam to Cle Elum Lake. These adults were from two stocks of sockeye salmon in the upper Columbia River–the Okanagan River and Wenatchee Lake. Transferred adults successfully spawned in tributaries above Cle Elum Lake and juveniles were observed migrating downstream through passage facilities at Roza and Prosser Dams in 2011 (WDFW 2016c).

In 2014, over 2,500 adult sockeye were counted at Prosser Dam (WDFW 2016d). These adults returned to the Yakima Basin as a result of Yakama Nation reintroduction efforts. Adults transferred to Cle Elum Lake remain in the lake in July and August, and spawn in the Cle Elum River from September through November (Yakama Nation 2015). Juveniles rear in the lake for about 2 years and out-migrate through a wooden flume in the Cle Elum Dam spillway (WDFW 2016a).

In an effort to continue these successful efforts, the Yakama Nation is working with Reclamation to restore upstream and downstream fish passage to and from the historic sockeye salmon lakes. Initial efforts are targeting passage facility improvements and construction on the Cle Elum Dam where fish passage facilities have been designed. The initial stages of construction for these facilities are currently underway.

3.7.1.2.1.6 Pacific Lamprey

Pacific lamprey are an important traditional food source for the Yakama Nation and other tribes. From 2002 through 2014, counts at Prosser Dam have ranged from 0 in 2010 to 87 in 2003 (Grote 2015). The Pacific lamprey is considered a species of concern by the USFWS, and is a monitored species in Washington State.

The Pacific lamprey has declined across much of its range in the Pacific Northwest, including the Yakima River. Adult lamprey migrate to freshwater from March through October, and overwinter before spawning in gravel substrates the following April through July. Pacific lamprey hatch as larvae called ammocoetes, and filter feed in fine silts and mud for up to 7 years before becoming young adults. As young adults, they out-migrate to the Pacific Ocean from March through July, typically at night during high flows (Grote 2015).

Adult lamprey can pass over rocks or dam walls by clinging to surfaces with their sucker-like mouths; however, radio-telemetry studies conducted in the Yakima Basin indicate that the overall passage efficiency at Roza Dam was 0 percent (Grote et al. 2016). These results indicate that, as currently built and operated, Roza Dam is a barrier to adult Pacific lamprey migration. Overall passage efficiency at other dams in the basin, including the Cowiche (Naches River), Wannawish, Prosser, Sunnyside, and Wapato Dams ranged from 48 to 82 percent (Grote 2015).

3.7.1.2.2 Resident Fish

The upper Yakima Basin supports a number of important resident fish species, including bull trout; rainbow trout; cutthroat trout; whitefish; and several species of dace, sculpins, and suckers. The lower Yakima Basin supports rainbow trout, whitefish, northern pikeminnow, redside shiner, chiselmouth and peamouth chubs, largescale, bridgelip and longnose suckers, and several species of sculpins and dace. In addition to these native species, three salmonid species (brook trout, lake trout, and brown trout) have been introduced, along with a variety of sunfish, perch, catfish, and minnows. Managed species or those with federal or state status are discussed below.

3.7.1.2.2.1 Bull Trout

Bull trout are a species of char (related to salmon and trout) that prefer cold, clean water. They were listed as threatened under the ESA in 1998 (63FR 31647) and spawn and rear in the upper portions of the Yakima Basin. Bull trout use the lower mainstem as a migratory corridor. The Yakima River “core area” is designated as critical habitat for bull trout (75 FR 63898). Critical habitat in the core area includes the mainstem Yakima River from its confluence with the Columbia River upstream to the uppermost point of bull trout distribution, including most tributaries in the basin. The canal and bypass are not designated critical habitat for bull trout (Halupka 2016a) The Yakima River core area is part of the Mid-Columbia Recovery Unit (USFWS 2015a).

The USFWS (2015a) identified 15 “local” bull trout populations in the Yakima River core area, including: Ahtanum Creek, Naches River tributaries (American River, Rattlesnake Creek, and Crow Creek), Rimrock Lake tributaries (Indian Creek, South Fork Tieton River, and North Fork Tieton River), Bumping Lake tributaries (Deep Creek and Bumping River), Cle Elum Lake tributaries (Cle Elum River and Waptus), Kachess Lake tributaries (Box Canyon Creek and the upper Kachess River), Keechelus Lake (Gold Creek), and the Yakima River (upper Yakima).The Teanaway River population is potentially extirpated and not currently included as a local population. These 15 local bull trout populations spawn in headwater streams and also use lower reaches of the stream and larger rivers and/or connected lakes as foraging, migratory, and overwintering areas.

Known bull trout presence extends downstream to the confluence of the Yakima and Naches Rivers, with presumed presence to the mouth of the Yakima River at the confluence with the mainstem Columbia River (Reiss et al. 2012). In the Naches River Basin, a stable bull trout population occupies the North and South Forks of the Tieton River; spawning occurs above RM 5 of the South Fork Tieton, and about 5 miles above Clear Lake in the North Fork Tieton (Newsome 2016c). Within the Yakima core area, some populations have access to reservoirs, but many are restricted to habitats upstream or downstream of dams due to a lack of fish passage facilities. Bull trout throughout the basin often face poor summer habitat conditions due to low flows and high instream temperatures resulting from irrigation withdrawals. Downstream of the confluence with the Cle Elum River, the Yakima River mainstem functions primarily as foraging, migratory, and overwintering habitat for bull trout.

Bull trout are a fish-eating species and need an abundant supply of forage fish to maintain healthy populations. They require cool water and temperatures: between 44 and 46°F are optimal; sustained temperatures above 59°F begin to stress fish (Bjornn and Reiser 1991; Yakama Nation 2012a). Bull trout exhibit several life-history strategies in the Yakima Basin. Those populations isolated above dams exhibit resident or adfluvial (migrating between tributary and reservoir/lake) life histories. Those populations below dams are typically fluvial (migrating between mainstem river and tributaries). Most populations spawn from mid-September to mid-October, but several spawn between August and early September or late October to early November (USFWS 2015a). Juveniles typically remain in their natal tributaries, and begin migratory movements as subadults.

3.7.1.2.2.2 Westslope Cutthroat Trout

Westslope cutthroat trout occur in the Yakima Basin in areas higher than 3,000 feet in elevation (Yakama Nation 2012a). Ten populations of westslope cutthroat trout have been identified in the upper Yakima Basin (Wydoski and Whitney 2003), although hybridization with other trout species has reduced the number of genetically pure populations. Westslope cutthroat trout spawn from March through July and exhibit several life history strategies (Yakama Nation 2012a). They may reside in tributary streams, lakes, larger rivers, and headwater streams. Generally, in streams, they occupy shoreline areas in the summer and move to deeper pools in the winter.

3.7.1.3 Ecological Interactions

In the Yakima Basin, ongoing ecological interactions between and among aquatic species are highly complex and can take the form of species-on-species predation and competition for food (prey) or space (habitat niches such as pools and undercut banks). Interactions can also occur on a genetic level. Breeding between stocks of fish from differing genetic origin can change the genetic structure or reproductive success of native populations.

Although interactions between and among naturally-occurring fish species is a common phenomenon in any fish-bearing waterbody, it is particularly important, in the context of the Proposed Action, to establish a baseline relative to ecological interactions between reintroduced coho salmon and nontarget fish species in the Yakima Basin. Hatchery-produced coho were first introduced into the Yakima Basin for harvest augmentation in 1983 with the release of 324,000 Little White Salmon Hatchery smolts. This program was modified when it was incorporated into the BPA-funded YKFP in 1996, with a goal of using hatchery production to reestablish or increase natural production of anadromous salmonids and to increase harvest opportunities (McMillen Jacobs Associates 2016). Since 1997, the Yakama Nation has annually released between about 600,000 and 1.4 million hatchery coho into the basin, most of which are smolts (Yakama Nation unpubl. data 2016; see Table 2.3-1).

Ongoing concerns about the potential for reintroduced coho to negatively impact nontarget fish in the Yakima Basin prompted stakeholders to develop and implement a risk containment monitoring program (BPA 1996; Busack et al. 1997; Ham and Pearsons 2001 as cited in BPA et al. 2012). This program continues today and includes ongoing MR&E studies in tributaries where reintroduced coho are released throughout the basin. Research has indicated that negative ecological interactions due to coho reintroduction efforts are minimal (Dunnigan 1999; Dunnigan et al. 2002; Pearsons et al. 2007; Temple et al. 2014), and that positive effects on fish growth might occur from restoring lost marine-derived nutrients (Bilby et al. 1998; Wipfli et al. 2003).

Baseline ecological interactions between hatchery-released coho and nontarget fish species in the Yakima Basin are summarized below, with an emphasis on ESA-listed species in the study area.

3.7.1.3.1 Residualism

Residualism is the failure of some hatchery-reared juveniles to out-migrate from freshwater as smolts (Sharpe et al. 2011). Residual fish remain in freshwater throughout their lives, and may therefore compete with and prey on other species (Dunnigan 1999; Dunnigan et al. 2002). Sampson and Fast (2000) report 2.9 and 13.6 residual coho per kilometer per 50,000 smolts released into the upper Yakima and Naches Rivers, respectively, (indicating that current coho residualism is relatively low.

Temple et al. (2012) also evaluated the presence and abundance of residualized hatchery smolts in the North Fork Teanaway River, below the Jack Creek acclimation pond, and in the mainstem Yakima River above Roza Dam. They found that some spring Chinook salmon smolts did not out-migrate, but very few coho smolts residualized. No coho residuals have been observed since 2007. Because of the low number of observed residualized hatchery coho, existing impacts on nontarget fish species from competitive interactions with residual hatchery coho are estimated to be low. In an effort to reduce the amount of residual coho, the Yakama Nation currently releases smolts that are ready to migrate. Reducing residualism reduces the potential for competition with and predation on other species (Ecology/BPA 1999).

3.7.1.3.2 Competition

Supplementation and conservation efforts, such as the Yakama Nation’s ongoing Yakima Basin coho reintroduction program, could result in competition for previously occupied habitat and resources. This may lead to displacement and reduced survival or abundance of one or both of the competitors (Glova 1984; Young 2004). Competition between and among fish species occurs when two or more individuals use the same resources, particularly when the resource is limited (YSFWPB 2004). In the Yakima Basin, reintroduced coho that are released as fry may currently compete with other fish species for rearing habitat and feeding opportunities. Juvenile coho salmon are thought to be more aggressive relative to other juvenile salmonids; thus, they may compete with other hatchery or naturally-produced salmonids under certain conditions. However, Groot and Margolis (1991) suggest there is little habitat overlap between coho and other salmonids, and that this habitat segregation provides a possible mechanism for reducing ecological interactions between the species.

Several studies have evaluated the existing growth and abundance of nontarget fish species (i.e., non-coho) following years of ongoing juvenile coho releases in the Yakima Basin. Dunnigan (1999) found no evidence that ongoing coho fry releases influenced the abundance or growth of rainbow or cutthroat trout in the Naches River watershed. The researchers acknowledged that low sample size could have biased the results, but speculated that spatial segregation, resource partitioning, and differences in diet minimize the potential for competition between coho and trout.

Temple et al. (2011) reported that reintroduced coho rarely occupy habitat that overlaps with cutthroat trout in tributaries, though some overlap occurs in higher elevations of the mainstem. Study findings indicate that considerable overlap between coho and rainbow trout currently occurs in tributaries and the mainstem. Coho also appear to overlap with mountain whitefish and sucker species in the mainstem, and dace and sculpin species in tributaries. However, other studies in the Yakima and nearby basins (Dunnigan et al. 1999; Spaulding et al. 1989 as cited in BPA et al. 2012) suggest that ongoing competition between coho and other species may not be significant. Although mountain whitefish are ubiquitous in the upper Yakima and Naches systems, they use different habitat than coho (BPA 2007).

Some level of competition likely exists between reintroduced coho and other native fish species in the basin; however, given that coho were once native to the basin, spatial segregation and use of habitats within individual tributaries might reduce competitive interactions. Potential impacts on other salmonids from coho adults spawning in tributaries is likely low because bull trout (discussed below) are the only species that spawns at the same time as coho.

3.7.1.3.2.1 Steelhead

Coho and rainbow trout/steelhead occupy similar habitats in the Yakima River and its tributaries (Pearsons and Temple 2007). Although researchers have observed some reduction in the mean size of rainbow trout and steelhead since the start of coho reintroduction (and spring Chinook supplementation), further analysis determined that this trend was not related to coho reintroduction activities (Pearsons and Temple 2007). Further, Pearsons and Temple (2007) found that the current level of salmon supplementation in the basin has not impacted steelhead in the upper Yakima Basin beyond “acceptable limits.” Acceptable levels of impact on nontarget fish of concern (e.g., ESA-listed steelhead) were defined as a significant change in abundance, size structure, and distribution of nontarget fish when compared to presupplementation conditions (Pearsons 1998; Temple and Pearsons 2012). In the *Biological Opinion for the Yakima River Spring Chinook Salmon, Summer/Fall Chinook Salmon, and Coho Salmon Hatchery Programs*, NMFS (2013) recognized that these “acceptable limits” provide a sufficient means to measure the impact of coho reintroduction on ESA-listed steelhead. These limits are monitored by the Chinook/Cle Elum Supplementation and Research Facility, as part of the overall ongoing MR&E program of the YKFP. The Chinook/Cle Elum Supplementation and Research Facility was incorporated into the Yakima River hatchery programs “to test the assumption that new artificial production can be used to increase harvest and natural production while maintaining the long-term fitness for the fish population being supplemented and keeping adverse genetic and ecological interactions with nontarget species or stocks within acceptable limits” (BPA 1996).

Temple et al. (2014) evaluated ecological interactions between naturally produced coho and rearing juvenile rainbow/steelhead trout following 5 years of coho reintroduction in Taneum Creek in the Yakima Basin. During the study, they observed coho and trout rearing together in all habitats sampled (e.g., pool, riffle, and glide), which confirmed that both species occupy similar habitats and therefore may compete for resources. By comparing rainbow/steelhead trout data from decades of previous study to post-coho reintroduction data, they found that increased natural coho production did not reduce rainbow trout abundance, size, condition, or growth. These findings suggest that ongoing reestablishment of natural coho densities has not resulted in negative ecological interactions for rainbow/steelhead trout. Further, Temple et al. (2014) did not detect impacts on rainbow trout abundance where adult coho were stocked during studies conducted in Taneum Creek.

The MCR steelhead recovery plan (NMFS 2009) does not identify the reintroduction of coho salmon as a factor limiting the productivity of the Yakima River MCR steelhead (NMFS 2009). The Yakima Recovery Plan (YBFWRB 2005) supported the continued reintroduction of coho salmon in the Yakima River Basin, and indicated that such programs could potentially increase the flow of marine-derived nutrients into salmon and steelhead rearing areas (NMFS 2013). Further, NMFS (2013) states that "the presence of hatchery fish and the progeny of naturally spawning hatchery fish in the juvenile steelhead rearing areas is likely to result in competition between rebuilding coho salmon and ESA-listed steelhead, but this competition is expected to have a low effect on ESA-listed steelhead."

3.7.1.3.2.2 Bull Trout

Introduced species such as brook trout compete with bull trout for resources (Dambacher et al. 1992) but reintroduced coho salmon in the Yakima Basin rarely overlap with bull trout in tributaries (Pearsons and Temple 2007). Spawning coho adults are spatially separated from bull trout, which spawn in higher elevation tributaries than coho. Ongoing releases of juvenile coho downstream of the upper Yakima River reaches are far downstream of areas where bull trout spawn and rear and therefore do not likely affect bull trout (USFWS 2007a). However, the expansion of coho release sites further upstream in the upper Yakima Basin may result in some level of interactions.
Several years of ecological interactions studies conducted in the Yakima Basin have not detected adverse effects on bull trout (Pearsons et al. 2006). However, the USFWS (2007a) notes that the number of bull trout collected in these studies was small and therefore make it difficult to detect possible effects.

3.7.1.3.3 Predation

Predation by hatchery fish on wild fish can occur anywhere the two stocks exist in the same space and time, and risks to wild fish are increased when hatchery fish, particularly larger smolts, are released during periods when vulnerable newly emergent fry are present. In general, hatchery fish can consume fish that are 50 percent of their body size; however, studies reviewed by Busack et al. (2006) indicated that the range may extend from approximately 38 percent (steelhead) to 75 percent (coho). In a number of documents, NMFS and the USFWS (USFWS 1994, NMFS 1999) concluded that juvenile salmonids can consume prey up to 33 percent (one-third) of their body length and smaller.

Some studies speculate that hatchery fish may be less efficient predators than their natural-origin counterparts of the same species, thus reducing the potential for predation (Bachman 1984, as cited in NMFS 2013; Olla et al. 1998). Still, in the Yakima Basin, hatchery-released coho smolts have been shown to prey on several species of salmonids (including spring Chinook fry) at very low frequencies. Because most salmonid fry emerge in mid-summer after coho smolts migrate, the risk of predation on other fish species by parr and by second generation coho spawned in the wild is low. This is also the case for predation on resident juveniles due to spatial and temporal separation between coho and other salmonid species (BPA 2007).

In an effort to establish a baseline for the ecological risk of re-establishing coho in the Yakima Basin, the Yakama Nation has conducted a number of field studies as part of Phase 1 and Phase 2 of the coho reintroduction program. Dunnigan (1999) conducted a 2-year coho smolt predation study investigating the predation of newly emergent spring Chinook fry in the upper Yakima Basin (Dunnigan 1999). The study reported that of nearly 1,100 coho smolts trapped in 1998, only 5 had consumed fish, and of those fish, only 1 individual had consumed an anadromous salmon (spring Chinook). The study concluded that ongoing hatchery coho smolt releases had no significant impact on the wild spring Chinook population. Similarly, in 1999, only 2 coho out of 993 collected smolts had consumed fish, and none of them were salmonids. Researchers investigating coho smolt predation on fall Chinook salmon found that the two most abundant fish species in coho stomachs were carp and sculpin, and the coho smolt diet consisted overwhelmingly of invertebrates. Based on these results, researchers estimated that coho predation on fall Chinook salmon was no higher than 0.1 percent and was likely much lower (McMichael and Pearsons 1998; Dunnigan et al. 2002).

3.7.1.3.3.1 Steelhead

Hatchery coho salmon smolts are currently released into the Yakima Basin in the spring and typically average 150 mm in length (NMFS 2013). Based on the assumption that coho smolts can eat fish smaller than one-third their length, steelhead juveniles smaller than 50 millimeters could be consumed by hatchery coho smolts. Steelhead spawn timing in the Yakima Basin varies by elevation and water temperature, but generally occurs from March through mid-June (see Section 3.7.1.2). Based on this spawn timing and the subsequent incubation period, steelhead fry do not emerge from the gravel until after the majority of the hatchery coho smolts have out-migrated from the Yakima Basin, thus reducing the potential for predation. The low likelihood of predation of salmonid fry by hatchery salmon smolts is supported by coho predation studies conducted in the Yakima Basin. As presented in the preceding section, stomach analyses conducted on coho smolts collected from the Yakima Basin found little evidence of coho smolt predation on other fish (Dunnigan 1999). Therefore, the ongoing risk of steelhead fry predation by hatchery-released coho smolts in the Yakima Basin appears to be low.

3.7.1.3.3.2 Bull Trout

As discussed above, Pearsons and Temple (2007) evaluated the impacts of coho salmon reintroduction in the Yakima Basin on several trout species, including bull trout. They found very little if any spatial overlap of coho and bull trout in Yakima River tributaries, including those in the upper Yakima River (e.g., North Fork Teanaway River at Jack Creek). Further, they did not capture any coho (or Chinook salmon) during electrofishing of areas where bull trout were present (Pearsons and Temple 2007).

Although it is possible that some overlap occurred at times and places when/where sampling did not occur, substantial overlap was unlikely because sampled areas were selected based on the likelihood of overlap. Pearsons and Temple (2007) speculated that some overlap between coho and bull trout is likely in unsampled areas, including the Naches River subbasin. However, because bull trout spawn in headwater tributaries, typically well upstream of coho spawning areas, the potential overlap of bull trout juveniles and coho salmon large enough to prey on them is likely very low. Salmon typically occupy streams of lower gradient, lower elevation, and warmer water temperatures than bull trout (Glova 1984; Dunham and Rieman 1999). Predation on bull trout juveniles by released coho salmon juveniles is therefore likely low.

3.7.1.3.4 Genetic Interactions

Hatchery fish pose a threat to natural population rebuilding and recovery when they interbreed with fish from natural populations (NMFS 2013). Native Yakima River coho were extirpated from the basin in the early 1980s, but reintroduction efforts began in 1983 using broodstock from the Little White Salmon Hatchery; the YKFP coho project began in 1996 using broodstock from the Eagle Creek National Fish Hatchery (Yakama Nation 2012a). Broodstock for the ongoing coho reintroduction program are now adults returning to the Yakima River that are largely naturally-produced fish of hatchery ancestry. There are no differences between the hatchery and natural coho populations in the Yakima Basin because the natural population was extirpated and the current hatchery population is being used to develop the natural stock.

With regard to ESA-listed steelhead and bull trout, coho do not interbreed with either species; therefore, neither species is currently susceptible to genetic interactions from the ongoing coho reintroduction program.

3.7.1.3.5 Beneficial Effects

Hatchery-origin as well as natural-origin fish contribute marine-derived nutrients stored in their bodies to freshwater and terrestrial ecosystems (Bilby et al. 1996). This transfer of marine-derived nutrients is occurring as a result of the coho reintroduction program. Another positive benefit may come from the disturbance of gravels by spawning adult coho (and other salmonids), which removes fine materials from the riverbed and increases flow exchange (NMFS 2013; Montgomery et al. 1996). The act of gravel churning by spawning coho salmon, the last spawners of the year in the Yakima Basin, may also bring macroinvertebrates to the surface and thereby increase the availability of this juvenile salmonid food source (Newsome 2016b). Finally, in areas where they overlap, juvenile coho might also provide another prey source for larger trout and sculpin (BPA 2007).

3.7.1.4 Monitoring, Research, and Evaluation Activities

MR&E activities related to the Yakama Nation’s coho reintroduction program are ongoing as part of the overall YKFP project and were included in the overall YKFP EIS (BPA 1996). These MR&E activities have the potential to affect nontarget fish, including ESA-listed steelhead and bull trout. However, the level of impact depends on the activity. For example, mobile adults observed during spawning ground surveys are not negatively impacted—the adults temporarily move away from the observers. Whereas, juvenile trapping and density surveys that require electroshocking temporarily impact small fish, resulting in some limited injury and mortality of nontarget species.

Impacts on nontarget fish associated with MR&E activities are considered part of the baseline for fish resources. Ongoing MR&E activities and a summary of potential ongoing effects on fish are summarized below.

- **Coho Spawning Surveys.** Redd surveys and activities associated with tracking radio-tagged adult coho salmon are conducted on an annual basis in various tributaries of the basin, but because coho do not spawn at the same time as most fish, there are typically no impacts on spawning habitat or salmonid eggs. Coho and bull trout spawning may overlap temporally, but do not typically overlap spatially. The presence of researchers in any stream channel may displace fish from occupied habitats, but this impact is temporary. All surveys are conducted in a manner that avoids touching, capturing, or intentionally displacing fish.

- **Screw Trapping.** The Yakama Nation and WDFW operate several screw traps in the Yakima Basin to monitor outmigration of coho smolts. Nontarget fish are sometimes incidentally collected in these traps and are subject to stress due to collection and holding. These traps, however, are monitored every 24 hours and nontarget fish are released with minimal handling.
- **Tributary Juvenile Monitoring.** The Yakama Nation and WDFW snorkel various waterbodies to observe coho in reintroduction streams. Snorkelers merely observe fish and do not touch, capture, or intentionally displace individuals from occupied habitat. Therefore, impacts to fish due to this action are minimal.

  Although snorkeling is preferred for tributary monitoring, an electrofisher is sometimes used during these surveys. If electrofishing is conducted, nontarget fish can be subjected to stress, and in the most severe case, mortality. However, fish are held in oxygenated buckets for minimal times, and released back into waterbodies soon after they are collected, which reduces stress. This measure, as well as the requirement that only experienced biologists operate the electrofishers, minimizes the risk to fish during these surveys. Further, operational protocols developed by the YKFP call for ESA-listed fish (e.g., bull trout) to immediately be released unharmed back to the river if encountered during electrofishing surveys anywhere in the basin.
- **Adult Coho Release.** Ongoing adult coho release into seeding tributaries is also an MR&E activity. The release of adult coho into tributaries for natural spawning may displace fish on the spawning grounds; however, aside from bull trout, salmonids do not spawn at the same time as coho. Coho are not currently released into bull trout spawning areas. Coho adults do not prey on fish during spawning and die shortly after; therefore, impacts to nontarget fish would be low.

Impacts on ESA-listed species or critical habitat from the interrelated MR&E action have been previously authorized under Sections 7 and 10 of the ESA (NMFS 2013; USFWS 2007a; USFWS 2016a). As the coho reintroduction project continues in future phases, MR&E activities would be subject to future ESA consultations.

3.7.1.5 Adult Collection Activities

As part of the overall YKFP program, spring Chinook salmon are currently collected for broodstock at Roza Dam, and both spring Chinook and coho are collected at Prosser Dam. Coho adults could also be collected at Cowiche and Wapatox Dams in the future. These ongoing adult collection activities are part of the baseline for fish resources. Nontarget species, including ESA-listed bull trout and steelhead, are occasionally encountered during adult broodstock collection activities at these sites. Potential impacts to nontarget fish associated with ongoing coho broodstock collection include potential stress during handling at fishways; lethal impacts are not common. Broodstock sorting and holding also results in minor migration delays to nontarget fish; however, long-term impacts on fish viability do not likely occur. All nontarget fish intercepted during broodstock collection at Cowiche and Roza Dams are immediately passed back to the river to minimize stress and potential mortality.

3.7.1.6 Climate Change

Climate change has negatively impacted aquatic habitats, including those that are designated as critical habitat for ESA-listed fish in the Pacific Northwest (ISAB 2007). East of the Cascades, the primary climate-related concerns are an increased likelihood for wildfires, reduced availability of habitat for salmon and steelhead due to warming stream temperatures and altered flow regimes, and the long-term impact of reduced water supply on the agricultural industry (Lawler and Mathias 2007; Littell et al. 2009).

Climate change models indicate significant changes in runoff in the Yakima River basin. Modeling conducted by Vano et al. (2009) suggests that, as the twenty-first century progresses, basin transitions to earlier and reduced spring snowmelt would increase the curtailment of water deliveries, especially to junior water right holders. The projected increased air temperatures would cause some precipitation to fall as rain instead of snow, which would increase winter and early spring runoff and reduce the volume of runoff from snowpack that occurs in the late spring and early summer. The net effect is anticipated to be a shift in the peak runoff period to earlier in the season, with a corresponding decrease in spring and summer (projected at 12 to 71 percent of existing runoff) and increase in fall and winter runoff (projected at an increase of 4 to 74 percent of existing runoff) (Reclamation 2015b).

3.7.2 Environmental Consequences of Proposed Action

The potential impacts of the alternatives on fish and fish habitat fall into three general categories:

- Facility impacts, caused by construction of the MRS Hatchery.
- Impacts caused by operation and maintenance of the MRS Hatchery and acclimation facilities.
- Ecological impacts resulting from the acclimation and release of MRS Hatchery coho into Yakima Basin streams, resulting in released coho interacting with fish already present in and outside of the area. Ongoing MR&E activities associated with ecological interactions are also included in this category.

Each of these types of effects is described below relative to each alternative.

3.7.2.1 MRS Hatchery Construction

This section analyzes potential changes to riparian and riverine habitats that are directly related to the construction/installation and maintenance of facility-related structures, including mobile acclimation sites.

Under the Proposed Action, a new hatchery would be constructed at the Holmes Ranch property (Figure 2.2-1). Construction of the MRS Hatchery would include work in and adjacent to the canal and bypass. To minimize impacts on fish, BPA would require all contractors to adhere to applicable conservation measures of the Habitat Improvement Program III BA (BPA 2012b) for general construction and in-water work. These measures include sedimentation and turbidity minimization measures and operational measures during construction to minimize impacts on aquatic habitat and species. Given the short duration of construction activities and the mitigation measures implemented as part of the Proposed Action (Section 3.7.2.4), construction impacts on fish and their habitat would be low.

The effects of construction activities on fish habitat and fish are described below.

3.7.2.1.1 Upland and Riparian Actions

Construction and grading activities would disturb upland areas at the site. The majority of construction would occur in areas that are either previously disturbed or dominated by grasses, and have limited riparian vegetation (shrubs and trees adjacent to waterbodies). Construction would increase the impervious surface area and could result in increased or rerouted runoff and sediment carried into the canal or bypass, which could disturb or displace fish, or impair their ability to feed. However, most construction activity would occur away from the canal or bypass and would be managed by the use of erosion control devices, removal of the least amount of vegetation possible, and revegetation of disturbed areas with native grasses, shrubs, and trees following disturbance (see Section 3.7.2.4). Impacts on fish or their habitat are anticipated to be localized to the hatchery site and short term and would thus be low. Demolition of existing upland structures (e.g., existing residence) would not result in any effects on fish or other aquatic resources.

Construction and grading activities at the proposed intake and outfall locations on the bypass would result in the removal of some riparian vegetation. The riparian corridor at these locations contains grasses, willows, black cottonwood, quaking aspen, and other deciduous trees. While these species provide shade in spring and summer, vegetation gaps are common along the narrow (about 25 feet wide) riparian corridor. Loss of riparian vegetation would result in a minor decrease in local nutrient recruitment to adjacent waterbodies; however, this loss would be low on a watershed scale and impacts on fish would be low.

The removal of future large woody debris is anticipated to be low as recruitment trees for large woody debris are sparse at the intake site. Any existing large woody debris that interferes with facility installation would be relocated either upstream or downstream of the construction area, but would not be removed from the bypass channel.

3.7.2.1.2 In-Channel Actions

In-water construction may alter water quality and negatively impact fish that are present near the activity. Impacts may range from behavioral modifications to injury or mortality of eggs or juvenile and adult fish. In-water construction can also degrade habitat function and reduce or block access to spawning and rearing habitats.

As described in Chapter 2, construction of the proposed MRS Hatchery and associated infrastructure would require the following in-water work in the canal, bypass, and historic side channel:

- Canal
  - Conversion of trash rack on canal diversion HDPE structure, with fiberglass reinforcement to minimize the formation of ice.
    - This would occur during the in-water work period and dewatering would not be necessary.

  - Modifications to the canal fish screening facility, including a low-lying concrete sill and two stoplog bays.
- Bypass
  - Addition of MRS Hatchery intake and two sheet pile sills to backwater the intake screen.
- Side Channel
  - Addition of the MRS Hatchery outfall.
  - Addition of the fire suppression intake.
- Wehl Ditch Conversion
  - The existing Wehl irrigation ditch that bisects the property would be partly replaced with a covered culvert. Because the ditch is non-fish-bearing and work would occur when it is not operating, no impacts on fish habitat would occur.

As described in Chapter 2, although the recommended in-water work window for Yakima River tributaries is July 15 to August 31, an alternate low-flow work window would be required because the canal diversion must operate to provide irrigation water from April through October. Considering this and onsite conditions, the proposed in-water work period for the canal, the bypass, and the historic side-channel would be November through December.

This work window has been approved by the USFWS (Halupka 2016b) and NMFS (Turner 2016) through the ESA Section 7 consultation for this project.

During the November through December in-water construction period, fish that inhabit the canal or bypass may be disturbed or displaced. Salmonids that may be present include coho and likely few juvenile *O. mykiss* and spring Chinook salmon (NMFS 2013). Lamprey ammocoetes may also be present in locations with suitable substrate (silt and sand). Resident fish such as sculpin would likely be present in both the canal and bypass. EFH for Chinook and coho salmon would be temporarily degraded from increased turbidity associated with construction of the outfall in the historic side channel.

The November through December in-water work window would overlap with the coho spawning period. Because coho are known to spawn in the bypass reach near the proposed intake, a temporary picket fish barrier would be erected across the mouth of the channel downstream of in-water work sites prior to construction. This would prevent adults from moving up the channel and spawning. Therefore, coho spawning habitat would be slightly reduced during the in-water construction year in the bypass, requiring coho to find other suitable habitat in the general project area. However, this approach would avoid direct, negative impacts on incubating redds near the in-water construction sites. The canal is not used by spawning coho, and the diversion would be closed in November, prohibiting fish access into the canal.

All seepage water pumped from the in-water work areas would be routed to settling basins prior to discharge. For this reason, no impacts on water quality and fish habitat downstream of the in-water construction sites are anticipated.

3.7.2.1.2.1 Fish Salvage

In-water work in both the canal and bypass is proposed to occur in the fall/early winter when the diversion is not operating. Despite the lack of surface water, groundwater seepage provides year-round flow in these channels, and therefore provides some fish habitat. Thus, dewatering of the in-water work areas would be necessary to isolate the construction areas. To facilitate dewatering, gravel- or water-filled supersack cofferdams would be placed in each channel to isolate work areas from active flow, thus allowing work to occur “in the dry.”

During cofferdam placement, the presence of construction workers may displace some fish to sites upstream or downstream of the work area. However, some fish would likely remain in the work area, particularly in the bypass. Therefore, prior to dewatering of in-water construction areas, qualified fish biologists would remove all remaining fish from areas behind the cofferdams. Remaining fish would be flushed from the area behind the cofferdams, typically by seining or herding and, if necessary, by use of a conventional backpack electrofisher (or other methods as determined by USFWS, NMFS, and/or WDFW). If capture is necessary, fish would be placed into a 5-gallon bucket using small dip-nets. Captured fish would be released back into the stream channel a safe distance upstream of the work area.

During the proposed in-water construction period (November through December), rearing coho and resident fish are the most likely species to be encountered during fish salvage activities. Salvage efforts would temporarily displace fish from occupied habitats and would stress fish during salvage and for a short duration after fish are relocated to unaffected reaches. Little, if any, direct mortality is anticipated from handling of fish during salvage operations. As previously discussed, a picket barrier would prohibit adult coho from entering the bypass during the construction period.

3.7.2.1.2.2 Displacement and Disturbance

Following in-water isolation for the November through December in-water work period, the quantity of available habitat for fish that are present in the canal or bypass would be temporarily reduced due to the presence of cofferdams. This habitat reduction would be minor and limited to the period of construction. Further, affected habitat represents a small fraction of available habitat in the study area for each waterbody. Due to the low quality of habitat at the canal’s fish screen facility, impacts on fish are expected to be low. At the intake location on the bypass, rearing juvenile salmonids and other resident fish would be temporarily displaced from about 600 square feet of habitat (assuming a 50-foot construction reach). In addition, for the construction year, the availability of spawning habitat for adult coho would be reduced because the temporary upstream passage barrier would limit access to the lower portions of the bypass. The single season duration of this impact on spawning habitat would minimize the effect on coho spawning productivity in the bypass, and impacts would be low.

3.7.2.1.3 Physical Habitat Alteration

The physical disturbance of in-water habitat has the potential to affect fish spawning, feeding, and rearing. At the canal’s fish screening facility, habitat is of low quality and the proposed concrete sill would not impact features such as holding pools, spawning habitat, migratory pathways, or rearing areas. Therefore, no measurable impacts on fish or fish habitat would occur. At the bypass intake location, the channel-spanning sills would permanently remove a minor amount of habitat that is currently used for coho spawning, incubation, and rearing. Ample spawning and rearing habitat would remain available both upstream and downstream of this structure. Salmonids would continue to be able to access this habitat after intake construction because the concrete sills would be passable to all life stages.

Sedimentation and turbidity would occur during the placement and removal of cofferdams. However, due to the low-flow conditions in both waterbodies during the November through December in-water work period, because groundwater is the only source of flow in the channels, measurable impacts on fish (e.g., gills damage, foraging disruption, or habitat displacement) are unlikely. Construction-related sedimentation impacts on fish in the canal and bypass would be temporary, and daily monitoring for turbidity during in-water work would ensure that construction impacts on the aquatic environment would be low. Considering that any sedimentation generated during instream work would be a temporary rather than a chronic condition, and that most fish can avoid sediment plumes that would likely be distributed over relatively short distances, the potential for effects to fish species due to construction-related sediment and turbidity would be low. At the bypass intake location, cobbles and gravels would be restored as close to the original location as possible following in-water construction.

3.7.2.1.4 Prey Species

Benthic macroinvertebrates are an important component in the diet of juvenile salmonids. Benthic invertebrates within the in-water work areas isolated by cofferdams would be lost during streambed and bank excavation. In addition, increased turbidity and sedimentation downstream of the in-water work areas are likely to negatively affect benthic invertebrates through alteration of water quality and substrate conditions. Benthic macroinvertebrate communities within the areas isolated by cofferdams and areas immediately downstream are expected to recolonize rapidly following construction. Full recovery of benthic invertebrate communities usually requires 6 months to 1 year after in-water work associated with excavation (Tsui and McCart 1981; Young and Mackie 1991; Vinikour and Schubert 1987; Anderson et al. 1998). Because of the small amount of habitat that would be affected by instream construction and isolation in the canal and bypass, low to no effects on the growth or survival of fish, particularly juvenile salmonids, are anticipated.

3.7.2.1.5 Release of Construction Fluids

There is some risk to rearing fish associated with potential accidental releases of fuel or oil into the canal or bypass from equipment and machinery used during in-water activities. Site-specific pollution control measures would be developed for construction of the MRS Hatchery as part of the NPDES Construction Stormwater General Permit. In the event of a spill, fish could be adversely affected by released chemicals or contaminants; effects could range from death to behavioral changes resulting in abandonment of the area of the spill. However, mitigation measures such as storing fuel away from waterbodies, and inspecting equipment for fuel leaks prior to use near waterbodies would minimize this risk. Further, as described in Section 3.7.2.4, spill prevention plans would be developed for the project and implemented as required.

3.7.2.1.6 Mobile Acclimation Facility Set Up and Removal

As described in Chapter 2, proposed mobile acclimation units would be similar to those that have been used at Toppenish and Easton Creeks. Each unit would be set up upland of the ordinary high water line in upland areas that have existing disturbance (e.g., spur roads). The Yakama Nation would not place acclimation units in sensitive areas (e.g., wetlands) or remove riparian vegetation, including trees, to set up the facilities. Little, if any, grading and site preparation would be required, and no mechanical grading would occur. Upland work required to set up the mobile acclimation units would therefore not impact aquatic habitats or fish.

A screened surface water pump with aboveground piping would be set up to deliver surface water from subject creeks to up to two tanks at each location. Water would be returned to the creek using a single outlet hose. The surface water intake and outlet would be removed following each acclimation season. Installation of the intake and outlet would not require any disturbance to the riverbank or bed, and would be completed in less than a few hours. Therefore, due to the short duration of in-water work and the limited area of potential impact, there would be a low impact on fish during these activities. If present along the stream margins during surface water intake or outlet installation (or removal), fish may be temporarily displaced from holding habitats, but would return to the area immediately after human activity has ceased. Following the acclimation season, if desired by the landowner, the Yakama Nation would remove each unit from the riverbank. Removal efforts would have low impact on fish or aquatic habitats.

3.7.2.1.7 Construction Impacts on ESA Resources

3.7.2.1.7.1 MRS Hatchery

During the November through December in-water construction period, fish that inhabit the canal or bypass may be disturbed or displaced. ESA-listed MCR steelhead are highly unlikely to be encountered in the dewatered canal (Turner 2016), and rearing bull trout would not be present in the canal or bypass. In the unlikely event that juvenile steelhead are present at either in-water work location, construction of in-water elements for the MRS Hatchery may temporarily displace individuals from habitat. No lethal impacts are anticipated, and individuals would have access to ample suitable habitat for rearing. Adult steelhead should not be affected by construction of the MRS Hatchery. Because the canal and bypass are not designated as critical habitat for bull trout or MCR steelhead (Halupka 2016a; Turner 2016), there would be no construction-related impacts on designated critical habitat. During the proposed in-water work window (November through December), each waterbody contains about 3 to 5 cfs of groundwater seepage. The low flow and low velocity conditions related to this seepage are unlikely to carry construction-related sedimentation from installation/removal of cofferdams to critical habitat in the mainstem Yakima River. There would be no construction-related impacts on populations of ESA-listed fish (bull trout and MCR steelhead) at the population level.

During a recent ESA consultation completed for the Proposed Action, NMFS (2017) concurred that construction of the Proposed Action is *not likely to adversely affect* MCR steelhead.

In the BA prepared for the Proposed Action under Section 7 of the ESA, BPA concluded that construction of the MRS Hatchery is *not likely to adversely affect* bull trout. USFWS issued a Biological Opinion stating that, although the Proposed Action is likely to adversely affect bull trout, it is not likely to jeopardize the continued existence of the species and is authorized under specific terms and conditions (USFWS 2017). .

3.7.2.1.7.2 Mobile Acclimation Facilities

Impacts on ESA-listed fish or their designated critical habitat would be low during set up of the mobile acclimation units and associated surface water delivery/return systems.

3.7.2.2 MRS Hatchery Operation and Maintenance

The primary potential impact of proposed MRS Hatchery operations would be anticipated to be related to the diversion and return of surface water for rearing coho in the hatchery. This action would not affect the spatial distribution of fish, including ESA-listed steelhead and bull trout.

The following MRS Hatchery operations could impact fish resources in the project study area:

- Diversion of up to 10 cfs from Yakima River at Reclamation’s canal diversion from November through March.
- Operation of a new surface water diversion in the bypass.
- Groundwater use.
- Discharge of hatchery effluent to the Yakima River.
- Operation of intake for fire suppression.
- Stormwater runoff from the site.
- Routine maintenance of in-water project elements (e.g., intake and outfall).

3.7.2.2.1 Surface Water Diversion

3.7.2.2.1.1 New Cascade Canal Diversion

As part of proposed MRS Hatchery operations, from November through March up to 10 cfs would be diverted from the Yakima River at the New Cascade canal diversion. Diverted surface water would be returned to the Yakima River side channel, and eventually flow back into the mainstem Yakima River approximately 6,900 feet downstream of the diversion. Based on flow data from Reclamation’s Horlick gage (see Section 3.7.1.1), the 10 cfs represents less than 2 percent of average Yakima River flows during the lowest flow period of proposed use (February). For this reason, measurable impacts on instream flows and temperatures within the diversion reach are unlikely, and impacts on fish in the mainstem Yakima River would be low. In its BiOp issued for ongoing hatchery programs in the Yakima River Basin, NMFS (2013) concluded that hatchery surface water diversions along the mainstem Yakima River do not adversely affect EFH.

The Proposed Action would not change current operations of the canal diversion during the irrigation season (April through October) because existing diversions would continue.

3.7.2.2.1.2 New Cascade Bypass

The proposed bypass intake would divert 6 to 7 cfs of surface water to the MRS Hatchery from the bypass from November through March, when irrigation water flows are shut off. The remaining 3 to 4 cfs of the 10 cfs surface water right would continue to flow through the bypass and side channel, supplementing groundwater seepage and effectively increasing instream flows for fish. During the irrigation season (April through October), the bypass intake would be shut off because the hatchery would not have a surface water right for those months and would operate solely on groundwater. Based on the analysis presented in Section 3.5.3, there would be no impact on baseline aquatic habitat conditions in the bypass or historic side channel. No impact is anticipated from groundwater use during the irrigation season.

The proposed bypass intake structure would be screened to meet NMFS criteria to prevent the entrainment or impingement of fish, particularly juvenile salmonids. A mechanical brush would periodically clean the screen. This action could startle and displace fish, if present, in the immediate vicinity of the screen structure. The two proposed concrete intake sills would be designed to accommodate upstream and downstream passage for all salmonid life stages. Therefore, operation of the bypass diversion would not impede passage in the channel and the impacts on fish would be low. The fire suppression intake would be screened to meet NMFS criteria. Operation of the fire suppression system would not contribute impacts on fish.

3.7.2.2.2 Groundwater Use

Groundwater would be used to support MRS Hatchery operations (see discussion in Section 3.5). It would be discharged to the historic side channel after use in the hatchery. This discharge location would mitigate for any reduction in natural seepage of water to the historic side channel from reduced groundwater elevations. Therefore, groundwater use would result in low impacts on instream flow volumes and available fish habitat in the bypass or side channel.

3.7.2.2.3 Effluent Releases

There are no known water quality violations on the Yakima River in the vicinity of the proposed MRS Hatchery; the canal is 303(d) listed for pH (listing 50704; Ecology 2016e). As described in Chapter 2, a clarifier would remove a large percentage of aquaculture pollutants from the hatchery drain system prior to discharge through the proposed hatchery outfall. Effluent from the proposed MRS Hatchery has the potential to alter water temperature, pH, suspended solids, ammonia, organic nitrogen, total phosphorus, and chemical oxygen demand in the Yakima River mixing zone (within about 300 feet of the MRS Hatchery outfall). If not properly treated, excessive amounts of discharged substances could combine with other conditions to impact the aquatic environment. For example, large loads of discharged phosphorous may contribute to eutrophication, which is an excessive increase in nutrient loading that can result in dense algal growth and a reduction in dissolved oxygen, which may adversely impact fish. Water quality changes due to discharges from the hatchery could disrupt the behavior and distribution of individual fish immediately adjacent to and downstream of the outfall structure; impacts on fish would be low.

According to NMFS (1999), although “the level of impact [of hatchery effluent] or the exact effect on fish survival is unknown, it is assumed to be very small and is probably localized at outfall areas as effluent is rapidly diluted in the receiving streams and rivers.” The clarifier would settle solids and cleaning waste from the rearing units to reduce potential impacts.

Formalin is the only chemical that may be used to treat fish in the MRS Hatchery. Formalin would be added to the water in the adult holding ponds as a disinfectant to control the growth of fungus on the bodies and gills of adults, which could lead to increased mortality. It may also be used on incubating eggs. Use of formalin is regulated under EPA’s *Effluent Limitations Guidelines and New Source Performance Standards* for the concentrated Aquatic Animal Production Point Source category, which establishes narrative limitations for aquaculture treatment chemicals. The Yakama Nation would monitor the discharges in compliance with the NPDES General Permit and ensure that the facility complies with the NPDES discharge limitation as stipulated in the permit. In consideration of this, formalin use would have for a low impact on fish and their habitat in the Yakima Basin.

Overall, the water use for MRS Hatchery fish holding and rearing is not anticipated to result in a measureable change in the water quality of the Yakima River (see Section 3.5.3 for analysis of effluent). By complying with acceptable effluent discharge values in accordance with the 2015 Upland Fin-Fish Hatching and Rearing General NPDES Permit (Ecology 2015a) and BMPs, the impact of effluent on receiving waters, the aquatic environment, and fish is expected to be low. Water quality changes due to discharges from the facilities could disrupt the behavior and distribution of individual fish immediately adjacent to and downstream of the outfall structure, but the overall impact is expected to be low. NMFS (2013) stated that existing Yakima River hatchery diversions and their discharges pose only a negligible effect on designated critical habitat in the basin. Further, the USFWS (2007a) stated that the lack of water quality violations in the reaches of the Yakima River downstream of existing YKFP hatchery facilities in the basin suggests that hatchery effluent from newer facilities does not impair fish habitat.

If MRS Hatchery production shifts to an “all smolt” production program, additional effluent would be produced. Potential effects on aquatic habitat from higher pollutant loadings would likely be subject to pollutant discharge monitoring requirements of the 2015 NPDES Upland Fin-Fish Hatching and Rearing General NPDES Permit for Washington, administered by Ecology (see Section 3.5.2 for a discussion of water quality impacts).

3.7.2.2.4 Site Runoff

The MRS Hatchery has been designed to route stormwater to designated infiltration areas, and the majority of the site would be graded to slope toward vegetative buffers for infiltration. Runoff from areas that do not infiltrate would be routed to discharge into an existing drainage channel via a culvert under Klocke Road. Fish are not known to occupy this drainage (Newsome 2016b). However, in the unlikely event that fish are present, because the hatchery runoff would not contain high amounts of copper and zinc (known to be toxic to fish), no impacts on aquatic habitat are anticipated from the discharge of filtered stormwater runoff. Copper and zinc, shed from automotive brake pads, are associated with stormwater runoff from heavily used roads and highways. Such pollutants are unlikely to be associated with stormwater discharged from the MRS Hatchery.

3.7.2.2.5 MRS Hatchery Maintenance

Occasional maintenance may be necessary throughout the life of the MRS Hatchery to remove debris from screens/outfall bars, check or replace stoplogs at the New Cascade Canal fish screen, and check or perform minor repairs on sills/screens at the proposed Bypass intake. Minor replacement of armoring adjacent to the new intake and outfall structures may be necessary. Periodic dewatering of infrastructure could be required to conduct inspections or minor maintenance for the life of the MRS Hatchery. To minimize impacts on fish, all in-water maintenance activities would occur during the standard in-water work window for Yakima River tributaries, July 15 to August 31. With implementation of the measures described in Section 3.7.2.4, impacts on fish and their habitat would be low.

3.7.2.2.6 Mobile Acclimation Facility Operations

As an extension of MRS Hatchery operations, a portion of the coho smolts reared at the hatchery would be transported to mobile acclimation sites throughout the Yakima Basin (see Chapter 2). The operation of these acclimation sites would result in similar effects to aquatic habitat and fish species as those from existing mobile acclimation sites. Since 2007, the YKFP has been using small-scale mobile acclimation units to reintroduce coho smolts into tributaries of the Naches and upper Yakima Rivers. Tributaries selected for acclimation can support coho spawning and rearing and were historically used by native coho.

Potential effects on aquatic habitat and fish species would be low and include: temporary disturbance, minor flow reductions associated with surface water diversions to operate the mobile acclimation units, and minor water quality degradation from effluent return to the respective waterbodies.

3.7.2.2.6.1 Surface Water Diversion

The Proposed Action would include acclimation and release of some coho smolts from mobile acclimation units in spring. The surface water diversion for mobile acclimation units would require temporary (5-year) use permits from Ecology. The diversions would not affect the rights of any other water users. All pertinent permits would be acquired by the Yakama Nation prior to this activity.

As described in Chapter 2 (Section 2.2.5.2), mobile acclimation units would continue to be used on Cowiche and Ahtanum Creeks, and, in the near term, a new one would be established on Williams Creek. In the future, acclimation units could be established on other tributaries (Newsome 2016b). Acclimation tanks would use up to 90 gpm (0.20 cfs) of surface water and the intake pumps would be screened to NMFS criteria for the protection of juvenile salmon. Diverted surface water would be returned to the subject tributary stream a short distance, typically about 50 feet, from the intake. Due to this limited diversion reach, potential effects on fish and their habitat would be low because only a small quantity of water would be removed for a short duration (about 4 to 6 weeks) during high flow periods in spring. For these same reasons, the spatial distribution of fish rearing in the vicinity of the intake and outfall hoses is unlikely to be affected by operation of the mobile acclimation units. Similarly, EFH for Chinook and coho salmon is unlikely to be affected during surface water withdrawals along reaches adjacent to acclimation facilities.

3.7.2.2.6.2 Effluent Releases and Water Quality

The discharge of fish wastes from mobile acclimation units may have a low impact on water quality. However, the number of fish in each acclimation unit (10,000 smolts for each of two to three tanks per site) would be low, and the fish would be present for only 4 to 6 weeks in the spring when flows are high. The proposed mobile acclimation units would not need NPDES permits because rearing levels would be well below permit minimums for upland fin-fish rearing. At the request of Ecology, the Yakama Nation collected effluent samples for 2 years at the existing Cowiche Creek mobile acclimation unit under for the YKFP and for 1 year at the Rattlesnake Creek mobile acclimation unit and the results showed no impacts on water quality (NMFS 2013; Yakama Nation 2016, unpublished data). Similarly low effects on water quality would be expected at any new acclimation sites (NMFS 2013).

Impacts on surface water temperature are unlikely to result from the short-term diversion of 0.2 cfs (90 gpm) of water from creeks proposed for placement of mobile acclimation units (see Table 2.3-1). The diversion would occur during spring runoff (April to mid-May) when water temperatures are naturally low and flows are typically high; minimum instream flows would be maintained due to the limited (less than 50 feet, typically) diversion reach. The diversion would have no impact on fish passage and would be screened to prevent fish from becoming entrained.

3.7.2.2.7 Operational Impacts on ESA Resources

The BA prepared pursuant to Section 7 of the ESA for the MRS Hatchery assessed operational impacts on ESA-listed fish, bull trout, and MCR steelhead. NMFS concurred with BPA’s determination that construction and on-site operation of the MRS Hatchery was not likely to adversely affect ESA-listed steelhead (NMFS 2017); impacts on steelhead from outplanting of hatchery coho were addressed in the *Biological Opinion for the Yakima River Spring Chinook Salmon, Summer/Fall Chinook Salmon, and Coho Salmon Hatchery Programs* (NMFS 2013).

The BPA concluded that bull trout could be adversely affected on an individual level. Appendix A provides an assessment of impacts on bull trout on an individual level, which is required under Section 7 of the ESA. As described in Appendix A, some activities have the potential to harm individual bull trout (e.g., electrofishing in streams to determine juvenile coho salmon abundance). Although the likelihood of individual harm or disturbance is low, it is not entirely discountable; therefore, under ESA, the project is *likely to adversely affect* bull trout on an individual level. Measurable effects on bull trout populations in the Yakima River basin, however, are not anticipated, and the effect of the Proposed Action on the bull trout population in the basin is considered low. In July 2017, USFWS issued its BiOp for impacts related to bull trout, including juvenile coho releases and adult outplanting, and concluded that, although the Proposed Action is likely to adversely affect individual bull trout, it is not likely to jeopardize the continued existence of the species and is authorized under specific terms and conditions (USFWS 2017).

Thus, as explained further below, the operational impacts on ESA-listed fish would likely be low.

3.7.2.2.7.1 MRS Hatchery

ESA-listed bull trout are unlikely to be present in the bypass at any time of the year. ESA-listed steelhead juveniles may be present, though very few *O. mykiss* have been collected in the existing Holmes acclimation ponds in the bypass (NMFS 2013). The proposed MRS Hatchery would use groundwater during the irrigation season that would be returned to the historic side channel. The hatchery would not divert water from the bypass from April through October and would therefore not impact ESA fish resources, including designated critical habitat for bull trout and steelhead in the side channel. On completion of construction, operation of the project would result in an increase in flow in the side channel during the November through March operational period. This flow increase would maintain instream habitat, and enhance the quantity of side channel habitat available in the side channel.

From November through March, diversion of Yakima River water is unlikely to result in impacts to the mainstem Yakima River, which is designated as critical habitat for both species. However, during this period, if ESA-listed juveniles enter the canal diversion, they would be delayed from their mainstem residency or migration until they make their way back to the Yakima River side channel. Impacts from migratory delay would be low.

From November through March, 10 cfs of surface water would be routed into the bypass. Compared to existing conditions, this 10 cfs would supplement groundwater to maintain instream flows for fish upstream of the bypass intake; 3 to 4 cfs would remain in the bypass to flow past the intake. If ESA-listed fish resources are present in the bypass, operational diversion of surface water in the bypass would therefore not interfere with usage of the channel for rearing or passage. Thus, the operation of the proposed MRS Hatchery would have no impacts on designated critical habitat for both ESA-listed species.

3.7.2.2.7.2 Acclimation Facilities

While operation of acclimation units may reduce flows to a small portion of each subject creek, acclimation activities would take place during the winter and spring when stream flows are relatively high. Therefore, surface water diversion would not cause dewatering of any reaches, and impacts on bull trout and their critical habitat, if any, would likely be low (USFWS 2007a). Similarly, NMFS (2013) stated that, although acclimation facilities can reduce flow in small sections of the stream, due to the short duration of operations during high flow periods, no impacts on ESA-listed steelhead distribution would occur. Similarly low effects on water quality are expected at any new acclimation sites as discussed above in Section 2.2.5.2 (NMFS 2013). No chemicals or prophylactic drug treatments would be used on juveniles during acclimation. Therefore, no impacts on water quality or fish-rearing habitat in adjacent streams are expected from the mobile acclimation units, including impacts on critical habitat for ESA-listed steelhead and bull trout.

In addition to mobile acclimation facilities, several existing, permanent facilities would be used to acclimate MRS coho smolts. These include the Yakima River ponds at Boone and Easton, Lost and Stiles in the Naches River, and Jack Creek (Teanaway River tributary). Impacts from the use of these sites are ongoing and include temporary dewatering during use. Impacts to water usage from acclimating MRS coho smolts would be the same as presently occurring with smolts from other hatcheries. Smolts from the MRS Hatchery would acclimate in place of smolts from existing out-of-basin hatcheries. Impacts on ESA-listed fish include possible juvenile interactions (see Appendix A for bull trout impact summary).

3.7.2.3 Acclimation and Release

This section addresses potential ecological interactions between MRS Hatchery coho juveniles released into the Yakima Basin and nontarget fish species, including ESA-listed steelhead and bull trout. Potential program impacts on nontarget species would be minimized by transitioning to local broodstock and operating the program consistent with HSRG principles (Yakama Nation 2012a).

The proposed hatchery would produce and release coho parr and smolts as part of the overall YKFP Phase 3 coho reintroduction program. Numbers of hatchery coho released in the Yakima Basin would not increase under the Proposed Action compared to the current annual release totals for the overall coho reintroduction program (Table 2.3-1). Proposed MRS Hatchery parr releases would replace approximately half of the existing smolt releases so that the total number of hatchery coho released per year would be about one million fish.

As part of Phase 2 of the coho reintroduction project initiated in 2007, the YKFP has direct-released coho parr into several sites within a number of tributaries throughout the upper Yakima, Naches, and mid-Yakima River tributaries. In addition, Phase 2 initiated the use of mobile acclimation sites for the release of smolts in several tributaries throughout the basin, and continued the volitional release of smolts from mainstem, permanent acclimation sites. Coho parr and smolts produced at the MRS Hatchery would similarly be released into Yakima Basin tributaries, either through scatter-planting (parr) or volitional release with acclimation (smolts). The vast majority of ecological impacts associated with the release of coho reared at the proposed MRS Hatchery would be low and similar to ongoing impacts associated with the coho reintroduction program (see Chapter 2).

Although existing ecological interactions between released juvenile coho and nontarget fish species are considered part of the baseline (Section 3.7.1.3), this section considers the following changes to existing release protocols that are proposed under MRS Hatchery operations and how they might impact ecological interactions compared to baseline conditions:

- **Increase in the Number of Parr Releases and Decrease in the Number of Smolt Releases.** Since 1998, juvenile coho releases have ranged from about 600,000 to just over 1 million fish (Table 2.3-1). Parr releases were initiated in 2007. The Proposed Action includes the release of in-basin juveniles reared at the MRS Hatchery and would substantially reduce (with the eventual goal to eliminate) out-of-basin coho transfers and releases so that the overall number of juvenile coho released into the Yakima Basin would not change. However, instead of an average of 27,000 parr released under current protocols, the Proposed Action would release up to 500,000 parr as part of the overall Yakima Basin coho program. The Proposed Action would also significantly reduce the number of coho smolt releases so that the total release of coho juveniles (parr + smolt) would remain the same as existing releases (i.e., 1 to 1.3 million fish).

- **Acclimation and Release of MRS Hatchery-propagated Coho into New Tributaries.** Juvenile coho propagated at the MRS Hatchery would be released into tributaries that are not currently subject to coho releases, with a goal of seeding more habitats throughout the basin (see Table 2.3-1). Coho juveniles and adults are currently, and would under the proposed project, be outplanted into areas that are either not occupied by bull trout, or are downstream of areas where bull trout are documented to spawn and rear. However, there may be the potential for overlap with rearing juvenile coho and bull trout. Ongoing and future MR&E activities would continue to study potential species interactions, and releases would be adaptively managed if negative impacts on bull trout are observed.
- **Potential Adaptive Management of the Hatchery Coho Production Program.** As discussed in Chapter 2, although the overall net number of juvenile coho released is expected to remain relatively static (1 to 1.3 million juveniles), the Yakama Nation would plan to have the flexibility to adjust the proportions to ensure that releases meet objectives for survival or adult return. Over time, such adjustments may include releasing more smolts and less parr, or switching to a full smolt-release protocol, which is similar to existing protocols.

3.7.2.3.1 Residualism

3.7.2.3.1.1 Increase in Parr Releases into More Tributaries

As discussed in Section 3.7.1.3.1, residualism occurs when smolts released from a hatchery do not migrate to the ocean but rather set up permanent stream residence in the vicinity of the release point. This is an undesirable behavior because these nonmigratory smolts may directly compete for food and space with natural origin fish.

Compared to existing conditions, the Proposed Action would release more MRS Hatchery-reared parr into the Yakima Basin. Because residualism is typically expressed when hatchery-released smolts fail to out-migrate to the ocean, it is a phenomenon more associated with smolt releases, not parr. Parr would be expected to reside in the vicinity of their release point for one year prior to outmigration; however, decreases in residualism, if any, would be low as rates of smolt coho residualism are already low.

3.7.2.3.1.2 Adaptive Management–Shift Back to More Smolt Releases

If monitoring determines that the program would benefit from increased smolt releases, residualism may increase. However, as presented in Section 3.7.1.3, studies of coho residualism in the Yakima Basin indicate that only a small fraction of the hatchery juvenile releases tend to residualize (Murdock and Dunnigan 2001; Temple et al. 2012). Therefore, the potential for residualism associated with juvenile coho released from the MRS Hatchery is anticipated to be low.

3.7.2.3.2 Competition

3.7.2.3.2.1 Increase in Parr Releases into More Tributaries

Juvenile hatchery fish released en-masse may displace naturally produced rearing juveniles from occupied stream areas, leading to abandonment of advantageous feeding stations, or premature out-migration (Pearsons 1998). Under the Proposed Action, up to 500,000 parr would replace 500,000 of current smolt releases into various tributaries throughout the Yakima Basin. Compared to baseline conditions, the shift to more parr releases into more tributaries could result in increased competitive interactions between MRS Hatchery-reared coho parr and nontarget fish in the basin. Because parr spend more time in freshwater than smolts, and therefore more time interacting with nontarget fish, it is assumed that releasing parr poses more competitive risk than releasing smolts (Pearsons and Temple 2007). Therefore, an increase in parr releases would have the potential to increase competitive interactions between coho and nontarget species compared to baseline conditions. The potential for this impact is moderate.

However, as described in Section 3.7.1.3, Dunnigan (1999) found no evidence that released coho fry (smaller than parr) influenced the abundance or growth of rainbow/steelhead trout or cutthroat trout in the Naches River watershed and that spatial segregation, resource partitioning, and differences in diet minimize the potential for competition between coho and trout. As described in Chapter 2, as part of the ongoing MR&E program, the Yakama Nation and WDFW would continue to monitor competitive interactions between released coho juveniles and nontarget fish species.

3.7.2.3.2.2 Adaptive Management–Shift Back to More Smolt Releases

Under the Proposed Action, after several years of parr releases, the Yakama Nation would determine if the parr release strategy is meeting program objectives for survival or adult return. If objectives are not being met, the Yakama Nation may adaptively manage the release strategy by replacing parr releases with smolts. As shown in Table 2.3-1, since 1997 the majority of coho juvenile releases in the Yakima Basin have been smolts. Therefore, reverting back to a smolt-dominated release strategy would result in competitive impacts on nontarget fish species that are similar to baseline conditions that have taken place over the last 20 years (see Section 3.7.1.3). Because substantially fewer parr would be released into the basin under this adaptive management scenario, there would be less potential for competition for food and space between nontarget fish and coho smolts that are actively outmigrating from the basin.

The ongoing practice of volitionally releasing hatchery smolts when they are ready to migrate reduces the potential for competition with naturally-occurring juvenile fish in freshwater (Steward and Bjornn 1990; HSRG 2012). However, Pearsons and Temple (2007) argue that hatchery smolts can also interact with wild fish during downstream migration and some hatchery-released yearlings swim upstream of release locations into areas containing ESA-listed species (McMichael and Pearsons 1998). Still, if competition occurs between smolts and nontarget fish, it is likely of short duration and low impact because hatchery smolts generally move downstream quickly (Coutant and Whitney 2006).

3.7.2.3.2.3 Steelhead

Temple et al. (2014) and others (Dunnigan 1999) suggest that increased natural coho production resulting from coho reintroduction in the Yakima Basin is unlikely to impact sensitive fish species (i.e., juvenile rainbow/steelhead trout) beyond acceptable levels in tributary systems (see Section 3.7.1.2; Pearsons and Temple 2007). Acceptable levels of impact on nontarget fish of concern (e.g., ESA-listed steelhead) are defined as significant changes in abundance, size structure, and distribution of nontarget fish when compared to pre-reintroduction conditions (Pearsons 1998; Temple and Pearsons 2012).

In the BiOp issued for the Yakima River Spring Chinook Salmon, Summer/Fall Chinook Salmon, and Coho Salmon Hatchery Programs, which included the in-basin rearing and release of coho under the Proposed Action, NMFS (2013) considered potential impacts on ESA-listed steelhead from juvenile and adult releases of coho into the Yakima Basin. NMFS (2013) concluded that although competitive interactions between juvenile *O. mykiss* and coho parr would increase compared to what would result from the release of smolts, impacts would be similar to those resulting from interactions with the progeny of naturally spawning hatchery coho. Further, coho parr releases have and would continue to focus on tributaries where steelhead are not present, or are present in low abundance (NMFS 2013). However, there may be potential for habitat overlap between coho and steelhead.

Where species overlap in occurrence, competition between juveniles of the same species would be expected to be greater than competition between different species (Species Interactions Working Group 1984). The effect of interspecies competition (between hatchery coho and juvenile *O. mykiss*) is expected to be low because the different species tend to have different habitat preferences (Species Interactions Working Group 1984). In a comparative study of the monthly diets of juvenile coho and steelhead in the same stream, Johnson and Ringler (1980) found that the diet overlap between juvenile coho and steelhead was not significant and that coho typically consumed drift fauna while steelhead were closely associated with benthic invertebrates.

Studies conducted by the Yakama Nation and WDFW have not found any detectable impacts on rainbow trout (the resident form of ESA-listed steelhead) from the coho reintroduction program, even though the abundance of coho has increased substantially in recent years (Temple et al. 2011 and 2012). Similar results were observed in Taneum Creek where natural coho production has been established after 4 years of adult outplanting. Studies have shown that rainbow trout abundance, average size, and condition have not been negatively affected by coho production in the study area (Temple et al. 2011, 2012, 2014). NMFS (2013) determined that “these studies support the assertion that the juvenile *O. mykiss* in the Yakima River Basin are not being negatively impacted through competitive interactions with hatchery juveniles, and with the progeny of naturally spawning hatchery salmon.” Further, because coho salmon and steelhead spawn at different times (see Table 3.7-2) in the Yakima Basin, coho spawning would not interfere with winter/spring steelhead spawning, nor would coho spawning disturb steelhead redds.

NMFS (2013) acknowledged that WDFW and the Yakama Nation have been evaluating the potential for coho reintroduction actions to negatively impact fish that are not the target of the enhancement—in this case, ESA-listed steelhead in the Yakima River basin

(Temple et al. 2012). These MR&E projects are ongoing (see MR&E and Chapter 2.2.6) and are included as part of the Proposed Action for the MRS Hatchery (as well as the No Action alternative).

3.7.2.3.2.4 Bull Trout

For the majority of the proposed program, coho parr releases have and would continue to focus on tributaries where bull trout are not present, or are present in low abundance (NMFS 2013). Coho are not released into high elevation streams because such habitats are not representative of preferred, historic habitat (Newsome 2016c). Given the limited, if any, spatial overlap between coho and bull trout (Pearsons and Temple 2007; see Section 3.7.1.3), competitive interactions between the species are likely low. Coho parr releases have and would continue to focus on tributaries where bull trout are not present or are at low abundance (NMFS 2013). Although bull trout and coho spawn at similar times, spawning areas are spatially separated, as bull trout spawn much higher in the tributaries than coho (BPA 2007). Therefore, potential competitive risks to bull trout from coho reared at the MRS Hatchery would be low. One exception to this is the North and South Forks of the Tieton River where the Yakama Nation proposes to outplant adult and release parr. These waterbodies provide bull trout spawning and rearing habitat; however, releases would occur downstream of known bull trout spawning areas. These releases would be monitored extensively given the potential overlap with rearing juveniles. Appendix A provides a breakdown of all release waterbodies relative to bull trout habitat and occurrence, and potential impacts on bull trout from these releases.

3.7.2.3.3 Predation

3.7.2.3.3.1 Increase in Parr Releases into More Tributaries

Under the Proposed Action, up to 500,000 parr would replace 500,000 current smolt releases into various tributaries throughout the Yakima Basin. Compared to baseline conditions, the shift to more parr releases into more tributaries could initially reduce the potential for coho predation on nontarget fish because parr are small and primarily consume invertebrates. The risk of predation on other fish species by parr and by second generation coho spawned in the wild is low, also due to spatial and temporal separation between them and other salmonid species (BPA 2007). Further, in their freshwater stage, coho primarily feed on plankton and insects (NMFS 2016b), including terrestrial drift and benthic aquatic invertebrates (Gonzales 2006; Dill et al. 1981; Johnson and Ringler 1980). However, as parr eventually grow and mature into smolts, the potential for predation of nontarget fish by coho smolts would be similar to baseline conditions.

3.7.2.3.3.2 Adaptive Management–Shift Back to More Smolt Releases

If post-parr release monitoring indicates that a shift back to more smolt releases is likely to achieve optimal survival and return objectives, or if future drought conditions preclude summer parr releases, the release strategy would shift to an all-smolt release (700,000 smolts). The release of more smolts would increase the potential for predation on nontarget fish species. As presented in Section 3.7.1.3, however, past and ongoing predation studies indicate that predation on fish by released coho hatchery smolts is low. Therefore, any adaptive management of release protocols that results in a higher proportion of released smolts is unlikely to impact predation of nontarget fish, and would be similar to baseline conditions.

3.7.2.3.3.3 Steelhead

In the BiOp for the Yakima River hatchery programs, NMFS (2013) concluded that although predation by hatchery coho on ESA-listed steelhead juveniles may occur in the Yakima River and its tributaries where the two species co-occur, predation is expected to affect only a few individuals and would have a low impact on the listed population. Released hatchery coho parr would not prey on ESA-listed steelhead because freshwater coho life stages typically consume insects and plankton (NMFS 2016b). The risk of coho smolt predation on steelhead juveniles is low, due to the lack of temporal and spatial overlap between the period of coho smolt outmigration and age-0 steelhead emergence. Yakama Nation field work has indicated that young-of-the-year steelhead emerge from the gravel after the coho have migrated through the Yakima system. Yearling rainbow/steelhead are too large to be readily consumed by coho smolts (BPA 2007).

3.7.2.3.3.4 Bull Trout

As described in Section 3.7.1.3, stomach-content analysis has revealed that coho smolts consume very few fish and no bull trout have been identified as prey items (Dunnigan 1999). The impact to bull trout is low due to the limited spatial and temporal overlap between coho smolt emigration corridors and bull trout spawning areas (BPA 2007; WDFW 1998). Although coho parr releases would occur downstream of bull trout spawning and rearing tributaries, if overlap did inadvertently occur, the potential for predation of juvenile bull trout by coho parr is unlikely given parr consume insects and plankton, not fish (NMFS 2016b). Further, as previously stated, coho juveniles and adults are outplanted into areas that are either not occupied by bull trout, or are well downstream of the headwater areas where bull trout spawn and rear. Foraging adult and subadult bull trout could benefit from increased prey availability following coho releases into the Yakima Basin.

3.7.2.3.4 Disease Transmission

As described in the *Yakima Basin Coho Hatchery and Genetic Management Plan* (Yakama Nation 2012b) that covers the proposed MRS Hatchery, the USFWS would screen adult broodstock for routine bacteria and viruses at the time of spawning. All life stages would be monitored for disease, and Integrated Hatchery Operations Team fish health guidelines would be followed to prevent disease transmission between fish on site and disease transmission or amplification to or within the watershed. The juvenile rearing density and loading guidelines used at the facility would be based on standardized agency guidelines. Juveniles would be screened monthly for routine bacteria, viruses, and parasites by USFWS. All fish would be examined for the presence of “reportable pathogens” as defined in the Pacific Northwest Fish Health Protection Committee disease control guidelines, within 3 weeks prior to release by USFWS pathologist under contract. Fish transfers into the basin have been inspected and accompanied by notifications as described in Integrated Hatchery Operations Team and Pacific Northwest Fish Health Protection Committee guidelines. Using these protocols, the potential for disease transmission from the proposed MRS Hatchery into the Yakima River is highly unlikely and therefore discountable.

3.7.2.3.5 Genetic Interactions

The release of coho reared at the proposed MRS Hatchery, and the subsequent return of coho adults to the Yakima Basin would not impact the genetic integrity of coho in the basin. As stated in Section 3.7.1.3, there are no differences between the hatchery and natural coho populations in the Yakima Basin because the natural population was extirpated and the current hatchery population is being used to develop the natural stock.

3.7.2.3.6 Beneficial Effects

An increase in coho parr releases and release locations compared to existing conditions would increase the availability of prey items for larger fish. If MRS Hatchery production were modified to an all-smolt release, this benefit would be reduced. If successful, over time, more MRS Hatchery-reared coho would return to the Yakima Basin to spawn as adults. The return of more coho to the Yakima Basin would result in increased marine derived nutrients, and natural spawning to improve streambed morphology (NMFS 2013), and overall would have a moderate impact.

3.7.2.3.7 Monitoring, Research, and Evaluation Activities

The Proposed Action is part of the overall YKFP coho reintroduction program. The MR&E activities associated with fish reared and released from the MRS Hatchery have been ongoing for many years. As such, potential impacts on nontarget species from MR&E, discussed in Section 3.7.1.4, are considered an existing condition for fish resources. However, because MRS Hatchery-reared coho would be introduced into several new tributaries, the Proposed Action would expand ongoing impacts (see Section 3.7.1.4) on nontarget fish species into more waterbodies of the Yakima Basin. Conducting these MR&E activities is anticipated to benefit nontarget fish, including ESA-listed steelhead and bull trout through enhanced, incidental data collection in tributaries throughout the basin. However, individual fish could be disturbed during certain MR&E activities, including juvenile trapping surveys. The impact from MR&E activities would thus be low. See Appendix A for a summary of anticipated impacts on bull trout from the proposed project prepared for the ongoing ESA consultation.

Under the Proposed Action, the Yakama Nation and WDFW would analyze the results of ongoing (and future) MR&E activities (see Section 3.7.1.4) to determine if modifications to the proposed juvenile coho release scenarios would be warranted. Potential impacts on fish resources due to the adaptive management scenarios presented in Chapter 2 are related to the possible future shift from a mixed life-stage release program (up to 500,000 parr releases and up to 200,000 smolts) to an all-smolt release program (700,000 smolts). Potential impacts on fish from this shift would primarily be ecological interactions, which are discussed in the following section. Any future modifications to the coho release program, including shifting from parr to smolts or the addition of new release tributaries, would be determined by management criteria determined through the MIPT. Any changes to the coho release strategy would be reported to both NMFS and the USFWS to track and, if required, consult on potential impacts on ESA-listed species (bull trout and MCR steelhead).

3.7.2.3.8 Adult Collection Activities

Up to 1,000 coho adults would be collected at Roza Dam for broodstock for the integrated program to be conducted at the proposed MRS Hatchery. Adults may also be collected at Prosser Dam as a backup source, and possibly in the future at the Cowiche or Wapatox Dams. The collection of coho broodstock at existing dam facilities could impact nontarget fish species by delaying their upstream passage and causing stress during potential handling. These effects would be similar to ongoing migration delays from the operation of adult salmonid collection facilities at Roza and Prosser Dams. To minimize stress and the potential for handling related mortality, the Yakama Nation would immediately release all nontarget fish intercepted during broodstock collection at Roza and Prosser Dams. Relative to ESA-listed species, the collection of adult coho at both dams has been previously consulted on for both bull trout (USFWS 2007a) and steelhead (NMFS 2013). The ESA Section 7 consultation prepared for the construction and operation of the MRS Hatchery would include adult collection at both sites as part of ancillary facility operations.

3.7.2.3.9 Climate Change

Construction and operation of the proposed MRS Hatchery is not expected to impact modeled effects of climate change on streams in the Yakima River Basin. The proposed MRS Hatchery would divert surface water of the Yakima River from November through February. Under modeled climate change scenarios (Vano et al. 2009; Reclamation 2015b), more instream flow would be available during the winter and early spring in the form of rain or as a result of runoff from an earlier shift in snowpack melt. This, combined with the low volume of water proposed for diversion from the Yakima River (10 cfs), would have low impacts on fish, and their habitat, from climate change. Relative to the use of up to 2.5 cfs of groundwater, use would only have a low impact on groundwater. This is because pumping would only cause localized effects to groundwater (Wallace Group Inc. 2012, 2016b), and because the majority of groundwater use would occur from April through early October when groundwater is most plentiful (i.e., because of irrigation water seepage). The intercepted groundwater would be discharged to the historic side channel after use in the hatchery and treatment. This discharge location would mitigate for any reduction in natural seepage of water to the historic side channel from reduced groundwater elevations.

In addition, a goal of the project is to develop a local population of naturally-spawning coho. Local adaptation enables populations to adjust to changing environmental conditions like climate change (HSRG 2014). Further, the inclusive species monitoring conducted by the Yakama Nation and WDFW for the Yakima River should aid efforts to track changes in fish populations and abundance as the area experiences global climate change.

Relative to juvenile releases, if climate change contributes to dewatering of rearing tributaries, released coho parr would be forced to seek out watered reaches. This could increase fish densities, and therefore competition for food and space, in habitats that remain suitable for rearing. Such scenarios would likely result in the modification of coho release strategies, and a shift to more smolt releases.

3.7.2.4 Cumulative Effects

For the purpose of this analysis, cumulative effects on fish resources consider the Yakima Basin and do not extend to the Columbia River (see Section 3.7.1 for a definition of the study area for fish resources). To the extent ongoing activities have occurred in the past and are currently occurring in the basin, their impacts on fish resources are considered in the baseline (Section 3.7.1). To the extent those same activities are reasonably certain to occur in the future, their future effects are included in the cumulative effects analysis.

Currently ongoing actions in the basin that have impacted fish resources and that are reasonably foreseeable include:

- Human activities, including land management and water development activities that have reduced the connection between river and riparian habitats, increased sedimentation in streams, and altered floodplain function. Land development has resulted in the straightening of rivers and creeks in some areas, particularly associated with road construction, bank armoring, and modification and irrigation diversions. This has caused some waterbodies to become straighter, wider, and shallower as well as increased solar heating in streams.
- Irrigation diversions and mainstem dams have altered natural flow patterns and blocked some fish from their historic spawning grounds (including coho). The return of irrigation water from agricultural lands back to the Yakima River has reduced water quality in the lower reaches in the river.
- Hatchery construction and operation, including operation of adult and juvenile collection facilities. At Roza Dam, all adult collection facilities have been designed to meet NMFS standards; therefore, injury or mortality to nontarget species during fish handling and sorting procedures are likely low to moderate. Reasonably certain new adult collection facilities, including a new facility at Sunnyside Dam, would also contribute to cumulative impacts on fish.
- Recreational, commercial, and tribal fish harvest of fish that are not listed under the ESA, as well as incidental catch of ESA-listed fish in the basin.

Ongoing actions that contribute to beneficial effects on fisheries resources include those actions aimed at protecting, enhancing, or restoring aquatic and riparian habitat in the Yakima Basin. The Yakama Nation’s YKFP is a comprehensive fish habitat rehabilitation program for the basin. Ongoing and proposed future projects include increasing streamflows, improving fish passage, screening diversions, reducing sediment loads, and restoring stream channel and riparian habitats. These programs, in combination with numerous state, federal, and local plans (described below) are anticipated to result in a beneficial effect on aquatic resources in the Yakima Basin.

- Salmon Recovery Funding Board Projects:

  Projects funded by the Washington State Salmon Recovery Funding Board are aimed at protecting intact functioning salmonid habitats through acquisition or restoration of impaired salmon habitats. Several ongoing salmon/habitat recovery projects are proposed in the Yakima Basin, including riparian habitat restoration. These projects would benefit fish species and their habitats.

- Yakima Subbasin Fish and Wildlife Planning Board and Yakima Basin Plan:

  The mission of the Yakima Subbasin Fish and Wildlife Planning Board and the Yakima Basin Plan is to restore sustainable and harvestable populations of salmon, steelhead, and other at-risk species through collaborative, economically-sensitive efforts; combined resources; and wise resource management of the Yakima Basin (Yakima Subbasin Fish and Wildlife Planning Board 2004).

- Washington State Salmon Recovery Planning Process and Yakima Basin Salmon Recovery Plan:

  The goal of the State Salmon Recovery Planning process is to "restore salmon, steelhead, and trout populations to healthy harvestable levels and improve those habitats on which the fish rely" (Joint Natural Resources Cabinet 2002). Actions associated with the Yakima Basin Salmon Recovery Plan (Freudenthal et al. 2005) contribute to beneficial planning processes in the region.

- Implementation of the Yakima River Basin Integrated Water Resource Management Plan:

  Developed by Ecology and Reclamation in coordination with the Yakima River Basin Water Enhancement Project Workgroup, this plan is a comprehensive approach to address a variety of water resource and ecosystem problems affecting fish passage and habitat in the Yakima Basin. This plan includes seven elements: reservoir fish passage, structural and operational changes to existing facilities, surface water storage, groundwater storage, habitat/watershed protection and enhancement, enhanced water conservation, and market reallocation. All elements are geared toward the recovery of fish resources in the basin.

- Yakima-Klickitat Fisheries Project:

  The Yakama Nation, as the Lead Agency, in coordination with the co-manager, WDFW, is testing the principles of supplementation and coho reintroduction as a means to rebuild fish populations through the use of locally-adapted broodstock in an artificial production program (the Prosser Hatchery and proposed MRS Hatchery), in compliance with the principles of the HSRG. The goal is to increase the numbers of naturally spawning fish.

  As part of the larger YKFP, BPA has funded numerous habitat improvement projects in the Yakima Basin, including bank stabilization, habitat complexity, levee set-back, riparian plantings and fencing, barrier removal, and side channel restoration efforts (Yakama Reservation Watersheds Project 2012; NMFS 2013).

- MR&E Actions–Component of Yakima-Klickitat Fisheries Project:

  Under the YKFP, smolt trapping is, and would continue to be, used to monitor migration of hatchery summer steelhead juveniles. Some nontarget fish species may be captured and handled at the trapping facilities, or displaced during snorkeling surveys. These evaluations have the potential to stress or injure fish if they are handled; however, these activities are necessary to determine the success of reintroduction/supplementation efforts, as well as the impact of supplementation on nontarget fish species.

- MCR Steelhead Recovery Plan and Bull Trout Recovery Plan:

  Federal, state, tribal, and local governments have developed plans and initiatives to benefit fish, particularly native salmonids, in the basin. Two such plans include the MCR Steelhead Recovery Plan (NMFS 2009) and the Recovery Plan for the Coterminous U.S. Population of Bull Trout (USFWS 2015a), which describe ongoing and proposed actions that are targeted to reduce known threats to listed steelhead and bull trout in the Yakima Basin.

In summary, the Proposed Action is compatible with other aquatic habitat and fish management programs in the region. When added to past, present, and reasonably foreseeable future activities in the basin, the Proposed Action would have low cumulative impacts on fish resources. Because the purpose of the proposed MRS Hatchery is to facilitate in-basin rearing of coho that have been reintroduced into the basin for nearly 20 years, no significant cumulative effects on fish resources are anticipated beyond existing levels. While the MRS Hatchery would divert surface water from the Yakima River from November through March, the use is nonconsumptive and would not further degrade surface water flows in the 6,900 feet diversion reach. This is due to the relatively small diversion (10 cfs) during months when instream flows are not generally limited and temperatures are typically low.

3.7.2.5 Mitigation Measures

BPA would require all contractors to adhere to applicable conservation measures of the Habitat Improvement Program III BA (BPA 2012b) for general construction and in-water work. These measures are part of the Proposed Action and are incorporated herein by reference.

- Implement measures to control erosion (see mitigation measures in Geology and Soils) and potential spills of hazardous materials (see mitigation measures in Water Resources) to minimize potential for impacting waterbodies.
- Implement an SPCC plan and comply with the NPDES General Permit (see mitigation measures in Water Resources).
- Screen the proposed Bypass intake structure to meet NMFS criteria. Equip the outfall with a bar rack to prevent entry of adult fish.
- Construct all in-water work during the negotiated agency-approved work window of November 1 through December 31.
- Install and remove cofferdams during the appropriate work window for each waterbody.
- In October, place a picket weir downstream of the proposed outfall location to prevent adult fish from entering during the in-water work period. The Yakama Nation would seine the Bypass and historic side channel to herd adult fish from the affected reach prior to installation of the picket barrier.
- Operate equipment in the active channel only if necessary to install and remove cofferdams. Install the cofferdam from the top of bank to the extent possible.

- Experienced fisheries biologists would remove all fish species from the immediate area where the cofferdams would be installed. Fish salvage would adhere to the following protocol:
    - Flush adult fish that do not disperse from the construction area from the area behind the cofferdams. As part of any dewatering process, use beach seines and sanctuary nets to herd all fish from the area of capture or release.
    - Capture by seining juveniles that do not displace voluntarily, and if necessary, use a backpack electrofisher. Once captured, place fish into a 5-gallon bucket using small dip-nets. Captured fish would be released back into the stream channel a safe distance (about 150 feet) upstream of the work area. Qualified Yakama Nation and/or WDFW biologists would conduct work by following NMFS guidelines (NMFS 2000).
    - Do not use seining or electrofishing if water temperatures exceed 64°F.
    - Transport fish in aerated buckets or tanks and release as quickly as possible and as near capture sites upstream as possible.
    - Notify USFWS and NMFS in the highly unlikely event that an ESA-listed fish is injured or killed during the salvage operation. Fish salvage biologists would prepare a report for the Services that summarizes the number of fish handled, species, and individual lengths.
- To minimize pulses of sediment downstream, remove the cofferdams incrementally.
- Dewater and actively pump in-water work areas prior to pouring concrete forms. Fully cure all poured on-site concrete structures prior to contact with surface waters to prevent concrete leachate from entering live waters.
- Create sumps as necessary within the work area to capture any seepage flow. Pump all seepage flow to an on-site temporary settling pond, Baker tank, or other facility as determined by the contractor. Seepage flow would percolate into the ground or alluvial material prior to entry back into the water.
- Install a fish screen that would meet NMFS screening criteria on pumps used for cofferdam dewatering.
- Adaptively manage juvenile coho releases based on studies on nontarget fish via MRS Hatchery-specific MR&E activities.
- Conduct all MR&E activities in accordance with the terms and conditions of the existing Section 7 ESA consultation for MCR steelhead (NMFS 2013).
- Comply with all applicable terms and conditions of the existing USFWS Section 10 permit issued for the overall Yakama Nation Fisheries program (TE-05166B-0; incorporated herein by reference), and future ESA Section 7 consultations terms and conditions.
- Screen all surface water pumps for acclimation units (one per site, to be used for all tanks) according to NMFS juvenile salmonid criteria.

3.7.3 Environmental Consequences of No Action Alternative

Under the No Action alternative, construction of the MRS Hatchery would not be funded by BPA and the majority of coho juveniles would continue to be reared out-of-basin for release in the Yakima Basin. Development of a locally-derived, naturally-sustaining in-basin coho population using an integrated facility would not be fully achieved. The use of localized broodstock is required to meet the goal of providing a self-sustaining coho run throughout the species' historic range in the Yakima Basin (see Section 2.1). The use of out-of-basin broodstock may result in reduced fitness and spawning success and would not further the goal of establishing a self-sustaining coho run.

Under the No Action alternative, fish would not be impacted by construction or operation of the proposed MRS Hatchery, but ongoing acclimation and release would continue under the larger YKFP as well as the establishment of the new acclimation sites. Ongoing MR&E activities would continue at current levels in the basin, as would adult broodstock collection and outplanting.

Under this alternative, impacts on nontarget fish species from continuing coho reintroduction activities (e.g., ecological interactions from juvenile releases, MR&E activities) would remain at current levels.

3.8 Wildlife

3.8.1 Affected Environment

The defined project study area for impacts on wildlife includes the proposed MRS Hatchery site, the New Cascade Canal Fish Screening facility, Reclamation's New Cascade Canal Diversion Structure, staging and access areas for construction, and areas potentially affected by construction noise. Project-related construction noise extends about 2,000 feet from construction work at the MRS Hatchery site and the New Cascade Canal Fish Screening facility site. Proposed modifications at Reclamation's New Cascade Canal Diversion Structure would likely to be limited to hand-held equipment, thus a 2,000-foot noise buffer is not applied to this project element. The new mobile acclimation sites would also not have a 2,000-foot buffer because of the short amount of time (hours) the set-up would take. Potential impacts on wildlife are described relative to impacts on USFWS threatened and endangered species, WDFW priority species, and common species.

Terrestrial wildlife in the study area was evaluated based on wildlife studies conducted by Johnson and O'Neil (2001) and information in the *Yakima Subbasin Summer-and Fall-Run Chinook and Coho Salmon Hatchery Master Plan* (Yakama Nation 2012a). Information from WDFW, the Yakama Nation, the Washington State Gap Analysis GIS data, as well as the USFWS, was used to evaluate the occurrence of general, priority, and threatened or endangered terrestrial wildlife species (Johnson and Cassidy 1997; Smith et al. 1997, Dvornich et al. 1997, Yakama Nation 2012a, USFWS 2016b, WDFW 2016c).

A site visit was conducted on May 25, 2016 to document general observations as well as habitat resources within the study area. No species-specific wildlife surveys or habitat surveys were conducted for this project. General habitat and species observations were noted during the site visit and transferred onto recent aerial images.

3.8.1.1 General Habitat and Wildlife Conditions

The project study area occurs in the Yakima Basin and comprises predominately habitats defined by Johnson and O'Neil (2001) as agricultural, pasture, and mixed environs, urban and mixed environs, riparian woodlands, and herbaceous wetlands.

The *Yakima Subbasin Summer-and Fall-Run Chinook and Coho Salmon Hatchery Master Plan* (Yakama Nation 2012a) identified 384 wildlife species occurring in the Yakima Basin. These include birds, mammals, reptiles, and amphibians (Yakama Nation 2012a). Of the species that occur in Kittitas County, WDFW Gap Analysis project data identified 219 potential wildlife species occurring within the vicinity of the project study area. Some species identified in the analysis have adapted to human activity, especially species like migratory birds suited to smaller patches of forested riparian habitat along corridors associated with the canals and tributaries of the Yakima River.

3.8.1.1.1 MRS Hatchery Property

Most of the MRS Hatchery property is composed of fallow pasture that has not been grazed for approximately 12 years and some residential and agricultural buildings. Pastures provide foraging habitat and open area between habitats for numerous species, including foraging raptors, shrews, moles, and rodents, and some native frog and lizard species (Johnson and O'Neil 2001). Woody vegetation communities located next to pastures may provide nesting sites for some bird and small mammal species, and shelter for mammals, reptiles, and amphibians.

Riparian habitat located along the New Cascade Bypass and historic side channel to the Yakima River in the southwest portion of the MRS Hatchery property is composed of deciduous tree stands and second-growth ponderosa pine. Although fragmented, riparian corridors on the site offer foraging and suitable habitat to numerous species, including many avian species that traverse the region during the spring and fall migratory period (Yakama Nation 2012a).

Infrastructure in the study area potentially disrupts migratory corridors for land-bound sensitive species. Klocke Road to the east and the John Wayne Pioneer Trail to the north, as well as Highway 10 to the north, could also act as a barrier to movement of wildlife or contribute to wildlife mortality. In the larger surrounding area, agriculture and I-90 could also disrupt wildlife movement through the study area.

3.8.1.1.2 New Cascade Canal Diversion and Fish Screening Facility

The New Cascade Canal facilities are existing structures within the New Cascade Canal. Access roads adjoin the canal and provide a very small amount of wildlife habitat. Habitats adjacent to the hatchery include agricultural land, open pastures, herbaceous wetlands, and limited woody riparian habitat. Residential and transportation development in the surrounding study area could also potentially act as barriers to wildlife movement or disrupt migratory corridors of sensitive species.

During the May 2016 site visit, red-winged blackbirds, marsh wrens, barn swallows, belted kingfishers, red-tailed hawk flyover, one frog, one turtle that could not be identified to species, and signs of beaver and deer activity were observed on the MRS Hatchery site. No wildlife was detected in the immediate vicinity of the New Cascade Canal facilities. Appendix D provides a summary of wildlife species that may occur in the project study area.

3.8.1.2 Bald Eagle

One bald eagle nest is documented on the south side of the Yakima River approximately 1,760 feet south of the MRS Hatchery property and 6,000 feet south of the New Cascade Canal facilities (WDFW 2016a). WDFW (2016b) last surveyed the nest in 2006 and confirmed that it was active; however, no offspring were detected.

3.8.1.3 Threatened and Endangered Species under the ESA

Although there are no aquatic species in Kittitas County that are listed as threatened or endangered under the ESA (other than fish discussed in Section 3.7), the USFWS has identified several terrestrial threatened and endangered species that may occur in Kittitas County (USFWS 2016b). An IPaC (Information for Planning and Conservation) trust resource report was generated on January 29, 2016 for the overall project study area. The purpose of the IPaC report is to identify a list of species managed by the Endangered Species Program that may be affected by construction activities. The potential occurrence of each species is discussed in detail below for the project study area.

3.8.1.3.1 Grizzly Bear

The grizzly bear is listed as endangered in Kittitas County. The Western Cascades population has been reduced to less than 20 individuals. The last grizzly bear siting was near the U.S.–Canadian border in 2002 (USFWS 2011). While there is suitable habitat in Kittitas County, research suggests work is needed to restore a population to take advantage of that habitat (USFWS 2015b). It is very unlikely grizzly bears would occur near the MRS Hatchery property or New Cascade Canal facilities due to the open lowland topography, human disturbance, human-made barriers such as roads and development and other current unsuitable natural conditions for feeding, reproduction, or denning. Due to the low likelihood of occurrence and poor quality of habitat, it is unlikely that grizzly bears occur in the study area.

3.8.1.3.2 Gray Wolf

Gray wolves are federally listed as endangered in the western two-thirds of Washington State, including Kittitas County. Although there is a pack of gray wolves in the northwestern corner of Kittitas County in the Teanaway watershed, it is unlikely they would be found near the study area, as it is outside of the pack’s current home range (WDFW 2015). There is also a significant amount of human activity in the study area, and barriers to movement such as Highway 10 and I-90 make the area less likely to be incorporated into home ranges for future packs of gray wolves. For these reasons, the occurrence of gray wolves in the project study area is unlikely.

3.8.1.3.3 Canada Lynx

Canada lynx are listed as threatened by federal and state resource agencies. Within Washington State, Canada lynx are mostly found in subalpine fir habitat above 4,000 feet in elevation (Stinson 2001). While subalpine fir habitat is present within Kittitas County (Yakama Nation 2012a), the habitat conditions of the site make it unlikely that Canada lynx would occur within the study area. The nearest critical habitat for the Canada Lynx is over 60 miles away to the north in the Cascades (USFWS 2014).

3.8.1.3.4 Northern Spotted Owl

Northern spotted owl is state listed as endangered and federally listed as a threatened species. Although the northern spotted owl does occur in Kittitas County, the study area does not meet WSDOT specifications for nesting, roosting, or foraging (WSDOT 2014a). Noise from the construction site would not reach the nearest spotted owl critical habitat approximately 10 miles away (USFWS 2012a). Therefore, it is unlikely that northern spotted owls occur in the study area.

3.8.1.3.5 Yellow-billed Cuckoo

The yellow-billed cuckoo is listed as threatened in all of Washington. The yellow-billed cuckoo has made very rare appearances for the past two decades in Washington, and is considered for the most part to be extirpated from Washington in terms of a breeding population. The species prefer wooded habitat near rivers; in Washington, the lower Columbia River has been specifically referenced by the WDFW as a potential area for colonization of vagrant individuals (WDFW 2012). An eBird query, which documents the presence or absence of species using a real-time, online checklist, showed no reported sightings of this species in Kittitas County (eBird 2012). Due to their near extirpated status and rarity in Washington, it is very unlikely this species occurs in the study area.

3.8.1.3.6 Marbled Murrelet

Marbled murrelets typically nest no more than 50 miles from the coast (USFWS 1997) and are therefore highly unlikely to occur in the study area. WDFW’s Priority Habitats and Species data (2016e) did not identify any marbled murrelet breeding areas in the project study area.

The study area does not meet WSDOT’s standard for marbled murrelet suitable nesting habitat because the area is located more than 70 miles from marine water (WSDOT 2014b). An eBird query also showed no recorded sightings of this species in Kittitas County (eBird 2012). Due to the failure of the study area to meet the conditions of livable habitat for this species, the species is unlikely to occur in the study area.

3.8.1.4 WDFW Priority Species

There are 55 priority species identified by the WDFW on its Priority Habitats and Species List that could occur within Kittitas County (WDFW 2008). These species are peer-reviewed, updated periodically, and are considered to be priorities for conservation and management. Of these species, 41 are potentially present in the vicinity of the project study area. Appendix E lists these species and associated habitats. Priority species likely to be present in the MRS Hatchery study area are those species that have a primary association with riparian areas, pastures, shallow ponds, freshwater wetlands, and species that are found in nearly flat terrain at low to mid elevations. WDFW requires impacts to these species be avoided, minimized, or mitigated.

In addition to listing potential species occurrence, WDFW identifies areas that priority species occupy for important aspects of their life cycle (e.g., breeding areas) or areas that support relatively high numbers of individuals (e.g., regular large concentrations). The project study area includes areas mapped as bald eagle winter range and Ellensburg mule deer winter range.

3.8.1.4.1 Bald Eagle Winter Range

There is a regular concentration of bald eagles inventoried along the riparian corridor of the Yakima River that is located approximately 1,600 feet northwest of the MRS Hatchery property and immediately adjoins the New Cascade Canal facilities (WDFW 2016a). Approximately 25 to 35 bald eagles use this area for foraging in the winter. There are no known communal roosts present in this study area.

3.8.1.4.2 Ellensburg Mule Deer Winter Range

A small portion of the Ellensburg mule deer winter range intersects the north part of the project study area, north of the New Cascade Canal (WDFW 2016a). Ninety percent of the WDFW tracked Ellensburg population traverse through this range in the winter. Mule deer are generally known to move to lowland dry-forest and shrub-steppe during winter to avoid harsh weather and also search for forage. During winter mule deer are known to experience nutrient deficiencies, which could make them vulnerable to disturbance (WDFW 2016f).

3.8.2 Environmental Consequences of Proposed Action

Impacts to wildlife and habitat would be due to project construction (facility footprint and construction disturbance) and operation (human presence).

3.8.2.1 MRS Hatchery Construction

Proposed construction would not impact ESA-listed wildlife species or potential suitable habitat because neither are known to occur in the project study area. Impacts to WDFW priority species known to occur within the project study area, as well as common species in the study area, are discussed below.

Construction of the new MRS Hatchery would permanently remove up to 3.5 acres of habitat that consist primarily of pasture grasses and forbs. This could create low, long-term impacts on wildlife that currently use the area. Although this disturbance would further contribute to habitat fragmentation, these impacts may be limited as the land was previously disturbed when it was developed for agricultural and residential use.

Temporary impacts from construction of the MRS Hatchery would include increased noise, temporary vegetation removal, and human activity. The duration of hatchery construction would be approximately 16.5 months. Accidental fuel and oil leaks or improperly disposed stormwater during construction could also create low, short-term impacts on wildlife. This potential temporary impact would be minimized by implementation of a Stormwater Pollution Prevention Plan.

Highly mobile wildlife would likely avoid the site during construction, while less mobile species such as reptiles, small mammals, and amphibians could potentially experience mortality from construction. The overall impact due to construction would be expected to be low because similar suitable habitat for breeding, rearing, and foraging is available in the immediate project vicinity and greater Yakima River watershed. The new facilities would be designed to preclude potential attraction of animals that may prey on juvenile or adult coho. The new rearing area and grow-out tanks would be located in the enclosed hatchery facility, and the new adult holding and spawning ponds would be recessed, covered by a shed roof, and cordoned off by railing to prevent access by birds or animals of prey.

The peak noise associated with the MRS Hatchery construction could be detected by breeding bald eagles south of the hatchery site or wintering eagles on the Yakima River. However, temporary disturbance during construction is anticipated to be low because construction activity would not be within 660 feet of known active nests, which is the threshold where human disturbance may cause eagles to become agitated, and potentially result in inadequate nest repair, expenditure of energy defending the nest rather than tending to their young, or abandonment of the nest altogether (USFWS 2007b). Wintering bald eagles on the Yakima River may avoid perches that are located near the MRS Hatchery during construction; however, this effect would be low as there is abundant wintering grounds north of the hatchery site along the Yakima River, birds are attracted to the area for winter food resources that would not be affected, and temporarily displaced birds would likely return to the area after construction.

3.8.2.1.1 New Cascade Canal Diversion and Fish Screening Facility

At the New Cascade Canal facilities, low, temporary impacts due to construction staging, access, and noise associated with modifications to the diversion and fish screening facility would be 4-6 weeks in duration and would likely generate less noise than construction on the MRS Hatchery site. No vegetation would be permanently removed, but some may be temporarily removed for staging and access, which would lead to a small decrease in available habitat in the immediate vicinity. Wildlife that is highly mobile would most likely leave the site during construction, while less mobile species would be directly impacted by disturbance of lands used for staging and access.

Noise from construction could temporarily affect nearby bald eagle winter range, as well as the nearby Ellensburg mule deer winter range, as they are both within the 2,000-foot noise buffer zone from the construction site. Any displaced wildlife from noise would likely return to the project area at the end of the construction period.

3.8.2.2 MRS Hatchery Operation and Maintenance

Operation of the MRS hatchery would increase daily human activity and noise over existing conditions, which could directly impact the ability of local wildlife to forage, roost, or nest. However, the impact of this would likely be minor as species that currently use this area may already be adjusted to human presence on site as well as the noise associated with the existing roads within the study area. During operations, wildlife sensitive to human disturbance would likely avoid the site due to the added operational noise. The potential project effects described for common species would be similar for priority species. Based on the overall analysis, project operations at the MRS hatchery would have a low effect on wildlife species.

Impacts during operations may include accidental fuel and oil leaks, which could be detrimental to vegetated areas and hazardous to wildlife. Implementing BMPs would minimize these affects.

At the New Cascade Canal facilities, occasional maintenance may be necessary to remove debris from screens/outfall bars, or check stoplogs at the New Cascade Canal fish screen. Impacts from operations and maintenance activities would have low effects on wildlife because actions would be brief and sporadic, and are not anticipated to cause the displacement of species.

3.8.2.3 Acclimation and Release

The proposed acclimation and release of coho at other sites within the basin would have low impacts to wildlife at those locations because there would be minimal vegetation removal and minimal disturbance or mortality due to vehicle noise, human activity at release sites, or vehicle strikes. Acclimation and release activities would be infrequent and temporary in nature, and thus are not likely to result in wildlife abandoning breeding habitat that may occur in the vicinity. Acclimation and release activities are not likely to impact ESA-listed terrestrial wildlife species.

3.8.2.4 Cumulative Effects

Currently, ongoing actions in the basin that have contributed to negative cumulative impacts and that are reasonably certain to continue in the future, include agricultural land management, infrastructure and commercial development, and water resource development. These actions have resulted in the loss of native habitat such as shrub-steppe and native grassland communities, as well as fragmentation and reduction of connectivity between river and riparian habitats and other vegetation communities. This has caused an overall loss in extent and connectivity of native vegetation communities that are necessary to sustain native wildlife species.

Permanent impacts to vegetation and corresponding habitat from the proposed project are expected to be localized and are would be low with the implementation of minimization measures and BMPs. Permanent loss of wildlife is also anticipated to be low and would not significantly contribute to a cumulative loss of any species. Construction and operation impacts to sensitive species are anticipated to be low because no breeding habitat would be altered and temporary construction disturbance is unlikely to impact individual species. Likewise, the impact to populations of nonsensitive species would be expected to be low. Overall, the cumulative impacts of the Proposed Action on wildlife when added to past, present, and reasonably foreseeable future actions would be low.

3.8.2.5 Mitigation Measures

The following mitigation measures would be implemented to avoid or minimize impacts on wildlife during construction at the hatchery site:

- Clean work areas would be maintained with proper litter control and sanitation to prevent wildlife attraction.

- Minimize lighting and use lighting fixtures that direct light downward and not towards off-site areas to minimize disturbance to wildlife.
- Develop and implement a plan to minimize and manage predatory wildlife being attracted to fish and other potential food sources available at the facility.
- Implement measures to control erosion (see mitigation measures in Geology and Soils) and potential spills of hazardous materials (see mitigation measures in Water Resources) to minimize potential for impacting habitat.
- Implement a revegetation plan (see mitigation measures in Vegetation) to ensure stabilization of disturbed soils.

3.8.3 Environmental Consequences of No Action Alternative

Under the No Action alternative, the proposed construction would not occur at the MRS Hatchery property or at the New Cascade Canal facilities. Habitats in these sites would not be altered, and existing human disturbance would continue. Species adapted to current conditions at the site would continue to use the study areas. New mobile acclimation and release sites would still be established under the larger YKFP, existing sites would continue to be used. As with the Proposed Action, the use of new acclimation and release sites would have low impacts to wildlife.

3.9 Cultural Resources

Cultural resources are resources associated with human occupation or activity related to history, architecture, archaeology, engineering, and culture. Historic properties, as defined by 36 CFR 800, the implementing regulations of Section 106 of the National Historic Preservation Act (54 USC § 300101 *et seq*.), are cultural resources that are eligible for inclusion in the National Register of Historic Places (referred to as the National Register or NRHP). Historic properties may be districts, sites, buildings, structures, artifacts, ruins, objects, works of art, natural features important in human history at the national, state, or local level or properties of traditional religious and cultural importance to an Indian tribe.

3.9.1 Affected Environment

This section describes the study area related to the proposed project, the cultural chronology of precontact and historic human activity in the project area, the known cultural resources in the study area, and the potential for undiscovered or undocumented cultural resources in the study area.

Background research for the Proposed Action included review of the Washington Department of Archaeology and Historic Preservation’s (DAHP) online database for archaeological site records, cultural resource survey reports, cemetery records, Historic Property Inventory forms, and nominations to the NRHP and the Washington Heritage Register. The Washington DAHP’s statewide predictive model was also analyzed for probability estimates for precontact cultural resources. General Land Office plats available online through the U.S. Department of the Interior’s Bureau of Land Management website were examined for historical features in the study area. The Yakama Nation Cultural Site Atlas as well as Yakama Nation Cultural Resources

Specialists who possess knowledge of Yakama culture, were also consulted on resources significant to the Yakama Nation. The Kittitas County Property Assessor's online parcel records database was used to identify buildings and structures over 45 years of age within the study area.

3.9.1.1 Study Area

The study area for the proposed project encompasses the location where impacts from construction and operation of the MRS Hatchery could occur. It includes the proposed development area for the hatchery building and related facilities, construction staging area, and areas where access activities would occur, including acclimation sites.

3.9.1.2 Cultural Setting

Located along the Columbia Plateau of central Washington, the Kittitas Valley has been occupied by Native American groups for thousands of years as the area is rich in natural resources. Over the last two centuries, these same resources have drawn the attention of nonnative farmers, ranchers, and others to settle in the area. The discovery of gold at Swauk Creek in 1873 brought the first large numbers of nonnative immigrants to Kittitas County. Native and nonnative peoples have cohabitated in the region to the present day.

3.9.1.2.1 Precontact Overview

Precontact cultural phases are developed from evidence researched through the archaeological record. Phases represent similar technologies, subsistence, and settlement patterns identified and grouped together in broad terms. The Kittitas Valley region is associated with five broad cultural phases over the last eleven millennia.

The earliest identified occupation in the region is from the Paleo-Indian period known as the Clovis cultural phase. This phase dates from 11,500 to 10,500 Before Present (BP) and is characterized by small groups of highly mobile hunters and foragers (Shellenberger and Kiona 2016). This phase is named for the Clovis point, a large base fluted spear point. These points were part of larger tool kit that included scrapers, blades, drills and needles. The classic image of this phase is a band of hunters spearing megafauna, like mammoths. In reality, the Clovis people primarily subsisted on foraging plants, hunting small mammals and, most likely, fishing (Mann 2013).

Following the Clovis is the Windust cultural phase that dates from approximately 10,500 to 8,000 BP. Like the previous Clovis people, the Windust phase saw a utilization of a primarily hunter and gather-based subsistence practice (Shellenberger and Kiona 2016). The Windust phase is represented by a well-developed lithic technology that produced lanceolate knives and short shouldered stemmed projectile points (Army 1990).

The Vantage phase dates from approximately 8,000 BP to 4,500 BP (Shellenberger and Kiona 2016). The Vantage phase peoples were still primarily nomadic and adapted to utilizing river and creek margins (Army 1990). Although nomadic, this phase has the introduction of subterranean pithouses, used for seasonal or temporary occupation.

The Frenchman Springs cultural phase ranged from 4,500 to 2,500 BP and is dominated by several forms of contracting stem projectile points. At this time, there was an increase in precipitation that altered natural habitats and changed the distribution of land use to include more nonriverine environments (BPA 2012a). This phase sees the continued transition into a more sedentary lifestyle with the expanded use of pithouses begun during the Vantage phase. Settlements range from isolated pithouses with associated camps along riverine systems and later transitioning into larger winter villages (Army 1990). Researchers believe that the ethnographic Plateau pattern began to develop toward the end of this phase (Shellenberger and Kiona 2016).

The Cayuse phase existed from 2,500 BP until contact and includes full development of the ethnographic Plateau pattern. The phase is represented by large winter villages of up to 50 pithouses with smaller varying seasonal camps for root crops and fishing and hunting activities. Widespread trade with coastal groups is also identifiable in the archaeological record (Shellenberger and Kiona 2016). During this time, the region sees the introduction of the bow and arrow, represented by smaller projectile points. The end of the Cayuse phase brings the introduction of the horse and the devastating impact of European diseases (FERC 2006).

3.9.1.2.2 Historic Overview

The beginning of the nineteenth century saw the expansion of the fur trade industry and expeditions such as Lewis and Clark in 1805-1806 traveling into the Columbia Plateau region (BPA 2012a). One of the earliest nonnatives to record a description of Kittitas region was the fur trader Alex Ross. In 1814, he described an encounter with a massive tribal gathering that included thousands of people engaged in “councils, root gathering, hunting, horse racing, gambling, singing, dancing, drumming, yelling, and a thousand other things…”(Becker 2005).

In 1855, the Yakama peoples and other neighboring bands of the Kittitas region signed a treaty with the governor of the newly established Washington Territory (1853). This treaty officially created what is known today as the Yakama Nation and ceded approximately 10 million acres of land to the U.S. government (Hoyt, Wilson, and Johnson 2011). The Yakima Indian Wars (1855-1858) ultimately ended with the forcible placement of the Yakama onto their present day reservation and opened the way for nonnative settlement in the Kittitas region. Kittitas County was officially formed in 1883 in the Washington Territory from a section of northern Yakima County. The territory became the 42nd U.S. state in 1889 (Becker 2005).

The Homestead Act of 1862 spurred a migration of settlement in the west and eventually brought immigrants into the Kittitas Valley region. The ample grasses and abundant water of the Kittitas Valley were ideal for ranching and other agricultural endeavors. With the introduction of the horse to the region by the 1700s, local natives raised and traded them with other area tribes and later with early white explorers passing through the area (Ochran n.d.). It has been estimated that the area supported as many as 3,000 head of horses at its peak (Shellenberger and Kiona 2016).

The same environment that supported the horses attracted cattle ranchers to establish land claims by the late 1860s (Ochran n.d.). Over-grazing by the late nineteenth century led to changes in ranching practices, including fenced pastures and the production of hay and grains for feed. Irrigation development projects in the 1930s improved ranching production and the growth of row crops. At its peak in the 1960s, there were approximately 70,000 head of cattle in the county.

In 1906, construction began on the Chicago-Milwaukee-St. Paul-Pacific Railroad line, sometimes referred to as The Milwaukee Road (Chicago, Milwaukee, St. Paul, Pacific Railroad Company, 1950). The line was completed in 1908 and its route runs through the northeast corner of the study area. The line was in operation until the company bankrupted in 1980. Currently, the former railroad route is used as a recreational trail (John Wayne Pioneer Trail) managed by Washington State Parks (Washington State Parks 2016).

The prominence of the ranching activities helped establish a strong hay production industry in the region. Beyond the local demand for hay, production also supported the Seattle and Tacoma regions with feed needed for draft horses. The need for hay began to taper off by the 1920s as the use of the draft horse was supplanted by the automobile (Ochran n.d.).

Coal mining has been a part of the regional industry since the early 1870s (Saunders 1914). The coal deposits are primarily located around the Yakima Valley and helped to spur the development of major railway lines through the county. By the 1930s, coal mining began to decline due to the rise of the oil industry. Other mining efforts for the region included silver, lead, copper, chromium, mercury, manganese, nickel, and gold. Several gold rush booms spurred migration to the Kittitas Valley from the 1870s to the 1930s (Ochran n.d.). The Swauk Mining District in the mountains of north central Kittitas County still attracts gold seekers from tourists to professional miners (Engstrom 2006).

The logging industry was primarily located in the western portion of the county along the Cascade Mountains and large lakes in that area. The first sawmill was established near Ellensburg in the early 1870s. Logging in the late nineteenth century supported not only settlement construction but the vast amount of ties needed for the developing railway systems (Ochran n.d.).

3.9.1.3 Cultural Resources within the Study Area

In 2016, Yakama Nation Cultural Resources Specialists conducted a pedestrian survey of the study area (Shellenberger and Kiona 2016). The Yakama Nation conducted previous cultural resources surveys in the study area in 2008 and 2009.

Based on the background research and the 2016 cultural resources survey, four buildings were identified in the study area dating to 1940, including the single family residence on the property. Furthermore, the John Wayne Pioneer Trail was identified within the study area. As previously mentioned, the trail is the now defunct Chicago-Milwaukee-St. Paul-Pacific Railroad line, which traverses the northeast corner of the study area. Additionally, review of an 1878 General Land Office plat indicated that there is potentially a historic road in the study area. The Washington DAHP database also indicated that three previously recorded cultural resources are located within 0.5 mile from the study area.

During the 2016 cultural resources survey, archaeologists did not identify any traditional cultural properties or sacred sites in the study area. Furthermore, archaeologists did not identify the road shown on the 1878 General Land Office plat. Based on a request from Washington DAHP, Yakama Nation Cultural Resources Specialists conducted a subsequent evaluation of the single family residence on the property. The Yakama Nation found that the residence lacked an association with a significant event or person, and modifications and additions impacted the integrity of the structure. BPA determined that the residence was not eligible for inclusion in the NRHP.

3.9.2 Environmental Consequences of Proposed Action

3.9.2.1 MRS Hatchery Construction

Construction of the hatchery would involve the permanent disturbance of approximately 3.7 acres for the development of hatchery buildings, groundwater wells, holding ponds, residential facilities, access road and driveways, and other hatchery-related facilities. Site preparation would also require clearing vegetation and grading of 8.3 acres that make up the development area of the hatchery site. This would require significant ground disturbance. The four buildings on the property dating to 1940 would be razed. Construction would also have a visual impact on the Chicago-Milwaukee-St. Paul-Pacific Railroad line, which is now the John Wayne Pioneer Trail (see Section 3.12.2.1). These visual impacts would be low. Washington DAHP’s statewide predictive model indicated that the study area was located in an area that would be categorized as an area of high potential for archaeological resources, indicating that a survey is highly advised.

The Yakama Nation Cultural Resources Specialists conducted a survey of the study area to identify any cultural resources that may be affected by the Proposed Action. The Yakama Nation completed the survey in 2017 as part of BPA’s NHPA and NEPA obligations. Archaeologists did not identify any historic properties, traditional cultural properties, or sacred sites within the study area.

3.9.2.2 MRS Hatchery Operation and Maintenance

Operation and production at the hatchery would not impact cultural resources as the area would have been surveyed before project construction and any impacts to the resources would have been previously determined and mitigated as needed. Maintenance of facilities would not affect known resources. If any ground disturbing maintenance activities need to occur outside of facility locations, a review of sensitive areas would be required to avoid disturbing cultural resources.

There is the potential for water flow from the outfall to impact downstream shoreline archaeological sites through erosional processes. However, the contribution to downstream erosion from the proposed project is expected to be minimal, if not the same as it is currently; as such, impacts on archaeological resources due to erosion are expected to be low.

3.9.2.3 Acclimation and Release

Acclimation and release would not have the potential to affect cultural resources because there would be no ground disturbance. Acclimation structures are not expected to create noticeable visual obstructions and they would only be operated for a period of three months (Feb-April) (see Section 3.12.2.3); therefore, visual impacts to cultural resources, if present, would be temporary and low. There would be low impacts to cultural resources at existing acclimation sites.

3.9.2.4 Cumulative Effects

Historic, ongoing, and future development of the region for agriculture, housing, transportation, and utilities has affected and would continue to affect cultural resources. The loss of individual historic resources because of development in a region results in a cumulative loss of elements of the historic record for the area. The loss of a historic structure under the Proposed Action (i.e., the residence on the hatchery site), when combined with past, present, and reasonably foreseeable future actions in the study area, contributes to the cumulative loss to the historic record. Implementation of project mitigation measures would reduce potential impacts to known historic properties. While the potential exists for previously unidentified historic properties to be affected as part of project operations, no negative cumulative effects to historic properties are anticipated. Conversely, the MRS Hatchery would help increase populations of coho salmon, a culturally important resource. Cultural resource investigations conducted as part of this project contribute cumulatively to the body of knowledge of history of the project area.

The former railroad line that is now the John Wayne Pioneer Trail has seen significant impacts due to trail construction and maintenance. The Proposed Action would have only temporary low visual impacts on the railroad line and, therefore, would not contribute to the cumulative effects of other actions on that resource.

3.9.2.5 Mitigation Measures

The following mitigation measures would be implemented to avoid or minimize impacts on cultural resources during construction at the hatchery site:

- Prepare an Archaeological/Cultural Resource Inadvertent Discovery Plan.
- Protect any unanticipated cultural resources discovered during construction as follows:
    - Stop work in the immediate vicinity of the discovery and protect find in place.
    - Notify Yakama Nation Project Manager, BPA Archaeologist, and BPA Environmental Compliance Lead immediately.
    - Implement mitigation or other measures as instructed by BPA.

3.9.3 Environmental Consequences of No Action Alternative

If the No Action alternative is selected, no new facilities would be constructed, nor would existing facilities be modified; therefore, there would be no impact to cultural resources. The new acclimation and release sites would be used under the No Action alternative and, like the Proposed Action, no ground disturbance is expected so there would be no impact to cultural resources. There would be no new impacts at existing acclimation sites.

3.10 Socioeconomics and Environmental Justice

3.10.1 Affected Environment

The socioeconomic environment potentially affected by the proposed project includes the regional economy as it relates to sport, commercial, and subsistence fisheries; county and Tribal communities; and established economic mainstays. Other socioeconomic factors include the local tax base, local employment, community services (e.g., fire, county sheriff, roads, and utilities), and local businesses (e.g., hotels and restaurants).

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Supporting environmental justice, Executive Order 12898 directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations. Census data at the state, county, and census tract levels were used to determine the potential presence of minority or low income populations in the study area.

The study area includes Kittitas County for socioeconomic elements and the Yakima Basin for impacts related to fisheries.

3.10.1.1 Economic Characteristics

3.10.1.1.1 Fisheries

Fisheries resources, at one time abundant throughout the Yakima Basin, have been adversely affected by the creation of reservoirs and storage dams over the last century. Dams present migration barriers to native anadromous and resident fish populations and have resulted in historic and ongoing habitat degradation in the basin (USFWS 2012b, Ecology 2016e). However, portions of the Yakima and Naches Rivers and several tributaries and reservoirs still support fish populations and provide opportunities for harvest thanks to fish passage structures at dams, and human-assisted release and reintroduction efforts (USFWS 2012b, Ecology 2016e).

Salmon fishing regulations established and enforced by WDFW change year-to-year, or even weekly if in-season updates indicate a particular run is weaker or stronger than anticipated. Recreational or sport fishing for salmon in the Yakima River can be open to nontribal members, with restrictions on timing and catch limits. In the 2016–2017 season, for example, salmon fishing for sport was allowed September 1–October 22 below Prosser Dam, with a catch limit of six (WDFW 2016g).

Subsistence fishing by the Yakama Nation is authorized in the Yakima River, roughly between Roza Dam, 10 miles north of Yakima, and Horn Rapids Dam, just north of Richland. This stretch of the river in which subsistence fishing is authorized begins approximately 30 miles downstream of the hatchery site. Fishing regulations set forth by the Yakama Tribal Council (2016) place further restrictions on the season, timing, methods, and location of subsistence fishing that is allowed and which species can be targeted. The Yakama Nation’s subsistence fishing provisions generally only apply to the harvesting of fish for traditional, noncommercial use; occasionally, however, commercial fishing periods are authorized by the Yakama Tribal Council and fishing regulations specific to commercial activities are issued.

Opportunities for tribal fishing of coho salmon do not currently exist in the Yakima basin since coho have been extirpated. The majority of tribal coho harvest for the region occurs in the Columbia River Zone 6 Fishery.

3.10.1.1.2 Population and Housing

As of July 2015, Kittitas County had an estimated population of 43,269; less than 1 percent of the statewide population of 7,170,351 (U.S. Census Bureau 2015). From 2010 to 2015, the growth rate of Kittitas County was 5.8 percent, which is below the statewide growth during the same period (6.6 percent) (U.S. Census Bureau 2015). In 2014, the total number of housing units in Kittitas County was 22,188, with a vacancy rate of 24.5 percent, which is much higher than the statewide average of 9.4 percent (U.S. Census Bureau 2014a).

3.10.1.1.3 Local Tax Base

Approximately 74 percent of Kittitas County is exempt from taxation as federal, state, county, city, and other miscellaneous exemptions. The local tax base in Kittitas County for 2015-2016 was $59,900,839, plus a $59,888 timber tax (Kittitas County Assessor 2015), representing an increase from $56,810,378 in 2014-2015. New construction added $116,981,735 of value to parcels in Kittitas County in 2015, increasing the tax base. The tax base is used to fund cemetery districts, Veterans assistance, community services, flood district, hospital districts, cities, county roads, fire districts, county, and local and state schools.

3.10.1.1.4 Local Employment

The leading industries within Kittitas County include educational services, and health care and social assistance (28.3 percent of total county-wide employment); arts, entertainment, and recreation, and accommodation and food services (15.7 percent); and retail trade (13.5 percent) (U.S. Census Bureau 2014a).

The nearest communities to the hatchery site include Thorp, a census designated place, and the City of Ellensburg, the Kittitas County Seat.

The leading industries within Thorp include retail trade (27.4 percent of total city-wide employment); construction (23.0 percent); and educational services, and health care and social assistance (15.9 percent) (U.S. Census Bureau 2014a).

The leading industries within Ellensburg include educational services, and health care and social assistance (33.1 percent of total city-wide employment); arts, entertainment, and recreation, and accommodation and food services (18.8 percent); and retail trade (14.1 percent) (U.S. Census Bureau 2014a). The top five employers in Ellensburg are Central Washington University, Kittitas Valley Community Hospital, Ellensburg School District, Kittitas County, and Anderson Hay and Grain (Ellensburg Downtown Association 2015).

Kittitas County's economy has generally been recovering from a substantial downturn experienced during the Great Recession (December 2007 through February 2010). In

2009, nonfarm employment dropped by 680 jobs (about 4.5 percent of all nonfarm jobs in the County) (Meseck 2016). From 2010 through 2015, average annual nonfarm employment has generally increased. Between 2014 and 2015, Kittitas County's economy provided 710 new nonfarm jobs as total nonfarm employment rose from 15,270 in 2014 to 15,980 in 2015, an average annual increase of 4.6 percent (Meseck 2016). Official, long-term (10-year) nonfarm employment projections produced by the Employment Security Department are for a 1.6 percent average annual growth rate from 2013-2023 for the four-county South Central Workforce Development Area (i.e., Kittitas, Klickitat, Skamania, and Yakima Counties).

Recent or potential economic developments that would improve employment prospects in Kittitas County include Suncadia Resort approximately 25 miles northwest of Ellensburg with a valuation of over $2 billion, a restaurant boom in Ellensburg, and the Surf City Water Park development in 2016 (Meseck 2016).

3.10.1.1.5 Community Services

The nearest schools are located in Thorp and Ellensburg. Other community services, including a library, a post office, grocery stores, hotels, and emergency and medical services are available in Ellensburg. Emergency service departments include Kittitas County Fire Marshall, Kittitas Valley Fire and Rescue, Ellensburg Police Department, Public Safety and Police Services, and State Patrol Office. Medical facilities include Family Health Care Ellensburg, Community Health of Central Washington – Ellensburg, and Kittitas Valley Community Hospital.

3.10.1.1.6 Local Businesses

Business types and number of establishments in Kittitas County are provided in Table 3.10-1.

Table 3.10-1. Local Business Establishments

Business Type	Number
Agriculture, Forestry, Fishing, and Hunting	15
Mining, Quarrying, and Oil and Gas Extraction	2
Utilities	9
Construction	191
Manufacturing	35
Wholesale Trade	43
Retail Trade	165
Transportation and Warehousing	51
Information	14
Finance and Insurance	46
Real Estate, Rental, and Leasing	64
Professional, Scientific, and Technical Services	70
Management of Companies and Enterprises	2
Administrative and Support, and Waste Management and Remediation Services	57
Educational Services	12

Table 3.10-1. Local Business Establishments

Business Type	Number
Health Care and Social Assistance	97
Arts, Entertainment, and Recreation	30
Accommodation and Food Services	161
Others Services	96

Source: U.S. Census Bureau 2014b – County Business Patterns

3.10.1.2 Environmental Justice

To characterize the potential for the proposed project to have environmental justice affects, minority and low-income populations were identified within the census tracts of the project area.

3.10.1.2.1 Minority Populations

The EPA Office of Environmental Justice has defined the term “minority” to include Hispanics, Asian-Americans and Pacific Islanders, African-Americans, American Indians, and Alaskan natives. Guidelines provided by the Council on Environmental Quality (CEQ 1997) and EPA (1998) indicate that a minority population may be defined where either 1) the minority population comprises more than 50 percent of the total population, or 2) the minority population of the affected area is meaningfully greater than the minority population of an appropriate benchmark region used for comparison. For this analysis, the total percentage of minorities in the study area census tracts was compared to the minority populations of the State of Washington and Kittitas County to determine whether the study area populations are 50 percent greater.

Minority populations within the state, county, and census tracts included in the project study area are provided in Table 3.10-2. Census Tract 9755 primarily includes the city of Ellensburg, whereas census tract 9753 primarily includes rural lands.

Table 3.10-2. Minority Population

	Washington	Kittitas County	Census Tract 9753	Census Tract 9755
Total Population	**6,899,123**	**41,705**	**4,594**	**5,737**
White (%)	71.3	85.0	95.0	81.5
Black or African American (%)	3.5	0.9	0.4	0.0
American Indian and Alaska Native (%)	1.2	0.9	0.5	0.0
Asian (%)	7.4	2.2	0.2	5.3
Native Hawaiian and Other Pacific Island (%)	0.6	0.0	0.0	0.0

Table 3.10-2. Minority Population

Other Race (%)	0.1	0.1	0.6	0.0
Two or More Races (%)	4.1	2.7	0.7	5.6
Hispanic or Latino (%)	11.7	8.3	2.5	7.6
Total Minority Population (%)	28.7	15.0	5.0	18.5

Source: U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates

In sum, the overall minority population (i.e., all minorities combined) of the study area is comparable to that of the state and county and is not meaningfully greater. However, there are a few individual minority populations that are meaningfully greater than those at county level. Therefore, Asian-Americans and minorities who identify as an “other race” or “two or more races” constitute minority populations within the study area for purposes of an environmental justice analysis.

Additionally, members of the Yakama Nation are also considered a potentially affected minority population.

3.10.1.2.2 Low-income Populations

Low-income populations are defined as a community, or group of individuals, in geographic proximity to one another, who are living below the federal poverty level (CEQ 1997). Low-income populations are identified using annual statistical poverty thresholds from the U.S. Census Bureau’s *Current Population Reports in Income and Poverty* (CEQ 1997, EPA 1998).

Low-income populations within the state, county, and study area census tracts are provided in Table 3.10-3.

Table 3.10-3. Low-Income Population

Area	Total Population	Low-Income Population (%)
Washington	6,765,200	13.5
Kittitas County	39,287	22.1
Census Tract 9753	4,575	10.3
Census Tract 9755	5,594	36.2

Source: U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates

3.10.2 Environmental Consequences of Proposed Action

3.10.2.1 MRS Hatchery Construction

Construction would provide short-term employment opportunities for local and nonlocal labor, based on the location of the contractors and the need for skilled and general laborers. The construction work force would consist of approximately 30 full time workers employed for an estimated construction period of 16.5 months. The majority of workers are expected to commute from within 50 miles or less. Construction would result in a short-term, low impact on employment in the region.

It is assumed that construction workers would travel from their homes within 50 miles or less of the site and any new housing needs for workers more than 50 miles away would be met by temporary housing such as hotels.

Spending by construction workers in the study area would have a short-term, low impact on the local economy. Construction workers would patronize hotels and restaurants and may also purchase personal and small construction-related supplies from local commercial enterprises. The short-term duration of the impact would result in a low impact on the local economy.

The presence of minority and low-income populations in the study area is generally consistent with the benchmark region. Construction activities would be limited to the site and immediate surroundings, which are removed from population centers. Construction effects on water resources, fisheries, air quality, noise, visual resources, land use, transportation, vegetation and wildlife, and other resources would be of short duration and low intensity. There would be no high and adverse human health or environmental effects as a result of construction. Any minor impacts would not be disproportionately borne by minority or low-income populations. No environmental justice impacts would result from construction of the proposed project.

3.10.2.2 MRS Hatchery Operation and Maintenance

Operation of the new hatchery facilities would result in the addition of up to five new full time hatchery workers, increasing the population of the project area by the number of resident hatchery workers hired to maintain the hatchery and their families (3 to 12 individuals). Additional housing would be required to allow hatchery workers and their families to live on site. The additional demand would be met by the construction of three additional residences at the hatchery site. The additional workers would likely be hired from somewhere within the study area, having a low impact on the regional economy. Spending by the added workforce in the community would result in a long-term, low impact to employment and the local tax base.

Operation of the hatchery would have a low impact on adjacent properties in terms of disruptive traffic, air emissions, visual impacts or noise. See Sections 3.2, 3.11, 3.12, 3.13. Based on the limited potential for traffic, air, visual, and noise impacts on nearby residences, the project is not expected to impact adjacent property values or increase the demand for community services.

Opportunities for recreational fishing of coho likely would improve if stocks increased. The proposed project would support returning coho to a level where the potential for predictable ceremonial and subsistence fisheries for the Yakama Nation would be possible and would continue to support coho harvest. The availability of fisheries resources for tribal members would ultimately increase, resulting in long-term, moderate impacts to subsistence fisheries. The project would not only support continued harvest in the Columbia River, but would also provide new opportunities for harvest of coho in the Yakima basin. Tribal fishing in the Yakima basin would most likely occur at Horn Rapids, Prosser, and Wapato Dams where tribal members currently fish for spring

Chinook salmon. Tribal fishing of coho in the Yakima would predominantly occur for ceremonial and subsistence purposes, using long handled dip nets and angling.

Operation of the hatchery would have no population level impacts on minority or low-income groups with the exception of long-term impacts for Yakama Nation tribal members. The availability of fisheries resources for tribal members would ultimately increase, resulting in low impacts to subsistence fisheries, which would benefit Yakama Nation tribal members over the long term.

There would be no high and adverse human health or environmental effects as a result of operation and maintenance of the hatchery. Any low impacts would not be disproportionately borne by minority or low-income populations. No environmental justice impacts would result from operation and maintenance of the proposed project.

3.10.2.3 Acclimation and Release

Acclimation and release sites would have no socioeconomic impacts beyond the impacts associated with operation of the hatchery. The same employees that would operate the hatchery would also operate the acclimation and release sites.

Ongoing fishing operations in the streams proposed for coho release could be affected by the acclimation and release activities. As described in Section 3.7.2.3, the impact of proposed coho releases on nontarget fish species, such as bull trout or rainbow/steelhead trout, depends on a number of factors, including the timing of release, the life stage of release (parr vs. smolt), the presence and abundance of nontarget fish species at each release site, whether or not the nontarget fish species have similar dietary and habitat preferences to coho, or whether or not they share similar timing of emergence or outmigration with coho.

There would be no high and adverse human health or environmental effects as a result of acclimation and release activities. Any minor impacts would not be disproportionately borne by minority or low-income populations. No environmental justice impacts would result from acclimation and release activities.

3.10.2.4 Cumulative Effects

Section 3.10.1.1 describes the existing state of socioeconomic elements. The official, long-term (10-year) nonfarm employment projections produced by the Employment Security Department are for a 1.6 percent average annual growth rate from 2013-2023 for the four-county South Central Workforce Development Area (i.e., Kittitas, Klickitat, Skamania, and Yakima Counties). There are no major commercial or residential developments planned in Kittitas County in the foreseeable future. Operation of the hatchery would result in minor, long-term increases to the population and local tax base from new employees and residences at the hatchery site; however, when compared with the ongoing impact of continued population growth and development in the area, this low increase of three new families would not contribute to a cumulative socioeconomic impact. The effect of the project, when combined with the effects of other past, present, and reasonably foreseeable future basin-wide restoration projects, hatchery facilities, and monitoring efforts aimed at increasing salmon returns, could have a long-term beneficial cumulative impact of subsistence fisheries and tribal families over time, depending on the success of these efforts. Considering the components that make up socioeconomics, when the incremental impact of the Proposed Action is combined with past, present, and reasonably foreseeable future activities, cumulative socioeconomic impacts would be low.

3.10.2.5 Mitigation Measures

Because of the low magnitude of impacts on socioeconomic and environmental justice resources, no mitigation measures are recommended.

3.10.3 Environmental Consequences of No Action Alternative

Under the No Action alternative, economic conditions in the region would not change from the existing conditions described above. No new construction would be undertaken and no additional jobs would be created. Because there would be no change in local economic conditions, there would be no impacts to low-income and minority populations from the No Action Alternative. The use of the new acclimation and release sites under the larger YKFP would not result in socioeconomic impacts.

3.11 Air Quality and Climate Change

The U.S. Environmental Protection Agency (EPA) and Ecology are both responsible for the enforcement of air quality and emissions standards in the State of Washington. The EPA has established National Ambient Air Quality Standards (NAAQS) to protect the public from air pollution under the Clean Air Act (42 USC 741 et seq.). The NAAQS focus on “criteria pollutants,” which are pollutants of particular concern for human health. The criteria pollutants are: carbon monoxide (CO), lead (Pb), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), course particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$). In addition to the NAAQS, Ecology has adopted current NAAQS in its state regulations, Washington Ambient Air Quality Standards (WAAQS; Chapter 173-476 WAC), that are at least as stringent as the NAAQS.

Although GHGs are not considered a direct cause of health effects, evidence shows that GHGs contribute to rising global temperatures that accompany changes in weather and climate (EPA 2016b). Ecology has adopted a new rule (Chapter 173-422 WAC, Clean Air rule) and amended another (Chapter 173-441 WAC, Reporting of Emissions of Greenhouse Gases) to regulate GHG emissions in Washington. Chapter 173-442 WAC provides emissions standards for GHGs from stationary sources located in Washington State, petroleum fuel producers or importers distributing fuel in Washington State, and natural gas distributors in Washington State. Ecology stipulates that parties covered under this program would have an obligation to reduce their GHG emissions over time and a wide variety of options would be available to do so.

Ecology amended Chapter 173-441 WAC to change the emissions covered by the reporting program, modify reporting requirements, and update administrative procedures. For projects that are expected to annually produce at least 10,000 but less than 25,000 metric tons of CO_2e (carbon dioxide equivalent), Ecology requires a qualitative analysis of GHG emissions. For projects that are expected to annually produce 25,000 metric tons of CO_2e or greater, a quantitative analysis is required. Projects with GHG emissions less than 25,000 metric tons of CO_2e per year are not considered significant in terms of GHG emissions and therefore, do not require mitigation.

3.11.1 Affected Environment

3.11.1.1 Air Quality

The study area for air quality includes the airshed of Kittitas County, Washington. This area represents the maximum geographic extent of air quality impacts that may result from sources of combustion, dust, or other air pollutant emissions during construction and operation and maintenance of the project. Because air quality monitoring data is lacking for the airshed of Kittitas County, air quality data from nearby cities (Seattle, Wenatchee, Mount Vernon, and Mount Rainier, Washington) is also considered in this analysis.

The most common sources of criteria pollutants in Kittitas County include emissions from vehicular and rail traffic, residential home heating (particularly wood burning), seasonal wildfires, and agricultural practices (particularly outdoor burning and resuspension of dust and fine particles). The county is situated in a valley, which creates optimal conditions for air inversions that can trap air in the low atmosphere for long periods of time. This is especially problematic during the winter months, when residents utilize their wood burning furnaces and the resulting smoke emissions linger in the area for weeks. The airshed of Kittitas County is currently in attainment[6] with the NAAQS, which means that the concentrations of criteria pollutants in the area are below the thresholds described in the NAAQS. However, Kittitas County is considered a high risk community that is in danger of violating federal air standards due to an increasing trend of unhealthy fine particulate pollution caused by ongoing use of home, wood-burning furnaces, and an increased occurrence of large wildfires over the past 4 years (Kittitas County Public Health Department 2015).

The closest air quality monitoring station is in Ellensburg, Washington (Site ID 530370002), approximately 2 miles south of the hatchery site. This monitoring station monitors only for $PM_{2.5}$ and does not have a complete record of recent years; i.e., monitoring at this site was discontinued in 2008 and restarted in 2015. In 2015, the air quality index rating for this site was predominantly rated “good”; however, it occasionally dropped down to “moderate” and was rated as “unhealthy” or “unhealthy for sensitive groups” for a total of 4 days in 2015 (EPA 2015).

The hatchery site is undeveloped, with the exception of a single residence. Electricity generated offsite is used for water and space heating in the residence. The only existing source of air pollutants at the hatchery site is exhaust emissions from residents traveling to and from the site, and from travelers on adjacent roadways. Existing residents generate 0 to 3 trips per day. The acclimation and release sites are also undeveloped and therefore have no emissions.

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[6] Attainment status is a federal designation determined by the EPA based on the NAAQS. Ecology does not determine or define attainment for areas based on the WAAQS.

3.11.1.2 Climate and Climate Change

3.11.1.2.1 Climate

The hatchery site lies within the Central Basin of Washington, east of the Cascade Mountains, which is considered the lowest and driest section of eastern Washington. The climate is largely influenced by prevailing westerly winds and dry, continental air masses coming from the north and east. In the summer season this air from over the continent results in low relative humidity and high temperatures, while in winter clear, cold weather prevails. In the Central Basin, annual precipitation typically ranges from 7 to 15 inches and snowfall ranges between 10 and 35 inches. Summer precipitation is usually associated with thunderstorms. During July and August, it is not unusual for 4 to 6 weeks to pass without measurable rainfall. In January, average maximum temperatures are usually between 30° and 40°F, and minimum temperatures are between 15° to 25°F. In July, the average maximum temperature is typically in the lower 90's, and the minimum temperature is in the upper 50's. Maximum temperatures typically reach 100° to 105°F on a few afternoons each summer. The Central Basin is subject to "chinook" winds, which produce a rapid rise in temperature. A few damaging hailstorms are reported in the agricultural areas each summer (Western Regional Climate Center 2016).

3.11.1.2.2 Climate Change

The EPA (2014b) defines climate change as any substantial change in measures of climate (such as temperature or precipitation) lasting for an extended period of time (decades or longer). Because climate change is a global concern, the affected environment for climate change is considered at a larger scale, specifically at the state and national scale.

In recent decades, climate change has had widespread impacts on human and natural systems, including rising sea levels, an increased frequency of extreme weather events (e.g., floods, drought, wildlife, heat waves), acidification of the ocean, shrinking glaciers and sea-ice retreat, reduced crop yields, and shifting geographic ranges or migration patterns for wildlife species (IPCC 2014).

According to the U.S. Global Change Research Program, U.S. average temperature has increased by 1.3° to 1.9°F since recordkeeping began in 1895; most of this increase has occurred since 1970 and the most recent decade was the nation's warmest on record (Walsh, et al. 2014). The resulting impacts of rising temperatures in the U.S. include an increased length of the growing (frost-free) season, increased average precipitation (with localized examples of increases and decreases), and an increase in the frequency and intensity of extreme weather events (e.g., heavy downpours, heat waves, hurricanes, droughts). In the interior Pacific Northwest, the most notable impacts of climate change have been changes in the timing of spring snowmelt and streamflow, widespread forest mortality due to increased wildfire, insect outbreaks and tree diseases, and an increasing vulnerability of the agricultural industry as a result of reduced water supply (Mote et al. 2014).

As average temperatures in the U.S. are expected to continue to rise, the resulting impacts are also expected to continue into the future. Although there is uncertainty about the specific magnitude and timing of future changes, regional climate models for the

Pacific Northwest generally predict continued increases in air temperature, stream temperature, and likelihood of wildfire, reductions in spring snowmelt and the supply of freshwater, and a shift in the timing of seasonal streamflow. East of the Cascades, the primary climate-related concerns are an increased likelihood for wildfires and mountain pine beetle outbreaks, reduced availability of habitat for salmon and steelhead due to warming stream temperatures and altered flow regimes, and the long-term impact of reduced water supply on the agricultural industry (Lawler and Mathias 2007, Littell et al. 2009).

Climate change may result from natural factors and processes or from human activities. GHG emissions caused by human activities represent the most significant driver of climate change since the mid-20th century (EPA 2014a, IPCC 2014). GHGs are chemical compounds found in the earth's atmosphere that absorb and trap infrared radiation or heat in the lower part of the atmosphere. The principle GHGs emitted into the atmosphere through human activities are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (EPA 2014a). Of these four gases, CO_2 is the major GHG emitted (EPA 2016b).

Currently, the main source of emissions in Washington is the transportation sector, which produces almost half of the state's GHG emissions. The next largest contributor is the residential, commercial and industrial sector, followed by the electricity consumption-based sector (Ecology 2014b). As noted earlier, the only existing source of GHG emissions at the hatchery site is exhaust emissions from residents traveling to and from the site, and from travelers on adjacent roadways.

3.11.2 Environmental Consequences of Proposed Action

3.11.2.1 MRS Hatchery Construction

Construction activities at the Holmes Ranch property may cause minor short-term increases in criteria air pollutant emissions. Ground-disturbing activities at the hatchery site would occur, potentially generating fugitive dust, a common pollutant introduced during clearing and grading. State regulations (WAC 173-400-040) require that reasonable precautions be taken to prevent fugitive dust from becoming airborne.

The use of heavy equipment and machinery during construction would also be a source of exhaust emissions. Emissions from vehicle exhaust would increase the amount of airborne particulates and other pollutants in the immediate vicinity of the construction activity. In addition, material truck deliveries, dump trucks, and construction workers traveling to and from the hatchery site would generate approximately 20-60 vehicle trips per day, further contributing to vehicle emissions in the region. However, the number of additional construction workers and vehicle trips is low when compared to the existing workforce and vehicular traffic of the region; therefore, the degree of the impact is low and there would be no significant reductions in the air quality of the surrounding region.

The construction contractor would be required to comply with all local, state, and federal regulations concerning air pollution abatement related to construction activities. Construction effects on air quality are expected to be low because they would be short term, local, and would cease when construction is complete. Appropriate BMPs would be used for the control of fugitive dust.

The use of heavy equipment during construction and additional vehicle trips for construction workers and truck deliveries would temporarily increase GHG emissions in the project vicinity. However, the temporary increases would not be significant—increases have been estimated to be approximately 3,073 metric tons of CO_2e, which would be less than Ecology's threshold for significance of 25,000 metric tons of CO_2e annually. Thus, the construction impacts on GHG would be low. See Appendix F for details on construction GHG emissions.

3.11.2.2 MRS Hatchery Operation and Maintenance

During operation of the hatchery, the number of employee or delivery trips to and from the site would increase from 0-3 trips per day, under existing conditions, to an average of 7-10 trips per day, which would slightly increase air pollutant and GHG emissions in those areas. Most of these trips would be generated by employee personal vehicles (up to 5 per day) and the remainder would be for deliveries and maintenance or support vehicles (1 per day each). This increase in the vehicle trips would result in low impacts to air quality emissions when compared to existing vehicular activity in the surrounding area.

All mechanical equipment at the hatchery site (e.g., pumps, chillers, water treatment) and residential units would be electric powered and, therefore, would not result in on-site air pollutant emissions. An emergency backup diesel generator would be located on site that would result in emissions of criteria air pollutants when operated. WAC 173-110 requires that portable generators in excess of 500 brake horsepower undergo "New Source Review." However, the project generator would be rated at 500 brake horsepower or less, and is exempt from WAC 173-400-110. Operational emissions from the hatchery would result in low, short-term impacts to air quality in the immediate vicinity of the site and along travel routes for vehicle trips. Air quality in the study area would remain in compliance with air quality standards and GHG emissions is estimated as 42.9 metric tons of CO_2e annually, which would not exceed Ecology's threshold for significance (25,000 metric tons of CO_2e annually). See Appendix F for details on operational GHG emissions.

As described in Section 3.11.1.2, while there is some uncertainty about the specific magnitude and timing of future changes in climate, regional climate models for the Pacific Northwest generally predict that existing trends of warming air and stream temperatures, increased wildfires, reduced snowmelt and water supply, and altered streamflow regimes are expected to continue into the future. In the coming years, the effects of regional climate change on water resources, aquatic ecosystems, and salmon habitat in the Pacific Northwest may impact hatchery operations. Specific concerns related to salmon stem from increased summertime water temperatures, reduced summer low flows, and increased flooding frequency and magnitude (Mantua et al. 2009). Should future changes in salmon habitat, stream temperatures, and summer flows occur as predicted, hatchery operations may need to adjust to these changing environmental conditions. For example, water intake structures and pumps may need to be modified (e.g., extend deeper or relocated) in response to seasonal changes in streamflow; additional measures to protect the hatchery from flooding may be necessary in response to potential for increased flooding in the Yakima River; changes in the mixing ratio of groundwater and surface water may need to be modified in response to increased summertime water temperatures; stocks being reared may need to change to those that are more resilient to warm water temperatures.

GHG emissions associated with the project would be well below Ecology’s threshold for significance; therefore, additional mitigation of GHG emissions from the project would not be necessary.

3.11.2.3 Acclimation and Release

Trucks would be used to transport parr and smolts from the hatchery to the acclimation and release sites between late February and mid-April. Vehicle emissions could slightly increase the amount of airborne particulates and other pollutants, including GHG, along the travel routes. However, these additional trips would have a low impact on existing traffic levels and resulting emissions. Mobile acclimation sites would require the use of a portable diesel generator for a period of about 4 weeks per year, which would slightly increase emissions of air pollutants in the immediate vicinity of these sites. Some of the areas are fairly remote but all are accessible by existing roads. Air emissions resulting from additional truck trips and generators at acclimation sites would be low and would not significantly reduce the air quality of the surrounding region.

Should future climate-related changes in salmon habitat, stream temperatures, and summer flows occur as predicted, acclimation sites may need to be relocated to ensure appropriate water temperatures, or the timing of fish releases may need to be shifted in response to seasonal changes in streamflow and temperature.

3.11.2.4 Cumulative Effects

Over the next 50 years (i.e., the useful life of the hatchery), ongoing vehicular traffic, seasonal wildfires, agricultural activities, and residential wood burning would continue to be the main sources of air pollutants. There is a number of minor transportation improvement projects planned in the project vicinity; however, these projects are geared toward rehabilitation of degraded roadways, and are not expected to facilitate increased traffic volumes or result in long-term impacts to air quality or climate change. Current activities in the study area do not violate air quality standards and the Proposed Action is not expected to cause significant increases of air pollutant emissions; therefore, the cumulative effect to air quality from the Proposed Action and ongoing rural land uses is expected to be low.

In terms of cumulative impacts to the atmospheric levels of GHG, any addition, when considered globally, could contribute to long-term significant effects to climate change. However, the concentrations estimated for the proposed project, when compared to the regional, national, and global rates, are low and comparatively insignificant.

3.11.2.5 Mitigation Measures

The following mitigation measures would be implemented to avoid or minimize impacts on air quality during construction and operation at the hatchery site:

- Sequence and schedule construction work to minimize the amount of bare soil exposed to wind erosion.

- Implement measures to control fugitive dust (see mitigation measures in Geology and Soils).
- Do not burn vegetation or other debris associated with construction clearing.
- Ensure that all vehicle engines are maintained in good operating condition to minimize exhaust emissions.
- Handle and dispose of all potentially odorous waste during operation in a manner that does not generate odorous emissions.
- Implement vehicle idling restrictions.
- Encourage carpooling and the use of shuttle vans among construction workers to minimize construction-related traffic and associated emissions.
- Encourage the use of the proper size of equipment for each job because larger equipment requires the use of additional fuel.
- Use alternative fuels, such as propane, for stationary equipment at the construction sites or use electrical power where practicable.
- Reduce electricity use in the construction office and during facility operation by using compact fluorescent or LED bulbs and turning off computers and other electronic equipment every night.
- Recycle or salvage nonhazardous construction and demolition debris, as well as waste generated during facility operation, where practicable.

3.11.3 Environmental Consequences of No Action Alternative

No new sources of air pollutants or GHG emissions would be added under the No Action alternative. In addition, there would be no construction activities causing temporary, localized increases in air pollutants or dust. The ongoing adult broodstock collection and outplanting would continue. Trucks would continue to visit ongoing acclimation and release sites as well as the new acclimation sites under the larger YKFP. Therefore, the No Action alternative would have a low impact on air quality in the study area and would contribute a low amount to climate change through increased GHG emissions.

3.12 Visual Resources

3.12.1 Affected Environment

The study area for visual resources includes the Holmes Ranch property, areas within one half mile of the Holmes Ranch property, and the area immediately surrounding the new acclimation and release sites. These areas represent the maximum geographic extent of visual impacts that may result from the presence of construction vehicles and equipment, increased human presence during construction, the permanent addition of structures and removal of structures or natural features, and long-term operation and maintenance of the proposed project.

The study area at the Holmes Ranch property is rural in character with very few residences or structures (Figure 3.12-1). The study area within half a mile of the Holmes Ranch property is typified by a combination of natural and manmade features include I-90, local paved and dirt roads, approximately 19 residences, agricultural fields, wooded areas, vegetated open space, and waterbodies, including the Yakima River, ponds, canals, and wetlands.

The Holmes Ranch property itself is mostly characterized by open space containing natural features such as a historic side channel of the Yakima River, streams, riparian vegetation, and aspen stands. There are only a few structures at the center of the site, including one residence, a barn, and some holding tanks.

Two major transportation corridors (I-90, SR-10) and three local routes (Klocke Road, O’Neil Road, and McManamy Road) are present within the study area. The John Wayne Pioneer Trail, which is managed by the Washington State Parks and Recreation Commission, runs along the northern boundary of the Holmes Ranch property, within the former Milwaukee Road railway corridor. The trail is used by hikers, bicyclists, and horseback riders.

Public views of the site are available from portions of the John Wayne Pioneer Trail, I-90, and Klocke Road. Figure 3.12-2 shows the viewpoints from which Photo 3-1 through Photo 3-4 were taken. Views of the existing structures on the Holmes Ranch property are generally limited by the presence of vegetation. Photo 3-2 shows an existing view of the hatchery site from the John Wayne Pioneer Trail, which represents the most sensitive potentially affected by the Proposed Action. The sensitivity is related to the recreational use of the trail and presence of sensitive viewer groups (i.e., recreational trail users). The view of the hatchery site from the trail is possible because of breaks in the vegetation, presenting the viewer with unobstructed views of the hatchery site and surrounding natural features.

Similar to the hatchery site, acclimation and release sites would be located in rural areas with limited development. Sites would generally be open and clear of structures, with the exception of some nearby residential and agricultural buildings.

DATA SOURCE: (Source: Kittatis County 2016, ESRI 2016

STUDY AREA FOR VISUAL RESOURCES

FIGURE 3.12-1

DATA SOURCE: (Source: Kittatis County 2016, ESRI 2016

VIEWPOINTS

FIGURE 3.12-2

Photo 3-1. Hatchery Site Overview

Photo 3-2. View of Hatchery Site from John Wayne Pioneer Trail

Photo 3-3. View of Hatchery Site from John Wayne Pioneer Trail at Klocke Road

Photo 3-4. View of Hatchery Site from Klocke Road

3.12.2 Environmental Consequences of Proposed Action

3.12.2.1 MRS Hatchery Construction

Construction-related activities at the Holmes Ranch property, including heavy equipment operation, clearing and grading, material stockpiles, and worker presence would be visible from existing viewpoints throughout construction. Construction activities would last approximately 16.5 months and take place almost year-round until completion.

Construction of the hatchery facilities would attract attention of sensitive viewers (trail users) and alter the existing viewscape in areas where construction equipment and personnel are visible. Sensitive viewers would experience a negative effect locally from construction activities; however, this effect would only occur for a temporary period of time. Existing views are partially screened by vegetation along the John Wayne Pioneer Trail and by riparian vegetation surrounding waterbodies within and around the hatchery site. This vegetation would not be removed during construction; therefore, the visibility of the construction activities from existing views would continue to be partially screened and would constitute a short-term moderate impact to visual resources.

3.12.2.2 MRS Hatchery Operation and Maintenance

The Project Action would add new structures to the hatchery site, including a new hatchery building, new shop/maintenance building, two new holding ponds, three new residences, and miscellaneous outdoor equipment (e.g., surface water pump station and effluent treatment system). The new hatchery building would be the largest new structure (approximately 27,000 square feet and 25 feet tall) and would be the most visible feature from existing viewpoints. All other structures, including the new residences and shop building, would be smaller (approximately 800-3,000 square feet and between 18 and 25 feet tall) and less visible from the surrounding views. The new structures would be similar in appearance (i.e., materials, color, and style) to existing structures and would be compatible with the existing rural character of the area.

The number of visible structures and duration of visibility would depend on the viewer’s location, rate of motion through the area, and the extent of vegetative screening. New structures would be intermittently visible for a short period of time, to users of the John Wayne Pioneer Trail beginning at the trail’s crossing of Klocke Road, and ending approximately 1,600 feet west of Klocke Road. Photo 3-5 includes a photo simulation of the proposed facilities as viewed from the John Wayne Pioneer Trail; for comparison, the simulation viewpoint shown in Photo 3-5 is in the same location of the existing viewpoint shown in Photo 3-2. Views of the facilities would be short and intermittent due to the traveling, mobile nature of viewers, and vegetative screening along the John Wayne Pioneer Trail.

Given that the new structures would be larger and slightly taller than the existing built features, it is anticipated that they would attract attention and contribute to the viewscape of the immediate surrounding area. The changes to existing views, as depicted in Photo 3-5, represent a long-term impact to visual resources. The new structures would have a moderate impact on the viewer experience as they travel through the rural landscape because the buildings would take up a large portion of the view to the south in an area that was previously occupied by a small residence and open space similar other properties in the study area.

Photo 3-5. Simulation of Proposed Facilities, Viewed from John Wayne Pioneer Trail (at same location as Photo 3-2)

3.12.2.3 Acclimation and Release

Activities at acclimation and release sites would not require construction activities. Operation of mobile acclimation sites would require temporary set-up of acclimation tanks and water pumps. The acclimation tanks and water pumps would be small (each tank would occupy approximately 100 square feet) and would be approximately 4 feet in height; therefore, acclimation structures are not expected to create noticeable visual obstructions. In addition, acclimation and release sites would only be operated for a period of three months (Feb-April) so visual impacts would be short term and low. There would be no new impacts at existing acclimation sites.

3.12.2.4 Cumulative Effects

Historic development activities within the vicinity of the project, primarily agricultural, have created the visual features that are present today. Additional development in the study area would need to be consistent with zoning for agricultural land use, and is somewhat constrained by the presence of the Yakima River and I-90. The open, rural, and natural character of the area would be expected to continue. There are no reasonably foreseeable future actions that, when combined with the proposed project, would contribute to a cumulative impact on visual resources in the study area.

3.12.2.5 Mitigation Measures

The following mitigation measures would reduce the temporary visual impacts during and after construction.

- Avoid removing vegetation along the John Wayne Pioneer Trail or waterbodies within and around the hatchery site.
- Limit areas of disturbance to those necessary for construction and operation.
- Implement a revegetation plan (see mitigation measures in Vegetation).

3.12.3 Environmental Consequences of No Action Alternative

Under the No Action alternative there would be no construction, ground-disturbing activities, or alteration of the hatchery site; therefore, existing views and viewer groups would not experience a change in site aesthetics. No long-term impacts to visual resources would result from the No Action alternative. Existing and new acclimation and release sites would be used under the larger YKFP and would create annual, short-term low impacts.

3.13 Noise, Hazardous Waste, Public Health, and Safety

3.13.1 Affected Environment

The study area for noise, hazardous waste, and public health and safety includes the hatchery site and surrounding areas within one half mile. This area represents the assumed potential geographic extent of noise, hazardous waste, and public health and safety impacts that may result from construction, operation, and maintenance of the Proposed Action.

3.13.1.1 Noise

Sound is typically described using the decibel (dB) scale, a logarithmic rating system that accounts for large differences in audible sound intensities. Using this scale to describe how humans perceive noise, a doubling of loudness is represented as an increase of 10 A-weighted decibels (dBA). A 70 dBA sound level, for example, sounds twice as loud as a 60 dBA sound level. Noise levels expressed in dBA for various common sources are presented in Table 3.13-1. Factors affecting potential noise impacts include distance from the source, frequency of the sound, absorbency of the ground, the presence of obstructions, and the duration of the sound.

Table 3.13-1. Typical Noise Levels

Noise Source or Effect	Sound Level (dBA)
Threshold of pain	140
Jet taking off (200 feet away)	130
Night Club (with music)	110
Construction site	100
Freight train (100 feet away)	80
Classroom chatter	70
Conversation (3 feet away)	60
Urban residence	50
Soft whisper (5 feet away)	40
Silent study room	20
Hearing threshold	0

Source: Occupational Safety and Health Administration 2013

Noise-sensitive land uses include residences and other areas (e.g., parks, outdoor eating areas, or sports fields) where noise can affect how outdoor areas are used or enjoyed. Based on review of aerial photography, parcel boundaries, and land use data, there are approximately 19 noise sensitive land uses within a half mile of the hatchery site, including 18 residences that are scattered throughout the study area and the John Wayne Pioneer Trail, which runs along the northern boundary of the hatchery site. The nearest residences are located approximately 900 feet (approximately 0.17 mile) from the hatchery site.

The primary existing noise sources in the study area are vehicles traveling on I-90, the Yakima River, agricultural operations (intermittent use of loud equipment and machinery), and light traffic on local roads. According to the Federal Transit Administration (FTA 2006) typical highway noise levels in the study area are likely to be between 70 dBA L_{eq} (A-weighted decibels at equivalent continuous levels) at 50 to 100 feet and 55 dBA L_{eq} at distances out to 800 feet during the day; nighttime highway noise levels would typically be 10 dBA lower. For areas close to the Yakima River (e.g., the New Cascade Canal Diversion), sound levels would be in the mid-60's dBA L_{eq}.

3.13.1.1.1 Regulatory Environment

Allowable noise levels are established by local and state regulations. The Kittitas County Noise Ordinance prohibits excessive and disruptive noise that is plainly audible within a dwelling unit, or generated within 200 feet of a dwelling unit, and is considered a detriment to public health, comfort, peace, and safety (Kittitas County 2016c, Chapter 9.45). Construction activities between the hours of 6:00 a.m. and 10:00 p.m. are exempt from this rule, along with sounds created by aircraft, emergency equipment, garden equipment, and many other reasonable and/or necessary activities.

WAC 173-60, *Maximum Environmental Noise Levels,* establishes maximum permissible noise levels based on the type of land uses being affected. Land uses are grouped into 3 classes of "environmental designations for noise abatements," or EDNAs, which are defined in Table 3.13-2. Maximum noise levels, as outlined in Table 3.13-3, are determined by the EDNA of the noise source and the receiving property. Construction activities between the hours of 7:00 a.m. and 10:00 p.m. are exempt from this rule, along with sounds created by aircraft, emergency equipment, silvicultural activities, discharge of firearms, and many other reasonable and/or necessary activities.

Table 3.13-2. Environmental Designations for Noise Abatement

EDNA Class	Description
Class A	Lands where human beings reside and sleep. Typically includes residential and recreational land uses.
Class B	Lands involving uses requiring protection against noise interference with speech. Typically includes commercial land uses.
Class C	Lands involving economic activities of such a nature that higher noise levels than experienced in other areas is normally to be anticipated. Persons working in these areas are normally covered by noise control regulations of the Department of Labor and Industries. Typically includes industrial and agricultural land uses.

Source: WAC 173-60-030

Table 3.13-3. Washington Maximum Permissible Noise Levels

EDNA of Source	EDNA of Receiving Property (dBA)		
	Class A	**Class B**	**Class C**
Class A	55	57	60
Class B	57	60	65
Class C	60	65	70

Noise limitations for Class A receivers are reduced by 10 dBA between the hours of 10:00 p.m. and 7:00 a.m.

Source: WAC 173-60-040

3.13.1.2 Hazardous Waste

Historic and current uses of the Holmes Ranch property do not indicate a likely presence of hazardous wastes on the property. Typical household materials may be stored at the existing residence on the property in small quantities, including cleaning supplies, paint, solvents, and gasoline for vehicles. When the Yakama Nation took ownership of the property, there was no formal documentation of a known or likely presence of hazardous wastes on the property. A detailed Environmental Site Assessment has not been completed to determine if hazardous substances occur within the study area; however, a records search of federal and state databases (Ecology 2016d, EPA 2016c) found no hazardous wastes or toxic substances documented as occurring within the study area.

3.13.1.3 Public Health and Safety

A combination of tribal, state, and county agencies provide public health and safety resources in the study area. Most of these resources can be accessed through the Kittitas County Sheriff’s office or the Yakama Nation Tribal Police Department, depending on the location. The Kittitas County Sheriff’s office and the Yakama Nation Tribal Police Department serve as a communication link between other public and emergency service providers. Local law enforcement departments coordinate emergency 911 calls and dispatch for fire districts, police, and emergency medical services for Kittitas County and the Yakama Nation Reservation.

Fire protection at the hatchery site is served by the Kittitas County Fire District No. 2, which serves the City of Ellensburg and surrounding rural areas. The closest hospitals to the hatchery site are located approximately 2 miles south of the hatchery site in Ellensburg, Washington. They include the Kittitas Valley Healthcare Hospital and Community Health of Central-Washington.

According to the Kittitas County Community Health Improvement Plan 2013-2017, some of the main public health concerns for the county relate to the quality and affordability of health care, lack of coordination between local public health system stakeholders, and a high level of familial stress reported by residents (Kittitas County 2012). In addition, recent increases in particulate matter pollution have raised some concerns regarding respiratory and health impacts.

There are no existing public health or safety concerns at the hatchery site.

3.13.2 Environmental Consequences of Proposed Action

3.13.2.1 MRS Hatchery Construction

Construction of the Proposed Action can be expected to cause moderate short-term noise impacts in areas directly adjacent to construction activity. Noise sources during construction would include employee vehicles, portable diesel generators, a temporary air conditioner used for the office trailer, construction equipment, and other small tools. The specific types of construction equipment anticipated for use include dozers, excavators, dump trucks, air wrenches, hammers, circular saws, vibratory rollers, jumping jacks, plate compactors, and concrete pump trucks. Construction equipment noise levels are usually measured at 50 feet from the source; some typical levels are listed in Table 3.13-4.

Table 3.13-4. Typical Construction Equipment Noise

Activity Type	Equipment Type	Noise Level Range at 50 Feet (dBA)
Materials Handling	Concrete mixers	75-87
	Concrete pumps	81-83
	Cranes (movable)	76-87
	Cranes (derrick)	86-88
Stationary Equipment	Pumps	69-71
	Generators	71-82
	Compressors	74-87
Impact Equipment	Pneumatic wrenches	83-88
	Rock drills	81-98
Land Clearing	Bulldozer	77-96
	Dump truck	82-94
Grading	Scraper	80-93
	Bulldozer	77-96
Paving	Paver	86-88
	Dump truck	82-94

Source: U. S. Environmental Protection Agency, 1971.

The nearest residences are located approximately 900 feet (0.17 mile) from the hatchery site and may experience some temporary moderate impacts from construction noise. Noise from construction activities is exempt from the WAC regulations, except for nighttime (10 p.m. to 7 a.m.) impacts to EDNA Class A properties. No nighttime construction is anticipated at the hatchery site and construction activities would only occur during permitted construction hours per the local zoning ordinance.

During construction, hazardous materials storage on the hatchery site would be limited to designated, enclosed storage areas with full secondary containment provided. Materials that would likely be stored on the hatchery site include diesel and gas fuel for the equipment, lubricant and motor oil for construction equipment, and paint used for buildings. A fuel truck would be used to refuel construction equipment. When not in use for refueling, the truck would be parked in a confined area with full secondary equipment provided. There would also be concrete wash-out containment areas.

During construction, the potential for public health and safety impacts would be short term, localized, and minor. The construction areas would be controlled by the construction contractor and access to the hatchery site during construction would be limited to construction and other approved personnel. Public health and safety in the surrounding study area would be impacted at a low level by construction at the hatchery site, other than the potential impacts related to air quality (see Section 3.11.2.1) and construction traffic on local roads (see Section 3.2.2.1).

3.13.2.2 MRS Hatchery Operation and Maintenance

Operational noise sources at the hatchery would include employee and visitor vehicles, truck deliveries, and HVAC system outdoor equipment (heat pumps, etc.) for the hatchery building, residences, and shop building. Additional pieces of equipment would operate indoors and would not lead to noticeable outdoor noise. The dominant ambient background noise sources at the hatchery site would continue to be from adjacent local roads (Klocke Road, SR-10, and I-90).

Assuming low volume vehicle use (between 7 and 10 vehicle trips per day), typical HVAC systems for facilities of this size, and distance to sensitive receptors, these noise sources combined would not generate noise levels that would exceed WAC thresholds at on-site residences, or at the nearest off-site receptors. Operational noise impacts would therefore be characterized as low at the hatchery facility.

During operation of the hatchery, storage of hazardous materials on-site would be limited to lubricant and motor oil for maintenance equipment, diesel and gas for hatchery vehicles, formalin, cleaning supplies, and paint. Formalin and paint would be stored in a designated storage room designed to contain the chemical in the event of a spill. All other materials would be stored in a designated enclosed storage area with full secondary containment provided.

Operational impacts to public health and safety are not expected to occur because the Proposed Action would have no impact on public and emergency service providers. Hatchery operations would largely occur within the hatchery building, which would only be accessible to hatchery employees and other approved personnel who would be trained on standard worker health and safety measures. The hatchery, located on private property, would not introduce an additional risk to public health in the area.

3.13.2.3 Acclimation and Release

Operational noise sources at acclimation and release sites would include trucks, water pumps, and emergency generators. These sources of noise would only be present on a seasonal basis (February through April), and noises from trucks would only occur intermittently, when employees come to maintain the facilities or release smolts into the stream. It is not anticipated that noise levels at the acclimation and release sites would cause noise impacts in exceedance of the WAC maximum environmental noise levels for nearby receptors. Operational noise impacts would therefore be characterized as low at new and existing acclimation and release sites.

Activities at the acclimation and release sites would not result in releases of hazardous wastes or materials. Chemicals would not be used at mobile acclimation and release sites. Acclimation and release activities would pose a low risk to public health and safety.

3.13.2.4 Cumulative Effects

Noise levels in the project study area would continue to be cumulatively affected by the Yakima River, agricultural operations, and existing roads and vehicular traffic. There are no major commercial or residential developments or transportation projects planned within 1 mile of the hatchery site in the reasonably foreseeable future. Although the Proposed Action would create new sources of noise and a minor increase in noise levels, these impacts would be low and localized and would not contribute significantly to cumulative noise impacts. When combined with the ongoing influence of agricultural operations and roads and vehicular traffic, the cumulative impact on noise, hazardous waste, public health and safety would be low.

3.13.2.5 Mitigation Measures

To reduce the potential for noise, hazardous waste, and public health and safety impacts, the following mitigation measures would be used:

- Schedule construction work during daylight hours between 7:00 a.m. and 9:00 p.m.
- Locate stationary construction equipment as far away from noise-sensitive receptors as possible.
- Require sound-control devices that are at least as effective as those originally provided by the manufacturer on all construction equipment powered by gasoline or diesel engines.
- Select pumps and backup generators that do not generate excessively high noise levels.
- Implement an SPCC plan (see mitigation measures in Water Resources).

3.13.3 Environmental Consequences of No Action Alternative

Implementation of the No Action alternative would result in no new sources of noise or hazardous wastes at the hatchery site. Existing noise levels would continue and the hatchery site would remain undeveloped. Normal ambient background noise would continue to originate from the Yakima River, I-90, and traffic on local roads. Existing and new acclimation and release sites would be used with occasional vehicles accessing the sites. Impacts from the use of acclimation and release sites would be the same as those for the Proposed Action (see Section 3.13.2.3),

3.14 Adverse Effects That Cannot Be Avoided and Irreversible and Irretrievable Commitments of Resources

- Reduction of flows between 6 and 10 cfs (November to March) in a 6,900-foot reach of the Yakima River.
- Short-term minor increases in sediment in the Yakima River.
- Minor decrease in local nutrient recruitment to the bypass due to loss of riparian vegetation.
- Minor increases in nutrient levels from hatchery discharges.
- Potential interaction between released coho and nontarget fish species.
- Potential impact to nontarget fish species from trapping for coho broodstock.
- Low potential to spread noxious weeds to and from the construction site
- Short-term avoidance by wildlife of the hatchery site due to construction activity.
- Emissions of GHG during construction and hatchery operations, which would minimally contribute to GHG concentrations.
- Irreversible uses of fuel, office supplies, petroleum products, chemicals, and other operational supplies. Some building materials and equipment might be re-usable, but much of it would not.

3.15 Short –Term Use of Environmental and Effects on Long-Term Productivity

The proposed MRS Hatchery Program is expected to enhance productivity of the aquatic environment through coho population increases, from which other aquatic and terrestrial species including humans may derive benefits. The lands developed for the hatchery facilities would be permanently taken out of vegetative productivity. Construction activities would temporarily affect more land than would be permanently developed, but long-term productivity would not likely be adversely affected because of the measures that would be taken to restore disturbed, undeveloped areas to pre-existing condition or better (replanting with native species, weed control, standard construction BMPs, etc.).

4 Consultation, Review, and Permit Requirements

Numerous federal, state, and local environmental laws and administrative requirements must be satisfied prior to initiation of the proposed project. Compliance with these regulatory requirements is examined in this chapter. The intent of each law, regulation, ordinance, or guideline is described, followed by an assessment of the proposed project's compliance/consistency.

4.1 Federal Compliance Requirements

4.1.1 National Environmental Policy Act

The National Environmental Policy Act of 1969 as amended (42 USC 4321 et seq.) requires federal agencies to assess and disclose the effects of proposed actions on the environment before making a decision to proceed. This EIS has been prepared to meet BPA's NEPA requirements. BPA conducted scoping meetings and outreach efforts with interested and potentially affected parties to help identify issues to be addressed in the EIS. Copies of the draft EIS were sent to relevant agencies, organizations, and interested parties for review and comment (See Chapter 5). Comments received on the draft EIS and BPA's responses to comments are in Appendix H. In addition, the EIS has been updated to address comments and provide corrections, clarifications to the analysis, and updated information. BPA will document its final decision in a Record of Decision no sooner than 30 days after the release date of this final EIS.

4.1.2 Heritage Conservation and Cultural Resources Protection

Section 106 of the National Historic Preservation Act of 1966 as amended (54 USC 300101) requires federal agencies with land management or permitting authority to take into account the potential effects of their undertakings on properties that are listed or eligible for listing on the National Register of Historic Places. Consultation must occur with the State Historic Preservation Office, Tribal Historic Preservation Officer, Indian tribes that attach religious and cultural significance to historic properties that may be affected by an undertaking, and additional consulting parties regarding the inventory and evaluation of properties potentially eligible for National Register nomination and to determine whether the project undertaking would adversely affect them. Yakama Nation archaeologists and cultural specialists conducted cultural resource surveys at the hatchery site where ground disturbance may occur (Section 3.9.2). BPA completed consultation in 2017 with the Yakama Nation and the Washington State Historic Preservation Office. BPA received concurrence on May 2, 2017, from the Washington DAHP on the determination that the residence was not eligible for inclusion in the NRHP, and the determination of no historic properties affected. BPA did not receive any comments from the Yakama Nation as part of the consultation effort.

The Archaeological Resource Protection Act (16 USC 470aa-mm) was enacted to protect archaeological resources on federal and tribal lands. The Archaeological

Resource Protection Act governs the excavation of archaeological sites on federal and tribal lands and the removal and disposition of the archaeological collections removed from those sites. As the proposed hatchery is on land owned by the Yakama Nation, The Archaeological Resource Protection Act would apply to the Proposed Action.

The Archaeological and Historic Preservation Act (16 USC 469 *et seq.*) directs federal agencies to notify the Secretary of the Interior if they find that a federal action might cause the destruction of significant scientific, prehistoric or archaeological data.

The Native American Graves Protection and Repatriation Act (25 USC 3001 *et seq.*) and its implementing regulations (43 CFR 10.4) provide protection for Native American graves and cultural materials of federal and tribal lands. The regulations also affect treatment and disposition of burials and funerary objects encountered through notification and consultation procedures for the lead federal agency.

Executive Order 13175, Consultation and Coordination with Indian Tribes, states that the U.S. government will continue to work with Indian Tribes on a government-to-government basis to address issues concerning tribal self-government, trust resources, and Indian tribal treaty and other rights.

BPA also complies with other laws and directives for the management of cultural resources, including, but not limited to:

- Antiquities Act of 1906 (16 USC § 431-433)
- Historic Sites Act of 1935 (16 USC § 461-467)
- Executive Order 13007, Indian Sacred Sites
- American Indian Religious Freedom Act of 1978 (42 USC § 1996, 1996a).

4.1.3 Wetlands, Floodplains, and Water Resources

4.1.3.1 Clean Water Act

Uncontrolled water pollution led to enactment of the Federal Water Pollution Control Act Amendments of 1972. As amended in 1977, this law became commonly known as the Clean Water Act (CWA). It is the principal federal law governing water pollution control and establishes the basic structure for regulating discharges of pollutants into the waters of the U.S. It gave the EPA the authority to implement pollution control programs such as setting wastewater standards for industry. The CWA also contains requirements to set water quality standards for all contaminants in surface waters and makes it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit is obtained under its provisions. The Corps was given the authority to regulate and issue permits for the discharge of dredged or fill material into waters of the U.S. Some provisions of the CWA have been delegated by the EPA to the states, including the issuance of wastewater discharge permits and stormwater permits for construction.

4.1.3.1.1 Section 401 (Water Quality Certification)

Section 401 of the CWA includes the State Water Quality Certification program requiring that the state certify compliance of federal permits and licenses with state water quality requirements. The Yakama Nation would apply to Washington Department of Ecology when final facility design is complete and prior to construction.

4.1.3.1.2 Section 402 (National Pollutant Discharge Elimination System)

This section authorizes stormwater discharges associated with construction activities greater than one acre. An NPDES permit authorizes construction projects, provided notice is given to the authorizing agency and appropriate erosion control plans and measures are implemented. The action agency is responsible for preparing and implementing a Stormwater Pollution Prevention Plan that would be overseen by Ecology. Application would need to be made to Ecology when final facility design is complete and prior to construction. Pertinent information would include construction schedules and quantities and quality of potential discharge.

4.1.3.1.3 Section 404

Authorization from the Corps is required under this section when there is a discharge of dredged or fill material into waters of the U.S., including wetlands. When design is finalized, a permit application would need to be submitted to the Corps at which time the Corps would determine if this project would be evaluated under the Nationwide Permit process or if an Individual Permit would be required.

4.1.3.2 Executive Orders on Floodplain Management and Protection of Wetlands

The U.S. Department of Energy mandates that impacts to floodplains and wetlands be assessed and alternatives for protection of these resources be evaluated in accordance with Executive Orders 11988 and 11990, along with the Compliance with Floodplain/Wetlands Environmental Review Requirements (10 CFR 1022.12). Section 3.6.2 describes the effects of the Proposed Action on wetlands and FEMA mapped floodplains.

4.1.4 Fish and Wildlife

4.1.4.1 Endangered Species Act

The Endangered Species Act of 1973 and its amendments (ESA, 16 USC 1531 et seq.) require federal agencies ensure their actions do not jeopardize endangered or threatened species or their critical habitats. Sources of information for the potential occurrence of endangered or threatened species and their habitats in the project area include the Yakama Nation, NMFS, USFWS, and WDFW. Each was consulted during formulation of the draft EIS for lists of threatened, endangered, or candidate species and presence of habitat. Potentially affected species and their habitat are discussed and analyzed in Sections 3.7 and 3.8. Based on this information, BPA prepared a BA for consultation in accordance with ESA Section 7. As discussed in Section 2.2.5, the Yakama Nation has submitted HGMPs to NMFS to address the fish production aspects of the coho production in the Yakima River basin, including that proposed at the MRS Hatchery.

This final EIS summarizes the outcome of these consultation efforts in Sections 3.7 and 3.8. USFWS issued a Biological Opinion stating that, although the Proposed Action is likely to adversely affect bull trout, it is not likely to jeopardize the continued existence of the species and is authorized under specific terms and conditions (USFWS, 2017). NMFS concurred with BPA that the Proposed Action is not likely to adversely affect MCR steelhead (NMFS 2017). Impacts on MCR steelhead from outplanting of hatchery coho, along with hatchery production in the Yakima River basin (as described in the several draft HGMPs) were addressed in the *Biological Opinion for the Yakima River Spring Chinook Salmon, Summer/Fall Chinook Salmon, and Coho Salmon Hatchery Programs* (NMFS 2013). .

4.1.4.2 Fish and Wildlife Conservation Act/Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act of 1934 (16 USC 661 *et seq.*) requires federal agencies consult with the USFWS and state fish and wildlife agencies when “waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified” by permit or license. Other federal acts and laws, such as the Fish and Wildlife Conservation Act of 1980 (16 USC 2901 et seq.), encourage federal agencies to conserve and promote conservation of game and nongame species and their habitats.

The proposed project would divert waters of the Yakima River from November through March to rear and acclimate coho salmon. This use would not consume the water, but would use it briefly and then discharge it back into the river. This use represents less than 2 percent of average Yakima River flows during the lowest flow period of proposed use (February). For this reason, measurable impacts on instream flows and temperatures within the diversion reach would be unlikely, and impacts on fish in the mainstem Yakima River would be low. Sections 3.7 and 3.8 describe the potential effects to fish and wildlife resources. USFWS and WDFW were sent a copy of the draft EIS. BPA received comments from WDFW, and those comments have been included and addressed in this final EIS (see Appendix H).

4.1.4.3 Magnuson-Stevens Fishery Conservation and Management Act

NMFS is responsible for ensuring compliance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1976. Public Law 104-297, the Sustainable Fisheries Act of 1996, amended the MSA to establish new requirements for evaluating and consulting on adverse effects to EFH. EFH includes all streams, lakes, ponds, wetlands, and other viable waterbodies, and most of the habitat historically accessible to salmon necessary for spawning, breeding, feeding, or growth to maturity. The Yakima River and its tributaries are designated as EFH for Chinook (*Oncorhynchus tshawytscha*) and coho salmon (*O. kisutch*).

Compliance with the MSA is consolidated with ESA Section 7 consultation. The BA includes an effects analysis and determination of effect on EFH. In addition, the BA contains conservation measures intended to appropriately avoid and minimize impacts to EFH of federally-managed fish species under the MSA. In their ESA and MSA concurrence letter for construction, operation and maintenance of the MRS Hatchery, NMFS concludes that the project would not adversely affect EFH for Chinook and coho salmon (NMFS 2107).

4.1.4.4 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 USC sections 703-712) prohibits the taking, killing, or possessing migratory birds or their eggs or nests except as allowed by the Secretary of the Interior. The list of migratory birds is found in 50 CFR 10, and permit regulations are found in 50 CFR 21. Due to the project's proximity to waterbodies, wetlands, and riparian corridors, migratory bird species are likely to occur within or near to the hatchery site; however, impacts to migratory bird species resulting from construction and operation of the hatchery are expected to be minimal and limited to avoidance of the project site due to increased human activity and noise.

4.1.4.5 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 USC 668-668d) prohibits the taking of, possession of, and commerce in bald and golden eagles, with limited exceptions. The Act specifically covers intentional acts or acts in “wanton disregard” of the safety of bald or golden eagles. Information from Section 3.8 reveals there is one bald eagle nest reported within 2,000 feet of the proposed hatchery site (WDFW 2016e). There is also designated WDFW Bald Eagle Winter Range located approximately 1,600 feet west of the hatchery site (WDFW 2016e). The type of disturbance that would occur in the project area would not interfere with or prevent bald or golden eagles from completing any portion of their life cycle.

4.1.5 Farmland Protection Policy Act

The Farmland Protection Policy Act (7 USC 4201 *et seq.*) directs federal agencies to identify and quantify adverse effects of federal programs on farmlands. The purpose of the act is to minimize the number of programs that unnecessarily contribute to the conversion of agricultural land to nonagricultural purposes. The location and aerial extent of Prime and other important farmlands as designated by the Natural Resource Conservation Service were obtained from Natural Resource Conservation Service soil surveys for Kittitas County. The hatchery site contains some areas of prime farmland (if irrigated and drained) and farmland of statewide importance (NRCS 2010, 2016). As described in Section 3.1, approximately 3.8 acres of prime farmland and 0.5 acre of farmland of statewide importance would be temporarily disturbed as a result of facility construction. Of that, 1.8 acres of prime farmland and 0.2 acre of farmland of statewide importance would be permanently covered by impervious surfaces (i.e., buildings or pavement).

4.1.6 Noise Control Act

The Noise Control Act of 1972 (42 USC 490 et seq.) promotes an environment free from noise that jeopardizes human health and welfare. Federal and state regulations establish guidelines that implement the intent of the act. Additional local noise standards exist for Kittitas County in their local noise ordinance. No noise in excess of state, federal, and local standards is expected from this project (Section 3.13). Temporary construction noise during daylight hours is exempt from state and federal standards.

4.1.7 Clean Air Act

Emissions produced by construction and operation of the proposed project facilities must meet standards of the Clean Air Act and the amendments of 1970 (42 USC 741 et seq.). In Washington, the authority for ensuring compliance with this act is delegated to Ecology. The Proposed Action would not violate current clean air standards, as described in Section 3.11.

4.1.8 Executive Order on Environmental Justice

Executive Order 12898 directs federal agencies to consider the effects of their programs, policies, and activities on minority and low-income populations. Federal agencies are required to assess environmental justice concerns in the NEPA analysis. The potential for the MRS Hatchery to affect low-income communities and minority populations is summarized in Section 3.10.1.2.

4.1.9 Resource Conservation and Recovery Act; Toxic Substances Control Act; and Federal Insecticide, Fungicide, and Rodenticide Act

The Resource Conservation and Recovery Act (42 USC 692 et seq.) regulates the disposal of hazardous wastes. The Toxic Substances Control Act (15 USC 2601) gives authority to the EPA to regulate substances that present unreasonable risks to public health and the environment. The federal Insecticide, Fungicide, and Rodenticide Act (7 USC 136 et seq.) authorizes the EPA to prescribe conditions for use of pesticides. Construction, operation, and maintenance of the proposed facilities would meet the guidelines for use, handling, storage, and disposal of such hazardous substances. Necessary permits would be obtained if regulated pesticide products were used.

All chemical handling, application, and disposal would comply with applicable federal, state, and other regulations to protect human and environmental health.

4.1.10 Executive Order on Federal Leadership in Environmental, Energy, and Economic Performance

Executive Order 13514 states that federal agencies should identify and analyze impacts from energy usage and alternative energy sources in all EIS’s and Environmental Assessments for proposals for new or expanded federal facilities under NEPA, as amended (42 USC 4321 et seq). BPA may fund the construction, operation, and maintenance of portions of the facilities proposed under the MRS Hatchery. The final designs have not yet been completed for these facilities; however, BPA has made the following general assessment of energy usage and the potential for using alternative energy sources.

Ground and surface water pumps would require the majority of the energy usage for this project. Energy requirements have been minimized in the conceptual design of the project through the use of gravity flow water supplies where possible. Where pumps would be needed, the primary power source would be nearby power lines, with generators to be used for emergency backup. Energy sources other than electrical power are not likely to be feasible due to the size of the requirement and the constant demand cycle. The use of propane rather than diesel fuel for the generators is being considered, as propane would emit fewer greenhouse gases that would contribute to climate change. Energy efficiency would also be considered in the sizing of the pumps and pipelines. BPA would also encourage the Yakama Nation to use and promote energy-efficient design and operations in the new hatchery buildings, utilize incentives for energy conservation from the local Public Utility District wherever feasible, and, where practical, to supply their power needs from existing renewable sources or install on-site renewable power generation, such as solar panels.

The Yakama Nation will own and operate the facilities, so the tribe would ultimately make final decisions for the hatchery designs and operations. However, BPA will use contractual mechanisms through the funding agreement to encourage design and operation practices in the manner described in Executive Order 13514.

4.2 Other Compliance Requirements

4.2.1 State Environmental Policy Act

SEPA, Washington State's most fundamental environmental law, was enacted in 1971 as chapter 43.21C, Revised Code of Washington. Much like the federal NEPA, SEPA is designed to provide decision makers and the public with impartial information about a project and analyze alternatives to the proposal, including ways to avoid or minimize adverse impacts or to enhance environmental quality. The purpose of SEPA is to encourage harmony between the citizenry and the environment, to promote efforts that will prevent or eliminate damage to the environment, to stimulate human health and welfare, and to enrich understanding of the ecological systems and natural resources that are important to Washington State. Information provided during the SEPA review process helps decision makers understand how a proposal would affect the environment and identify measures to reduce likely effects, or deny a proposal when adverse effects are identified. This EIS may be adopted by Ecology as the lead state agency to fulfill the SEPA requirement.

4.2.2 Water Rights and Wells

The hatchery and acclimation ponds are water-dependent uses, so water rights and in-water work permits are required. Elements would be incorporated into project design to ensure consistency with the appropriate authorizations once they are known.

4.2.3 Hydraulic Project Approval

Instream construction (below the OHWM) requires a Hydraulic Project Approval from Washington State, which would specify when in-water work can occur and what measures would be needed to protect channels, riparian zones, and water quality. The Hydraulic Project Approval would also cover long-term operation and maintenance of the fish screen.

4.2.4 Floodplain Approval

Kittitas County may also require an approval to allow construction within a designated floodplain to ensure that appropriate design measures are included.

4.2.5 Shoreline Permit

On February 22, 2016, Ecology approved Kittitas County’s updated Shoreline Master Program and it became effective March 7, 2016. Construction activities within 200 feet of a body of water and/or associated floodway and wetlands under the jurisdiction of the Kittitas County Shoreline Master Program require a Shoreline Permit from the County.

4.2.6 Land Use/Building Permits

Kittitas County is currently updating its Critical Areas Ordinance. A Critical Areas Permit likely would be required from the County for any activities that may impact a wetland, stream, or associated buffers. Kittitas County may also require building permits such as: Grading, Access and Address, Adequate Water Supply Determination, and On-Site Sewage Installation Permits.

5 List of Preparers

Name	EIS Section	Experience and Education
Black, Carrie HDR	Project Coordinator	Seven years of experience in project support, editing, and administration. Three years of experience technical editing environmental documents. B.S., Communication B.A., Visual Communication
Buffington, Lori HDR	Technical Editor	More than 25 years of experience in technical editing and document design; responsible for editorial review of EIS', BAs, and other large-scale studies.
Danieleski, Lisa HDR	Wildlife, Vegetation and Wetlands	Fifteen years of experience in wetland and stream science botanical and wildlife studies in support of NEPA documents B.A., Biology
Goodman, Dave BPA	Purpose and Need, Alternatives	Eight years' experience in development and review of NEPA documents B.S., Economics J.D., Environmental Studies
Gregory, James HDR	QA/QC	More than 25 years' experience managing, writing, and reviewing NEPA documents. B.S., Biology MURP, Environmental Planning
Holloway, Becky HDR	Fish	More than 18 years of environmental consulting experience, including development of NEPA documentation for project-related impacts on aquatic species, with an emphasis on federally-listed species and their habitat. B.S., Marine Biology M.S., Biology
LaRue, Nicholas HDR	GIS Analysis, EIS Figures	Fourteen years of Geospatial experience in GIS and Remote Sensing B.A. Geography and Natural Resource Management
Noel, Scott HDR	Air Quality, Noise, Hazardous Waste, and Public Health and Safety	Sixteen years' experience conducting air quality noise analysis. B.A., Geography and Environmental Planning
Ramsey, Dawn HDR	Cultural Resources	Twenty years' experience conducting archaeological and historic built environment studies and contributing to Section 106 and NEPA documents. B.A., History and Anthropology M.A., Anthropology
Sahatjian, Brittany HDR	Socioeconomics, Transportation, Visual Resources, Land Use and Recreation	More than 3 years' experience writing NEPA documents and evaluating potential impacts to the built environment. B.S., Environmental Science and Resource Management M.S., Environmental Management
Snead, Carol HDR	Project Manager; Geology and Soils	More than 25 years' experience managing and writing NEPA documents. B.S., Geology M.S., Geological Sciences

Name	EIS Section	Experience and Education
Takieddine, Malda HDR	Visual Resources (Visual Simulation)	More than 8 years' experience in landscape design and visual simulation Bachelor of Fine Arts Master of Landscape Architecture
Wiseman, Chad HDR	Water Resources	Ten years' experience writing NEPA documents M.S., Environmental Science

6 Persons, Tribes, and Agencies Receiving Notice of Availability of this EIS

The project mailing list contains stakeholders, including 17 potentially interested or affected landowners; tribes; local, state, and federal agencies; public officials; nongovernmental organizations; businesses; and libraries. They have directly received or have been given instructions on how to receive all project information made available so far. Information distributed to these stakeholders includes scoping notifications, comment submission forms and website addresses, review opportunities for the draft EIS, and notification of the availability of the final EIS. Specific entities (other than private persons) receiving or consulted during the preparation of this EIS are listed below by category. All comments on the draft EIS and responses to them are provided at Appendix H.

6.1 Federal Agencies and Officials

U.S. Forest Service

U.S. Fish and Wildlife Service

U.S. Environmental Protection Agency

National Marine Fisheries Service

Senator Patty Murray

Senator Maria Cantwell

Representative Dave Reichert

6.2 Tribes

Yakama Nation

6.3 State Agencies and Officials

Washington Office of the Governor

Washington Department of Fish and Wildlife

Washington Department of Transportation

Washington Department of Ecology

6.4 Local Governments and Utilities

Kittitas County, Washington

Kittitas County Public Works Department

Kittitas County PUD No. 1

Kittitas County Commissioner

City of Ellensburg, Washington

City of Milton-Freewater, Oregon

Yakama Basin Fish and Wildlife Recovery Board

6.5 Non-governmental Organizations

American Rivers

Idaho Conservation League

Native Fish Societies of Oregon and Washington

Northwest Sportfishing Industry Association

NW Guides and Anglers Association

Pacific Coast Federation of Fishermans Association

RedFish BlueFish

River Network

Salmon for All

Save Our Wild Salmon Coalition

Sierra Club

Snake River Alliance

Trout Unlimited

Walla Walla Watershed Management Partnership

Washington Wildlife Federation

6.6 Libraries

Carpenter Memorial Library, Cle Elum, WA

City of Ellensburg Public Library, Ellensburg, WA

Kittitas Public Library, Kittitas, WA

Roslyn Public Library, Roslyn, WA

Wapato City Library, Wapato, WA

Washington State Library

Yakima Valley Regional Library, Yakima, WA

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Appendix A. Effects of MRS Hatchery Coho Release on Individual Bull Trout in Yakima River Basin

This table was developed as part of the ESA Section 7 consultation for the MRS Hatchery. Consistent with the requirements of ESA Section 7, it lists the potential impacts of specific project activities on federally-threatened Bull Trout on an individual level. Under the Proposed Action, individual Bull Trout may be subject to "take" as defined under the ESA (i.e., an action that may harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any threatened or endangered species) from project activities such as electrofishing in streams to determine juvenile Coho Salmon abundance. Although the potential for take is low, it is not entirely discountable; i.e., under ESA, the project may adversely affect Bull Trout (i.e., result in take) on an individual level.

Location	River/Stream River Mile	Bull Trout Presence	Critical Habitat	Action	Applicable Coho Life-Stage and Release No.	Ongoing?	Impact/Interaction
NOTE: Abbreviations are defined at end of table. Justification for proposed release numbers and references for citations are presented after the							
				Juvenile and Adult Outplantings			
				Mainstem Yakima River			
Ahtanum Creek	Ahtanum Creek RM 4-12 All releases would occur below the forks	Ahtanum Creek from its confluence with the Yakima River upstream to its confluence with the N Fork and S Forks is occupied and provides foraging, migration, and overwintering FMO habitat and connectivity (USFWS 2010). Ahtanum Creek bull trout are isolated from fish in the lower Yakima River due to thermal barriers and total dewatering of lower Ahtanum Creek below RM 19.7 at Wapato Irrigation Diversion by irrigation water withdrawals (WDFW 1998). Although bull trout are present in the mainstem Ahtanum Creek (above RM 19.7) they are probably more abundant in the upper portion of the drainage, particularly in the North, Middle and South forks where habitat conditions are more favorable The population is mostly above the forks (North and South) where spawning habitat and gradient are too steep for coho to spawn. Spawning areas are documented in the upper reaches of all three forks and Shell Neck Creek, a tributary to the North Fork. A falls at RM 2.5 on the South Fork is believed to be a barrier to upstream migration. Juvenile rearing occurs in the upper reaches and may extend all the way to the confluence of the forks.	Yes	• Summer parr plants, mid-late July	Parr – 20,450	Yes	Some interaction possible between winter pre-smolts and adult and juvenile bull trout; however, spatial separation within the creek would limit any interactions. All releases would occur below the forks. Any additional production farther up river should benefit any bull trout that venture into the lower stretches of Ahtanum Creek. LAA
				• Adult plants – October–November	Adults – 279		
				• Smolt release	20,000		
				Naches River Watershed			
Naches River mainstem • Stiles Pond • Lost Creek Pond	RM 3.5 ~RM 37-38	Naches River from its confluence with the Yakima River upstream 71.8 km (44.6 mi) to its confluence with the Little Naches and Bumping Rivers is occupied and provides FMO habitat and connectivity (USFWS 2010).	Yes	Smolt acclimation and release	20,000 each site	Yes	Naches River used as a migratory corridor; FMO habitat. Limited interaction with adults and subadults possible from smolt releases. Potential for competition with subadults if smolts residualize, but discountable. NLAA
Lower Tieton River	Tieton River RM 1–21.3	Occupied by low number of adults/subadults downstream of dam (likely entrained through dam); no spawning downstream. Tieton River from its confluence with the Naches River upstream to Tieton Dam provides FMO habitat and connectivity between Naches and Yakima Rivers (USFWS 2010).	Yes	Adult plants	Adults – 834	No[1] (new activity under Proposed Action)	If present, limited potential for overlap because bull trout spawn and rear upstream of Rimrock Dam, limited occurrence downstream in mainstem Tieton River. LAA
North Fork Tieton River	NF Tieton River – Clear Lake RM 7.3–10	From its confluence with Rimrock Reservoir to Clear Lake Dam NF is occupied FMO habitat; from its confluence with Clear Lake Reservoir upstream 21.0 km (13.0 mi) to a natural barrier is occupied SR habitat (USFWS 2010). Spawning occurs 5 miles above Clear Lake, about 1 mile above Rimrock Lake; Spawning surveys are conducted in an index reach approximately 2.3 miles in length, which ends at the barrier waterfall. An average of 16 redds have been observed since 2001, with a range of 1 to 37 redds (Reiss et al. 2012).	Yes	Following implementation of fish passage at Tieton Dam: • Adult plants	Adults – 555	No[1]	Although outplants and releases would occur downstream of known bull trout spawning areas, there is potential for overlap with rearing juveniles. LAA
				• Parr plants into Clear Lake	Parr – 10,000		

Location	River/Stream River Mile	Bull Trout Presence	Critical Habitat	Action	Applicable Coho Life-Stage and Release No.	Ongoing?	Impact/Interaction
South Fork Tieton River	SF Tieton River RM 1–5	From its confluence with Rimrock Reservoir upstream 26.8 km (16.6 mi) to a natural barrier, SF provides SR habitat (USFWS 2010).The most downstream extent of bull trout spawning occurs at RM 5 (Newsome 2016); migratory habitat throughout. Very stable bull trout population in the basin.	Yes	Following implementation of fish passage at Tieton Dam: • Adult plants	Adults – 628	No[1]	Although outplants and releases would occur downstream of known bull trout spawning areas, there is potential for overlap with rearing juveniles. LAA
Little Naches River	Little Naches River RM 9	Adult and subadult presence possible; FMO habitat from confluence with Naches River upstream to confluence with SF (USFWS 2010); not known to be used for spawning or rearing (Mizell and Anderson 2010). Little Naches tributary, Crow Creek, provides SR habitat (USFWS 2010).	Yes	• Summer parr plants, mid-late July	Parr – 15,767	No[1]	If present, some juveniles may have direct interactions. Interactions would be limited due to the small number of coho and large amount of habitat. LAA
				• Adult plants	Adults – 277		
Rattlesnake Creek	Rattlesnake Creek RM 1–5	Bull trout have recently been documented in Rattlesnake Creek. Adults, subadults and juveniles may be present. SR habitat provided (USFWS 2010). Coho parr would be scatter-planted from RM 1-5; adults would be released downstream of RM 2, which is well downstream of habitat used for spawning bull trout. The primary spawning area for this population is located in the South fork above the wilderness boundary at RM 14 and extends about seven miles upstream; it includes Little Wildcat and Shell Creeks. Juvenile bull trout are assumed to rear in Rattlesnake Creek all the way down to the mouth; adult FMO habitat is primarily the Naches River below the Rattlesnake confluence but some adults also utilize FMO habitat upstream (Mizell and Anderson 2010).	Yes	• Adult plants	Adults – 186	No[1]	Interactions may be possible; however, due to the low numbers of coho and bull trout, negative interactions are unlikely. NLAA
				• Parr summer plants	26,538		
Nile Creek	Nile Creek RM 3–6	No confirmed bull trout in Nile Creek. An occasional adult or juvenile may swim in the winter, summer temperatures are low 60s (°F).	No	• Summer parr plants, mid-late July	Parr – 15,470	Yes	Interactions may be possible; however, due to the low numbers of coho and bull trout, negative interactions are unlikely. NLAA
Cowiche Creek	Cowiche Creek above RM 6	Cowiche Creek from its confluence with the Naches River upstream to its confluence with N. Fork Cowiche Creek and S. Fork Cowiche Creek is occupied and provides FMO habitat (USFWS 2010). Bull Trout have not been documented in Cowiche Creek since 2002 (Reclamation 2015a). Juvenile bull trout would most likely be above the Cowiche Creek forks.	Yes	• Summer parr plants, mid-late July	Parr – 11,708	Yes	Due to the low occurrence of bull trout in Cowiche, there is little likelihood of direct interactions. However, likely discountable. NLAA
				• Adult plants – October–November	Adults – 262		
South Fork Cowiche	South Fork Cowiche RM 7.5–17	Possible, though unconfirmed bull trout presence in Reynolds Creek (tributary to SF). No confirmed bull trout in SF Cowiche (Newsome 2016). South Fork Cowiche Creek from its confluence with the Naches River upstream to its confluence with N. Fork Cowiche Creek and S. Fork Cowiche Creek is occupied by bull trout and provides FMO habitat (USFWS 2010).	Yes	• Spring smolt plants, early April	Smolts – 20,000	No[1]	Due to potential though unconfirmed occurrence of bull trout in tributary to SF Cowiche, there is potential for direct interactions. However, likely discountable. NLAA
Rock Creek	Rock Creek RM 1–2	No confirmed bull trout in Rock Creek. However, Rock Creek from its confluence with S. Fork Cowiche Creek upstream 4.4 km (2.8 mi) is occupied and provides SR habitat (USFWS 2010).	Yes	• Summer parr plants, mid-late July	1,561	No[1]	No interaction anticipated. NE
North Fork Little Naches	North Fork Little Naches RM 13–14	North Fork Little Naches River from its confluence with the Little Naches River upstream 12.5 km (7.8 mi) provides SR habitat for the Little Naches potential local population (USFWS 2010); FMO habitat provided.	Yes	• Summer parr plants, mid-late July	Adults – 94	Yes	If present, some juveniles may have direct interactions. Interactions would be limited due to the small number of coho and large amount of habitat. LAA

Location	River/Stream River Mile	Bull Trout Presence	Critical Habitat	Action	Applicable Coho Life-Stage and Release No.	Ongoing?	Impact/Interaction
Bumping Lake/ Bumping River	Bumping River (base of dam) RM 19 Bumping River (top of lake) RM 21.1	Bumping River from its confluence with the Naches River upstream to Bumping Dam is occupied and provides FMO habitat connecting upstream populations to the Naches River (USFWS 2010). Deep Creek has a fairly stable but fluctuating bull trout population and appears to be the only tributary of Bumping Lake where bull trout spawn from late August to mid-September. (WDFW 1998). Juveniles likely spend several years in Deep Creek before migrating to Bumping Lake. Upper Bumping River has only had an occasional adult found in it; SR habitat reported (USFWS 2010).	Yes	• Adult plants	Adults – 939	Yes	Interactions may be possible; however, due to the low numbers of coho and bull trout, negative interactions are unlikely. LAA
Quartz Creek	Quartz Creek RM 1–4	Quartz Creek from its confluence with the Little Naches River upstream 9.7 km (6.0 mi) provides FMO habitat (USFWS 2010). Subadults and adults may be present.	Yes	• Summer parr plants, mid-late July	Parr – 5,776	Yes, but more parr releases proposed	Interactions may be possible; however, due to the low numbers of coho and bull trout, negative interactions are unlikely. NLAA
American River	American River RM 1–16	American River from its confluence with the Bumping River upstream to its confluence with Morris Creek is occupied and provides SR habitat (USFWS 2010). Known spawning includes the American River beginning just below the confluence with Kettle Creek (about RM 9) extending about 8.5 miles upstream. Adults and subadults in lower reaches (FMO), all life stages in upper reaches.	Yes	• Adult plants	Adults – 329	No	Interactions may be possible; however, adult outplanting would be restricted to lower reaches where bull trout are not known to spawn or rear. LAA
				• Parr summer plants	Parr – 26,538		
Upper Yakima River							
Wilson Creek	Wilson Creek RM 3–20 (adult releases RM 3–8; juvenile 6–20)	No bull trout residing in Wilson Creek (USFWS 2007; BPA et al. 2006).	No	• Summer parr plants, mid-late July	Parr – 31,221	Yes	No interaction anticipated. NE
				• Adult Plants – October–November	Adults – 335		
Reecer Creek	Reecer Creek RM 0–3	No bull trout have been found or documented in Reecer Creek.	No	• Summer parr plants, mid-late July	Parr – 15,298	Yes	No interaction. NE
				• Adult plants – October–December	Adults – 380		
Taneum Creek	Taneum Creek RM 3–12	No bull trout documented in lower reaches of Taneum Creek. Upper reaches may be occupied by all life stages. Taneum Creek from confluence with Yakima River upstream to its confluence with the N. Fork Taneum Creek and S. Fork Taneum Creek likely provides FMO habitat (USFWS 2010).	Yes	• Adult plants – October–November	Adults – 602	Yes – outplanting of adult coho has occurred	Limited interaction anticipated in areas where adults would be outplanted. NLAA
Swauk Creek	Swauk Creek RM 0–18	Swauk Creek from confluence with Yakima River upstream 4.8 km (3.0 mi) provides FMO habitat for populations below the Reclamation dams in the Upper Yakima (USFWS 2010). Occurrence rare; one adult in Swauk Creek in 1993 (Reiss et al. 2012).	Yes	• Summer parr plants, mid-late July	Parr – 26,966	Yes	No interaction. NE
				• Adult plants	Adults - 204		
First Creek	First Creek RM 0-1	No documented presence or use of habitat (Streamnet 2016). Not included in Yakima River Critical Habitat Unit.	No	• Summer parr plants, mid-late July	Part of overall Swauk Creek parr outplanting	No[1]	No interaction. NE
Blue Creek	Blue Creek RM 0-1	No documented presence or use of habitat (Streamnet 2016). Not included in Yakima River Critical Habitat Unit.	No	• Summer parr plants, mid-late July	Part of overall Swauk Creek parr outplanting	No[1]	No interaction. NE
Iron Creek	Iron Creek RM 0–2	Not present.	No	• Summer parr plants, mid-late July	Parr – 3,122	No[1]	No interaction. NE
Williams Creek	Williams Creek RM 1	Not present.	No	• Mobile acclimation site (smolts, April–May)	Smolts – 20,000	No[1]	No interaction. NE
Lower Cle Elum River (below dam)	Cle Elum River RM 0–8.2	Cle Elum River from its confluence with the Yakima River upstream to Cle Elum Dam is occupied and provides FMO habitat (USFWS 2010).	Yes	• Summer parr plants, mid-late July	Parr – 12,801	No[1]	Interactions may be possible; however, due to the low numbers of coho and bull trout, negative interactions are unlikely. NLAA
				• Adult plants – October–December	Adults - 125		

Location	River/Stream River Mile	Bull Trout Presence	Critical Habitat	Action	Applicable Coho Life-Stage and Release No.	Ongoing?	Impact/Interaction
Upper Cle Elum River	Cle Elum River RM 20–30	Cle Elum River from its confluence with the Cle Elum Reservoir upstream 33.4 km (20.7 mi) to its headwaters is occupied and provides SR habitat for the Cle Elum populations (USFWS 2010). Bull trout in the Lake Cle Elum System are very rare. Small numbers of juveniles have been observed in the upper Cle Elum River and one hybrid was observed and captured in the upper Waptus River. (Reiss et al. 2012).	Yes	• Summer parr plants, mid-late July • Adult plants, October–December	Parr – 48,393 Adults – 1,091	Yes	Interactions may be possible; however, due to the low numbers of coho and bull trout, negative interactions are unlikely. NLAA
Big Creek	Big Creek RM 1–3	No bull trout residing in Big Creek.	No	• Adult plants, October–December	Adult - 597	Yes, parr plants.	No interaction. NE
Mainstem Upper Yakima River – Keechulus to Easton	Yakima River RM 202–215.5	Yakima River from the confluence with the Columbia River to Easton Dam is currently occupied FMO habitat (USFWS 2010). Areas downstream of the dams, including the Keechelus Reach of the upper Yakima River, provide FMO habitat. The upper Yakima River above Easton Dam may provide SR habitat for bull trout entrained out of project reservoirs. Very limited spawning reported over past decade (i.e., <1 redd/year on average) (Reiss et al. 2012).	Yes	• Adult plants, October–December	Adults - 1,621	Yes	Interactions may be possible; however, due to the low numbers of coho and bull trout, negative interactions are unlikely. NLAA
Manastash Creek	Manastash Creek RM 1–8.5	Not present	No	• Summer parr plants, mid-late July • Adult plants, October–December	Parr – 30,207 Adults - 256	No[1]	No interaction. NE
Mercer Creek	Mercer Creek RM 0–8	Not present.	No	• Summer parr plants, mid-late July	Parr – 15,611	No[1]	No interaction. NE
Cherry Creek	Cherry Creek RM 0–1.6	Not present.	No	• Summer parr plants, mid-late July	Parr – 4,215	No[1]	No interaction. NE
Coleman Creek	Coleman Creek RM 0–16	Not present.	No	• Summer parr plants, mid-late July • Adult plants, October–December	Parr – 24,977 Adults – 146	No[1]	No interaction anticipated. NE
Nanuem Creek	Naneum Creek RM 0–8	Not present.	No	• Summer parr plants, mid-late July	Parr – 20,294	No[1]	No interaction. NE
Little Creek	Little Creek RM 0–3.6	Not present.	No	• Summer parr plants, mid-late July	Parr - 5,620	No[1]	No interaction anticipated. NE
Teanaway River	Teanaway River RM 0–10.6	Very limited spawning documented via redd surveys – only in the North Fork (see below); population may be extirpated. However, few individuals of all life stages present in the upper headwaters; adults and subadults may be present in lower reaches. USFWS (2010) reports that Teanaway River from its confluence with the Yakima River upstream to its confluence with the Middle Fork and W. Fork is occupied, and provides FMO and connectivity for the Yakima Core Area.	Yes	• Summer parr plants, mid-late July • Adult plants, October–December	Parr – 16,547 Adults – 182	No[1]	Some interaction possible between winter pre-smolts and adult and juvenile bull trout; however, spatial separation within the creek would limit any interactions. Any additional production farther up river should benefit any bull trout that venture into the lower stretches of the Teanaway River. LAA
South Fork Teanaway River	SF Teanaway RM 0–2	Not likely present; possibly extirpated.	Yes	• Summer parr plants, mid-late July	Parr – 15,611	No[1]	Bull trout not documented to be present; suitable habitat exists. However, potential for interactions likely discountable. NLAA
Middle Fork Teanaway River	MF Teanaway RM 0–2	Not likely present; possibly extirpated. The U.S. Forest Service conducted extensive snorkel surveys in the Middle Fork Teanaway River in 2003 and encountered no bull trout (Haskins 2003 as cited in Reiss et al. 2012).USFWS (2010) reports MF from its confluence with the Teanaway River upstream 25.5 km (15.9 mi) provides FMO and connectivity for the Yakima River.	Yes	• Summer parr plants, mid-late July	Parr – 28,099	No[1]	Bull trout not documented to be present; suitable habitat exists. However, potential for interactions likely discountable. NLAA

Location	River/Stream River Mile	Bull Trout Presence	Critical Habitat	Action	Applicable Coho Life-Stage and Release No.	Ongoing?	Impact/Interaction
North Fork Teanaway River	NF Teanaway RM 0–11	Possibly extirpated. Six bull trout were captured in the North Fork Teanaway River in 1990 and 1992, and 17 bull trout in traps from 1991-1995 (Reiss et al. 2012). Five bull trout were seen by snorkelers in 2006 (Reiss 2006); none in 2007-2008 surveys. None in 2005 surveys by USFWS (Morgan 2005 as cited in Reiss et al. 2012). The five juveniles in 2006 were the last confirmed bull trout sightings in the Teanaway system. Night snorkel surveys conducted in the North Fork in 2009, 2010, and 2011 produced no bull trout observations (USFWS 2009; Reiss 2010; Reiss 2011). From 1997-2008, crews surveyed designated reaches on the mainstem North Fork Teanaway in August or September and recorded information about all species seen. When bull trout were not found in the three years after 2005, this survey was subsequently dropped from the EIT sampling scheme in 2009 (G. Temple, WDFW, pers comm 2012).USFWS (2010) reports that NF upstream to 29.7 km (18.4 mi) to a barrier falls near its headwaters is occupied and provides SR Habitat.	Yes	• Summer parr plants, mid-late July	Parr – 26,538	No[1]	Bull trout not documented to be present for nearly a decade; suitable habitat exists. However, potential for interactions likely discountable. NLAA If passage conditions continue to improve, potential for interaction could increase – LAA.
Jack Creek	Jack Creek RM 5.9	One juvenile bull trout was captured in traps in 1994 (Reiss et al. 2012). None observed during surveys in 2006 (Reiss et al. 2006). Jack Creek from its confluence with the N. Fork Teanaway River upstream 11.0 km (6.8 mi) to its headwaters is occupied; headwaters provides SR habitat (USFWS 2010).	Yes	• Smolt acclimation (at existing permanent acclimation site used since 1999 for spring Chinook)	Smolts – 20,000.	No[1] (however, ongoing for spring Chinook)	NLAA
Indian Creek	Indian Creek RM 0-2.8; steelhead access limit	No record of occurrence; however, Salmonscape (WDFW 2016) indicates "presumed presence" in lower three river miles. This tributary to the North Fork Teanaway is not designated as critical habitat for bull trout (USFWS 2010).	No	• Summer parr plants, mid-late July	Parr (part of overall Teanaway River estimate)	No[1]	Bull trout not documented to be present; suitable habitat exists. However, potential for interactions likely discountable. NLAA
Stafford Creek	Stafford Creek RM 0-6; steelhead access limit	Yakima Species Interaction Team conducts annual electrofishing surveys in reaches of this stream, but have never detected bull trout (Reiss 2006). Probably extirpated. No bull trout observed during surveys in 1993, 1994, 1998, or 1999 (Reiss et al. 2012), or 2006 (Reiss 2006). Stafford Creek from its confluence with N. Fork Teanaway River upstream 8.0 km (5.0 mi) to its headwaters provides SR habitat (USFWS 2010).	Yes	• Summer parr plants, mid-late July	Parr (part of overall Teanaway River estimate)	Yes (e-fishing for monitoring of Chinook releases)	Bull trout not documented to be present; suitable habitat exists. However, potential for interactions likely discountable. NLAA
Jungle Creek	Jungle Creek RM 0-1; steelhead access limit	Jungle Creek from its confluence with the N. Fork Teanaway River upstream 6.4 km (4.0 mi) to its headwaters is occupied and provides SR habitat (USFWS 2010). Two juvenile bull trout were observed in Jungle Creek in 1994 and 1 in Jack Creek in 1995 (Reiss et al. 2012). The lower part of the stream is open and heavily grazed. One bull trout was captured in a trap by the Yakima Species Interaction Team in 1999, but overall conditions made this stream a low priority for bull trout surveys (Reiss 2006). No bull trout in 2006 surveys (Reiss 2006).	Yes	• Summer parr plants, mid-late July	Parr (part of overall Teanaway River estimate)	Yes (e-fishing for monitoring of Chinook releases)	Bull trout not documented to be present; suitable habitat exists. However, potential for interactions likely discountable. NLAA
Yakima River Ponds – Easton to Cle Elum Reach • Boone • Easton	RM 183 RM 202	Juvenile, subadults, and adults may be present.	Yes	• Smolt acclimation and release (existing, permanent sites, February– April)	Smolts – 20,000.	Yes (Easton currently acclimates Chinook, not coho)	Most likely the only interaction would be positive; however, some juveniles may have direct interactions. LAA

Location	River/Stream River Mile	Bull Trout Presence	Critical Habitat	Action	Applicable Coho Life-Stage and Release No.	Ongoing?	Impact/Interaction
Cabin Creek	Cabin Creek RM 0-3.3	Bull trout not present (USFWS 2007).	No	• Summer parr plants, mid-late July	TBD	Yes (e-fishing for monitoring of Chinook releases)	No interaction anticipated. NE

[1] Under Ongoing, a “No” indicates that the activity is not currently ongoing as part of YKFP Phase 2 of the Yakima River coho reintroduction program; it is a new activity proposed under Phase 3 as part of the Proposed Action.

Abbreviations:

FMO = foraging, migratory, and overwintering
LAA = likely to adversely affect
NLAA = not likely to adversely affect
RM = River mile
SR = spawning and rearing
TBD = to be determined

Sources: WDFW 1998; USFWS 2007; BPA et al. 2012; YN unpubl. data 2016; Mizell and Anderson 2010; Reiss et al. 2012; Newsome 2016

Justification for Release Numbers in Table

Artificial production strategies for Phase 3 of the Yakima River basin coho reintroduction program would include adult coho outplants, summer parr outplants, and smolt outplants for selected tributaries within the Naches River and upper Yakima River watersheds. The selection of one or more strategies for individual tributaries considered both abiotic and biotic factors, including the size and quality of available habitat, presence or absence of other sensitive species, and logistical constraints (i.e., accessibility). The foundation and biological justification for generating optimal release numbers are based on natural production estimates from the Ecosystem Diagnosis and Treatment (EDT) model. The EDT model is a scientifically based habitat model that estimates the natural production potential in the form of adult carrying capacity and equilibrium abundance (e.g., an adult recruitment ratio of 1 to 1). Estimates produced from the EDT model assume a fully fit, naturally adapted population of coho. Additional adjustments were made to release numbers to account for a reduced fitness factor of hatchery fish that lack the natural productivity and relative fitness of a fully adapted natural population.

In a review of relative fitness of hatchery and natural salmon, Berejikain and Ford (2004) cited studies that have demonstrated the relative fitness of hatchery salmon ranges from approximately 20 percent to as high as 100 percent depending on the species, brood source, and number of generations the hatchery line has experienced. For our purposes, we assume a 50 percent relative fitness factor for hatchery origin coho adults released into the selected tributaries.

For tributaries utilizing hatchery coho adult outplants as a release strategy, the 50 percent relative fitness factor was applied to the EDT equilibrium adult abundance estimate. For example, the corresponding hatchery adult outplant estimate for a tributary that has an estimated equilibrium adult abundance of 50 natural origin coho adult would require 100 hatchery-origin adult coho to seed the habitat at equilibrium. To estimate the number of smolts produced from the adult outplants and, furthermore, the number of natural origin adults returning from the hatchery adult outplants, empirically based survival estimates from previous work were applied to numerous life-stages. The number of wild smolts produced from the adult outplants was estimated by applying a 1.5 percent egg to smolt survival (Reclamation 2007) to the estimated potential egg deposition, which is based on the number of females multiplied by the average fecundity of an adult female coho. The number of natural-origin adult coho returning from the hatchery adult outplants calculations was estimated by applying a range of empirically based smolt-to-adult return rates (SARs) to the smolt production estimates (ranged from 3.0 to 6.0 percent).

Other methods were needed to estimate summer parr release numbers for several tributaries where EDT estimates were not generated. Reclamation (2007) published a document investigating the coho production potential above Lake Cle Elum Dam. This was done as part of the Lake Cle Elum Fish Passage Study. The study estimated the number of summer parr per linear stream kilometer of available habitat. The number of accessible kilometers of linear habitat available for coho was estimated from EDT reach delineations. The upper extremities of anadromous fish distributions are limited by documented or assumed natural fish passage barriers. In the Reclamation study, a 0.97

coho per meter factor, was applied to the overall to the river (Reclamation 2007). This gave each tributary a parr population minimum. This same method and percent were used to estimate minimum numbers of coho in individual tributaries. The parr were then given an average estimate of 13 percent survival estimate to be conservative. A 3 percent average SAR was applied to the smolts, and a total adult number was then produced. These were also assumed to be all female. The two female estimates were then added together and given a 50 percent male population.

Some tributaries were not analyzed in the EDT model. For these tributaries, best professional judgment based on specific knowledge of each tributary was used to estimate what population size the tributary could support. In areas where only coho adults would be outplanted, parr estimates for adult populations were substituted with additional adults by back-calculating the adults produced by the parr-to-adult stage. These estimates were brought together and assigned to individual tributaries.

Tributaries would be prioritized for up to 6-year treatments. Following the initial 6 years, all releases would cease, and monitoring would continue in tributaries where reintroduction was done. A new set of tributaries would then be selected for reintroduction efforts.

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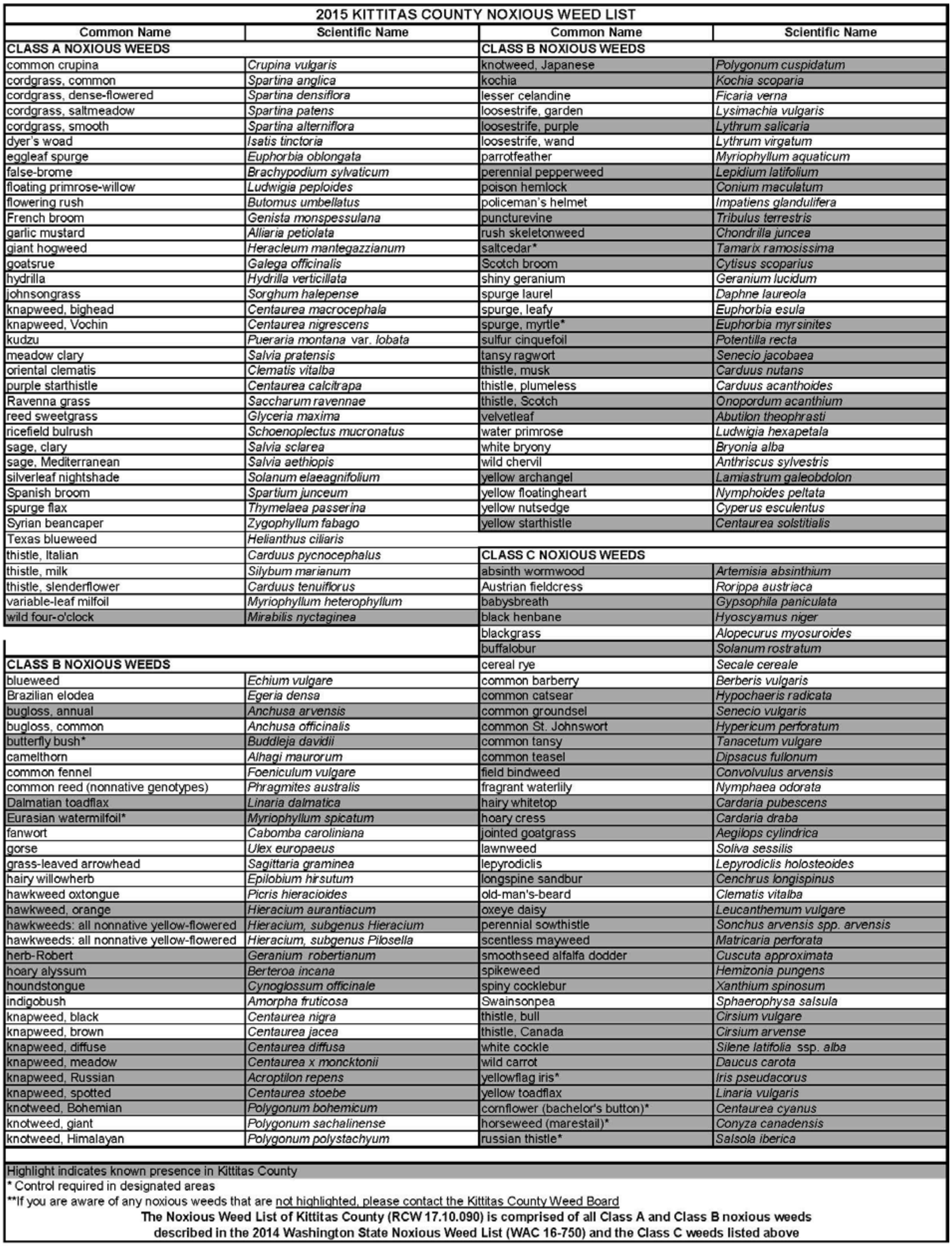
Appendix B. State/Federal Listed Rare Plant Species

State/Federal Listed Rare Plant Species that May be Present in the Study Area

Common Name	Scientific Name	Federal Status	State Status	Typical Habitat
Bristly sedge	*Carex comosa*		Sensitive	Marshes, lakeshores, and wet meadows.
Large-awned sedge	*Carex macrochaeta*		Threatened	Moist open places such as seeps, meadows, or around streams, lakes, and waterfalls.
Few-flowered sedge	*Carex pauciflora*		Sensitive	Wet acidic environments such as sphagnum bogs and acidic peat.
Wenatchee larkspur	*Delphinium viridescens*	Species of concern	Threatened	Moist meadows, seasonally wet openings in aspen groves and hardwood thickets, moist microsites in open coniferous forests, springs, seeps, and riparian areas.
Piper's daisy	*Erigeron piperianus*		Sensitive	Dry, open places on level ground to moderate slopes.
Suksdorf's monkeyflower	*Erythranthe suksdorfii*		Sensitive	Open, moist or dry places, from valleys to foothills.
Oregon goldenaster	*Heterotheca oregona*		Threatened	Sand and gravel bars along rivers and streams.
Adder's-tongue	*Ophioglossum pusillum*		Threatened	Seasonally wet areas in pastures, old fields, roadside ditches, bogs, fens, wet meadows, floodplains, moist woods, grassy swales, dry or damp sand, dry hillsides, and in seasonally wet, acidic soil.
Orthotrichum moss	*Orthotrichum praemorsum*	Species of concern	Endangered	On rock, often dry areas, at higher elevations.
Sticky goldenweed	*Pyrrocoma hirta var. sonchifolia*		Sensitive	Meadows, rocky vernally wet places, open or sparsely wood slopes at moderate mountain elevations.
Marginate splashzone moss	*Scouleria marginata*		Threatened	On bedrock or large boulders at the waterline of perennial rivers and streams.

Source: WDNR. 2014. Washington Natural Heritage Information System List of Known Occurrences of Rare Plants in Washington, September 2014, Kittitas County. Accessed June 16, 2016. http://www1.dnr.wa.gov/nhp/refdesk/lists/plantsxco/kittitas.html”

Appendix C. Kittitas County Noxious Weeds



2015 KITTITAS COUNTY NOXIOUS WEED LIST

Common Name	Scientific Name	Common Name	Scientific Name
CLASS A NOXIOUS WEEDS		**CLASS B NOXIOUS WEEDS**	
common crupina	*Crupina vulgaris*	knotweed, Japanese	*Polygonum cuspidatum*
cordgrass, common	*Spartina anglica*	kochia	*Kochia scoparia*
cordgrass, dense-flowered	*Spartina densiflora*	lesser celandine	*Ficaria verna*
cordgrass, saltmeadow	*Spartina patens*	loosestrife, garden	*Lysimachia vulgaris*
cordgrass, smooth	*Spartina alterniflora*	loosestrife, purple	*Lythrum salicaria*
dyer's woad	*Isatis tinctoria*	loosestrife, wand	*Lythrum virgatum*
eggleaf spurge	*Euphorbia oblongata*	parrotfeather	*Myriophyllum aquaticum*
false-brome	*Brachypodium sylvaticum*	perennial pepperweed	*Lepidium latifolium*
floating primrose-willow	*Ludwigia peploides*	poison hemlock	*Conium maculatum*
flowering rush	*Butomus umbellatus*	policeman's helmet	*Impatiens glandulifera*
French broom	*Genista monspessulana*	puncturevine	*Tribulus terrestris*
garlic mustard	*Alliaria petiolata*	rush skeletonweed	*Chondrilla juncea*
giant hogweed	*Heracleum mantegazzianum*	saltcedar*	*Tamarix ramosissima*
goatsrue	*Galega officinalis*	Scotch broom	*Cytisus scoparius*
hydrilla	*Hydrilla verticillata*	shiny geranium	*Geranium lucidum*
johnsongrass	*Sorghum halepense*	spurge laurel	*Daphne laureola*
knapweed, bighead	*Centaurea macrocephala*	spurge, leafy	*Euphorbia esula*
knapweed, Vochin	*Centaurea nigrescens*	spurge, myrtle*	*Euphorbia myrsinites*
kudzu	*Pueraria montana* var. *lobata*	sulfur cinquefoil	*Potentilla recta*
meadow clary	*Salvia pratensis*	tansy ragwort	*Senecio jacobaea*
oriental clematis	*Clematis vitalba*	thistle, musk	*Carduus nutans*
purple starthistle	*Centaurea calcitrapa*	thistle, plumeless	*Carduus acanthoides*
Ravenna grass	*Saccharum ravennae*	thistle, Scotch	*Onopordum acanthium*
reed sweetgrass	*Glyceria maxima*	velvetleaf	*Abutilon theophrasti*
ricefield bulrush	*Schoenoplectus mucronatus*	water primrose	*Ludwigia hexapetala*
sage, clary	*Salvia sclarea*	white bryony	*Bryonia alba*
sage, Mediterranean	*Salvia aethiopis*	wild chervil	*Anthriscus sylvestris*
silverleaf nightshade	*Solanum elaeagnifolium*	yellow archangel	*Lamiastrum galeobdolon*
Spanish broom	*Spartium junceum*	yellow floatingheart	*Nymphoides peltata*
spurge flax	*Thymelaea passerina*	yellow nutsedge	*Cyperus esculentus*
Syrian beancaper	*Zygophyllum fabago*	yellow starthistle	*Centaurea solstitialis*
Texas blueweed	*Helianthus ciliaris*		
thistle, Italian	*Carduus pycnocephalus*	**CLASS C NOXIOUS WEEDS**	
thistle, milk	*Silybum marianum*	absinth wormwood	*Artemisia absinthium*
thistle, slenderflower	*Carduus tenuiflorus*	Austrian fieldcress	*Rorippa austriaca*
variable-leaf milfoil	*Myriophyllum heterophyllum*	babysbreath	*Gypsophila paniculata*
wild four-o'clock	*Mirabilis nyctaginea*	black henbane	*Hyoscyamus niger*
		blackgrass	*Alopecurus myosuroides*
		buffalobur	*Solanum rostratum*
CLASS B NOXIOUS WEEDS		cereal rye	*Secale cereale*
blueweed	*Echium vulgare*	common barberry	*Berberis vulgaris*
Brazilian elodea	*Egeria densa*	common catsear	*Hypochaeris radicata*
bugloss, annual	*Anchusa arvensis*	common groundsel	*Senecio vulgaris*
bugloss, common	*Anchusa officinalis*	common St. Johnswort	*Hypericum perforatum*
butterfly bush*	*Buddleja davidii*	common tansy	*Tanacetum vulgare*
camelthorn	*Alhagi maurorum*	common teasel	*Dipsacus fullonum*
common fennel	*Foeniculum vulgare*	field bindweed	*Convolvulus arvensis*
common reed (nonnative genotypes)	*Phragmites australis*	fragrant waterlily	*Nymphaea odorata*
Dalmatian toadflax	*Linaria dalmatica*	hairy whitetop	*Cardaria pubescens*
Eurasian watermilfoil*	*Myriophyllum spicatum*	hoary cress	*Cardaria draba*
fanwort	*Cabomba caroliniana*	jointed goatgrass	*Aegilops cylindrica*
gorse	*Ulex europaeus*	lawnweed	*Soliva sessilis*
grass-leaved arrowhead	*Sagittaria graminea*	lepyrodiclis	*Lepyrodiclis holosteoides*
hairy willowherb	*Epilobium hirsutum*	longspine sandbur	*Cenchrus longispinus*
hawkweed oxtongue	*Picris hieracioides*	old-man's-beard	*Clematis vitalba*
hawkweed, orange	*Hieracium aurantiacum*	oxeye daisy	*Leucanthemum vulgare*
hawkweeds: all nonnative yellow-flowered	*Hieracium, subgenus Hieracium*	perennial sowthistle	*Sonchus arvensis ssp. arvensis*
hawkweeds: all nonnative yellow-flowered	*Hieracium, subgenus Pilosella*	scentless mayweed	*Matricaria perforata*
herb-Robert	*Geranium robertianum*	smoothseed alfalfa dodder	*Cuscuta approximata*
hoary alyssum	*Berteroa incana*	spikeweed	*Hemizonia pungens*
houndstongue	*Cynoglossum officinale*	spiny cocklebur	*Xanthium spinosum*
indigobush	*Amorpha fruticosa*	Swainsonpea	*Sphaerophysa salsula*
knapweed, black	*Centaurea nigra*	thistle, bull	*Cirsium vulgare*
knapweed, brown	*Centaurea jacea*	thistle, Canada	*Cirsium arvense*
knapweed, diffuse	*Centaurea diffusa*	white cockle	*Silene latifolia* ssp. *alba*
knapweed, meadow	*Centaurea x moncktonii*	wild carrot	*Daucus carota*
knapweed, Russian	*Acroptilon repens*	yellowflag iris*	*Iris pseudacorus*
knapweed, spotted	*Centaurea stoebe*	yellow toadflax	*Linaria vulgaris*
knotweed, Bohemian	*Polygonum bohemicum*	cornflower (bachelor's button)*	*Centaurea cyanus*
knotweed, giant	*Polygonum sachalinense*	horseweed (marestail)*	*Conyza canadensis*
knotweed, Himalayan	*Polygonum polystachyum*	russian thistle*	*Salsola iberica*

Highlight indicates known presence in Kittitas County
* Control required in designated areas
**If you are aware of any noxious weeds that are not highlighted, please contact the Kittitas County Weed Board

The Noxious Weed List of Kittitas County (RCW 17.10.090) is comprised of all Class A and Class B noxious weeds described in the 2014 Washington State Noxious Weed List (WAC 16-750) and the Class C weeds listed above

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eggleaf spurge	*Euphorbia oblongata*	parrotfeather	*Myriophyllum aquaticum*
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Appendix D. General Wildlife Species Likely to Occur in Project Area

Common Name	Scientific Name	Observed (O) or Potential to Occur (P) in Proposed Project Site Study Area
Amphibians		
Bullfrog	*Rana catesbeiana*	P
Columbia spotted frog	*Rana luteiventris*	P
Great basin spadefoot	*Spea intermontana*	P
Long-toed salamander	*Ambystoma macrodactylum*	P
Pacific treefrog (Chorus frog)	*Hyla regilla*	P
Roughskin newt	*Taricha granulosa*	P
Western toad	*Bufo boreas*	P
Birds		
American coot	*Fulica americana*	P
American crow	*Corvus brachyrhynchos*	O
American dipper	*Cinclus mexicanus*	P
American goldfinch	*Carduelis tristis*	P
American kestrel	*Falco sparverius*	P
American robin	*Turdus migratorius*	O
Bank swallow	*Riparia*	P
Barn swallow	*Hirundo rustica* *Riparia*	O
Barred owl	*Strix varia*	P
Belted kingfisher	*Megaceryle alcyon* *Ceryle alcyon*	P
Black billed magpie	*Pica hudsonia*	P
Black-capped chickadee	*Poecile atricapillus*	P
Black-chinned hummingbird	*Archilochus alexandri*	P
Black-headed grosbeak	*Pheucticus melanocephalus*	P
Brewer's blackbird	*Euphagus cyanocephalus*	P
Brewer’s sparrow	*Spizella breweri*	P
Brown-headed cowbird	*Molothrus ater*	P
California quail	*Callipepla californica*	P
Calliope hummingbird	*Selasphorus calliope*	P
Canada goose	*Branta canadensis*	P
Cassin’s finch	*Haemorhous cassinii*	P
Cassin's vireo (Solitary vireo)	*Vireo cassinii* *Vireo solitarius*	P

Common Name	**Scientific Name**	**Observed (O) or Potential to Occur (P) in Proposed Project Site Study Area**
Cedar waxwing	*Bombycilla cedrorum*	P
Chukar	*Alectoris chukar*	P
Cinnamon teal	*Anas cyanoptera*	P
Cliff swallow	*Hirundo pyrrhonota*	P
Common barn-owl	*Tyto alba*	P
Common merganser	*Mergus merganser*	P
Common nighthawk	*Chordeiles minor*	P
Common poorwill	*Phalaenoptilus nuttallii*	P
Common raven	*Corvus corax*	P
Common snipe	*Gallinago*	P
Common yellowthroat	*Geothlypis trichas*	P
Dark-eyed (Oregon) junco	*Junco hyemalis*	P
Downy woodpecker	*Picoides pubescens*	P
Eastern kingbird	*Tyrannus*	P
European starling	*Sturnus vulgaris*	P
Gray catbird	*Dumetella carolinensis*	P
Grey flycatcher	*Empidonax wrightii*	P
Gray partridge	*Perdix*	P
Great blue heron	*Ardea herodias*	P
Great horned owl	*Bubo virginianus*	P
Green winged teal	*Anas crecca*	P
Hairy woodpecker	*Picoides villosus*	P
Hammond’s flycatcher	*Empidonax hammondii*	P
Hooded merganser	*Lophodytes cucullatus*	P
Horned lark	*Eremophila alpestris*	P
House finch	*Carpodacus mexicanus*	P
House sparrow	*Passer domesticus*	P
House wren	*Troglodytes aedon*	P
Killdeer	*Charadrius vociferus*	P
Lazuli bunting	*Passerina amoena*	P
Lewis’ woodpecker	*Melanerpes lewis*	P
Loggerhead shrike	*Lanius ludovicianus*	P
Long-billed curlew	*Numenius americanus*	P
Long-eared owl	*Asio otus*	P
MacGillivray's warbler	*Oporornis tolmiei*	P
Mallard	*Anas platyrhynchos*	P
Mountain bluebird	*Sialia currucoides*	P

Common Name	Scientific Name	Observed (O) or Potential to Occur (P) in Proposed Project Site Study Area
Mourning dove	*Zenaida macroura*	P
Nashville warbler	*Oreothlypis ruficapilla*	P
Northern flicker	*Colaptes auratus*	P
Northern harrier	*Circus cyaneus*	P
Northern rough-winged swallow	*Stelgidopteryx serripenni*	P
Olive-sided flycatcher	*Contopus borealis*	P
Osprey	*Pandion haliaetus*	P
Pacific slope flycatcher (Western)	*Empidonax difficilis*	P
Pine siskin	*Carduelis pinus*	P
Prairie falcon	*Falco mexicanus*	P
Purple finch	*Carpodacus purpureus*	P
Red-breasted nuthatch	*Sitta canadensis*	O
Red-tailed hawk	*Buteo jamaicensis*	O
Red-winged blackbird	*Agelaius phoeniceus*	P
Ring-necked pheasant	*Phasianus colchicus*	P
Rock dove	*Columba livia*	P
Ruffed grouse	*Bonasa umbellus*	P
Rufous hummingbird	*Selasphorus rufus*	P
Savannah sparrow	*Amphispiza belli*	P
Say’s phoebe	*Sayornis saya*	P
Sharp-shinned hawk	*Accipiter striatus*	P
Song sparrow	*Melospiza melodia*	P
Sora	*Porzana carolina*	P
Spotted sandpiper	*Actitis macularius*	P
Spotted towhee (Rufous-sided)	*Pipilo maculatus*	P
Steller's jay	*Cyanocitta stelleri*	P
Swainson’s hawk	*Buteo swainsoni*	P
Swainson's thrush	*Catharus ustulatus*	P
Tree swallow	*Tachycineta bicolor*	P
Turkey vulture	*Cathartes aura*	P
Vaux's swift	*Chaetura vauxi*	P
Veery	*Catharus fuscescens*	P
Vesper sparrow	*Pooecetes gramineus*	P
Violet-green swallow	*Tachycineta thalassina*	P
Virginia rail	*Rallus limicola*	P
Warbling vireo	*Vireo gilvus*	P
Western bluebird	*Sialia mexicana*	P

Common Name	Scientific Name	Observed (O) or Potential to Occur (P) in Proposed Project Site Study Area
Western kingbird	*Tyrannus verticalis*	P
Western meadowlark	*Sturnella neglecta*	P
Western screech-owl	*Otus kennicottii*	P
Western tanager	*Piranga ludoviciana*	P
Western wood-pewee	*Contopus sordidulus*	P
White-crowned sparrow	*Zonotrichia leucophrys*	P
Willow flycatcher	*Empidonax traillii*	P
Wilson's warbler	*Wilsonia pusilla*	P
Wood duck	*Aix sponsa*	P
Yellow warbler	*Setophaga petechia*	P
Yellow-breasted chat	*Icteria virens*	P
Yellow-headed blackbird	*Xanthocephalus*	P
Yellow-rumped warbler	*Dendroica coronata*	P
Mammals		
Badger	*Taxidea taxus*	P
Beaver	*Castor canadensis*	P
Big brown bat	*Eptesicus fuscus*	P
Black-tailed jack rabbit	*LepusCalifornicus*	P
Bobcat	*Lynx rufus*	P
Bushy-tailed woodrat	*Neotoma cinerea*	P
California ground squirrel	*Otospermophilus beecheyi*	P
California myotis	*Myotis californicus*	P
Cascade golden-mantled ground squirrel	*Callospermophilus saturatus*	P
Coast mole	*Scapanus orarius*	P
Coyote	*Canis latrans*	P
Deer mouse	*Peromyscus maniculatus*	P
Douglas’ squirrel	*Tamiasciurus douglasii*	P
Eastern cottontail	*Sylvilagus floridanus*	P
Elk	*Cervus elaphus*	P
Great basin pocket mouse	*Perognathus parvus*	P
Hoary bat	*Lasiurus cinereus*	P
House mouse	*Mus musculus*	P
Least chipmunk	*Neotamias minimus*	P
Little brown myotis	*Myotis lucifugus*	P
Long-eared myotis	*Myotis evotis*	P
Long-legged myotis	*Myotis volans*	P
Long-tailed vole	*Microtus longicaudus*	P

Common Name	Scientific Name	Observed (O) or Potential to Occur (P) in Proposed Project Site Study Area
Long-tailed weasel	*Mustela frenata*	P
Mink	*Mustela vison*	P
Montane vole	*Microtus montanus*	P
Mountain lion	*Felis concolor*	P
Mule deer	*Odocoileus hemionus*	P
Muskrat	*Ondatra zibethicus*	P
Northern flying squirrel	*Glaucomys sabrinus*	P
Northern grasshopper mouse	*Onychomys leucogaster*	P
Northern pocket gopher	*Thomomys talpoides*	P
Nuttall's cottontail	*Sylvilagus nuttallii*	P
Pallid bat	*Antrozous pallidus*	P
Porcupine	*Erethizon dorsatum*	P
Raccoon	*Procyon lotor*	P
Red fox	*Vulpes*	P
River otter	*Lutra canadensis*	P
Sagebrush vole	*Lemmiscus curtatus*	P
Silver-haired bat	*Lasionycteris noctivagans*	P
Striped skunk	*Mephitis*	P
Townsend's big-eared bat	*Plecotus townsendii*	P
Western red-backed vole	*Myodes californicus*	P
White-tailed deer	*Odocoileus virginianus*	P
White-tailed jack rabbit	*Lepus townsendii*	P
Yellow-bellied marmot	*Marmota flaviventris*	P
Yellow-pine chipmunk	*Neotamias amoenus*	P
Yuma myotis	*Myotis yumanensis*	P
Reptiles		
Common garter snake	*Thamnophis sirtalis*	P
Gopher snake	*Pituophis catenifer*	P
Night snake	*Hypsiglena chlorophaea*	P
Painted turtle	*Chrysemys picta*	P
Racer	*Coluber constrictor*	P
Rubber boa	*Charina bottae*	P
Sagebrush lizard	*Sceloporus graciosus*	P
Sharp-tailed snake	*Contia tenuis*	P
Side-blotched lizard	*Uta stansburiana*	P
Southern alligator lizard	*Elgaria multicarinata*	P
Western fence lizard	*Sceloporus occidentalis*	P

Common Name	Scientific Name	Observed (O) or Potential to Occur (P) in Proposed Project Site Study Area
Western rattlesnake	*Crotalus oreganus*	P
Western skink	*Plestiodon skiltonianus*	P
Western terrestrial garter snake	*Thamnophis elegans*	P

Notes: Observed = species observed by project team members May 25, 2016

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Appendix E. State and Federal Listed Wildlife in the Study Area

Common Name[a]	Scientific Name	Federal Status	State Status	Habitat Association
Amphibians				
Columbia Spotted Frog	*Rana pipiens*	—	C	Inhabits marshes, edges of ponds, streams, lakes and moist, and in dry areas deep pools within the main portions of watercourses.[b]
Western Toad	*Anaxyrus boreas*	SOC	C	Found in a wide variety of habitats ranging from desert springs to mountain wetlands; and ranges into various upland habitats around ponds, lakes, reservoirs, and slow-moving rivers and streams.[c]
Reptiles				
Sharptail Snake	*Contia tenuis*	SOC	C	Moist situations in pastures, meadows, oak woodlands, broken chaparral, and the edges of coniferous or hardwood forests; also shrubby rabbitbrush-sagebrush.[c]
Sagebrush Lizard	*Sceloporus graciosus*	SOC	C	Sagebrush and other types of shrublands, also pinyon-juniper woodland and open pine and Douglas-fir forests.[c]
Birds				
American White Pelican	*Pelecanus erythrorhynchos*	—	E	Isolated islands on freshwater lakes and rivers.[d]
Western grebe	*Aechmophorus occidentalis*	—	C	Marshes, lakes, and bays; in migration and winter also sheltered seacoasts, less frequently along rivers.[c]
Black-crowned Night-heron	*Nycticorax nycticorax*	—	—	Marshes, swamps, wooded streams, mangroves, shores of lakes, ponds, lagoons; salt water, brackish, and freshwater situations.[c]
Great Blue Heron	*Ardea herodias*	—	—	Fresh and saltwater wetlands, including seashores, rivers, swamps, marshes, and ditches.[d]

Common Name[a]	Scientific Name	Federal Status	State Status	Habitat Association
Harlequin Duck	*Histrionicus histrionicus*	—	—	Fast-flowing water with loafing sites nearby. Streams usually have substrate that ranges from cobble to boulder, with adjacent vegetated banks.[d]
Tundra Swan	*Cygnus columbianus*	—	—	Shallow ponds, lakes, riverine marshes [c]
Bald Eagle	*Haliaeetus leucocephalus*	SOC	S	Breeding territories include upland woodlands and lowland riparian stands with a mature conifer or hardwood component; roosting trees vary.[d]
Ferruginous Hawk	*Buteo regalis*	SOC	T	Obligate grassland or desert-shrub nesters.[d]
Golden Eagle	*Aquila chrysaetos*	—	C	Open, arid plateaus deeply cut by streams and canyons, western shrub steppe and grassland communities and transition zones between shrub, grassland, and forested habitat.[d]
Northern Goshawk	*Accipiter gentilis*	SOC	C	Generally prefer mature or old forest habitat with a high density of large trees.[d]
Peregrine Falcon	*Falco peregrinus*	SOC	S	Nest on cliffs, off-shore islands and ledges on vegetated slopes; winter and fall, forage in areas with large shorebird or waterfowl concentrations.[d]
Dusky Grouse	*Dendragapus obscurus*	—	—	Deciduous and mixed forests in summer, conifer forest in winter, sagebrush flats in summer. [c]
Sooty Grouse	*Dendragapus fuliginosus*	C	T	Open foothills closely associated with streams, springs, and meadows; primarily in mountainous areas wherever open coniferous forests are present.[d]
Wild Turkey	*Meleagris gallopavo*	—	—	Nonnative species; habitat generalists, adapting to a variety of conditions across their range.[d]
Marbled Murrelet	*Brachyramphus marmoratus*	T	T	Lakes and rivers, coastal areas, costal. Old growth forests.[c]

Common Name[a]	Scientific Name	Federal Status	State Status	Habitat Association
Yellow-billed Cuckoo	*Coccyzus americanus*	T	C	Open woodland with rich undergrowth, parks, cottonwood and willow riparian woodland.[c]
Flammulated Owl	*Otus flammeolus*	—	C	Mid-elevation coniferous forests containing mature to old, open canopy yellow pine, ponderosa pine, Jeffrey pine, Douglas fir, and grand fir.[d]
Vaux's Swift	*Chaetura vauxi*	—	C	Strongly associated with old-growth forests.[d]
Black-backed Woodpecker	*Picoides arcticus*	—	C	Standing dead lodgepole pine, ponderosa pine, western larch and mixed coniferous forests.[d]
Lewis' Woodpecker	*Melanerpes lewis*	—	C	Forested habitat with an open canopy and a shrubby understory, with snags available for nest sites and hawking perches.[d]
Pileated Woodpecker	*Dryocopus pileatus*	—	C	Inhabit mature and old-growth forests, and second-growth forests with large snags and fallen trees.[d]
White-headed Woodpecker	*Picoides albolarvatus*	—	C	Open-canopied, mature and old-growth ponderosa pine forests.[d]
Loggerhead Shrike	*Lanius ludovicianus*	SOC	C	Open habitat during both breeding and nonbreeding seasons. Grasslands or pastures with short or patchy grasses are usually used for foraging. Scattered trees, shrubs, or hedgerows are most often used for nesting and perching.[d]
Mammals				
Merriam's Shrew	*Sorex merriami*	—	C	Sagebrush-steppe, semi-arid grasslands, pinyon-juniper woodlands, high elevation brushlands, and mixed woodlands of ponderosa pine, Douglas-fir, and cottonwood.[f]
Townsend's Big-eared Bat	*Corynorhinus townsendii*	SOC	C	Ponderosa pine forest and woodlands, mixed conifer forests, shrub steppe, lowland conifer-hardwood forests, and riparian wetlands. Roost in old buildings, caves, barns, and mines.[g]

Common Name[a]	Scientific Name	Federal Status	State Status	Habitat Association
Black-tailed Jackrabbit	*Lepus californicus*	—	C	Inhabits open plains, fields and deserts; open country with scattered thickets or patches of shrubs.[c]
Western Gray Squirrel	*Sciurus griseus*	C	T	Areas where oak woodlands and pine forests converge, particularly near riparian areas.[h]
Townsend's Ground Squirrel	*Spermophilus townsendii*	SOC	C	Open sagebrush and grass but also includes large patches of sagebrush at the lower edges of forest, as well as pastures and abandoned fields.[c]
Canada Lynx	*Lynx canadensis*	T	T	Lodgepole pine forests, mixed forests with thick undergrowth, travels through open areas for prey.[c]
Gray Wolf	*Canis lupus*	E	E	Alpine, Desert, Forest, Savanna, Shrubland/chaparral, Tundra, Woodland.[c]
Grizzly Bear	*Ursus arctos horribilis*	T	E	Subalpine mountain forests arctic tundra, alpine tundra. Historic habitat of open prairies, brush lands, riparian woodlands, and semi desert scrub. c
Marten	*Martes americana*	—	—	Dense deciduous, mixed, or (especially) coniferous upland and lowland forest.[c]
Columbian Black-tailed Deer	*Odocoileus hemionus columbianus*	—	—	Coniferous forests, desert shrub, chaparral, grasslands with shrubs.[c]
Elk	*Cervus elaphus*	—	—	Uses open areas such as alpine pastures, marshy meadows, river flats, and aspen parkland, as well as coniferous forests, brushy clear cuts or forest edges, and semi-desert areas.[c]
Rocky Mountain Mule Deer	*Odocoileus hemionus*	—	—	Coniferous forests, desert shrub, chaparral, grasslands with shrubs.[c]

Common Name[a]	Scientific Name	Federal Status	State Status	Habitat Association

Legend:

C=Candidate
E=Endangered
S=Sensitive
SOC=Species of Concern
T=Threatened

Sources:

[a] WDFW 2008. Priority Habitat and Species List. Olympia, Washington. 174 pp.

[b] Larsen, Eric M. 1997. Washington Department of Fish and Wildlife Management Recommendations for Washington's Priority Species, Volume III: Amphibians and Reptiles, Oregon Spotted Frog.

[c] Nature Serve Explorer. 2015. http://www.natureserve.org/explorer/servlet/NatureServe? Accessed June 17th, 2016.

[d] Larsen, Eric M et al. 2004. Management Recommendations for Washington's Priority Species – Volume IV: Birds. Washington Department of Fish and Wildlife, Olympia, WA.

[e] USFWS. 2007. 2007 Draft Recovery Plan for the Northern Spotted Owl (Strix occidentalis caurina): Merged Options 1 and 2. USFWS, Region 1, Portland, OR.

[f] Azerrad, Jeff. 2004. Management Recommendations for Washington's Priority Species, Volume V: Mammals. Washington Department of Fish and Wildlife, Olympia, WA

[g] Woodruff, Kent 2005. Management Recommendations for Washington's Priority Species: Volume V, Mammals, Townsend's big-eared bat. Washington State Department of Fish and Wildlife, Olympia, WA.

[h] Linders and Stinson 2007. Washington State Recovery Plan for the Western Gray Squirrel. Washington Department of Fish and Wildlife, Olympia. 128+ viii pp.

Appendix F. Assumptions Used to Calculate Greenhouse Gas Emissions and Detailed Results

Implementation of the Melvin R. Sampson Hatchery could contribute to an increase in greenhouse gas concentrations through the activities described in this appendix. The assumptions and methods used to determine the Hatchery's contribution to greenhouse gas levels, as well as detailed results, are described in the following sections.

Assumptions

The assumptions and methods used to calculate greenhouse gas emissions for construction and operation of the Hatchery are described in the sections that follow.

Construction

Project construction for the Proposed Action would take approximately 16.5 months, including the construction of the hatchery facilities and in-water work associated with the New Cascade Canal Fish Screen and the MRS Hatchery Intake and Outfall Structures (see Section 2.1.4).

The transportation components of greenhouse gas emissions were estimated based on the approximate number of vehicles that would be used during project construction and the approximate distance those vehicles would travel. Greenhouse gas emissions were calculated for the 16.5 month construction period.

Overestimating the number of round trips ensures that greenhouse gas emissions estimates are conservatively high. The number of round trips was deliberately overestimated using the following assumptions:

- All workers would travel in separate vehicles to the project area each day.
- A maximum number of workers would be required to construct the Hatchery.
- Fuel consumption is based on the average fuel economy for standard pickup trucks of 17 miles per gallon (EPA 2013). Again, this is likely an overestimation as more efficient vehicles may be occasionally used.

Up to 30 construction workers would work on the hatchery facilities during the construction period. For purposes of estimation, these construction workers are assumed to be traveling from Yakima (80 miles roundtrip).

Tribal staff would travel to the MRS hatchery for various purposes, such as road inspection, work inspection, staff meetings, and environmental compliance monitoring. One staff member in Cle Elum (50 miles roundtrip) would be on site approximately 5 days a week during the 16.5 month-long construction period; two other staff members, one in Ellensburg (10 miles roundtrip) and one in the Tri-Cities (200 miles roundtrip) would travel on average once a week to the hatchery site.

Fuel consumption and greenhouse gas emissions would also result from operation of on-site heavy construction equipment. Heavy construction equipment may include bulldozers, excavators, vibratory rollers, dump trucks, forklifts, and cranes.

Greenhouse gas emissions associated with equipment operation were overestimated to account for all potential construction activities and associated material deliveries to and from the construction site. Although it is difficult to develop an accurate estimation of total fuel consumption associated with heavy construction equipment operation, the following assumptions were used:

- A maximum of 6 pieces of equipment would be in operation during construction.
- The average size of the equipment would not exceed 250 horsepower. All equipment would operate at maximum power for 8 hours per day and 5 days per week throughout the construction phase. This is an overestimation because equipment commonly operates in idle or at reduced power.
- Equipment would operate at approximately 35% efficiency, representing the percentage of productive energy extracted from the diesel fuel relative to the maximum potential energy within the fuel (i.e., 128,450 British thermal units per gallon of diesel) (AFDC 2013).

Operation

Normal hatchery operations would include three on-site employees who would live on the property and would therefore not need to drive to and from the hatchery. It is assumed that hatchery employees would drive off-site once per day for supplies (10 miles round trip to Ellensburg). Coho releases would occur in various tributaries over the course of the year. It is assumed that direct releases of juvenile parr would occur at approximately 10 tributaries a year. These outplantings would occur once a year, and would require approximately three trucks driving an average of 100 miles roundtrip. Mobile acclimation of smolts would be used at approximately five tributaries per year (assumed 100 miles roundtrip from the hatchery). Initially, three trucks would be needed to install the unit, followed by one staff member visiting each mobile acclimation unit twice a day over the 4-6 week period of acclimation. Because this staff member is able to visit multiple units without going back to the hatchery after each visit, it is assumed that to visit each of the mobile acclimation units twice daily would require 200 miles of driving per day.

Detailed Results

The greenhouse gas emissions, or storage loss, are quantified below for each type of activity described above.

Construction Emissions

Table F-1 displays the results of calculations for the construction activities that would contribute to greenhouse gas emissions. Construction of the Hatchery would result in an estimated 3,073.2 metric tons of CO2e[7] emissions for the 16.5-month construction period, or 2,235.1 metric tons of CO2e in the first year of construction.

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[7] CO_2e is a unit of measure used by the Intergovernmental Panel on Climate Change that takes into account the global warming potential of each of the emitted greenhouse gases using global warming potential factors. See Table F-1.

Table F-1. Estimated Greenhouse Gas Emissions from Construction Activities

Estimated Greenhouse Gas Emissions from Construction Activities	CO_2 (metric tons)	CH_4 (CO_2e)[a,b] (metric tons)	N2O (CO_2e)[b] (metric tons)	Total CO_2e (metric tons)c
Construction transportation	89.7	72.5	337.5	**499.7**
Tribal employee transportation	0.4	0.3	1.4	**2.1**
Construction equipment operation	2,479.5	3.1	15.9	**2,498.5**
Total[c]	**2,582.6**	**86.5**	**404.0**	**3,073.2**

Notes:
CO_2 = carbon dioxide
CH_4 = methane
N_2O = nitrous oxide
CO_2e = units of equivalent carbon dioxide

[a] Carbon dioxide emissions factors calculated from The Climate Registry (2014).

[b] Methane and nitrous oxide emissions have been converted into units of equivalent carbon dioxide (CO2e) using the Intergovernmental Panel on Climate Change global warming potential (GWP) factors of 25 GWP for methane and 298 GWP for nitrous oxide (The Climate Registry 2014).

[c] The sum of the individual entries may not sum to the total depicted due to rounding.

Operation Emissions

Table F-2 displays the contribution to greenhouse gas emissions that would result from operation of the new hatchery and weir facilities through the life of the Hatchery (assumed 50 years). Facility operation would result in an estimated 42.9 metric tons of CO2e emissions annually.

Table F-2. Estimated Greenhouse Gas Emissions from Operation of New Hatchery, Acclimation, and Release Activities

Type of Activity	CO_2 (metric tons)	CH_4 (CO_2e) (metric tons)	N_2O (CO_2e) (metric tons)	Total CO_2e (metric tons)[a]
Worker supply runs	95.3	30.1	358.9	**484.4**
Parr releases	78.4	24.8	295.0	**398.1**
Smolt acclimation installation	39.2	12.4	147.5	**199.1**
Smolt acclimation operations and releases	209.0	66.0	786.7	**1,061.7**
Total[a]	**421.9**	**133.2**	**1,588.2**	**2,143.3**

Notes:
CO_2 = carbon dioxide
CH_4 = methane
N_2O = nitrous oxide
CO_2e = units of equivalent carbon dioxide
[a] The sum of the individual entries may not sum to the total depicted due to rounding.

References

AFDC (Alternative Fuels Data Center)

2013 Alternative Fuels Data Center – Fuel Properties Comparison. Website. Available: http://www.afdc.energy.gov/fuels/fuel_comparison_chart.pdf. Accessed: August 23, 2016.

The Climate Registry

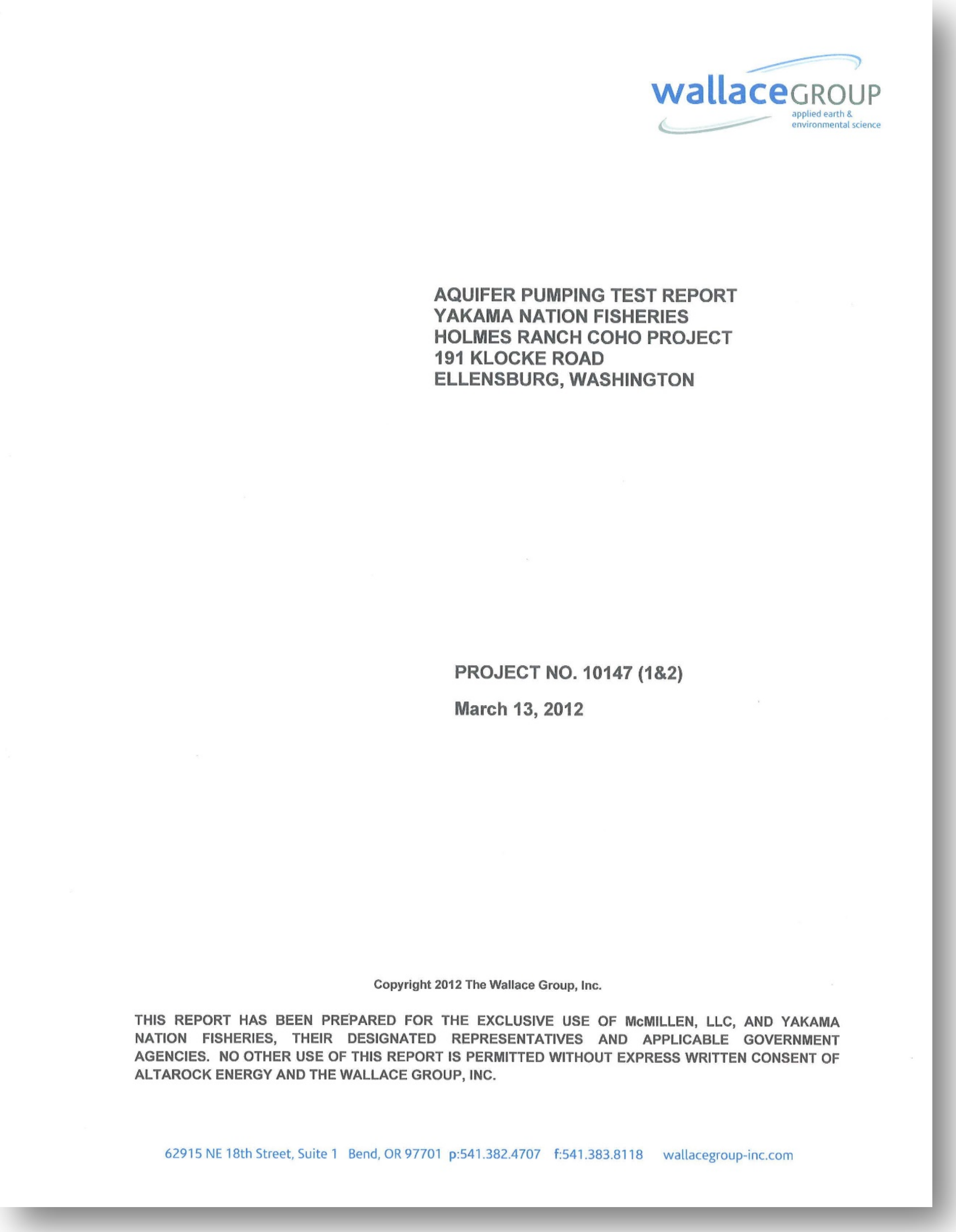
2014 Table 12.1, U.S. Default Factors for Calculating CO2 Emissions from Fossil Fuel and Biomass Combustion, 2014 Climate Registry Default Emission Factors. Released April 11, 2014. Available: http://www.theclimateregistry.org/wp-content/uploads/2014/11/2014-Climate-Registry-Default-Emissions-Factors.pdf. Accessed: August 23, 2016.

EPA (U.S. Environmental Protection Agency)

2013 Model year 2013. Fuel Economy Guide. Available: https://www.fueleconomy.gov/feg/pdfs/guides/FEG2013.pdf. Accessed: August 23, 2016.

Appendix G. Aquifer Pumping Test Reports and Well Drawdown Alternatives Analysis

G1. Aquifer Pumping Test Report 2012



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AQUIFER PUMPING TEST REPORT
YAKAMA NATION FISHERIES
HOLMES RANCH COHO PROJECT
191 KLOCKE ROAD
ELLENSBURG, WASHINGTON

PROJECT NO. 10147 (1&2)

March 13, 2012

THIS REPORT HAS BEEN PREPARED FOR THE EXCLUSIVE USE OF McMILLEN, LLC, AND YAKAMA NATION FISHERIES, THEIR DESIGNATED REPRESENTATIVES AND APPLICABLE GOVERNMENT AGENCIES. NO OTHER USE OF THIS REPORT IS PERMITTED WITHOUT EXPRESS WRITTEN CONSENT OF ALTAROCK ENERGY AND THE WALLACE GROUP, INC.

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AQUIFER PUMPING TEST REPORT
YAKAMA NATION FISHERIES
HOLMES RANCH COHO PROJECT
191 KLOCKE ROAD
ELLENSBURG, WASHINGTON

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APPENDICES

1.0 INTRODUCTION

1.1 GENERAL

On behalf of Yakama Nation Fisheries, Wallace Group, Inc. was retained by McMillen, LLC to drill and install three (3) test/observation wells, and conduct initial aquifer pumping tests for a perspective salmon hatchery along the east bank of the Yakima River at 191 Klocke Road in Ellensburg, Washington (Figure 1). The property is owned by the Yakama Indian Nation and the project is referred to as the Holmes Ranch Coho Project. Wallace Group's work was performed to support hatchery design and planning efforts and provide an initial assessment of groundwater resource availability at the site. This report summarizes background information, well installation, test procedures, and results of two (2) aquifer pumping tests performed on September 30, 2011 and February 14-17, 2012. The September 2011 pumping test coincided with irrigation season while the February 2012 pumping test was performed during the winter, non-irrigation season.

1.2 PROJECT BACKGROUND

The property was recently acquired by the Yakama Indian Nation from the Holmes family and is located within the floodplain of the Yakima River. The Holmes Ranch Coho Project site includes approximately ten (10) acres of undeveloped pasture land between Klocke Road and a side channel of the river where Coho Salmon naturally congregate to spawn. Preliminary hatchery design includes ponds and tanks with water supplied from both surface and groundwater. We understand the tribe has up to 3.2 cubic feet per second (cfs) of Yakima River surface water rights that can be converted to groundwater rights. Preliminary annual water requirements for the hatchery vary by season based on fish development stages, and include months where there will be very little groundwater demand (March-May); lower use winter months (November-February) with groundwater flow requirements of 60 to 100 gallons per minute (gpm); and heavy groundwater use from June-October when continuous flows averaging 450 gpm, with a peak of 975 gpm in July (2.2 cfs) will be required.

1.3 SCOPE OF WORK

The scope of work for aquifer analysis at the Holmes Ranch Coho Project included the following tasks:

- *Pumping/Observation Well Installation:* One (1) eight-inch diameter pumping well and two (2) two-inch diameter observation wells were drilled and installed in the northeast portion of the site between September 26-29, 2011.
- *Irrigation Season Step-Drawdown Pumping Test:* After well completion, the pumping well (PW-1) was pumped at three rates or "steps" (50, 105 and 125 gpm) while monitoring drawdown in the pumping and two observation wells (OW-1 and OW-2). A total of approximately 63,600 gallons of water was pumped over a ten hour period on September 30, 2011. After completing the pumping phase of the test, water level data was collected in the pumping well and one observation well (OW-1) to monitor aquifer recovery.
- *Non-Irrigation Season Step-Drawdown Pumping Test:* Between February 14-17, 2012, PW-1 was pumped at three rates or "steps" (95, 100 and 110 gpm) while monitoring drawdown in the pumping and two observation wells. A total of approximately 443,000 gallons of water was pumped over 72 hours from the pumping well. After completing the pumping phase of the test, water level data was collected in the pumping and both observation wells to monitor aquifer recovery.
- *Groundwater Monitoring and Sampling:* During both pumping tests, periodic water quality samples were collected from pumping well PW-1. Samples were monitored in the field for pH, temperature, and conductivity. Groundwater samples were also collected just prior to termination of pumping. The samples were submitted to accredited laboratories for analytical testing.
- *Analysis and Reporting:* Based upon our research and knowledge of hydrogeologic conditions in the Yakima River basin and the water level data derived from pumping and recovery monitoring, Wallace Group and Aegis Groundwater Consulting prepared this Aquifer Pumping Test Report which includes a summary of field activities, a discussion of the geologic setting, analysis and discussion of aquifer/well testing, conclusions and recommendations.

2.0 GEOLOGIC SETTING

The Holmes Ranch Coho Project is located in the Yakima River basin of south-central Washington. The Yakima basin encompasses approximately 6,200 square miles and the headwaters are on the upper, eastern slope of the Cascade Range where mean annual precipitation is over 120 inches. The basin terminates at the confluence of the Yakima and Columbia Rivers in an arid region that receives less than 6 inches of annual precipitation.

The Yakima River basin is located along the western margin of the Columbia Plateau and contains the Yakima Fold Belt sub-province. As the name implies, this sub-province is highly folded and faulted and is underlain by various consolidated rock assemblages ranging from Precambrian to Tertiary age, and unconsolidated sediments and volcanic rocks of Quaternary age. Yakima River basin lowlands are underlain by unconsolidated and weakly consolidated valley-fill comprising glacial, glaciofluvial, lacustrine, and alluvium deposits that in places exceed 1,000 feet in thickness (Drost and others, 1990). The valley-fill deposits were eroded from the Cascade Range and from east-west trending anticlinal ridges that developed due to buckling of the underlying Columbia River Basalt Group (CRBG) during mid-to-late Miocene time. Most of these deposits are included in the Ellensburg Formation which underlies, intercalates, and overlies the basalts along the western edge of the basin and accounts for most of the unconsolidated deposits within the basin (Vaccaro, 2011).

Valley-fill deposits and the underlying basalt flows of the CRBG form important aquifers within the Yakima River basin. Groundwater underlying the Holmes Ranch Coho Project area is hosted in near-surface, unconsolidated alluvial deposits under unconfined/semi-confined conditions. The groundwater zone penetrated by wells at Holmes Ranch includes well-graded, sand, gravel and cobble deposits to a depth of approximately 30 feet. Below 30 feet, the alluvium contains significantly higher percentages of silt and clay particles and does not readily transmit water. Deeper Ellensburg Formation and CRBG basalt aquifers are also present beneath Holmes Ranch; however, these aquifers are generally found in excess of 300 feet below ground surface (bgs) and are not groundwater production targets for the Holmes Ranch Coho Project.

It appears the shallow aquifer beneath the Holmes Ranch site receives recharge from precipitation infiltration and seasonal irrigation canal leakage. Based upon seepage investigations conducted by others (Vaccaro, 2011) and higher groundwater levels measured in the pumping and observation wells relative to river and side channel surface water levels, it appears this reach of the Yakima River receives discharge from groundwater and can be characterized as a "gaining reach." The groundwater flow direction is interpreted to be to the south-southwest, parallel to and toward the river.

3.0 AQUIFER TESTING PROCEDURES

3.1 WELL INSTALLATION

Between September 26-29, 2011, one (1) pumping well (PW-1) and two (2) observation wells (OW-1 and OW-2) were drilled and constructed at the Holmes Ranch site by Richardson Well Drilling of Tacoma, Washington. The wells are located in the northeast portion of the site at an elevation of approximately 1,595 feet above sea level in the NE ¼ of the NE ¼ of Section 19, T.18N, R.18E, Willamette Meridian. Well locations are shown on Figures 1 and 2. Well logs and Washington Department of Ecology Water Well Reports are included for reference in Appendix A.

Pumping well PW-1 (BHJ 060) was drilled to a total depth of 29 feet bgs and completed at a depth of 26 feet bgs. Well PW-1 is constructed of 8-inch diameter welded steel liner from +2.5 to 21 feet, and 0.060-inch slotted, stainless steel well screen from 21 to 26 feet bgs. The background "static" water level was 0.7 feet bgs prior to the start of the pumping test on September 30th.

Observation well OW-1 (BHJ062) is located approximately 50 feet southwest of PW-1 and is completed to a depth of 30 feet bgs. The OW-1 boring was drilled to a depth of 80 feet, however, the boring encountered silty-to-clayey sand and gravel below approximately 29 feet. Formation samples increase from less than ten percent passing a #40 sieve (0.42 mm) at 20 to 25 feet bgs to over 62 percent passing a #40 sieve in a sample collect at 29 feet bgs (Appendix B). Therefore, OW-1 was constructed in the coarser, more permeable alluvium within 30 feet of ground surface. Well OW-1 is constructed of 2-inch diameter PVC pipe from just below ground surface to 30 feet. This well includes 0.020-inch slotted PVC casing from 5 to 30 feet bgs. The background water level in OW-1 prior to the start of pumping on September 30th was approximately 0.7 feet bgs.

A second observation well OW-2 (BHJ063) is located approximately 20 feet north of PW-1 and is completed to a depth of 29 feet bgs. Well OW-2 is constructed of 2-inch diameter PVC pipe from just below ground surface to 29 feet. This well includes 0.020-inch slotted PVC casing from 4 to 29 feet bgs. The background water level in OW-2 prior to the start of pumping on September 30th was approximately 0.7 feet bgs.

Table 1 presents well construction and background "static" water level information as measured on September 30, 2011.

Table 1 Well Details
Holmes Ranch Coho Project
Ellensburg, Washington

Well ID	Approximate Ground Elevation (ft. above MSL)	Casing Diameter & Type	Screen Interval (slot size in inches and ft. bgs)	Total Well Depth (ft.)	Static Groundwater Level (ft. bgs)
PW-1	1,595	8" Steel	0.060-inch 21-26	26	0.7
OW-1	1,595	2" PVC	0.020-inch 5-30	30	0.7
OW-2	1,595	2" PVC	0.020-inch 4-29	29	0.7

Notes
Groundwater levels based on pre-test "background" monitoring (September 30, 2011)
ft. bgs – feet below ground surface
ft. MSL – feet above mean sea level

3.2 WELL EQUIPMENT AND INSTRUMENTATION

Pressure transducers and data-loggers were installed in the pumping and observation wells to monitor the pre-test "background" groundwater level in PW-1, in addition to groundwater levels while pumping PW-1. Wells OW-1 and OW-2 functioned as observation wells to record pumping-induced water level drawdown during the tests. The water level data presented in this report is correlated to feet of drawdown below background or "static" water levels in the various pumping test plots (Appendices C, D and E).

3.2.1 IRRIGATION SEASON TEST

Well PW-1 was equipped with a 5 hp submersible pump for the September 2011 pumping test. Well PW-1 was pumped at three increasing rates or "steps" (50, 105 and 125 gpm) over a 10-hour period on September 30, 2011. The pump was connected to 300 feet of fire hose that transported discharge water down-gradient (south) of the pumping well to the south-central portion of the Holmes Ranch property. After pumping, water level data was collected until water levels recovered to within ten (10) percent of their pre-pumping levels to monitor aquifer recovery. Due to equipment malfunction, recovery data from OW-2 was not obtained.

3.2.2 NON-IRRIGATION SEASON TEST

Well PW-1 was equipped with a larger, 15 hp submersible pump for the February 2012 pumping test. One objective of the February 2012 pumping test was to pump PW-1 at a higher, sustained rate than the September 2011 pumping test. Unfortunately, excessive drawdown within PW-1 limited the pumping rates to three increasing steps of 95, 100 and 110 gpm over a 72-hour period between February 14 and 17, 2012. The pump was connected to 400 feet of 4-inch diameter irrigation pipe that transported discharge water down-gradient (south) of the pumping well to the south-central portion of the Holmes Ranch property. After pumping, water level data was collected until water levels recovered to within ten (10) percent of their pre-pumping levels to monitor aquifer recovery.

3.3 WATER QUALITY SAMPLING

During pumping, water quality samples were collected and monitored in the field for pH, temperature, and conductivity. One set of samples was also collected for laboratory analyses prior to the end of each pumping test. Laboratory analyses included inorganics, metals, nitrate, and several other general water quality parameters.

4.0 FINDINGS

4.1 BACKGROUND WATER LEVELS

4.1.1 IRRIGATION SEASON

Background water level monitoring was conducted in PW-1 over an approximate 14-hour period prior to the start of pumping on September 29-30, 2011. The depth to groundwater in PW-1 was 0.67 feet bgs. The background water level in PW-1 decreased slightly (0.03 feet) over the 14-hour monitoring period (Figure C-1 in Appendix C), however, the background monitoring data reflect relatively minor, temporal variations in groundwater levels attributed to normal barometric pressure changes in the Ellensburg area. Observation well background water levels were also measured at less than one foot bgs.

4.1.2 NON-IRRIGATION SEASON

Background water level monitoring was conducted in PW-1 over an approximate 14.5-hour period (February 13-14, 2012) prior to the start of pumping. The depth to groundwater in PW-1 was 2.1 feet bgs, which represents a decrease of approximately 1.4 feet compared to the irrigation season background water level. Background water levels in the observation wells also experienced similar declines. The background water level in PW-1 decreased slightly (0.02 feet) over the 14.5-hour monitoring period (Figure D-1 in Appendix D), however, similar to September 2011 background water level data, the minor variations are attributed to normal barometric pressure changes in the Ellensburg area.

4.2 STEP-DRAWDOWN PUMPING TESTS

4.2.1 IRRIGATION SEASON TEST

A step-drawdown pumping test for well PW-1 was conducted on September 30, 2011. The initial 50 gpm step (step 1) began at 08:00 hours and within the first 15 minutes experienced some erratic pump behavior due to freezing overnight conditions and ice build-up in the discharge hose. The mechanical problems were remedied and step 1 pumping continued for a total of 120 minutes. The pumping rate was increased to 105 gpm and step 2 began at 10:00 hours and ended at noon (12:00 hours). At the conclusion of step 2, the pumping rate was increased to the pump capacity of 125 gpm. The final pumping step (step 3) began at 12:00 hours and ended at 18:00 hours after pumping for 360 minutes. The total elapsed pumping time was approximately 600 minutes (10 hours).

Pumping at 50 gpm, showed a near-instantaneous water level drawdown of approximately 0.6 feet, and exhibited a relatively "flat" pumping curve (less than 0.1 foot of additional drawdown) after 120 minutes. Water level data from pumping step 2, at 105 gpm, reflects an additional 1.4 feet of drawdown within one minute of increasing the pumping rate. Pumping continued at 105 gpm for 120 minutes with no additional drawdown observed at the end of step 2. The pumping rate for step 3 was increased to 125 gpm and resulted in 0.5 feet of additional drawdown within two minutes of increasing the pumping rate. Pumping continued at 125 gpm for 360 minutes with about 0.2 feet of additional drawdown at the end of pumping. The total drawdown in pumping well PW-1 was 2.7 feet at the conclusion of pumping. Recovery data indicates water levels returned to within 0.1 feet of the pre-test level within three minutes of pump shutdown. Pumping Well PW-1 drawdown and recovery data is presented in Appendix C on Figure C-2.

Aegis Groundwater Consulting, LLC, provided analysis and review of the aquifer pumping test data and prepared a series of technical data plots which are included for reference in Appendix F.

4.2.2 NON-IRRIGATION SEASON TEST

A longer duration step-drawdown pumping test was performed over a 72-hour period between February 14 and 17, 2012. The initial pumping rate was set at approximately 150 gpm and resulted in excessive drawdown below the submersible pump intake within the first minute of pumping. Pumping was terminated and water levels recovered to the pre-test level within one minute. The pump was re-started at 07:48 hours at a reduced pumping rate of 95 gpm (step 1). Pumping water levels fluctuated between approximately 10.5 and 11.0 feet of drawdown during the first 3 hours. Pumping water levels rose slightly after 3 hours (0.5 to 1.0 feet) and remained at approximately 9.5 to 10.0 feet of drawdown for 6 hours. After approximately 9 hours of pumping, step 1 water levels lowered once again to approximately 10.5 to 11.0 feet of drawdown and remained at this level until the end of step 1 (603 minutes or 10.1 hours).

The pumping rate was increased to 100 gpm and step 2 began at 17:50 hours on February 14th and ended at 05:46 hours on February 15th (715 minutes or 11.9 hours). The increased step 2 pumping rate resulted in an immediate water level drop of approximately 1 foot to 12.0 feet of drawdown. The pumping water level remained at approximately 12.0 feet of drawdown for 3 hours when, similar to step 1, it began to rise. The pumping water level steadily rose over the next 4 hours to approximately 10.9

feet of drawdown before falling back to 12.0 feet of drawdown at the end of step 2. At the conclusion of step 2, the pumping rate was increased to the maximum pumping rate (110 gpm) that maintained pumping water levels above the transducer and pump intake. The final pumping step (step 3) began at 05:46 hours on February 15th and ended at 07:46 hours after pumping for 3,000 minutes (50 hours). The pumping water levels observed during step 3 fluctuated from approximately 12.7 to 13.5 feet of drawdown, but remained in this "relatively flat" range for the duration of step 3 pumping. The total elapsed pumping time for steps 1-3 was 4,320 minutes (72 hours). Recovery data indicates water levels returned to within 0.1 feet of the pre-test level within one (1) minute of pump shutdown. Pumping Well PW-1 drawdown and recovery data is presented on Figure D-2.

The delayed response (increase) in water levels observed after approximately 3 hours of pumping during steps 1 and 2 represents "delayed yield" as water slowly drains from the geologic strata above the cone of depression that develops during pumping. Delayed yield is not unusual in unconfined alluvial aquifers and is reflected by the parabolic shape of the step 1 and step 2 pumping curves (Figure D-2 in Appendix D).

4.3 OBSERVATION WELLS

Water levels were monitored in observation wells OW-1 and OW-2 during both pumping tests. The wells are located 50 feet (OW-1) and 20 feet (OW-2) from pumping well PW-1 (Figure 2).

4.3.1 IRRIGATION SEASON TEST

As shown on Figures C-3 and C-4 in Appendix C, very rapid water level declines were recorded in both observation wells in response to changes in pumping rates. Despite the difference in lateral distance from PW-1, both observation well experienced similar pumping-induced response times and drawdown. Total drawdown in both observation wells was less than 0.4 feet after 10 hours of pumping.

4.3.2 NON-IRRIGATION SEASON TEST

As shown on Figures D-3 and D-4 in Appendix D, rapid water level declines were also recorded in both observation wells in response to changes in pumping rates during the non-irrigation season test. Despite the difference in lateral distance from PW-1, both observation well experienced similar pumping-induced response times and drawdown. Total drawdown in both observation wells was less than 0.5 feet after 72 hours of pumping.

4.4 RECOVERY MONITORING

4.4.1 IRRIGATION SEASON TEST

Water level recovery was monitored in PW-1 and OW-1 after the pump was shut-down. The recovery was very rapid with water levels recovering to within 0.1 feet of pre-test levels within 5 minutes of pump shut-down. The recovery data is reflected in the far right side of the pumping test plots for PW-1 and OW-1 (Appendix C, Figures C-2 and C-3, respectively).

4.4.2 NON-IRRIGATION SEASON TEST

Water level recovery was monitored in PW-1 and both observations wells after the pump was shut-down. The recovery was very rapid with water levels recovering to within 0.1 feet of pre-test levels within 3 minutes of pump shut-down. The recovery data is reflected in the far right side of the pumping test plots for PW-1, OW-1 and OW-2 (Appendix D, Figures D-2, D-3 and D-4, respectively).

4.5 WATER QUALITY DATA

General groundwater parameters including temperature, pH and conductivity were periodically monitored in the field during both pumping tests. For the September 2011 (irrigation season) pumping test, the groundwater temperatures ranged from 58 to 59° F (Fahrenheit), the mean pH was 7.4, and conductivity was relatively consistent at 105 to 109 μS/cm (microsiemen/centimeter). A groundwater sample was collected shortly before the conclusion of pumping and submitted to Umpqua Research Company for general water chemistry analysis. The laboratory report and chain-of-custody documentation issued by Umpqua Research Company is included for reference in Appendix E.

Field groundwater parameters from the February 2012 (non-irrigation season) pumping test, yielded very consistent groundwater temperatures of 48 to 49° F, the mean pH was 6.6, and conductivity ranged from 99 to 107 μS/cm. A groundwater sample was collected after approximately 50 hours of pumping and submitted to Test America for general water chemistry analysis. The laboratory report and chain-of-custody documentation issued by Test America is also included for reference in Appendix E.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The irrigation and non-irrigation season pumping tests performed at the Holmes Ranch Coho Project yielded valid data for aquifer and well analysis. The aquifer is comprised of well-graded sand and gravel alluvium of the Yakima River floodplain and is less than 30 feet thick. The groundwater drawdown and recovery data from both tests did not indicate the presence of readily apparent boundary conditions in the aquifer; however, the data are indicative of a shallow, relatively thin, and highly transmissive aquifer that is heavily-influenced by surface/irrigation water.

Irrigation Season Pumping Test

From the September 2011 (irrigation season) pumping test, logarithmic trend lines were applied to drawdown data from the three pumping rate curves (Appendix F, Figure 1). At a pumping rate of 125 gpm, the extrapolated drawdown for PW-1 over a 30-day period (43,500 minutes of pumping) is approximately 3.5 feet (Appendix F, Figure 2). The specific capacity (S_c) for well PW-1 is estimated to be 47.2 gallons per minute/foot of drawdown (gpm/ft.) (Appendix F, Figure 3). The well efficiency for PW-1 is the measured drawdown in the pumping well (0.65 feet at 100 minutes of pumping) divided by the projected drawdown (0.75 feet based on extrapolation), which yields a value of 0.86 or 86% efficiency (Appendix F, Figure 4).

Transmissivity (T) is the rate at which the aquifer can transmit water through a unit width of the aquifer under a unit hydraulic gradient and is commonly reported in gallons per day per foot (gal./day/ft.) or in square feet/day (ft.^{2}/day). We calculated T for the aquifer by applying PW-1 data from pumping step 3 of the September 2011 test to a variation of the Theis equation ($T=264Q/s$) where Q is discharge in gpm and s is drawdown in feet-per-log cycle of time (Driscoll, 1989). An extrapolated semi-log plot of drawdown vs. pumping time is shown in Appendix F, Figure 2. Drawdown s was obtained from the best-fit line associated with the 125 gpm pumping rate from the portion of the semi-log plot between 100 and 1,000 minutes (one log cycle). The resulting T for the aquifer is 8.25×10^4 gal./day/ft. (or 1.10×10^4 ft.^{2}/day). This correlates reasonably well with T calculations for PW-1 and the observation wells using the Cooper & Jacob method where T ranged from 5.59×10^4 to 4.29×10^5 gal./day/ft. (or 7.47×10^3 to 5.74×10^4 ft.^{2}/day) (Appendix F, Figures 1-2). Transmissivities greater than 1.0×10^5 gal./day/ft. (or 1.34×10^4 ft.^{2}/day) represent “good” aquifers and are targets for water well exploitation (Freeze and Cheery, 1979).

Hydraulic conductivity (K) is the capacity of a porous medium to transmit water and is commonly reported in feet/day (ft./day). The Cooper & Jacob method was also used to estimate K based upon test data from pumping steps 1-3. The resulting K range for the aquifer is 1.86 x 10^3 to 1.43 x 10^4 gal./day/ft.^{2}) or 249 to 1,915 ft./day (Appendix E, Figures 1-2). The variation in K values between the pumping and observation wells suggest that there is lateral and vertical variability in the geologic materials that comprise the shallow aquifer beneath the site. This is also evidenced by the aquifer's gradational characteristics reflected in the sieve analyses. Lateral and vertical variability is common in buried stream channel deposits formed in similar fluvial environments around the U.S.

The specific yield (equivalent to storativity in an unconfined aquifer) ranged from 1.66 x 10^{-4} to 1.33 x 10^{-2} (dimensionless) based on data from the two observation wells. Specific yield/storativity calculations are not valid in a pumping well. The specific yield/storativity values are consistent with unconfined aquifers; however, the variability also underscores the potential for significant lateral variability in the aquifer.

The background water level in PW-1 was measured at approximately 0.67 feet bgs prior to pumping. This equates to approximately 20 feet of available drawdown in PW-1 (assuming a 5-foot buffer with the pump set at the bottom of the 26 foot deep well). The long-term drawdown trend (Appendix F, Figure 2) at 125 gpm, suggests that well PW-1 could be pumped at this rate for 60 days (86,400 minutes) with less than 4 feet of total drawdown, assuming conditions (pumping rate, recharge, geologic uniformity) observed during this pumping test remain unchanged. PW-1 is constructed of 8-inch diameter steel casing with a 5-foot section of 0.060-inch stainless steel well screen at the bottom of the well (21 to 26 feet bgs). Under optimal conditions with a groundwater entrance velocity of 0.1 feet/second (ft./sec.), well PW-1, as constructed, is capable of pumping up to approximately 210 gpm. Additional capacity may be obtained by increasing the screen section of other wells installed in this alluvial aquifer, however, additional pumping tests should be conducted in order to further assess drawdown at higher pumping rates and potential aquifer boundary conditions.

Non-Irrigation Season Pumping Test

The non-irrigation season pumping test was performed over a 72-hour period between February 14 and 17, 2012. The third and final incremental pumping step was run at a maximum discharge rate of approximately 110 gpm for 50 hours, with a maximum drawdown of 13.8 feet. Prior to the start of pumping, background water levels were approximately 1.5 feet lower compared to water levels measured before the September 2011 pumping test. The total drawdown after 72 hours was over 10 feet lower than the pumping water level observed during the irrigation season test after 10 hours of pumping at between 50 and 125 gpm.

The extrapolated drawdown for PW-1 over a 30-day, non-irrigation season period does not appear to exceed 14 feet, however, the S_c for well PW-1 decreased significantly from 47.2 gpm/ft. to 8.3 gpm/ft. between irrigation and non-irrigation seasons. In addition, during steps 1 and 2 of the non-irrigation season test the characteristic parabolic curve associated with "delayed yield" was observed. Delayed yield is the slow drainage of partially-dewatered material immediately above the cone of depression generated during a pumping test. This phenomena is significant because delayed yield was not observed during the irrigation season pumping test and is an indicator of irrigation recharge affects on the aquifer. The rapid recovery at the conclusion of pumping in both tests also suggests that the near-surface aquifer is relatively shallow and comprised of highly transmissive materials.

Pumping Test Comparison

The factor most likely responsible for the significant difference between seasonal pumping test results is attributed to surface water (irrigation) recharging the shallow alluvial aquifer underlying the Holmes Ranch Coho Project site. Pumping well drawdown during the September 2011 test was likely muted as a result of irrigation recharge, while the February 2012 drawdown and dynamic (pumping) water level fluctuations were more likely indicative of actual conditions within the shallow alluvial aquifer. The absence of significant drawdown, delayed yield, and the relative stability of dynamic water levels during the irrigation season pumping test supports the hypothesis of recharge masking drawdown during the September 2011, irrigation season test. The effect of surface/irrigation water recharge on the aquifer is also indicated by groundwater temperature variations between irrigation (58-59° F) and non-irrigation (48-49° F) seasons.

It is important to note that subsurface geologic conditions at the site are variable (both laterally and vertically) and this variability will have a direct effect on the recharge rate and storage capacity of this relatively thin (less than 30 feet), highly transmissive alluvial aquifer. The aquifer's limited thickness makes it sensitive to recharge and storage. The significant increase in drawdown observed in the non-irrigation season pumping test underscores the need to understand the lateral extent and varying aquifer thickness as these physical conditions will control water availability (i.e. storage) for proposed Holmes Ranch Coho Project operations. Furthermore, understanding the general configuration of the aquifer will aid future decision-making with regard to vertical vs. horizontal wells, well location, pumping rates, and pumping duration.

Recommendations

Prolonged pumping from a single, vertical well at 110 gpm, or higher, may not be sustainable and additional vertical or horizontal collection (Ranney-type) wells will be required to provide system redundancy and to meet the seasonal groundwater flow requirements for the Holmes Ranch Coho Project. Target location(s) for additional groundwater production are to the west between the existing pumping well (PW-1) and the side channel where there is greater potential to induce flow (recharge) from the river.

We recommend additional subsurface characterization of alluvial materials within 30 feet of existing surface grades, seasonal surface and groundwater level monitoring, and supplemental well installation and testing to assess the lateral and vertical variability within the shallow aquifer, and it's ability to sustain adequate production capacity over the duration of the facility's pumping season. Additional site characterization and analyses should include:

- Subsurface Geophysical Survey (shallow electrical resistivity methods) to assess the lateral extent of the near-surface alluvial aquifer across the site
- Subsequent geotechnical drilling to obtain formation samples and verify aquifer thicknesses, in support of the geophysical survey
- Installation of at least one additional pumping well (10-12 inch diameter) to assess both individual well and combined pumping effects relative to anticipated long-term groundwater requirements
- Pumping test of the proposed second supply well, along with simultaneous pumping of PW-1, with concurrent observation well and river level monitoring, and water quality analyses.

Wallace Group is available to discuss these recommendations and to prepare a work plan, schedule and cost estimate for additional work, upon request.

6.0 LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of our profession practicing in the same locality, under similar conditions and at the date the services are provided. Our findings, conclusions and recommendations are based on information provided by McMillen (Client) and a limited number of field observations and related data. It is possible that conditions could vary between or beyond the points explored or data evaluated. Wallace Group makes no other representation, guarantee or warranty, express or implied, regarding the services, communication (oral or written), report, opinion or instrument of service provided.

This report may be used only by McMillen, Yakama Nation Fisheries and applicable regulatory agencies, only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two (2) years from the date of the report. Use of this report beyond a two-year period will require a review by Wallace Group to evaluate the report's applicability to the current project and any changed site conditions.

7.0 REFERENCES

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G2. Aquifer Pumping Test Report 2016

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environmental science

AQUIFER PUMPING TEST REPORT
M.R. SAMPSON COHO HATCHERY
191 KLOCKE ROAD
ELLENSBURG, WASHINGTON

PROJECT NO. 10632 (3)

November 8, 2016

THIS REPORT HAS BEEN PREPARED FOR THE EXCLUSIVE USE OF McMILLEN JACOBS ASSOCIATES, YAKAMA NATION FISHERIES, BPA, THEIR DESIGNATED REPRESENTATIVES AND APPLICABLE GOVERNMENT AGENCIES. NO OTHER USE OF THIS REPORT IS PERMITTED WITHOUT EXPRESS WRITTEN CONSENT OF THE WALLACE GROUP, INC.

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AQUIFER PUMPING TEST REPORT
M.R. SAMPSON COHO HATCHERY
191 KLOCKE ROAD
ELLENSBURG, WASHINGTON

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1.0 INTRODUCTION

1.1 GENERAL

Wallace Group, Inc., as a member of the McMillen Jacobs EPC team, was commissioned by Yakama Nation Fisheries and the Bonneville Power Administration (BPA) to install groundwater wells and conduct aquifer pumping tests for a proposed salmon hatchery along the east bank of the Yakima River in Kittitas County, Washington. The proposed hatchery site is owned by Yakama Nation Fisheries and the project is referred to as the Melvin R. Sampson (MRS) Coho Hatchery. The site address is 191 Klocke Road, in Ellensburg, Washington (Figure 1). The groundwater data and recommendations presented in this report are intended to support McMillen Jacobs facility planning and design work. This report summarizes background information, well installation, test procedures, field and laboratory water quality data, and the results of two aquifer pumping tests performed over a four-day period between August 18 and 21, 2016.

1.2 PROJECT BACKGROUND

The MRS Hatchery property was formerly the Holmes Ranch and encompasses approximately 50-acres of land within the floodplain of the Yakima River. Current on-site improvements include a ranch house, barn, shop, four aluminum holding tanks, a bridge over a side channel of the river, and several outbuildings that are used for Yakama Nation Fisheries operations. There are approximately eight acres of developable land on the site which includes pasture and wetlands south of the access road between Klocke Road and the side channel. The project will include a main hatchery building for incubation, early rearing and grow-out facilities, water re-use modules, broodstock holding and spawning structures, an effluent clarifier, groundwater supply/cooling systems, three new residences, a shop building, surface water diversion and pump station, and asphalt paved parking/access drive areas. The proposed hatchery improvements are shown on Figure 2, Site and Well Location Map.

Annual water requirements for the MRS Hatchery vary by season based on fish development stages, and include periods where surface water will be the primary water source and others (during irrigation season) when groundwater will be the primary water source. Based upon available Yakama Nation surface water and groundwater rights, we understand a surface water division from the Yakima River side channel will supply up to 6 cubic feet per second (cfs) during non-irrigation season (November-March). The groundwater supply system for the MRS Hatchery will be constructed in a shallow, braided stream channel aquifer approximately 30 feet thick. Based upon preliminary designs which assume a 75 percent water re-use scenario, the groundwater system must sustainably deliver between 1.66 and 2.5 cfs (747 to 1,122 gallons per minute, gpm) from March through November each year, to meet facility demands.

1.3 SCOPE OF WORK

The scope of work for this groundwater investigation at the MRS Hatchery Project included the following tasks:

- *Pumping/Observation Well Installation:* Based upon geotechnical and geophysical data previously collected at the site, one, ten-inch diameter pumping well (PW-2), and one, two-inch diameter observation well (OW-3) were drilled and installed on July 11-12 and May 11, 2016, respectively. The new wells are located within the developable area south of the main entrance road to the site (Figure 2).
- *Aquifer Pumping Tests:* Between August 18 and 21, 2016, two constant drawdown/constant flow rate aquifer pumping tests were conducted using an existing 8-inch diameter well (PW-1), the new 10-inch diameter pumping well (PW-2), and three observation wells (OW-1, OW-2 and OW-3). The first test involved pumping only PW-2 at two rates (150 and 175 gallons per minute, gpm) for a total of 15 hours: 40 minutes. The second test involved pumping PW-1 at 125 gpm and PW-2 at 140 gpm, for 42 hours: 24 minutes. After completing the pumping phase of the tests, water level data was collected in the pumping and observation wells to monitor aquifer recovery. The primary objective for the simultaneous pumping test was to assess the potential for interference between PW-1 and PW-2, while pumping, in addition to assessing the interconnectedness of the aquifer.
- *Surface water Monitoring:* Two temporary monitoring stations (YSC-1 and YSC-2) were established in the side channel of the Yakima River. YSC-1 was approximately 250 feet down-gradient of PW-2, and YSC-2 was about 600 feet upstream near a footbridge over the site channel. The monitoring locations are shown on **Figure 2**. At YSC-1, surface water level and water quality parameters were monitored at 15-minute intervals over the entire duration of both pumping tests. A surface water sample was also collected from YSC-1 on August 22, 2016, and submitted for a comprehensive suite of water quality analyses. Field water quality measurements were made at YSC-2 on October 6, 2016.

- *Groundwater Monitoring and Sampling:* During the pumping tests, field parameters (pH, conductivity, TDS and temperature) were periodically-monitored for pumping wells PW-1 and PW-2. Two groundwater sampling events were conducted for both pumping wells, and submitted for a comprehensive suite of water quality analyses. An on-site domestic well that serves the existing residence was also sampled and submitted for the same suite of water quality analyses as PW-1 and PW-2.
- *Prepare Aquifer Analysis Report:* Analyze pumping test data and prepare this Aquifer Pumping Test Report which includes a summary of field activities, water quality analyses, a discussion of the geologic/hydrogeologic setting, analysis and discussion of aquifer/well testing, conclusions and recommendations.

2.0 GEOLOGIC SETTING

The MRS Hatchery Project is located in the Yakima River basin of south-central Washington. The Yakima basin encompasses approximately 6,200 square miles and the headwaters are on the upper, eastern slope of the Cascade Range where mean annual precipitation is over 120 inches. The basin terminates at the confluence of the Yakima and Columbia Rivers in an arid region that receives less than 6 inches of annual precipitation.

The Yakima River basin is located along the western margin of the Columbia Plateau and contains the Yakima Fold Belt sub-province. As the name implies, this sub-province is highly folded and faulted and is underlain by various consolidated rock assemblages ranging from Precambrian to Tertiary age, and unconsolidated sediments and volcanic rocks of Quaternary age. Yakima River basin lowlands are underlain by unconsolidated and weakly consolidated valley-fill comprising glacial, glaciofluvial, lacustrine, and alluvium deposits that in places exceed 1,000 feet in thickness (Drost and others, 1990). The valley-fill deposits were eroded from the Cascade Range and from east-west trending anticlinal ridges that developed due to buckling of the underlying Columbia River Basalt Group (CRBG) during mid-to-late Miocene time. Most of these deposits are included in the Ellensburg Formation which underlies, intercalates, and overlies the basalts along the western edge of the basin and accounts for most of the unconsolidated deposits within the basin (Vaccaro, 2011).

Valley-fill deposits and the underlying basalt flows of the CRBG form important aquifers within the Yakima River basin. Groundwater underlying the MRS Hatchery Project area is hosted in near-surface, unconsolidated alluvial and buried stream channel deposits under unconfined/semi-confined conditions. The groundwater zone penetrated by wells at the site includes an upper well-graded, alluvial sand, gravel and cobble unit to a depth of approximately 15 feet below ground surface (bgs). Below 15 feet the alluvium contains significantly higher percentages of silt and clay particles that do not transmit water as readily as the overlying, sand and gravel strata. Geophysical studies have mapped what are interpreted to be a series of buried stream channels, in a complex depositional environment, that transect the site (Wallace Group, 2016). A very general description of this environment is that coarser, more permeable deposits of sand and gravel will be found in the stream channels themselves, while moving away from the actual channel, finer lithologies will be encountered including silty and clayey strata.

Within these relatively narrow, sinuous, buried stream channels, the highly-transmissive sand, gravel and cobble extends to depths of approximately 30 feet bgs. Underlying the buried stream channels, at depths of over 30 feet, the native soils transition to cemented gravel and cobble in a silt and clay matrix which can be characterized as an “aquitard” that does not readily transmit water. Deeper Ellensburg Formation and CRBG basalt aquifers are also present beneath the MRS Hatchery site; however, these aquifers are generally found in excess of 300 feet bgs and appear to be too warm for salmonid aquaculture purposes.

It appears the shallow aquifer beneath the MRS Hatchery site receives recharge from precipitation infiltration and seasonal irrigation canal leakage. Based upon seepage investigations conducted by others (Vaccaro, 2011) and slightly higher groundwater levels measured in the pumping and observation wells relative to river and side channel surface water levels, it appears this reach of the Yakima River receives discharge from groundwater and can be characterized as a “gaining reach.” The groundwater flow direction is interpreted to be to the south-southwest, parallel to and toward the river.

3.0 AQUIFER TESTING PROCEDURES

3.1 WELL INSTALLATION

On May 11, 2016, one observation well (OW-3) was drilled and constructed at the MRS Hatchery site by Cascade Drilling of Federal Way, Washington. On July 11-12, 2016 one pumping well (PW-2) was drilled and constructed by Richardson Well Drilling of Tacoma, Washington. PW-2 is interpreted to be underlain by braided stream channel deposits, based on previous test pits, soil borings and geophysical studies at the site. The wells are located in the southeast portion of the site at an elevation of approximately 1,584.5 feet above sea level, within the NE ¼ of the NE ¼ of Section 19, T.18N, R.18E, Willamette Meridian. Well locations are shown on **Figure 2**. Well logs and Washington Department of Ecology (WDOE) Water Well Reports are included for reference in **Appendix A**.

Pumping well PW-2 (WDOE #BJN473) is located at/near the confluence of what appear to be two buried stream channels (**Figure 3**). The well was drilled to a total depth of 36.5 feet bgs and completed at a depth of 30 feet bgs. Well PW-2 is constructed of 10-inch diameter PVC pipe from +2.3 to 15 feet bgs, and 0.050-inch slotted, stainless steel well screen from 15 to 30 feet bgs. The screen section includes an 8-16 silica sand filter pack from 9 to 30 feet bgs. A well construction variance was obtained from the Washington Department of Ecology and allowed Richardson Well Drilling to install a 9-foot, bentonite surface seal. The background "static" water level in PW-2 was 2.0 feet bgs prior to the start of the first pumping test on August 18th.

Observation well OW-3 (WDOE #BIY880) is located approximately 40 feet northwest of PW-2 and the boring was drilled to a depth of 28 feet. The boring encountered clayey-sand and gravel below approximately 15 feet, which suggests that OW-3 is located outside the buried stream channel in which PW-2 was installed. A cross-section illustrating the stratigraphy and lateral variability of the subsurface soils in the vicinity of PW-2 and OW-3 is shown on **Figure 4**. Well OW-3 is constructed of 2-inch diameter PVC pipe from just below ground surface to 25 feet bgs. This well includes 0.020-inch slotted PVC casing from 5 to 25 feet bgs. The background water level in OW-1 prior to the start of pumping on August 18th was approximately 2.4 feet bgs.

Table 1 summarizes well construction and background "static" water level information for the two new, and three existing wells (PW-1, OW-1 and OW-2), as measured prior to the start of pumping on August 18, 2016.

Table 1
Well Construction Details
MRS Hatchery Project

Well ID (year installed)	Approximate Ground Elevation (ft. MSL)	Casing Diameter & Type	Screen Interval (slot size in inches and ft. bgs)	Total Well Depth (ft.)	Static Groundwater Level (ft. bgs)
PW-1 (2011)	1,582	8" Steel & Stainless Steel	0.060-inch 21-26	26	0.5
OW-1 (2011)	1,582	2" PVC	0.020-inch 5-30	30	1.1
OW-2 (2011)	1,582	2" PVC	0.020-inch 4-29	29	0.5
PW-2 (2016)	1,584.5	10" PVC & Stainless Steel	0.050-inch 15-30	30	2.0
OW-3 (2016)	1,584.5	2" PVC	0.020-inch 5-25	26	2.4

Notes
Groundwater levels based on pre-test "background" monitoring (August 18, 2016)
ft. bgs – feet below ground surface
ft. MSL – feet above mean sea level

3.2 WELL EQUIPMENT, INSTRUMENTATION AND ANALYSIS

Pressure transducers and data-loggers were installed in the pumping and observation wells to monitor the pre-test "background" groundwater levels, in addition to groundwater levels while pumping. Wells OW-1, OW-2 and OW-3 functioned as observation wells to record pumping-induced water level drawdown during the tests. The water level and drawdown data presented in this report is correlated to initial background or "static" water levels in the various pumping and observation wells.

The August 2016 pumping tests involved pumping first from PW-2, and monitoring changes in the water levels in the other wells; and then pumping from both PW-2 and PW-1 simultaneously, to assess potential interference that might occur at one or both wells, as a result of coincidental pumping. This was deemed important both to assess the interconnectedness between the two pumping wells, and to begin understanding the potential behavior of the aquifer system when more wells are withdrawing water simultaneously, to support the proposed hatchery.

Aegis Groundwater Consulting, LLC (Aegis), provided analysis of the aquifer pumping test data using Aquifer Test Pro, 2016 from Waterloo Hydrogeologic. The aquifer was assumed to be about 30 feet thick, unconfined and laterally extensive, and in this analysis, partially-penetrating. In the previous analysis performed in 2012, the wells were considered to be fully-penetrating the aquifer, but in this analysis we have refined that condition to more accurately reflect new data, which suggests the wells may only partially-penetrate the entire aquifer, i.e. the aquifer may be thicker than 30 feet in places. Corrections for barometric pressure change, borehole skin effects, and variations in geologic condition were not applied to the data set. The pumping well data was analyzed using both the Neuman and Boulton methods, which are applicable methods when applied to anisotropic, unconfined aquifers, with partially-penetrating wells. Aquifer test data plots prepared by Aegis are included for reference in **Appendix D**.

3.2.1 PW-2 TEST

Pumping well PW-2 was equipped with a 15 hp submersible pump and on August 18, 2016, was pumped at an initial rate of 175 gallons per minute (gpm) for 1 hour and 12 minutes. The static water level prior to pumping was 2.0 feet bgs and over this initial period the well experienced 13.5 feet of drawdown which resulted in a “dynamic” (pumping) water level that was 0.5 feet below the top of the well’s screened interval (15.0 feet bgs). Dynamic water levels that drop below the top of the well screen can create inefficiencies and other pumping complications including air entrainment and sand pumping. As such, the pumping rate was decreased to approximately 150 gpm to reduce drawdown and stabilize the dynamic water level. At 150 gpm the measured drawdown decreased to 12.8 feet which corresponds to a dynamic water level that was 0.2 feet above the top of the well screen. A pumping rate of 150 gpm was maintained for 14 hours and 28 minutes over which time the dynamic water level in PW-2 varied by less than 0.2 feet.

The PW-2 wellhead was connected to approximately 300 feet of 10-inch diameter PVC pipe that transported discharge water down-gradient (south) of the pumping well to the south-central portion of the property (outside the buildable zone).

3.2.2 PW-1 & PW-2 TEST

Well PW-1 was equipped with a 10 hp submersible pump and on August 19, 2016, both PW-1 and PW-2 were pumped simultaneously. After approximately 30 minutes, constant pumping rates which yielded constant dynamic water levels were established for PW-1 at 125 gpm, and PW-2 at 140 gpm. These pumping rates were maintained for 42 hours and 24 minutes and resulted in 8.7 and 11.2 feet of drawdown in PW-1 and PW-2, respectively. For PW-1, this corresponds to a dynamic water level that was 11.8 feet above the top of the well screen. For PW-2, the dynamic water level after 42+ hours of pumping was 1.8 feet above the top of the well screen.

The PW-1 wellhead was connected to approximately 350 feet of 4-inch diameter PVC pipe that transported discharge water down-gradient (south) of the pumping well to the south-central portion of the property (outside the buildable zone).

3.3 WATER QUALITY SAMPLING

General water quality parameters for groundwater and surface water were monitored periodically during the August pumping tests. Water quality samples were also collected for groundwater and surface water on August 22 and October 6, 2016, and submitted to Umpqua Research Company of Myrtle Creek, Oregon, and Anatek Labs of Spokane, Washington, respectively. The water quality testing included a comprehensive suite of analytes, specified by the McMillen Jacobs design team. Laboratory analytical reports, chain-of-custody, and laboratory quality assurance/quality control documentation is included for reference in **Appendix B**.

3.3.1 GROUNDWATER

Pumping well groundwater quality monitoring included pH, temperature, conductivity and total dissolved solids (TDS). With exception of temperature which was monitored inside the well casing, samples were collected at the distal end of each pumping well's PVC discharge pipe. A supplemental round of groundwater sampling was conducted on October 6, 2016, and included four additional parameters: dissolved oxygen (DO), turbidity, alkalinity and hardness. An on-site domestic well (DW-1) which serves the existing on-site residence was also sampled at a hose spigot east of the residence. The flow rate at the spigot was approximately 20 gpm. The pressure tank at the residence read 54 pounds per square inch (psi) when off, and 38 psi when the spigot was on. Field groundwater quality data is summarized on **Table 2**.

Table 2
Field Groundwater Quality Monitoring
MRS Hatchery Project

Well ID	Sample Date & Time	pH	In-Well Temp. (°C)	TDS (ppm)	DO (mg/L)	Turbidity (NTU)	Alkalinity (mg/L)	Hardness (mg/L)	Cond. (µmhos /cm)
PW-1	8/19/16 1015 hrs	6.5	15.2	68	--	--	--	--	139
PW-1	8/19/16 1530 hrs	6.5	15.0	86	--	--	--	--	160
PW-1	8/20/16 0950 hrs	6.6	15.0	71	--	--	--	--	148
PW-1	8/20/16 1510 hrs	6.7	15.0	71	--	--	--	--	142
PW-1	8/20/16 1840 hrs	6.7	15.0	72	--	--	--	--	139
PW-1	10/6/16 0840 hrs	6.6	13.4	56	0.5	7.3	80	100	96
PW-2	8/18/16 1015 hrs	6.1	13.0	71	--	--	--	--	143
PW-2	8/18/16 1630 hrs	6.2	14.7	85	--	--	--	--	171
PW-2	8/18/16 2020 hrs	6.3	14.4	91	--	--	--	--	183
PW-2	8/19/16 1015 hrs	6.6	14.6	76	--	--	--	--	153
PW-2	8/19/16 1530 hrs	6.5	14.6	71	--	--	--	--	141
PW-2	8/20/16 0940 hrs	6.5	14.5	79	--	--	--	--	159
PW-2	8/20/16 1500 hrs	6.6	14.6	84	--	--	--	--	172
PW-2	8/20/16 1830 hrs	6.7	14.6	67	--	--	--	--	127
PW-2	10/6/16 0930 hrs	6.6	13.8	79	1.6	0.5	60	80	95
DW-1	10/6/16 1020 hrs	8.5	11.7	87	4.2	0.5	100	40	121

PW-1 Pumping Well

DW-1 Domestic Well

- -	Sample Not Analyzed for this Parameter

Groundwater quality data from the August 22 and October 6, 2016 sampling events are summarized on **Table C-1 (Appendix C)**.

3.3.2 SURFACEWATER

An automated monitoring station was established in the Yakima River side channel (YSC-1), approximately 250 feet downgradient (southwest) of PW-2 (**Figure 2**). Field water quality parameters and surface water elevation within the side channel were monitored at 15 minute intervals on August 18-21, 2016. A second surface water monitoring station was established on October 6, 2016, upstream (north) of the side channel bridge (YSC-2). Field instruments and reagents were used to monitor field surface water quality parameters and are summarized in **Table 3**.

Table 3
Field Surface water Quality Monitoring
MRS Hatchery Project

Sample ID	Date & Time	pH	Temp. (°C)	Water Level (ft.)	DO (mg/L)	Turbidity (NTU)	Alkalinity (mg/L)	Hardness (mg/L)	Cond. (µmhos /cm)
YSC-1	8/18/16 0715 hrs	6.9	17.9	1.4	6.8	--	--	--	33
YSC-1	8/18/16 1815 hrs	6.9	21.6	1.4	6.3	--	--	--	31
YSC-1	8/19/16 1200 hrs	7.4	19.0	1.5	6.4	--	--	--	32
YSC-1	8/19/16 2330 hrs	7.7	19.1	1.5	6.3	--	--	--	32
YSC-1	8/20/16 0900 hrs	7.8	17.2	1.5	6.4	--	--	--	34
YSC-1	8/20/16 1600 hrs	7.7	20.6	1.5	6.1	--	--	--	31
YSC-1	8/21/16 1500 hrs	7.7	20.6	1.5	6.0	--	--	--	31
YSC-2	10/6/16 1100 hrs	7.4	10.0	NM	10.3	0	60	60	50

YSC-1 Yakima River Side Channel Monitoring Site
NM Not Measured
- - Sample Not Analyzed for this Parameter

The water quality data for August 2016 YSC-1 side channel monitoring is also included for reference on **Table C-2 (Appendix C)**.

4.0 FINDINGS

4.1 BACKGROUND WATER LEVELS

Background water level monitoring was conducted in all wells over an approximate one-hour period prior to the start of pumping on August 18, 2016. The depth to groundwater ranged from 0.5 to 2.4 feet bgs in all wells. Groundwater elevations generally reflect a gentle east-to-west gradient toward the Yakima River. This is consistent with previous groundwater levels and gradient for the MRS Hatchery site. There were very slight variations recorded, however, the data reflect relatively minor, temporal variations in groundwater levels attributed to normal barometric pressure changes.

4.2 AQUIFER PUMPING TESTS

4.2.1 PW-2 TEST

A constant drawdown pumping test for well PW-2 was conducted on August 18-19, 2016. The initial groundwater level in PW-2 was measured at 2.0 feet bgs. The well was pumped at an initial rate of 175 gpm for 72 minutes, and experienced 13.5 feet of drawdown. The pumping rate was reduced to approximately 150 gpm to reduce drawdown and stabilize the dynamic water level above the screened interval of the well, which starts at 15 feet bgs. At 150 gpm, the drawdown decreased to 12.8 feet (plus 2.0 feet = 14.8 feet bgs) and this pumping rate was maintained for 14 hours and 28 minutes. After 15 hours: 40 minutes of total pumping time, the drawdown in PW-2 was relatively stable at 12.8 feet and exhibited a slightly downward pumping curve with less than 0.2 feet of change observed over the final 14+ hours of pumping. The groundwater level in PW-2 returned to the pre-test level within 2 minutes of pump shutdown (**Appendix D: Fig. 2)**. Groundwater temperature, measured at 23.2 feet bgs within PW-2, ranged from 13.0 to 14.7° C (55.4 to 58.5° F) during the test.

Observation wells OW-1, OW-2 and PW-1 are located between about 325 and 375 feet northeast of PW-2, and all experienced very minor amounts of drawdown (< 0.15 feet) during the test. OW-1 is closest to PW-2 and is also located nearer to the interpreted meander channel, which is reflected in slightly greater drawdown, compared to OW-2 and PW-1 (**Appendix D: Fig. 1**). In fact, the most drawdown occurred within the first 72 minutes when PW-2 was pumped at 175 gpm, before being throttled back to 150 gpm. The water levels began to recover, and actually rose slightly through the latter half of the test, as shown in **Appendix D: Fig. 3**.

The total drawdown in OW-3, located 40 feet northwest of PW-2 was less than 0.2 feet after 15 hours: 40 minutes of pumping. As shown on **Appendix D: Fig. 3**, OW-3 clearly exhibits more change over time, especially the difference caused by reducing the pumping rate in PW-2. Furthermore, only OW-3 experienced water level drawdown that remained below the pre-test static water level, while PW-2 was pumping.

Based upon the observed distance-drawdown relationship between PW-2 and OW-3, these wells were used for analysis of PW-2 test data. **Appendix D: Fig. 4** is a plot of drawdown in feet versus time since pumping started in minutes, using the Neuman Method. **Appendix D: Fig. 5** is a similar plot, using a different but equally-suitable method by Boulton, for unconfined aquifers with partially-penetrating wells. The results for transmissivity, hydraulic conductivity and specific yield (analogous to storativity for unconfined aquifers, OW-3 only) are presented on each plot.

There appears to be a relatively “steep” cone of depression surrounding PW-2 during pumping. This suggests the alluvial aquifer penetrated by PW-2 is highly transmissive and produces most of the groundwater in relative close proximity to the well. Consistent with PW-2, the groundwater level in OW-3 recovered to the pre-test level (2.4 feet bgs) within 2 minutes of pump shutdown. Groundwater temperature ranged from 13.2 to 14.0 C in OW-3 during the 15+ hour test. There was no change in surface water level (depth, ft.) measured at the Yakima River side channel monitoring station (YSC-1) during the August 18-19, PW-2 pumping test (**Table C-2 in Appendix C**).

4.2.2 PW-1 & PW-2 SIMULTANEOUS TEST

A longer-duration, constant drawdown pumping test utilizing both pumping wells was performed over a 42-hour period between August 19 and 21, 2016. Initial static groundwater levels were measured at 0.5 and 2.0 feet bgs for PW-1 and PW-2, respectively. Pumping rates of 125 gpm for PW-1, and 140 gpm for PW-2, were maintained for a total elapsed pumping period of 42 hours: 24 minutes.

Groundwater drawdown in PW-1 was 6.0 feet after approximately 40 minutes of pumping at 125 gpm. Near the end of pumping, the dynamic water level in PW-1 dropped an additional 2.7 feet, resulting in 8.7 feet of total drawdown. This reflects a slow, consistent decline in dynamic water level over the 42+ hour pumping period. The resultant 8.7 feet of total drawdown at the end of pumping was 11.8 feet above the top of the well screen in PW-1, which is at 21.0 feet bgs. The groundwater level in PW-1 returned to the pre-test level within 2 minutes of pump shutdown.

Drawdown in PW-2 was recorded at 11.8 feet after approximately 30 minutes of pumping at 140 gpm. After 42+ hours of pumping, the dynamic water level in PW-2 rose by 0.6 feet, to 11.2 feet of total drawdown. This gradual increase in dynamic water level may be attributed to a recharge boundary where groundwater begins flowing into the well from other area(s) of the aquifer. Longer duration pumping would be needed to further assess potential boundary conditions at the site. Total drawdown at the end of pumping was 1.8 feet above the top of the well screen (15.0 feet bgs) in PW-2. The groundwater level in PW-2 returned to the pre-test level within 1 minute of pump shutdown. There was no change in surface water level observed at the Yakima River side channel monitoring station (YSC-1) during the simultaneous well pumping test.

Groundwater temperature, measured at a depth of 17.2 feet bgs in PW-1, ranged from 15.0 to 15.9° C (59.0 to 60.6° F), and 12.4 to 14.6° C (54.3 to 58.3° F) at a depth of 23.2 feet bgs in PW-2, over the test period.

Appendix D: Fig. 6 graphically represents water levels recorded in the observation and pumping wells during the test. The majority of drawdown occurred within the first 100 to 200 minutes. The dynamic water level declined throughout the entire pumping test in PW-1, and the PW-2 dynamic water level, after a brief, initial period of drawdown, began to recover and continued to do so throughout the duration of the test.

Rapid, relatively small water level declines were recorded and all three observation wells with similar pumping-induced response times and drawdown. The most drawdown recorded in the observation wells was less than 0.3 feet after 42+ hours of pumping. Relative drawdown in the observation and pumping wells is shown on the left and right Y-axes, respectively, versus time on **Appendix D: Fig. 7**. The slight observation well recharge, previously mentioned, is reflected in these plots, as is the gradual drawdown in PW-1, and recharge in PW-2.

Appendix D: Figs. 8 and 9 illustrate drawdown in feet over time for the simultaneous PW-1/PW-2 pumping test using the Neuman and Boulton analysis methods, respectively. The results for transmissivity and hydraulic conductivity are presented on each plot.

Similar to the PW-1 only pumping test data, both pumping wells exhibit relatively "steep" cones of depression during simultaneous pumping and the small deflection (drawdown) observed in the observation wells indicates the aquifer is highly-transmissive within the buried stream channel alignment. It is also very evident that groundwater flow is highly asymmetrical with limited production from adjacent clayey-sand and gravel overbank deposits in close proximity to the pumping wells.

4.3 WATER QUALITY DATA

During the pumping tests, pH measurements ranged from 6.5 to 6.7 in PW-1, which is consistent with Anatek Labs reported pH of 6.6 from an October 6, 2016 groundwater sample from PW-1. The pH measurements in PW-2 ranged from 6.1 to 6.7 during the pumping tests, and a sample collected from PW-2 on October 6th and analyzed by Anatek Labs also had a reported pH of 6.6. An October 6th sample collected from the on-site domestic well (DW-1) had a significantly higher reported pH of 8.5. During the pumping tests in August 2016, Yakima River side channel pH readings at YSC-1 ranged from 6.6 to 7.9, and averaged 7.4. Side channel pH readings at YSC-2 on October 6th were also 7.4.

The groundwater temperature, measured at 23.2 feet bgs in PW-2 ranged from 13.0 to 14.7° C (55.4 to 58.5° F) during the PW-2 pumping test on August 18-19, 2016. The temperature in PW-1 at a depth of 17.2 feet bgs, during the same pumping test, was consistently recorded at 15.4° C (59.7° F). During the simultaneous pumping test on August 19-21, 2016, groundwater temperature in PW-1, ranged from 15.0 to 15.9° C (59.0 to 60.6° F), and 12.4 to 14.6° C (54.3 to 58.3° F) in PW-2. The groundwater temperature measured in DW-1 on October 6, 2016 was 11.7° C (53.1° F).

Total dissolved solids (TDS) in PW-1 ranged from 68 to 86 parts per million (ppm) during the pumping tests, and a sample collected from PW-1 on October 6, 2016 was reported at 56 ppm by Anatek Labs. TDS in PW-2 ranged from 71 to 91 ppm during the pumping tests, and a sample collected from PW-2 on October 6, 2016 was reported at 79 ppm by Anatek Labs. The sample from DW-1 collected on October 6, 2016, had a reported TDS concentration of 87 ppm.

During the pumping tests, field conductivity measurements ranged from 139 to 160 micro ohms/centimeter (μmhos/cm) in PW-1, and a sample collected from PW-1 on

October 6, 2016, had a reported conductivity of 126 µmhos/cm. Conductivity in PW-2 ranged from 127 to 183 µmhos/cm during the pumping tests, and a sample collected from PW-2 on October 6, 2016 was reported at 132 µmhos/cm by Anatek Labs. A sample from DW-1 collected on October 6, 2016, had a reported conductivity of 180 µmhos/cm. Yakima side channel field conductivity readings at YSC-1 ranged from 30 to 34 µmhos/cm during the pumping tests.

Groundwater samples from the two pumping well and a surface water sample from YSC-1 were collected on August 22, 2016, and submitted to Umpqua Research Company for a comprehensive suite of water quality analyses. A second round of groundwater samples were collected from PW-1, PW-2 and DW-1 on October 6, 2016, and submitted to Anatek Labs for a similar suite of salmonid aquaculture-specific water quality parameters. These included, but were not limited to, dissolved oxygen, carbon dioxide, hydrogen sulfide and aluminum. A summary of groundwater/surface water quality sampling results is presented in **Appendix C; Table C-1**. Laboratory analytical reports, chain-of-custody and QA/QC documentation are also included for reference in **Appendix B**.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The field exploration and aquifer pumping tests performed during irrigation season in August 2016 at the MRS Hatchery Project indicate that subsurface conditions beneath the site are most likely comprised of several braided stream channels, which transect the site in a complex depositional environment that includes low permeability clayey-sand units in close proximity to the channels. The buried stream channels are present to maximum depths of approximately 30-35 feet bgs, appear highly transmissive, and represent target areas for future groundwater production wells. The degree that the stream channels are interconnected will play a vital role in determining the amount of water that can be withdrawn from a specific location by a well, and for how long. Ideally, a well located at the intersection of two or more channels, would reduce the risk of low yields or short pumping durations, or both. The shallow, relatively thin, alluvial aquifer appears to be influenced by surface/irrigation water.

The aquifer pumping data was analyzed by both the Neuman and Boulton methods, which are applicable when applied to site conditions at the MRS Hatchery site (anisotropic, unconfined aquifer with partially-penetrating wells). Aquifer analysis plots are included for reference in **Appendix D on Figs. 4, 5, 8 and 9**. Aquifer parameters calculated for this report include the following:

- Hydraulic conductivity (K) is the capacity of a porous medium to transmit water and is commonly reported in gallons per day-per foot squared (gal/day-ft^2);
- Transmissivity (T) is the rate at which the aquifer can transmit water through a unit width of the aquifer under a unit hydraulic gradient and is commonly reported in gallons per day-per foot (gal/day/ft.);
- Specific yield is dimensionless and is equivalent to storativity in an unconfined aquifer. Specific yield/storativity calculations are applied to observation wells and are not valid for pumping wells.
- Specific capacity (S_c) is the rate at which a well can be pumped per foot of drawdown within the well and is reported in gallons per minute-per foot of drawdown (gpm/ft.).

Our conclusions from the PW-2 only pumping test can be summarized as follows:

- The K value in PW-2 ranged from 1.4 x 10^5 gal/day-ft^2) via Neuman, and 3.13 x 10^5 via Boulton. The K in OW-3 (2.24 x 10^2 gal/d-ft^2 is similar for both analysis methods.

- The specific yield for the aquifer from OW-3 data is $1x10^{-1}$, which is indicative of an unconfined aquifer.
- The T value for PW-2 ranged from $4.34x10^5$ gal/day-ft via Neuman, to $9.71x10^5$ gal/day-ft via Boulton. For OW-3, T was equivalent in both methods ($6.96x10^3$ gal/day-ft).
- The S_c for PW-2 after 15 hours: 40 minutes of pumping at 150 gpm was 11.7 gpm/ft.
- There was no apparent impact to surface water levels within the Yakima River side channel at the YSC-1 monitoring station during the PW-2 only aquifer pumping test.

Our conclusions from the simultaneous PW-1/PW-2 pumping test can be summarized as follows:

- The K value in PW-1 was 1.91 x 10^3 gal/day-ft^2 for both methods.
- The K value in PW-2 was 2.25x 10^3 gal/day-ft^2 by Neuman, and 5.08 x 10^4 gal/day-ft^2 by Boulton.
- The T value for PW-1 was the same, $5.94x10^4$ gal/day-ft for both methods.
- The T value for PW-2 ranged from $6.97x10^4$ gal/day-ft via Neuman, to $1.58x10^6$ gal/day-ft via Boulton.
- The S_c for PW-1 after 42+ hours of pumping at 125 gpm was 14.3 gpm/ft.
- The S_c for PW-2 after 42+ hours of pumping at 140 gpm was 12.5 gpm/ft.
- There was no apparent impact to surface water levels within the Yakima River side channel at the YSC-1 monitoring station during, and up to 15 hours after, the simultaneous PW-1/PW-2 aquifer pumping test.

The August 2016 (irrigation season) pumping test analysis for PW-1 provides consistent T and K values for this pumping well, compared to the irrigation season pumping test analysis performed in September 2011, shortly after PW-1 was installed. However, the S_c calculated in August 2016 (14.3 gpg/ft.) is significantly lower than the S_c calculated in September 2011 (47.2 gpm/ft.). This variation is the result of the increase in pumping-induced drawdown measured in PW-1 in August 2016 (8.7 feet after 42+ hours of pumping at 125 gpm) versus September 2011 (2.7 feet after 10 hours of pumping at 125 gpm). For additional comparison, the S_c calculated for PW-1 in February 2012 (non-irrigation season) was even lower (8.3 gpg/ft.). At this time, we are uncertain whether seasonal changes, well-screen fouling, pumping duration, or other cause(s) are responsible for the observed S_c variability in PW-1. However, the overall dataset appears to reflect anisotropic groundwater flow conditions that would be anticipated in this type of complex, hydrogeologic environment.

The pumping test data and analyses indicate there is wide lateral variation in the aquifer hydraulics, as evidenced by the different hydraulic conductivities (K) over short distances (PW-2 is 40 feet from OW-3). The coarser, well-graded sandy-gravel and cobbles found in PW-2 have a K value that is 3 orders of magnitude higher than OW-3, which is reflective of the finer-grained, clayey-sand and gravel formation present below 15 feet in this observation well. The difference in transmissivity (T) between these wells (2 orders of magnitude) also highlights the lateral differences, and underscores the need to clearly identify the location and orientation of the buried stream channels prior to installing additional pumping wells at the site.

The PW-2 only test suggests there is some communication between the pumped well (PW-2) and the observation wells, but the subsurface lithology limits that communication. This can be seen by the induced drawdown during the initial portions of the test, both in nearby OW-3, and the more distant wells OW-1, OW-2 and PW-1. This is suggestive of a limited, and steep cone of depression around the pumping wells, which is typical of a moderate-highly transmissive aquifer, juxtaposed with finer-grained, less transmissive aquifers.

The simultaneous PW-1/PW-2 test revealed that while there are varying degrees of communication between the pumping wells and the observation wells, there is little to no communication between the pumping wells, i.e. they do not appear to adversely influence each other when being pumped. Pumping wells within the shallow, braided stream channel aquifer appear capable of producing 125 to 150 gpm.

Based on our findings, analysis and discussion of the same, we recommend the following:

- Additional on-site assessment and subsurface characterization focused on the buried stream channels to accurately map these features and effectively locate future production wells. The additional assessment can be accomplished through targeted geophysical survey work in suspected buried stream channels, and geotechnical test drilling to obtain formation samples to verify aquifer thickness and groundwater production zones.

- Given a 75 percent water re-use scenario and the reported need for groundwater (up to nine months continuously, at combined production ranging from 747 to 1,122 gpm), pumping tests of significantly longer duration are warranted to adequately assess the long-term sustainability of requested cumulative flow rates from this aquifer. A minimum pumping duration of 30 to 60 days during irrigation and non-irrigation season are advisable.
- Additional production wells should be 10-inches in diameter and have maximum blank casing lengths to facilitate greater available drawdown during pumping. Existing well PW-1 is an example of such a construction, with the blank casing (21of 26 feet) representing nearly 80% of the total well depth.

6.0 LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of our profession practicing in the same locality, under similar conditions and at the date the services are provided. Our findings, conclusions and recommendations are based on information provided by McMillen Jacobs Associates (Client) and a limited number of field observations and related data. It is possible that conditions could vary between or beyond the points explored or data evaluated. Wallace Group makes no other representation, guarantee or warranty, express or implied, regarding the services, communication (oral or written), report, opinion or instrument of service provided.

This report may be used only by McMillen, Yakama Nation Fisheries, BPA, and applicable regulatory agencies, only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two (2) years from the date of the report. Use of this report beyond a two-year period will require a review by Wallace Group to evaluate the report's applicability to the current project and any changed site conditions.

7.0 REFERENCES

Driscoll, F.G., 1989, Groundwater and wells: Johnson Filtration Systems, Inc., Second Edition, St. Paul, Minnesota, p. 220.

Drost, B.W., Whiteman, K.J., and Gonthier, J.B., 1990, The geologic framework of the Columbia Plateau regional aquifer system, Washington, Oregon, and Idaho: U.S. Geological Survey Water-Resources Investigations Report 87-4238, 10p., 10 sheets.

Vaccaro, J.J., 2011, River-aquifer exchanges in the Yakima River basin, Washington: U.S. Geological Survey Scientific Investigations Report 2011-5026, Prepared in cooperation with the U.S. Bureau of Reclamation, Washington State Department of Ecology, and the Yakama Nation, 98 p.

Wallace Group, Inc., March 13, 2012, Aquifer Pumping Test Report, Yakama Nation Fisheries, Holmes Ranch Coho Project, 191 Klocke Road, Ellensburg, Washington; Project No. 10147(1&2).

Wallace Group, Inc., March 11, 2016, Technical Memorandum: Groundwater Exploration, MR Sampson Coho Hatchery Facility, Klocke Road, Ellensburg, Washington; Project No. 10632(1).

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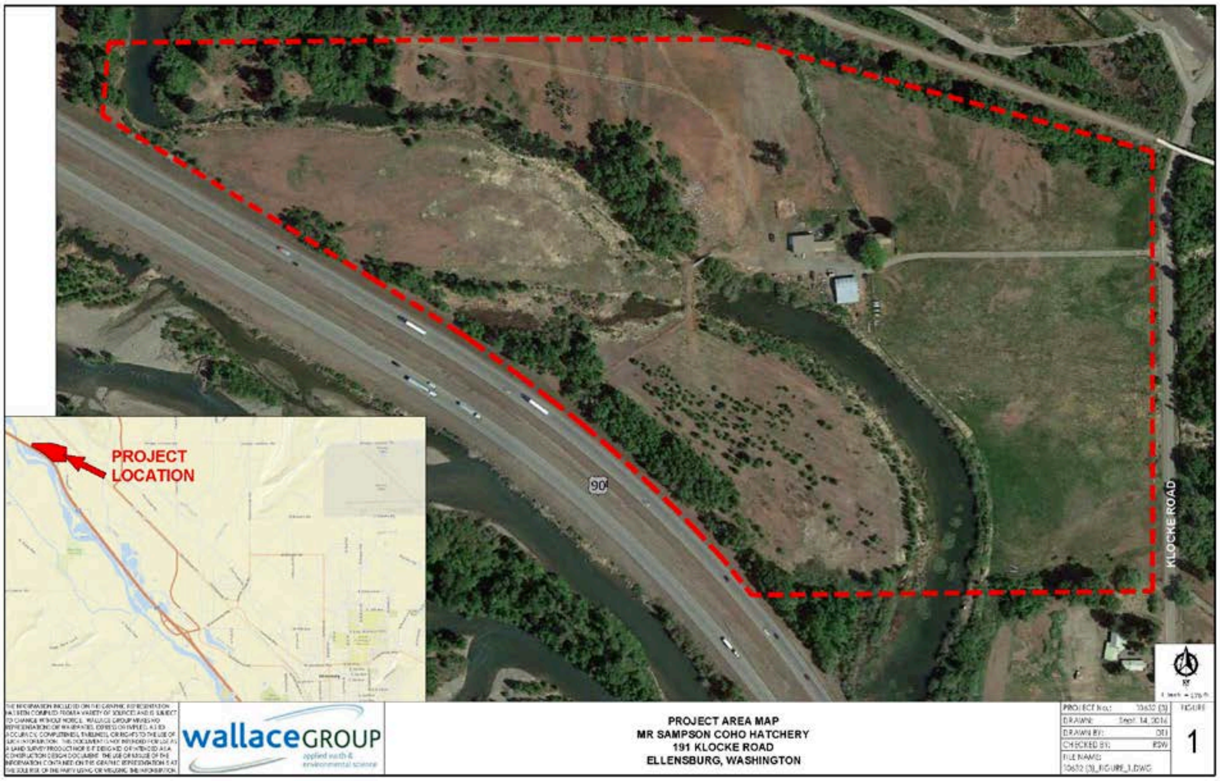
FIGURES


PROJECT LOCATION
90
KLOCKE ROAD
1 inch = 176 ft
wallaceGROUP
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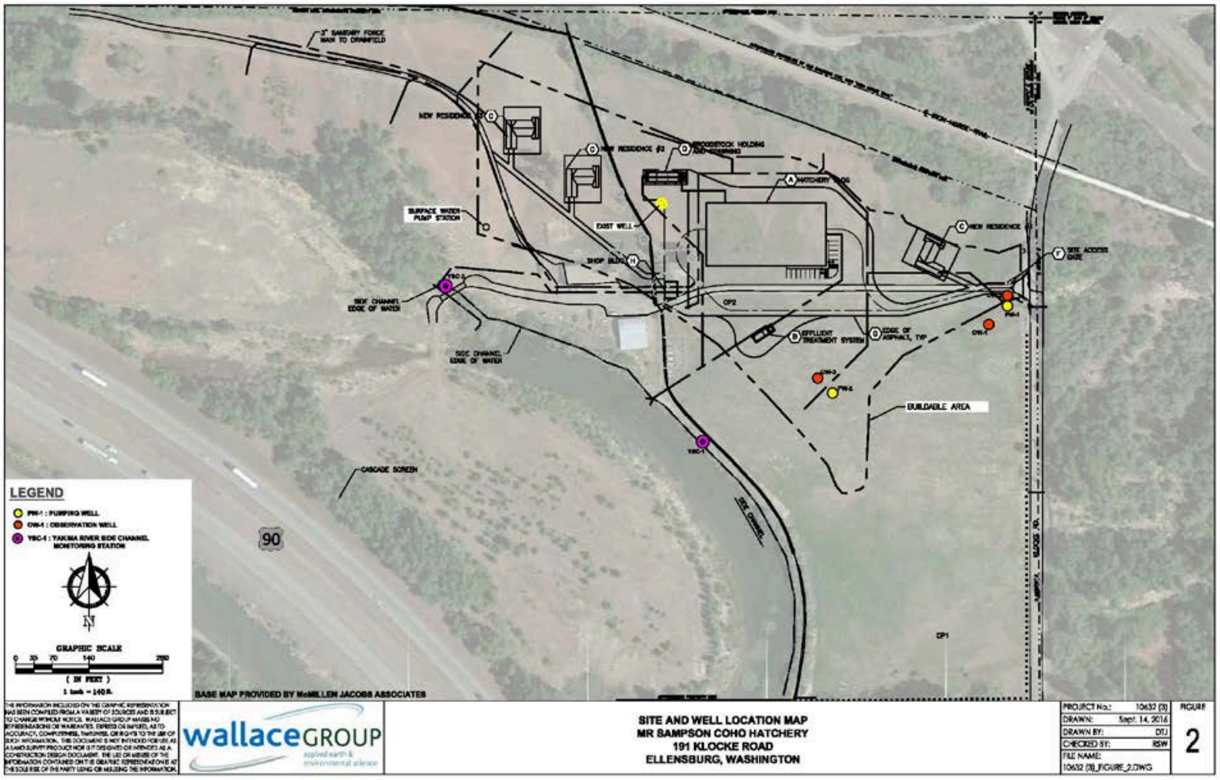
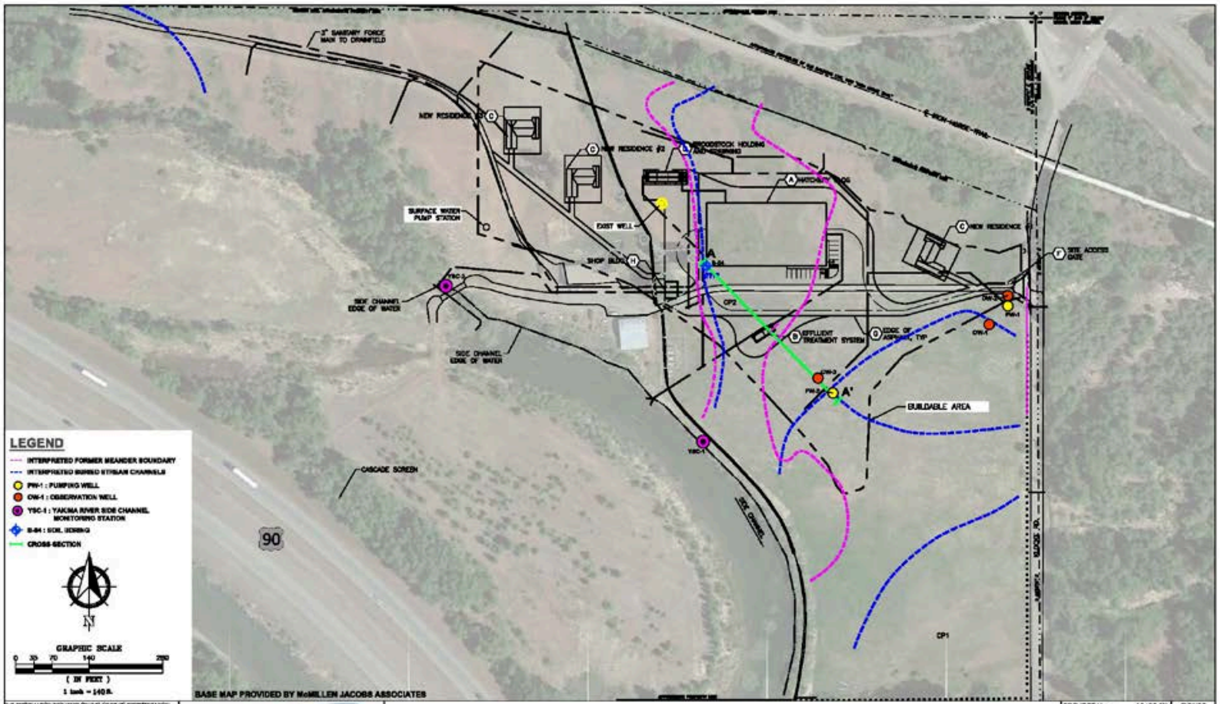
PROJECT AREA MAP
MR SAMPSON COHO HATCHERY
191 KLOCKE ROAD
ELLENSBURG, WASHINGTON
PROJECT No.: 10632 (3)
DRAWN: Sept. 14, 2016
DRAWN BY: DTJ
CHECKED BY: RSW
FILE NAME: 10632 (3)_FIGURE_1.DWG
FIGURE
1


2" SANITARY FORCE MAIN TO DRAINFIELD
NEW RESIDENCE
C
NEW RESIDENCE #2
D
BROODSTOCK HOLDING AND SPAWNING
A
HATCHERY BLDG
SURFACE WATER PUMP STATION
EXIST WELL
SHOP BLDG
H
C
NEW RESIDENCE
F
SITE ACCESS GATE
YSC-2
SIDE CHANNEL EDGE OF WATER
CP2
B
EFFLUENT TREATMENT SYSTEM
G
EDGE OF ASPHALT, TYP
OW-1
PW-1
SIDE CHANNEL EDGE OF WATER
OW-2
PW-2
BUILDABLE AREA
YSC-1
CASCADE SCREEN
SIDE CHANNEL
CP1
90
LEGEND
PW-1 : PUMPING WELL
OW-1 : OBSERVATION WELL
YSC-1 : YAKIMA RIVER SIDE CHANNEL MONITORING STATION
GRAPHIC SCALE
0 35 70 140 280
(IN FEET)
1 inch = 140 ft.
BASE MAP PROVIDED BY McMILLEN JACOBS ASSOCIATES
wallaceGROUP
applied earth & environmental science
SITE AND WELL LOCATION MAP
MR SAMPSON COHO HATCHERY
191 KLOCKE ROAD
ELLENSBURG, WASHINGTON
PROJECT No.: 10632 (3)
DRAWN: Sept. 14, 2016
DRAWN BY: DTJ
CHECKED BY: RSW
FILE NAME: 10632 (3)_FIGURE_2.DWG
FIGURE
2



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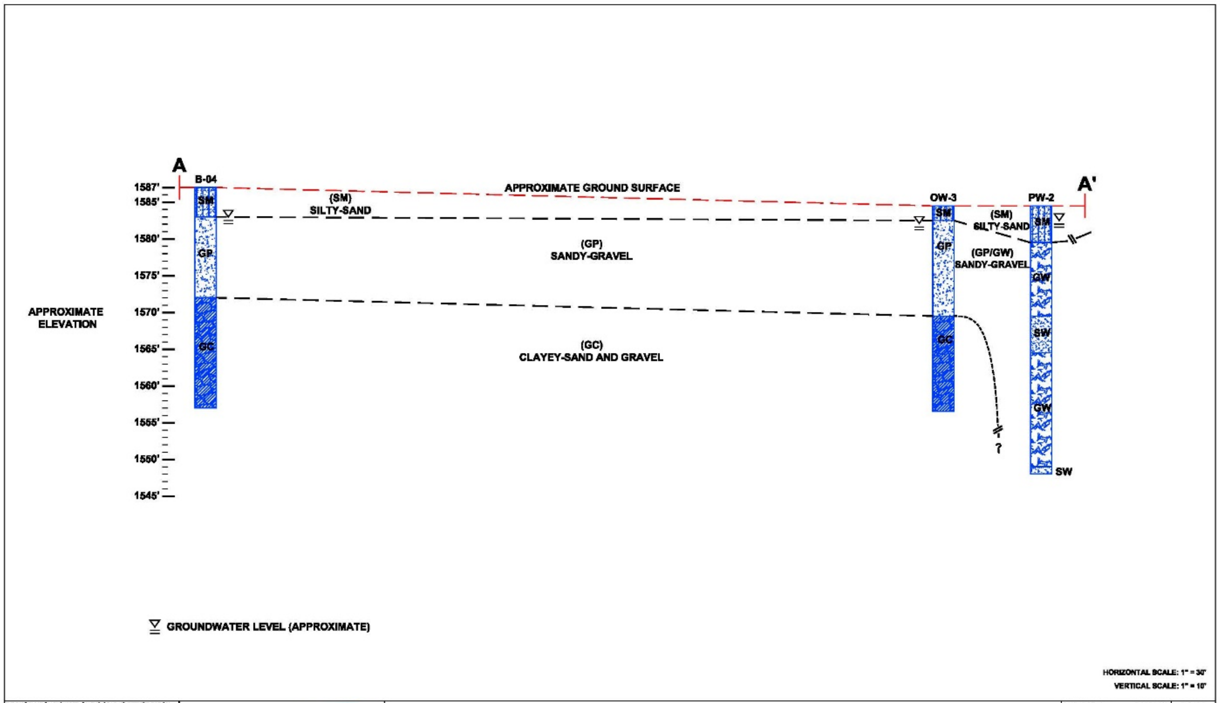
HYDROGEOLOGIC FEATURES MAP
MR SAMPSON COHO HATCHERY
191 KLOCKE ROAD
ELLENSBURG, WASHINGTON

PROJECT No.: 10632 (3)
DRAWN: Sept. 19, 2016
DRAWN BY: DTJ
CHECKED BY: RSW
FILE NAME: 10632 (3)_FIGURE_3.DWG
FIGURE 3



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CROSS-SECTION A-A'
MR SAMPSON COHO HATCHERY
191 KLOCKE ROAD
ELLENSBURG, WASHINGTON

PROJECT No.: 10632 (3)
DRAWN: Sept. 19, 2016
DRAWN BY: DTJ
CHECKED BY: RSW
FILE NAME: 10632 (3)_FIGURE_4.DWG
FIGURE 4

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APPENDIX A

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Boring and Test Pit Log Legend

Soil Classification

▨	**GW**-Well graded gravels, gravel-sand mixture, little or no fines
▨	**GP**-Poorly graded gravels, gravel-sand mixtures, little or no fines
▨	**GM**-Silty gravels, gravel-sand-silt mixtures
▨	**GC**-Clayey gravels, gravel-sand-clay mixture
▨	**SW**-Well graded sands, gravelly sands, little or no fines
▨	**SP**-Poorly graded sands, gravelly sands, little or no fines
▨	**SM**-Silty sands, sand-silt mixture
▨	**SC**-Clayey sands, sand-clay mixture
▥	**ML**-Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
▨	**CL**-Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
▦	**OL**-Organic silts and organic silty clays of low plasticity
▥	**MH**-Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
▨	**CH**-Inorganic clays of high plasticity, fat clays
▨	**OH**-Organic clays of medium to high plasticity, organic silts
▨	**PT**-Peat, humus, swamp and other highly organic soils
▩	**AF**-Fill, man-made, inorganic, variable density, composition, and soil types

Bedrock Units

▨	Basalt
▨	Weathered Basalt
▨	Tuff
▨	Sandstone
▨	Metamorphic

Surficial Material

■	Asphalt or concrete
□	Topsoil
▤	Fill, organic with debris

Log Descriptions and Field/Laboratory Measurements

Depth: Depth is depth below ground surface.

Graphic Log: Graphic depiction of the surface materail encountered.

Material Description: Classification of subsurface soils and rock encountered. Soil classifications are in general conformance with either ASTM Unified Soil Classification System, D2487 or Visual-Manual Procedure, D2488. Changes may be gradual in nature or occur over a longer interval than indicted on log.

Groundwater Elevation: Approximate water level (∇) at time of drilling/trenching and water level at time other than ATD/T (▼).

Sample Type: Refers to soil sampling apparatus (eg. SPT-split spoon, bag sample-bulk sample collected with shovel, Core-rock cored sample, HSA-hollow stem auger.

% **Recovery**: The total length of the sample recovered as a percentage of the total sample interval.

Standard Penetration Test (SPT N-Value): N-Value is the number of blows required to drive a standard 2.0" split spoon sampler a distance of 12" using a 140-lbs. hammer, dropped 30" (ASTM D-1586). Other samplers and hammers may be corrected to SPT values.

Dynamic Cone Penetrometer (DCP Value): DCP value is the number of blows required to drive a 1.5" diameter cone a distance of 6" using a 15-lbs. hammer, dropped 18" (ASTM Special Technical Publication 399).

Geovane:Hand instrument used to measure shear strength of soil in pounds per square foot (psf).

% **Passing No. 200 Sieve**: Amount of fine material passing the No. 200 sieve expressed as a percentage of the amount of sample tested in comformance with ASTM C117/C136.

% **Moisture**: Natural water content of the soil sample as determined in the lab.

Liquid and Plastic Limit: Characterization of the boundaries of the consistency states of plastic soils in conformance with ASTM D-4318. The results of these two values are used to compute the **Plasticity Index;** the range of water content of soil in which it behaves plastically. **Non-Plastic (NP)**: Soil does not exhibit plasticity.

Unconfined Compressive Strength (UCS):Determines the unconfined compressive strength of intact soil or rock using a compressive device which measures load in pounds per square foot (psf), or pounds per square inch (psi).

Rock Quality Designation (RQD): The sum of the length of sound core pieces greater than 4" divided by the total length of core run.

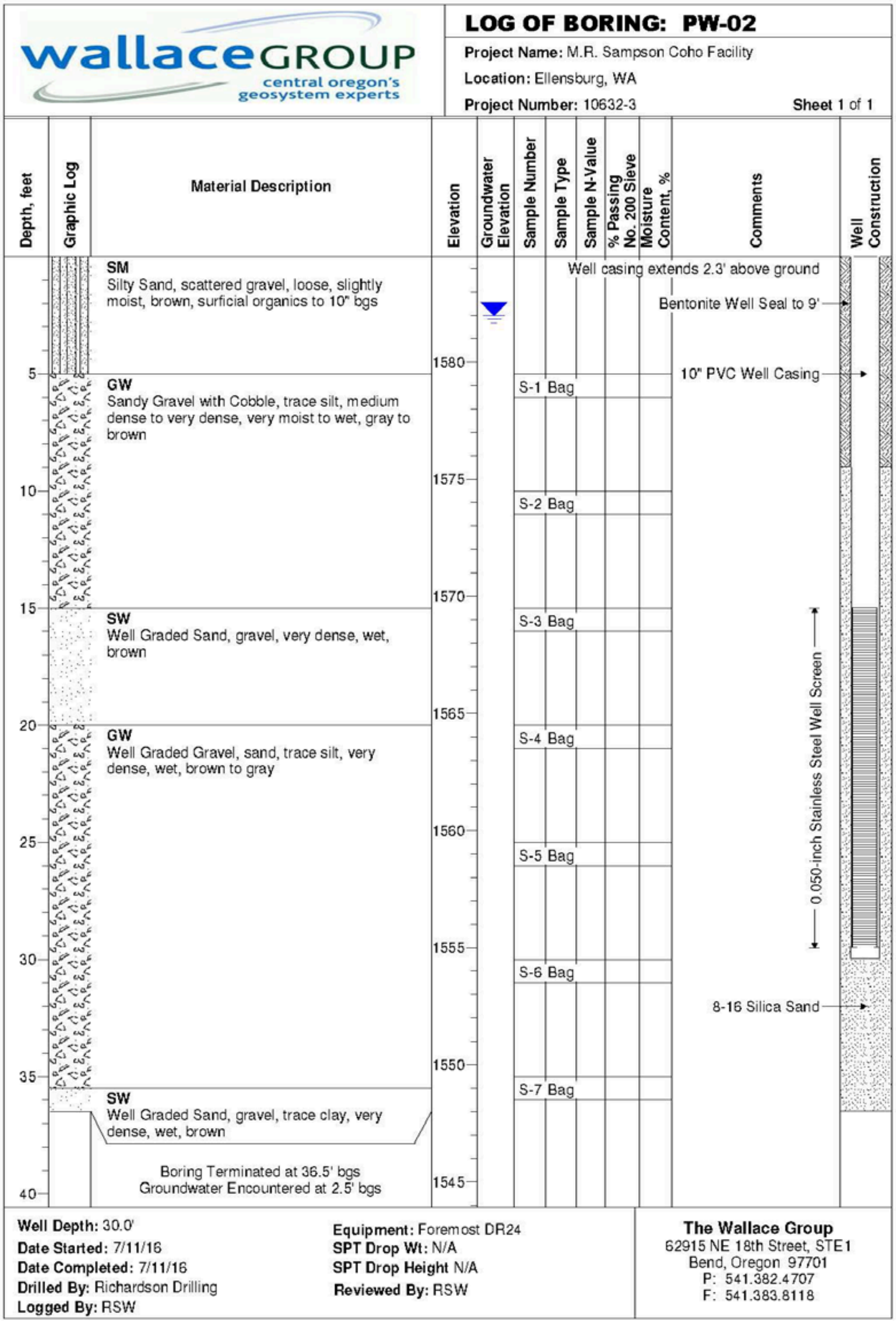
Sample Types

HSA: Hollow Stem Auger
SPT: Split Spoon (2 1/2" outside diameter)
Bulk: Bulk Sample
Core: Rock Core Sample
Sonic: Sonic Sample
SHT: Shelby Tube Sample (3" outside diameter)
Bag: < 1-gallon size sample
DM: Dames & Moore (3" outside diameter)

Proposed M.R. Sampson Coho Facility
191 Klocke Road
Ellensburg, Washington
Project Number: 10632 (3)

Figure A

The Wallace Group
62915 NE 18th St., STE 1
Bend, Oregon 97701
P: 541.382.4707
F: 541.383.8118



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central oregon's
geosystem experts

LOG OF BORING: PW-02

Project Name: M.R. Sampson Coho Facility
Location: Ellensburg, WA
Project Number: 10632-3
Sheet 1 of 1

SM
Silty Sand, scattered gravel, loose, slightly moist, brown, surficial organics to 10" bgs

GW
Sandy Gravel with Cobble, trace silt, medium dense to very dense, very moist to wet, gray to brown

SW
Well Graded Sand, gravel, very dense, wet, brown

GW
Well Graded Gravel, sand, trace silt, very dense, wet, brown to gray

SW
Well Graded Sand, gravel, trace clay, very dense, wet, brown

Boring Terminated at 36.5' bgs
Groundwater Encountered at 2.5' bgs

Sample Number	Sample Type
S-1	Bag
S-2	Bag
S-3	Bag
S-4	Bag
S-5	Bag
S-6	Bag
S-7	Bag

Well casing extends 2.3' above ground
Bentonite Well Seal to 9'
10" PVC Well Casing
0.050-inch Stainless Steel Well Screen
8-16 Silica Sand

Well Depth: 30.0'
Date Started: 7/11/16
Date Completed: 7/11/16
Drilled By: Richardson Drilling
Logged By: RSW

Equipment: Foremost DR24
SPT Drop Wt: N/A
SPT Drop Height N/A
Reviewed By: RSW

The Wallace Group
62915 NE 18th Street, STE1
Bend, Oregon 97701
P: 541.382.4707
F: 541.383.8118

Figure A-1

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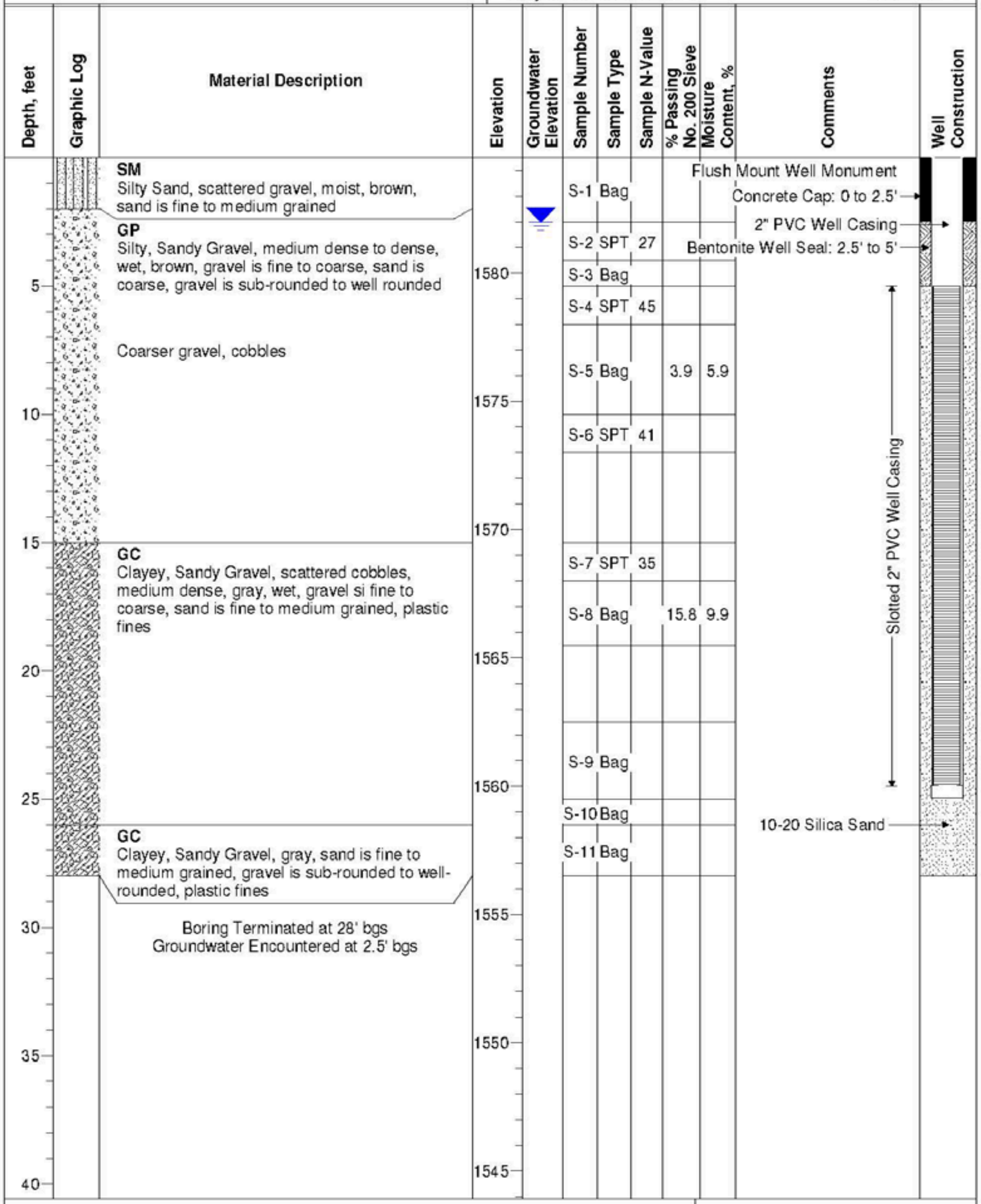
LOG OF BORING: OW-03

Project Name: M.R. Sampson Coho Facility
Location: Ellensburg, WA
Project Number: 10632-3
Sheet 1 of 1



SM
Silty Sand, scattered gravel, moist, brown, sand is fine to medium grained

GP
Silty, Sandy Gravel, medium dense to dense, wet, brown, gravel is fine to coarse, sand is coarse, gravel is sub-rounded to well rounded

Coarser gravel, cobbles

GC
Clayey, Sandy Gravel, scattered cobbles, medium dense, gray, wet, gravel si fine to coarse, sand is fine to medium grained, plastic fines

GC
Clayey, Sandy Gravel, gray, sand is fine to medium grained, gravel is sub-rounded to well-rounded, plastic fines

Boring Terminated at 28' bgs
Groundwater Encountered at 2.5' bgs

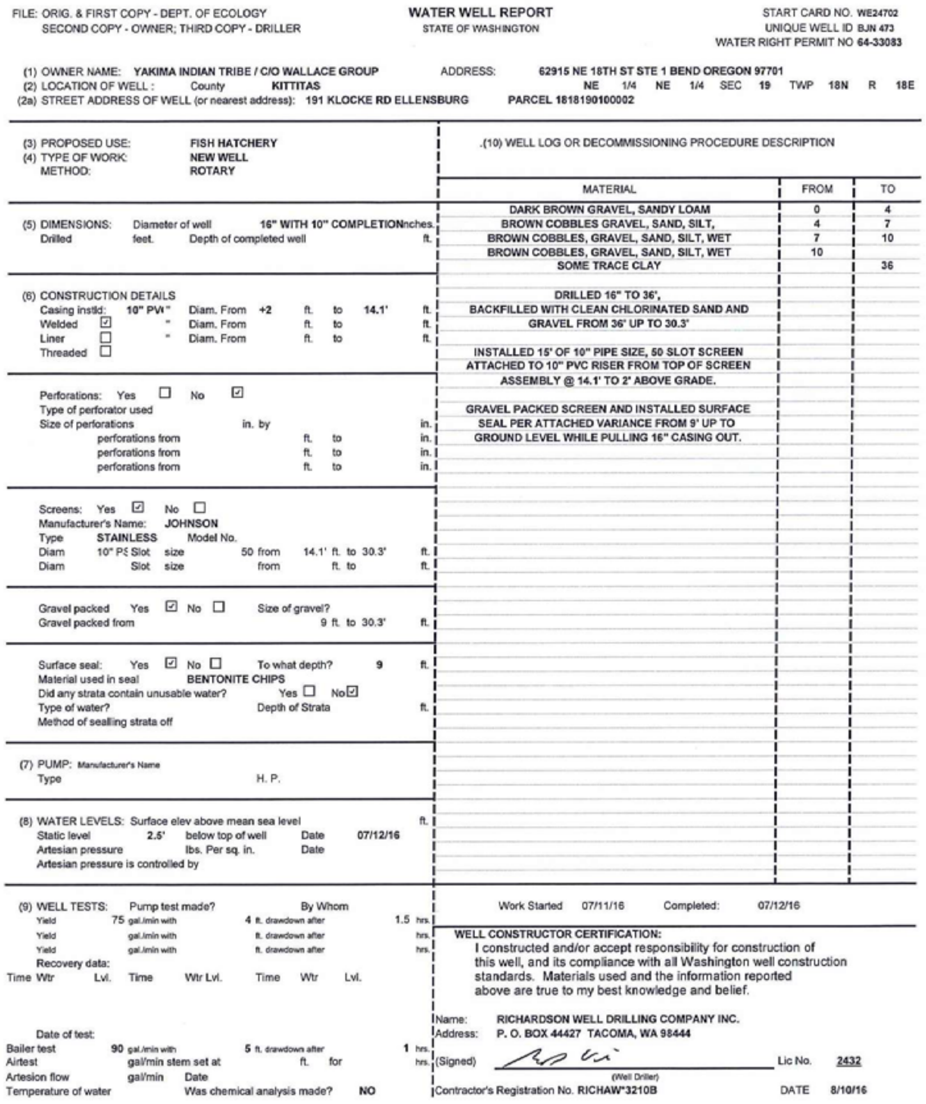
Sample Number	Sample Type	Sample N-Value	% Passing No. 200 Sieve	Moisture Content, %
S-1	Bag			
S-2	SPT	27		
S-3	Bag			
S-4	SPT	45		
S-5	Bag		3.9	5.9
S-6	SPT	41		
S-7	SPT	35		
S-8	Bag		15.8	9.9
S-9	Bag			
S-10	Bag			
S-11	Bag			

Well Depth: 25'
Date Started: 5/11/16
Date Completed: 5/11/16
Drilled By: Cascade Drilling
Logged By: AML

Equipment: Boart Longyear Sonic
SPT Drop Wt: 140 lbs
SPT Drop Height 30 in
Reviewed By: J. Parker

The Wallace Group
62915 NE 18th Street, STE1
Bend, Oregon 97701
P: 541.382.4707
F: 541.383.8118

Figure A-2



FILE: ORIG. & FIRST COPY - DEPT. OF ECOLOGY
SECOND COPY - OWNER; THIRD COPY - DRILLER

WATER WELL REPORT

STATE OF WASHINGTON

START CARD NO. WE24702
UNIQUE WELL ID BJN 473
WATER RIGHT PERMIT NO 64-33083

(1) OWNER NAME: **YAKIMA INDIAN TRIBE / C/O WALLACE GROUP** ADDRESS: **62915 NE 18TH ST STE 1 BEND OREGON 97701**
(2) LOCATION OF WELL : County **KITTITAS** **NE** 1/4 **NE** 1/4 SEC **19** TWP **18N** R **18E**
(2a) STREET ADDRESS OF WELL (or nearest address): **191 KLOCKE RD ELLENSBURG** **PARCEL 1818190100002**

(3) PROPOSED USE: **FISH HATCHERY**
(4) TYPE OF WORK: **NEW WELL**
METHOD: **ROTARY**

(5) DIMENSIONS: Diameter of well **16" WITH 10" COMPLETION**nches.
Drilled feet. Depth of completed well ft.

(6) CONSTRUCTION DETAILS
Casing instld: **10" PV\"** Diam. From **+2** ft. to **14.1'** ft.
Welded ☑ " Diam. From ft. to ft.
Liner ☐ " Diam. From ft. to ft.
Threaded ☐

Perforations: Yes ☐ No ☑
Type of perforator used
Size of perforations in. by in.
perforations from ft. to in.
perforations from ft. to in.
perforations from ft. to in.

Screens: Yes ☑ No ☐
Manufacturer's Name: **JOHNSON**
Type **STAINLESS** Model No.
Diam 10" PS Slot size 50 from 14.1' ft. to 30.3' ft.
Diam Slot size from ft. to ft.

Gravel packed Yes ☑ No ☐ Size of gravel?
Gravel packed from 9 ft. to 30.3' ft.

Surface seal: Yes ☑ No ☐ To what depth? **9** ft.
Material used in seal **BENTONITE CHIPS**
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? Depth of Strata ft.
Method of sealling strata off

(7) PUMP: Manufacturer's Name
Type H. P.

(8) WATER LEVELS: Surface elev above mean sea level ft.
Static level **2.5'** below top of well Date **07/12/16**
Artesian pressure lbs. Per sq. in. Date
Artesian pressure is controlled by

(9) WELL TESTS: Pump test made? By Whom
Yield 75 gal./min with 4 ft. drawdown after 1.5 hrs.
Yield gal./min with ft. drawdown after hrs.
Yield gal./min with ft. drawdown after hrs.
Recovery data:
Time Wtr Lvl. Time Wtr Lvl. Time Wtr Lvl.

Date of test:
Bailer test 90 gal./min with 5 ft. drawdown after 1 hrs.
Airtest gal/min stem set at ft. for hrs.
Artesion flow gal/min Date
Temperature of water Was chemical analysis made? **NO**

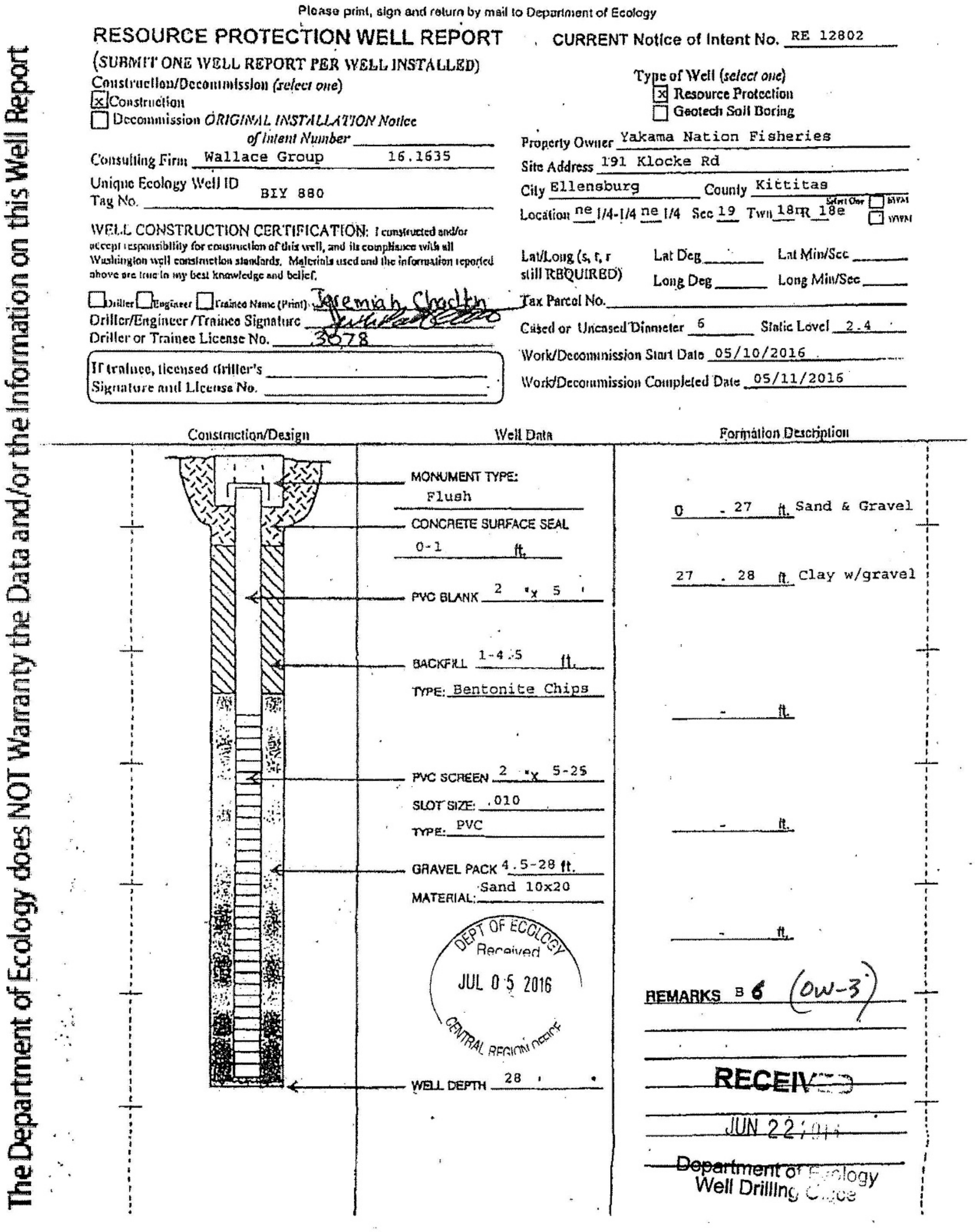
.(10) WELL LOG OR DECOMMISSIONING PROCEDURE DESCRIPTION

MATERIAL	FROM	TO
DARK BROWN GRAVEL, SANDY LOAM	0	4
BROWN COBBLES GRAVEL, SAND, SILT,	4	7
BROWN COBBLES, GRAVEL, SAND, SILT, WET	7	10
BROWN COBBLES, GRAVEL, SAND, SILT, WET	10	
SOME TRACE CLAY		36
DRILLED 16" TO 36',		
BACKFILLED WITH CLEAN CHLORINATED SAND AND		
GRAVEL FROM 36' UP TO 30.3'		
INSTALLED 15' OF 10" PIPE SIZE, 50 SLOT SCREEN		
ATTACHED TO 10" PVC RISER FROM TOP OF SCREEN		
ASSEMBLY @ 14.1' TO 2' ABOVE GRADE.		
GRAVEL PACKED SCREEN AND INSTALLED SURFACE		
SEAL PER ATTACHED VARIANCE FROM 9' UP TO		
GROUND LEVEL WHILE PULLING 16" CASING OUT.		

Work Started 07/11/16 Completed: 07/12/16

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Name: **RICHARDSON WELL DRILLING COMPANY INC.**
Address: **P. O. BOX 44427 TACOMA, WA 98444**
(Signed) Ep Ui (Well Driller) Lic No. 2432
Contractor's Registration No. **RICHAW*3210B** DATE **8/10/16**



Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. RE 12802

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*
☒ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well *(select one)*
☒ Resource Protection
☐ Geotech Soil Boring

Consulting Firm Wallace Group 16.1635
Unique Ecology Well ID Tag No. BIY 880

Property Owner Yakama Nation Fisheries
Site Address 191 Klocke Rd
City Ellensburg County Kittitas
Location ne 1/4-1/4 ne 1/4 Sec 19 Twn 18 R 18e Select One ☐ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) Jeremiah Charlton
Driller/Engineer/Trainee Signature
Driller or Trainee License No. 3078

If trainee, licensed driller's Signature and License No. ______

Lat/Long (s, t, r still REQUIRED) Lat Deg ______ Lat Min/Sec ______
Long Deg ______ Long Min/Sec ______
Tax Parcel No. ______
Cased or Uncased Diameter 6 Static Level 2.4
Work/Decommission Start Date 05/10/2016
Work/Decommission Completed Date 05/11/2016

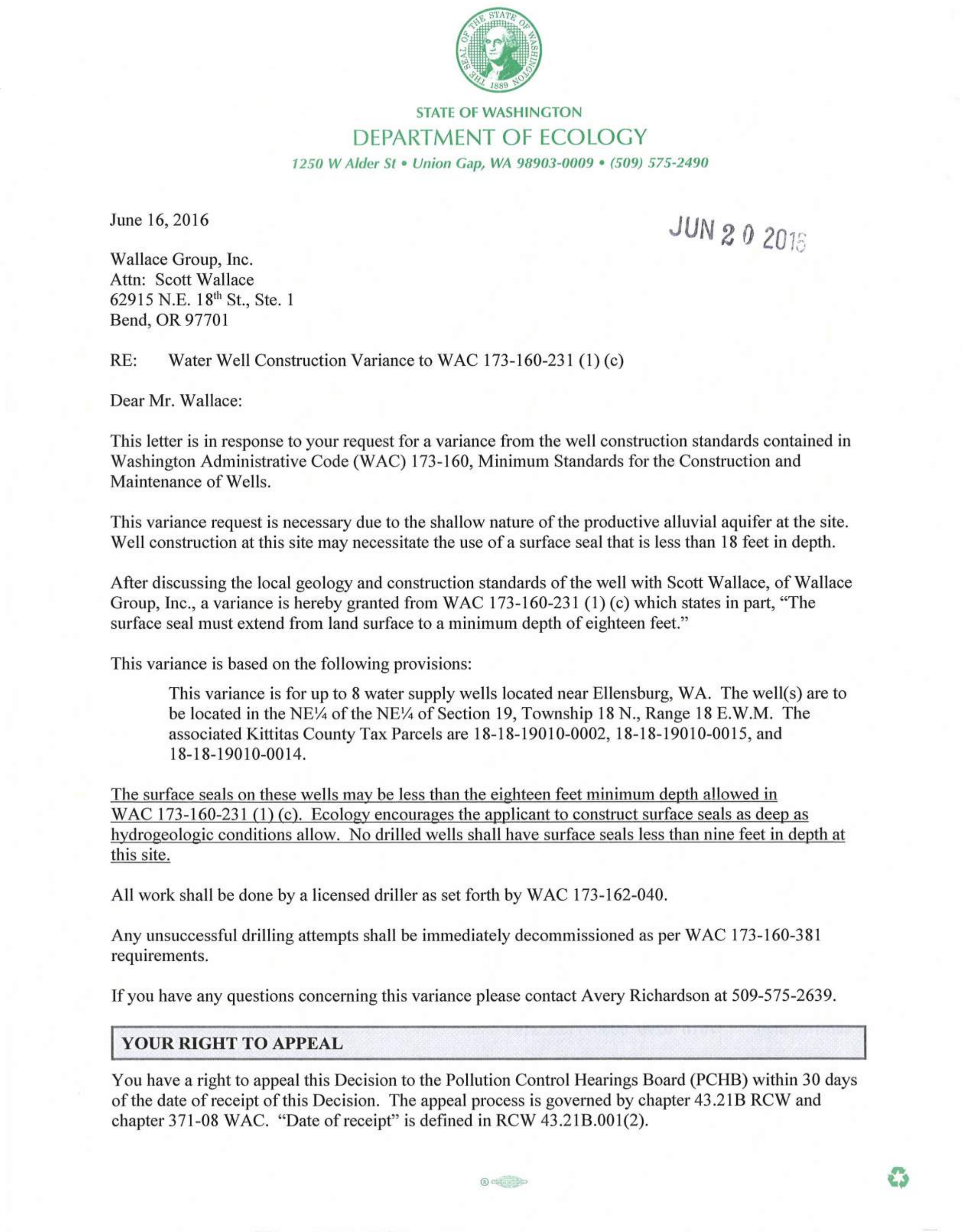
Construction/Design | Well Data | Formation Description

MONUMENT TYPE: Flush
CONCRETE SURFACE SEAL 0-1 ft.
PVC BLANK 2 "x 5 '
BACKFILL 1-4.5 ft.
TYPE: Bentonite Chips
PVC SCREEN 2 "x 5-25
SLOT SIZE: .010
TYPE: PVC
GRAVEL PACK 4.5-28 ft.
MATERIAL: Sand 10x20
WELL DEPTH 28 '

0 - 27 ft. Sand & Gravel
27 - 28 ft. Clay w/gravel
- ft.
- ft.
- ft.

REMARKS B 6 (OW-3)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
1250 W Alder St • Union Gap, WA 98903-0009 • (509) 575-2490

June 16, 2016

JUN 20 2016

Wallace Group, Inc.
Attn: Scott Wallace
62915 N.E. 18th St., Ste. 1
Bend, OR 97701

RE: Water Well Construction Variance to WAC 173-160-231 (1) (c)

Dear Mr. Wallace:

This letter is in response to your request for a variance from the well construction standards contained in Washington Administrative Code (WAC) 173-160, Minimum Standards for the Construction and Maintenance of Wells.

This variance request is necessary due to the shallow nature of the productive alluvial aquifer at the site. Well construction at this site may necessitate the use of a surface seal that is less than 18 feet in depth.

After discussing the local geology and construction standards of the well with Scott Wallace, of Wallace Group, Inc., a variance is hereby granted from WAC 173-160-231 (1) (c) which states in part, "The surface seal must extend from land surface to a minimum depth of eighteen feet."

This variance is based on the following provisions:

> This variance is for up to 8 water supply wells located near Ellensburg, WA. The well(s) are to be located in the NE¼ of the NE¼ of Section 19, Township 18 N., Range 18 E.W.M. The associated Kittitas County Tax Parcels are 18-18-19010-0002, 18-18-19010-0015, and 18-18-19010-0014.

The surface seals on these wells may be less than the eighteen feet minimum depth allowed in WAC 173-160-231 (1) (c). Ecology encourages the applicant to construct surface seals as deep as hydrogeologic conditions allow. No drilled wells shall have surface seals less than nine feet in depth at this site.

All work shall be done by a licensed driller as set forth by WAC 173-162-040.

Any unsuccessful drilling attempts shall be immediately decommissioned as per WAC 173-160-381 requirements.

If you have any questions concerning this variance please contact Avery Richardson at 509-575-2639.

YOUR RIGHT TO APPEAL

You have a right to appeal this Decision to the Pollution Control Hearings Board (PCHB) within 30 days of the date of receipt of this Decision. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do all of the following within 30 days of the date of receipt of this Decision:

- File your appeal and a copy of this Decision with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Decision on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION	
Street Addresses	**Mailing Addresses**
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia WA 98504-7608
Pollution Control Hearings Board 1111 Israel Road SW, Suite 301 Tumwater WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia WA 98504-0903

For additional information visit the Environmental Hearings Office Website: http://www.eho.wa.gov
To find laws and agency rules visit the Washington State Legislature Website: http://www.leg.wa.gov/CodeReviser

Avery A. Richardson, LHG
Well Construction Coordinator
Central Regional Office

Trevor Hutton

Trevor Hutton, Section Manager
Water Resources Program
Central Regional Office

TH:AR:SS/160617

Enclosure: Your Right to Be Heard

By certified mail: 7010 0290 0000 7128 2197

cc: Yakama Nation Fisheries
Scott Malone, Ecology - Water Resources HQ (email PDF)

wallaceGROUP
applied earth &
environmental science

APPENDIX B

UMPQUA Research Company
626 NE Division St. - P.O. Box 609
Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
E-mail: Lab@URCmail.net
Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT
URC # 6082413

Wallace Group
62915 NE 18th St. STE 1
Bend, OR 97701

Project: General
Project #: Sampson Hatchery
Client Contact: Shane Cochran

Date Reported: 09/09/16
Date Sampled: 08/22/16 07:15
Date Received: 08/24/16 12:05
Sampled By: RSW

Sample Location: PW-1

URC Sample #: 6082413-01

Matrix: Aqueous

Inorganics

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
EPA 300.0									
Fluoride		ND	mg/L	1.00		08/24/16	08/24/16	TDL	
Nitrate as N		**ND**	mg/L	1.00		08/24/16 14:25	08/24/16	TDL	O-07
Chloride		**5.40**	mg/L	5.00		08/24/16	08/24/16	TDL	
Nitrite as N		ND	mg/L	0.10		08/24/16 14:25	08/24/16	TDL	O-07
Nitrate/Nitrite as N		**ND**	mg/L	1.00		08/24/16 14:25	08/24/16	TDL	O-07
Sulfate		**ND**	mg/L	10.0		08/24/16	08/24/16	TDL	
SM 2320B									
Alkalinity		**58.9**	mg/L	3.00		09/02/16	09/02/16	TDL	
SM 2340C									
Hardness		**68.0**	mg/L	2.00		09/08/16	09/08/16	AVW	
SM 2540C									
TDS		**92.0**	mg/L	30.0		08/25/16	08/26/16	JTM	
SM 2540D									
TSS		**ND**	mg/L	1.0		08/25/16	08/26/16	JTM	
SM 4500 NH3									
Ammonia as N		ND	mg/L	0.40		08/29/16	08/29/16	DJP	

UMPQUA Research Company/MC

Tom Williams

Tom Williams, Laboratory Manager

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Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
E-mail: Lab@URCmail.net
Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT

URC # 6082413

Wallace Group	Project: General	Date Reported: 09/09/16
62915 NE 18th St. STE 1	Project #: Sampson Hatchery	Date Sampled: 08/22/16 07:15
Bend, OR 97701		Date Received: 08/24/16 12:05
	Client Contact: Shane Cochran	Sampled By: RSW

Sample Location: PW-1 URC Sample #: 6082413-01 Matrix: Aqueous

Metals

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
EPA 6020									
Aluminum		**ND**	mg/L	0.040		08/25/16	08/25/16	DJP	
Arsenic		**ND**	mg/L	0.001		08/25/16	08/25/16	DJP	
Barium		**ND**	mg/L	0.030		08/25/16	08/25/16	DJP	
Cadmium		**ND**	mg/L	0.0010		08/25/16	08/25/16	DJP	
Copper		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Lead		**ND**	mg/L	0.002		08/25/16	08/25/16	DJP	
Manganese		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Mercury		ND	mg/L	0.0010		09/01/16	09/01/16	DJP	
Nickel		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Selenium		**ND**	mg/L	0.005		08/25/16	08/25/16	DJP	
Silver		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Zinc		**0.038**	mg/L	0.020		08/25/16	08/25/16	DJP	
SM 3111B									
Iron		**0.121**	mg/L	0.020		08/29/16	08/29/16	DJP	
Magnesium		**7.72**	mg/L	0.020		08/26/16	08/26/16	DJP	
Potassium		**0.570**	mg/L	0.100		09/01/16	09/01/16	DJP	
Sodium		**3.43**	mg/L	0.100		09/01/16	09/01/16	DJP	
SM 3111D									
Calcium		**13.8**	mg/L	0.100		09/01/16	09/01/16	DJP	

UMPQUA Research Company/MC

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Tom Williams

Tom Williams, Laboratory Manager

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Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
E-mail: Lab@URCmail.net
Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT
URC # 6082413

Wallace Group
62915 NE 18th St. STE 1
Bend, OR 97701

Project: General
Project #: Sampson Hatchery
Client Contact: Shane Cochran

Date Reported: 09/09/16
Date Sampled: 08/22/16 07:15
Date Received: 08/24/16 12:05
Sampled By: RSW

Sample Location: PW-2

URC Sample #: 6082413-02

Matrix: Aqueous

Inorganics

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
EPA 300.0									
Fluoride		ND	mg/L	1.00		08/24/16	08/24/16	TDL	
Nitrate as N		**ND**	mg/L	1.00		08/24/16 14:25	08/24/16	TDL	O-07
Chloride		**5.59**	mg/L	5.00		08/24/16	08/24/16	TDL	
Nitrite as N		ND	mg/L	0.10		08/24/16 14:25	08/24/16	TDL	O-07
Nitrate/Nitrite as N		**ND**	mg/L	1.00		08/24/16 14:25	08/24/16	TDL	O-07
Sulfate		**ND**	mg/L	10.0		08/24/16	08/24/16	TDL	
SM 2320B									
Alkalinity		**59.8**	mg/L	3.00		09/02/16	09/02/16	TDL	
SM 2340C									
Hardness		**72.0**	mg/L	2.00		09/08/16	09/08/16	AVW	
SM 2540C									
TDS		**90.0**	mg/L	30.0		08/25/16	08/26/16	JTM	
SM 2540D									
TSS		**6.4**	mg/L	1.0		08/25/16	08/26/16	JTM	
SM 4500 NH3									
Ammonia as N		ND	mg/L	0.40		08/29/16	08/29/16	DJP	

UMPQUA Research Company/MC

Tom Williams

Tom Williams, Laboratory Manager

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ORELAP ID# OR100031

ANALYSIS REPORT
URC # 6082413

Wallace Group
62915 NE 18th St. STE 1
Bend, OR 97701

Project: General
Project #: Sampson Hatchery
Client Contact: Shane Cochran

Date Reported: 09/09/16
Date Sampled: 08/22/16 07:15
Date Received: 08/24/16 12:05
Sampled By: RSW

Sample Location: PW-2

URC Sample #: 6082413-02

Matrix: Aqueous

Metals

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
EPA 6020									
Aluminum		**0.116**	mg/L	0.040		08/25/16	08/25/16	DJP	
Arsenic		**ND**	mg/L	0.001		08/25/16	08/25/16	DJP	
Barium		**ND**	mg/L	0.030		08/25/16	08/25/16	DJP	
Cadmium		**ND**	mg/L	0.0010		08/25/16	08/25/16	DJP	
Copper		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Lead		**ND**	mg/L	0.002		08/25/16	08/25/16	DJP	
Manganese		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Mercury		ND	mg/L	0.0010		09/01/16	09/01/16	DJP	
Nickel		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Selenium		**ND**	mg/L	0.005		08/25/16	08/25/16	DJP	
Silver		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Zinc		**ND**	mg/L	0.020		08/25/16	08/25/16	DJP	
SM 3111B									
Iron		**0.116**	mg/L	0.020		08/29/16	08/29/16	DJP	
Magnesium		**7.94**	mg/L	0.020		08/26/16	08/26/16	DJP	
Potassium		**0.640**	mg/L	0.100		09/01/16	09/01/16	DJP	
Sodium		**3.25**	mg/L	0.100		09/01/16	09/01/16	DJP	
SM 3111D									
Calcium		**15.6**	mg/L	0.100		09/01/16	09/01/16	DJP	

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Tom Williams

Tom Williams, Laboratory Manager

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E-mail: Lab@URCmail.net
Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT
URC # 6082413

Wallace Group
62915 NE 18th St. STE 1
Bend, OR 97701

Project: General
Project #: Sampson Hatchery
Client Contact: Shane Cochran

Date Reported: 09/09/16
Date Sampled: 08/22/16 07:30
Date Received: 08/24/16 12:05
Sampled By: RSW

Sample Location: YSC

URC Sample #: 6082413-03

Matrix: Aqueous

Inorganics

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
EPA 300.0									
Fluoride		ND	mg/L	1.00		08/24/16	08/25/16	TDL	
Nitrate as N		**ND**	mg/L	1.00		08/24/16 14:25	08/25/16	TDL	O-07
Chloride		**ND**	mg/L	5.00		08/24/16	08/25/16	TDL	
Nitrite as N		ND	mg/L	0.10		08/24/16 14:25	08/25/16	TDL	O-07
Nitrate/Nitrite as N		**ND**	mg/L	1.00		08/24/16 14:25	08/25/16	TDL	O-07
Sulfate		**ND**	mg/L	10.0		08/24/16	08/25/16	TDL	
SM 2320B									
Alkalinity		**28.1**	mg/L	3.00		09/02/16	09/02/16	TDL	
SM 2340C									
Hardness		**28.0**	mg/L	2.00		09/08/16	09/08/16	AVW	
SM 2540C									
TDS		**45.0**	mg/L	30.0		08/25/16	08/26/16	JTM	
SM 2540D									
TSS		**ND**	mg/L	1.0		08/25/16	08/26/16	JTM	
SM 4500 NH3									
Ammonia as N		ND	mg/L	0.40		08/29/16	08/29/16	DJP	

UMPQUA Research Company/MC

Tom Williams

Tom Williams, Laboratory Manager

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ANALYSIS REPORT
URC # 6082413

Wallace Group
62915 NE 18th St. STE 1
Bend, OR 97701

Project: General
Project #: Sampson Hatchery
Client Contact: Shane Cochran

Date Reported: 09/09/16
Date Sampled: 08/22/16 07:30
Date Received: 08/24/16 12:05
Sampled By: RSW

Sample Location: YSC

URC Sample #: 6082413-03

Matrix: Aqueous

Metals

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
EPA 6020									
Aluminum		**ND**	mg/L	0.040		08/25/16	08/25/16	DJP	
Arsenic		**ND**	mg/L	0.001		08/25/16	08/25/16	DJP	
Barium		**ND**	mg/L	0.030		08/25/16	08/25/16	DJP	
Cadmium		**ND**	mg/L	0.0010		08/25/16	08/25/16	DJP	
Copper		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Lead		**ND**	mg/L	0.002		08/25/16	08/25/16	DJP	
Manganese		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Mercury		**ND**	mg/L	0.0010		09/01/16	09/01/16	DJP	
Nickel		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Selenium		**ND**	mg/L	0.005		08/25/16	08/25/16	DJP	
Silver		**ND**	mg/L	0.010		08/25/16	08/25/16	DJP	
Zinc		**ND**	mg/L	0.020		08/25/16	08/25/16	DJP	
SM 3111B									
Iron		**0.120**	mg/L	0.020		08/29/16	08/29/16	DJP	
Magnesium		**3.11**	mg/L	0.020		08/26/16	08/26/16	DJP	
Potassium		**0.281**	mg/L	0.100		09/01/16	09/01/16	DJP	
Sodium		**1.60**	mg/L	0.100		09/01/16	09/01/16	DJP	
SM 3111D									
Calcium		**5.81**	mg/L	0.100		09/01/16	09/01/16	DJP	

UMPQUA Research Company/MC

Tom Williams

Tom Williams, Laboratory Manager

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Qualifiers and Definitions

O-07	Sample received outside recommended method hold time. Sample analyzed per client request.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the MRL (minimum reporting limit)
NA	Not Applicable
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MRL	Minimum Reporting Limit
MDL	Minimum Detection Limit
BML	Benchmark Level
(‡)	ORELAP Accredited Analyte
(~)	Due to rounding of individual analytes, the "total" may vary slightly from the sum of the individual analyte values.

UMPQUA Research Company/MC

Tom Williams

Tom Williams, Laboratory Manager

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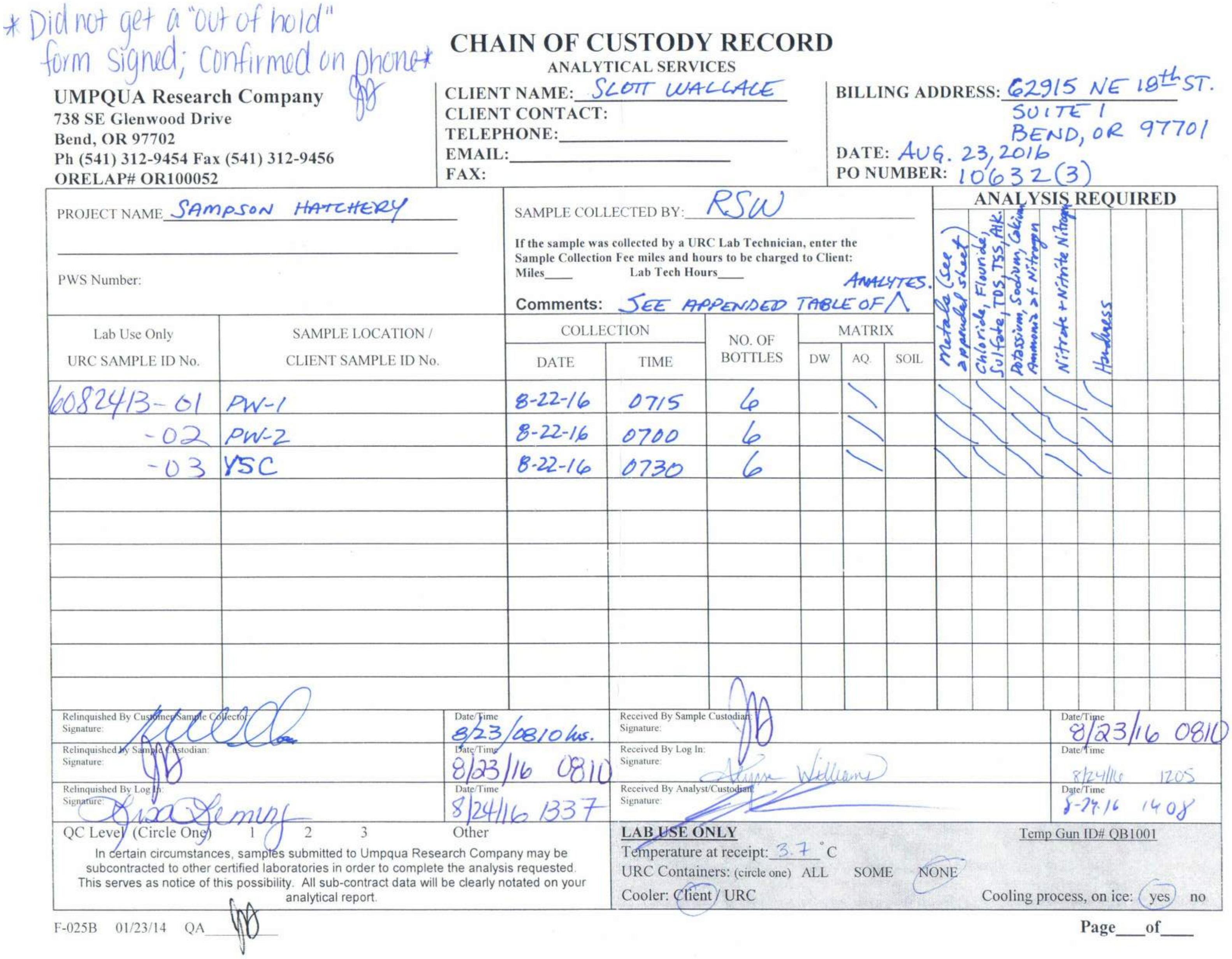


* Did not get a "out of hold" form signed; confirmed on phone*

CHAIN OF CUSTODY RECORD

ANALYTICAL SERVICES

UMPQUA Research Company
738 SE Glenwood Drive
Bend, OR 97702
Ph (541) 312-9454 Fax (541) 312-9456
ORELAP# OR100052

CLIENT NAME: SLOTT WALLACE
CLIENT CONTACT:
TELEPHONE:
EMAIL:
FAX:

BILLING ADDRESS: 62915 NE 18th ST.
SUITE 1
BEND, OR 97701
DATE: AUG. 23, 2016
PO NUMBER: 10632(3)

PROJECT NAME SAMPSON HATCHERY

PWS Number:

SAMPLE COLLECTED BY: RSW

If the sample was collected by a URC Lab Technician, enter the Sample Collection Fee miles and hours to be charged to Client:
Miles____ Lab Tech Hours____

Comments: SEE APPENDED TABLE OF ANALYTES.

Lab Use Only URC SAMPLE ID No.	SAMPLE LOCATION / CLIENT SAMPLE ID No.	COLLECTION		NO. OF BOTTLES	MATRIX			ANALYSIS REQUIRED							
		DATE	TIME		DW	AQ.	SOIL	Metals (see appended sheet)	Chloride, Flouride, Sulfate, TDS, TSS, Alk.	Potassium, Sodium, Calcium, Ammonia as Nitrogen	Nitrate + Nitrite Nitrogen	Hardness			
6082413-01	PW-1	8-22-16	0715	6		\		\	\	\	\	\			
-02	PW-2	8-22-16	0700	6		\		\	\	\	\	\			
-03	YSC	8-22-16	0730	6		\		\	\	\	\	\			

Relinquished By Customer/Sample Collector: Signature:	Date/Time 8/23/0810 hs.	Received By Sample Custodian: Signature:	Date/Time 8/23/16 0810
Relinquished By Sample Custodian: Signature:	Date/Time 8/23/16 0810	Received By Log In: Signature: Williams	Date/Time 8/24/16 1205
Relinquished By Log In: Signature:	Date/Time 8/24/16 1337	Received By Analyst/Custodian: Signature:	Date/Time 8-24-16 1408

QC Level (Circle One) 1 2 3 Other

In certain circumstances, samples submitted to Umpqua Research Company may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

LAB USE ONLY

Temp Gun ID# QB1001

Temperature at receipt: 3.7 °C

URC Containers: (circle one) ALL SOME [✓ NONE]

Cooler: [✓ Client] / URC

Cooling process, on ice: [✓ yes] no

F-025B 01/23/14 QA____

Page___of___

Quality Assurance/Quality Control Review of Analytical Data

PROJECT AND SAMPLE INFORMATION

Project Name:	Aquifer Testing Report, M.R. Sampson Coho Facility
Project Number:	10632 (3)
Date of Review:	November 4, 2016
Reviewer Name:	Stephen Woodward, G.I.T.
Lab Name(s):	Umpqua Research Company
Report Date:	September 9, 2016
Sample Date:	August 22, 2016
Sample Numbers:	See Umpqua Research Company Laboratory Report
Lab Job ID No.	6082413-01

ANALYTICAL METHODS

EPA 300.0, SM2320B, SM2340C, SM2540C, SM2540D, SM4500 NH3, EPA 6020, SM311B, SM311D

CHAIN OF CUSTODY DOCUMENTATION

Samples were transported under laboratory chain-of-custody with no discrepancies.

SAMPLE HOLDING TIMES

Holding times were exceeded for Nitrate as N, Nitrite as N, and Nitrate/Nitrite as N (EPA 300.0).

SAMPLE CONTAINERS

Containers were appropriate for the analyses performed, have legible labels, and were completely filled with sufficient volume for all requested analyses.

INSTRUMENT CALABRATION

No discrepancies noted

REPORTING NARRATIVE

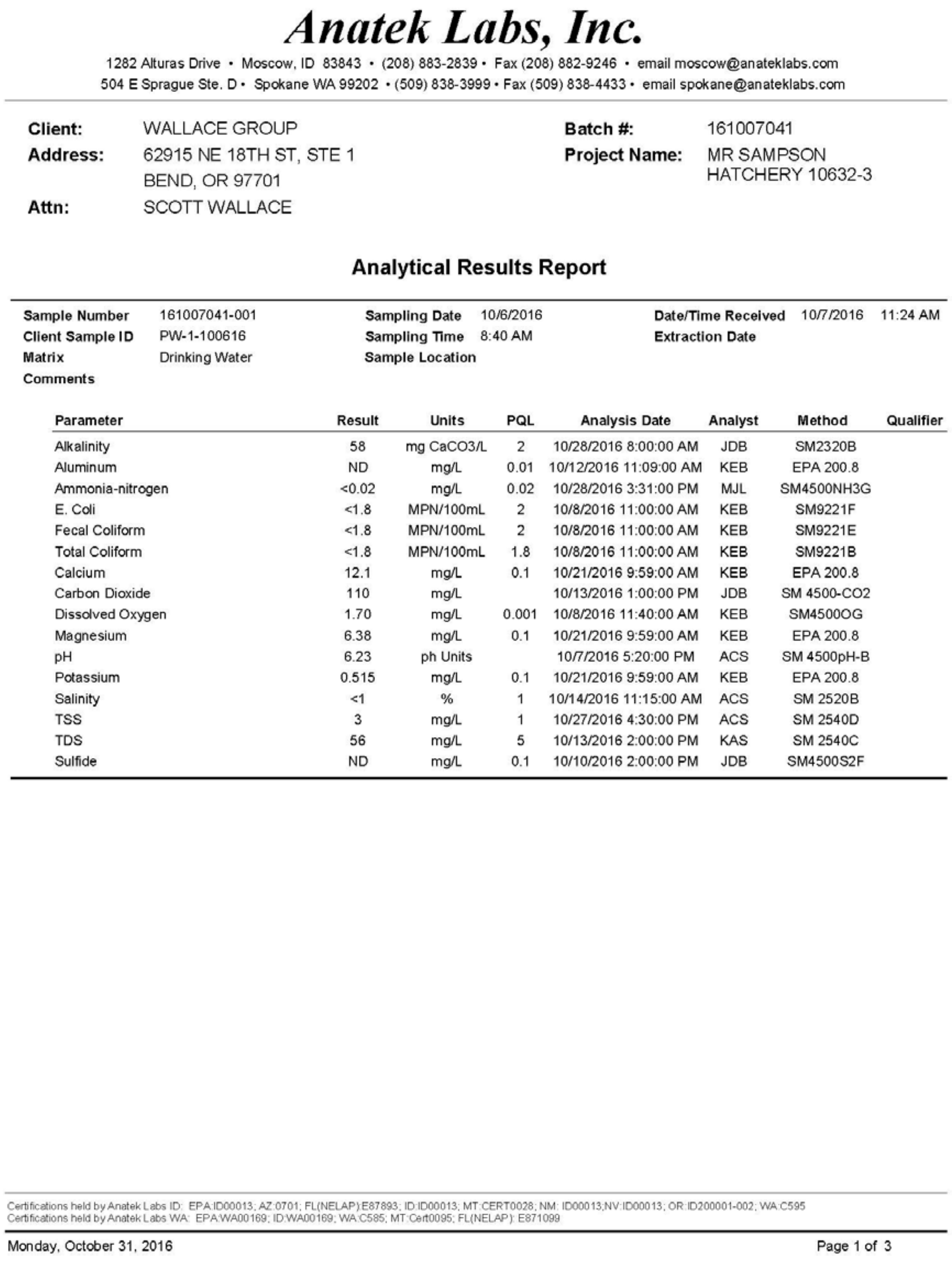
The samples were received on August 24, 2016 at 12:05 pm; the samples arrived in good condition, were properly preserved and, where required, on ice at a temperature of 3.7 degrees C. No other analytical or quality issues were noted.

DUPLICATE ANALYSIS

a) Field Dups.- Not collected

DATA USE LIMITATIONS

The results were non-detect for all samples involved in the exceeded hold times. Samples taken on October 6, 2016 at the same locations showed similar results. All Nitrite, Nitrate, and Total Nitrogen were well below their respective RBC's.



Anatek Labs, Inc.

1282 Alturas Drive • Moscow, ID 83843 • (208) 883-2839 • Fax (208) 882-9246 • email moscow@anateklabs.com
504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client:	WALLACE GROUP	**Batch #:**	161007041
Address:	62915 NE 18TH ST, STE 1 BEND, OR 97701	**Project Name:**	MR SAMPSON HATCHERY 10632-3
Attn:	SCOTT WALLACE		

Analytical Results Report

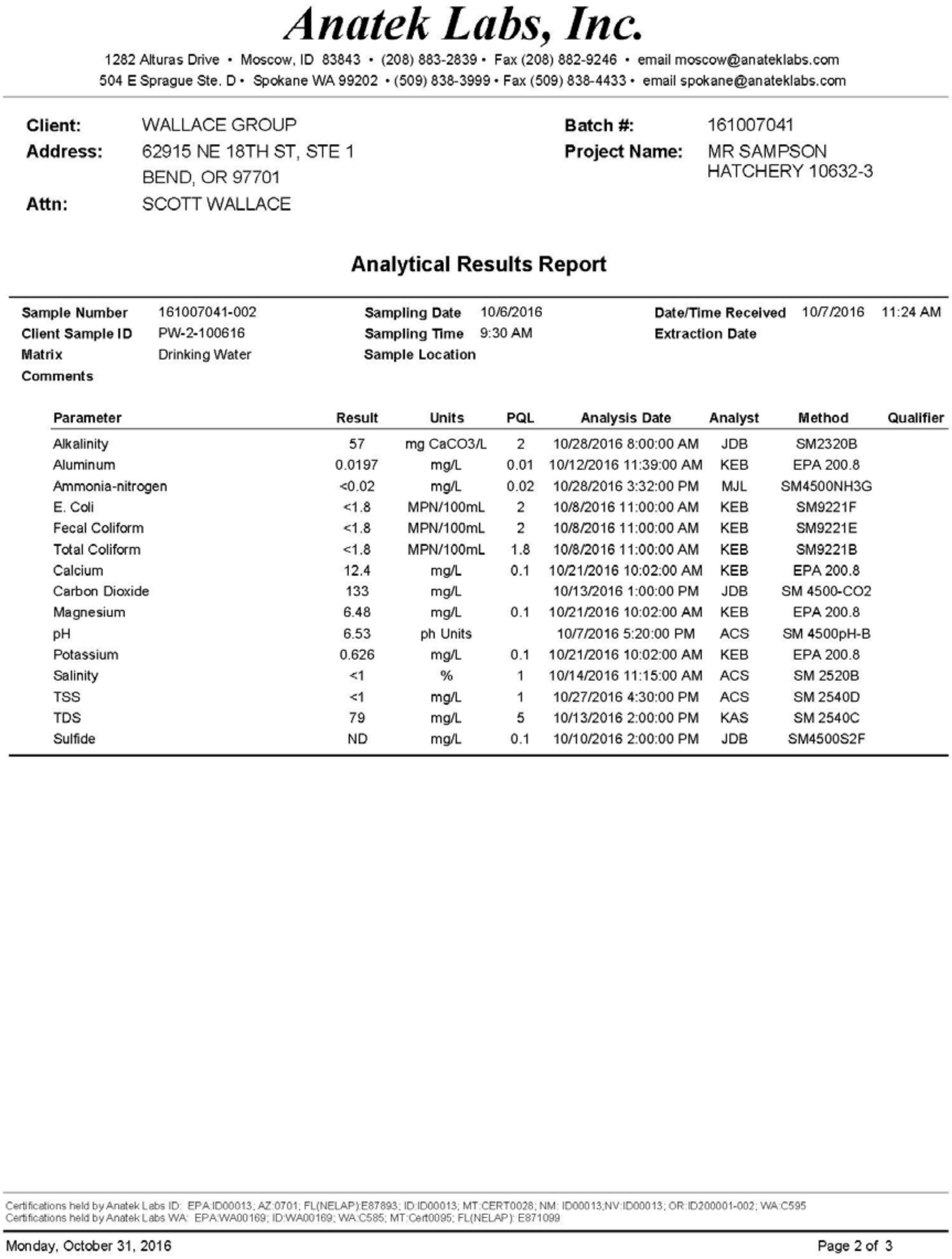
Sample Number	161007041-001	**Sampling Date**	10/6/2016	**Date/Time Received**	10/7/2016	11:24 AM
Client Sample ID	PW-1-100616	**Sampling Time**	8:40 AM	**Extraction Date**		
Matrix	Drinking Water	**Sample Location**				
Comments						

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Alkalinity	58	mg CaCO3/L	2	10/28/2016 8:00:00 AM	JDB	SM2320B	
Aluminum	ND	mg/L	0.01	10/12/2016 11:09:00 AM	KEB	EPA 200.8	
Ammonia-nitrogen	<0.02	mg/L	0.02	10/28/2016 3:31:00 PM	MJL	SM4500NH3G	
E. Coli	<1.8	MPN/100mL	2	10/8/2016 11:00:00 AM	KEB	SM9221F	
Fecal Coliform	<1.8	MPN/100mL	2	10/8/2016 11:00:00 AM	KEB	SM9221E	
Total Coliform	<1.8	MPN/100mL	1.8	10/8/2016 11:00:00 AM	KEB	SM9221B	
Calcium	12.1	mg/L	0.1	10/21/2016 9:59:00 AM	KEB	EPA 200.8	
Carbon Dioxide	110	mg/L		10/13/2016 1:00:00 PM	JDB	SM 4500-CO2	
Dissolved Oxygen	1.70	mg/L	0.001	10/8/2016 11:40:00 AM	KEB	SM4500OG	
Magnesium	6.38	mg/L	0.1	10/21/2016 9:59:00 AM	KEB	EPA 200.8	
pH	6.23	ph Units		10/7/2016 5:20:00 PM	ACS	SM 4500pH-B	
Potassium	0.515	mg/L	0.1	10/21/2016 9:59:00 AM	KEB	EPA 200.8	
Salinity	<1	%	1	10/14/2016 11:15:00 AM	ACS	SM 2520B	
TSS	3	mg/L	1	10/27/2016 4:30:00 PM	ACS	SM 2540D	
TDS	56	mg/L	5	10/13/2016 2:00:00 PM	KAS	SM 2540C	
Sulfide	ND	mg/L	0.1	10/10/2016 2:00:00 PM	JDB	SM4500S2F	

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

Monday, October 31, 2016

Page 1 of 3



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Client: WALLACE GROUP
Address: 62915 NE 18TH ST, STE 1
BEND, OR 97701
Attn: SCOTT WALLACE

Batch #: 161007041
Project Name: MR SAMPSON HATCHERY 10632-3

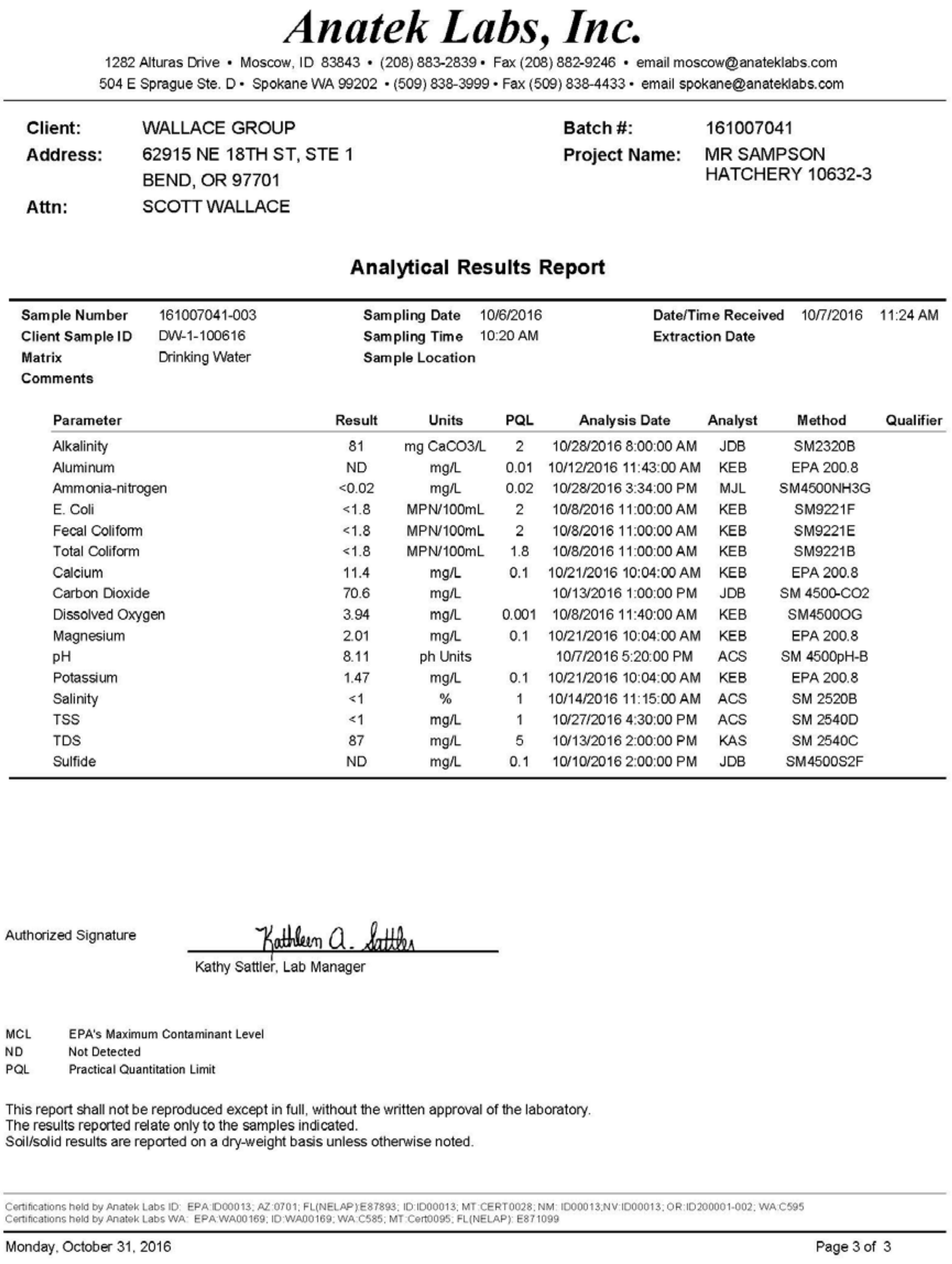
Analytical Results Report

Sample Number	161007041-002	**Sampling Date**	10/6/2016	**Date/Time Received**	10/7/2016 11:24 AM
Client Sample ID	PW-2-100616	**Sampling Time**	9:30 AM	**Extraction Date**	
Matrix	Drinking Water	**Sample Location**			
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Alkalinity	57	mg CaCO3/L	2	10/28/2016 8:00:00 AM	JDB	SM2320B	
Aluminum	0.0197	mg/L	0.01	10/12/2016 11:39:00 AM	KEB	EPA 200.8	
Ammonia-nitrogen	<0.02	mg/L	0.02	10/28/2016 3:32:00 PM	MJL	SM4500NH3G	
E. Coli	<1.8	MPN/100mL	2	10/8/2016 11:00:00 AM	KEB	SM9221F	
Fecal Coliform	<1.8	MPN/100mL	2	10/8/2016 11:00:00 AM	KEB	SM9221E	
Total Coliform	<1.8	MPN/100mL	1.8	10/8/2016 11:00:00 AM	KEB	SM9221B	
Calcium	12.4	mg/L	0.1	10/21/2016 10:02:00 AM	KEB	EPA 200.8	
Carbon Dioxide	133	mg/L		10/13/2016 1:00:00 PM	JDB	SM 4500-CO2	
Magnesium	6.48	mg/L	0.1	10/21/2016 10:02:00 AM	KEB	EPA 200.8	
pH	6.53	ph Units		10/7/2016 5:20:00 PM	ACS	SM 4500pH-B	
Potassium	0.626	mg/L	0.1	10/21/2016 10:02:00 AM	KEB	EPA 200.8	
Salinity	<1	%	1	10/14/2016 11:15:00 AM	ACS	SM 2520B	
TSS	<1	mg/L	1	10/27/2016 4:30:00 PM	ACS	SM 2540D	
TDS	79	mg/L	5	10/13/2016 2:00:00 PM	KAS	SM 2540C	
Sulfide	ND	mg/L	0.1	10/10/2016 2:00:00 PM	JDB	SM4500S2F	

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

Monday, October 31, 2016 Page 2 of 3



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Client: WALLACE GROUP
Address: 62915 NE 18TH ST, STE 1
BEND, OR 97701
Attn: SCOTT WALLACE

Batch #: 161007041
Project Name: MR SAMPSON HATCHERY 10632-3

Analytical Results Report

Sample Number 161007041-003
Client Sample ID DW-1-100616
Matrix Drinking Water
Comments

Sampling Date 10/6/2016
Sampling Time 10:20 AM
Sample Location

Date/Time Received 10/7/2016 11:24 AM
Extraction Date

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Alkalinity	81	mg CaCO3/L	2	10/28/2016 8:00:00 AM	JDB	SM2320B	
Aluminum	ND	mg/L	0.01	10/12/2016 11:43:00 AM	KEB	EPA 200.8	
Ammonia-nitrogen	<0.02	mg/L	0.02	10/28/2016 3:34:00 PM	MJL	SM4500NH3G	
E. Coli	<1.8	MPN/100mL	2	10/8/2016 11:00:00 AM	KEB	SM9221F	
Fecal Coliform	<1.8	MPN/100mL	2	10/8/2016 11:00:00 AM	KEB	SM9221E	
Total Coliform	<1.8	MPN/100mL	1.8	10/8/2016 11:00:00 AM	KEB	SM9221B	
Calcium	11.4	mg/L	0.1	10/21/2016 10:04:00 AM	KEB	EPA 200.8	
Carbon Dioxide	70.6	mg/L		10/13/2016 1:00:00 PM	JDB	SM 4500-CO2	
Dissolved Oxygen	3.94	mg/L	0.001	10/8/2016 11:40:00 AM	KEB	SM4500OG	
Magnesium	2.01	mg/L	0.1	10/21/2016 10:04:00 AM	KEB	EPA 200.8	
pH	8.11	ph Units		10/7/2016 5:20:00 PM	ACS	SM 4500pH-B	
Potassium	1.47	mg/L	0.1	10/21/2016 10:04:00 AM	KEB	EPA 200.8	
Salinity	<1	%	1	10/14/2016 11:15:00 AM	ACS	SM 2520B	
TSS	<1	mg/L	1	10/27/2016 4:30:00 PM	ACS	SM 2540D	
TDS	87	mg/L	5	10/13/2016 2:00:00 PM	KAS	SM 2540C	
Sulfide	ND	mg/L	0.1	10/10/2016 2:00:00 PM	JDB	SM4500S2F	

Authorized Signature Kathleen A. Sattler
Kathy Sattler, Lab Manager

MCL	EPA's Maximum Contaminant Level
ND	Not Detected
PQL	Practical Quantitation Limit

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
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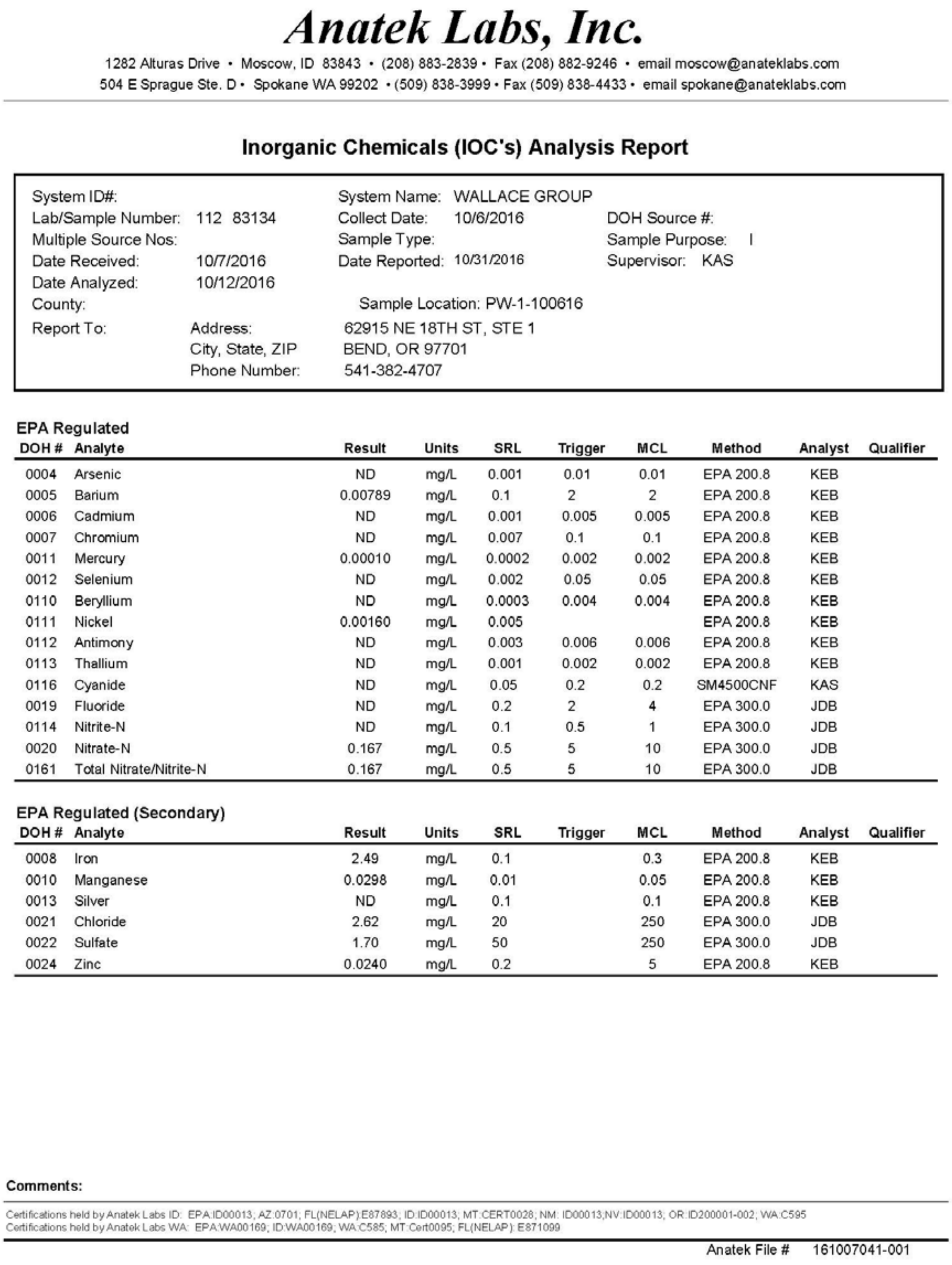
Monday, October 31, 2016 Page 3 of 3



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Inorganic Chemicals (IOC's) Analysis Report

System ID#:
System Name: WALLACE GROUP
Lab/Sample Number: 112 83134
Collect Date: 10/6/2016
DOH Source #:
Multiple Source Nos:
Sample Type:
Sample Purpose: I
Date Received: 10/7/2016
Date Reported: 10/31/2016
Supervisor: KAS
Date Analyzed: 10/12/2016
County:
Sample Location: PW-1-100616
Report To:
Address: 62915 NE 18TH ST, STE 1
City, State, ZIP BEND, OR 97701
Phone Number: 541-382-4707

EPA Regulated

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0004	Arsenic	ND	mg/L	0.001	0.01	0.01	EPA 200.8	KEB	
0005	Barium	0.00789	mg/L	0.1	2	2	EPA 200.8	KEB	
0006	Cadmium	ND	mg/L	0.001	0.005	0.005	EPA 200.8	KEB	
0007	Chromium	ND	mg/L	0.007	0.1	0.1	EPA 200.8	KEB	
0011	Mercury	0.00010	mg/L	0.0002	0.002	0.002	EPA 200.8	KEB	
0012	Selenium	ND	mg/L	0.002	0.05	0.05	EPA 200.8	KEB	
0110	Beryllium	ND	mg/L	0.0003	0.004	0.004	EPA 200.8	KEB	
0111	Nickel	0.00160	mg/L	0.005			EPA 200.8	KEB	
0112	Antimony	ND	mg/L	0.003	0.006	0.006	EPA 200.8	KEB	
0113	Thallium	ND	mg/L	0.001	0.002	0.002	EPA 200.8	KEB	
0116	Cyanide	ND	mg/L	0.05	0.2	0.2	SM4500CNF	KAS	
0019	Fluoride	ND	mg/L	0.2	2	4	EPA 300.0	JDB	
0114	Nitrite-N	ND	mg/L	0.1	0.5	1	EPA 300.0	JDB	
0020	Nitrate-N	0.167	mg/L	0.5	5	10	EPA 300.0	JDB	
0161	Total Nitrate/Nitrite-N	0.167	mg/L	0.5	5	10	EPA 300.0	JDB	

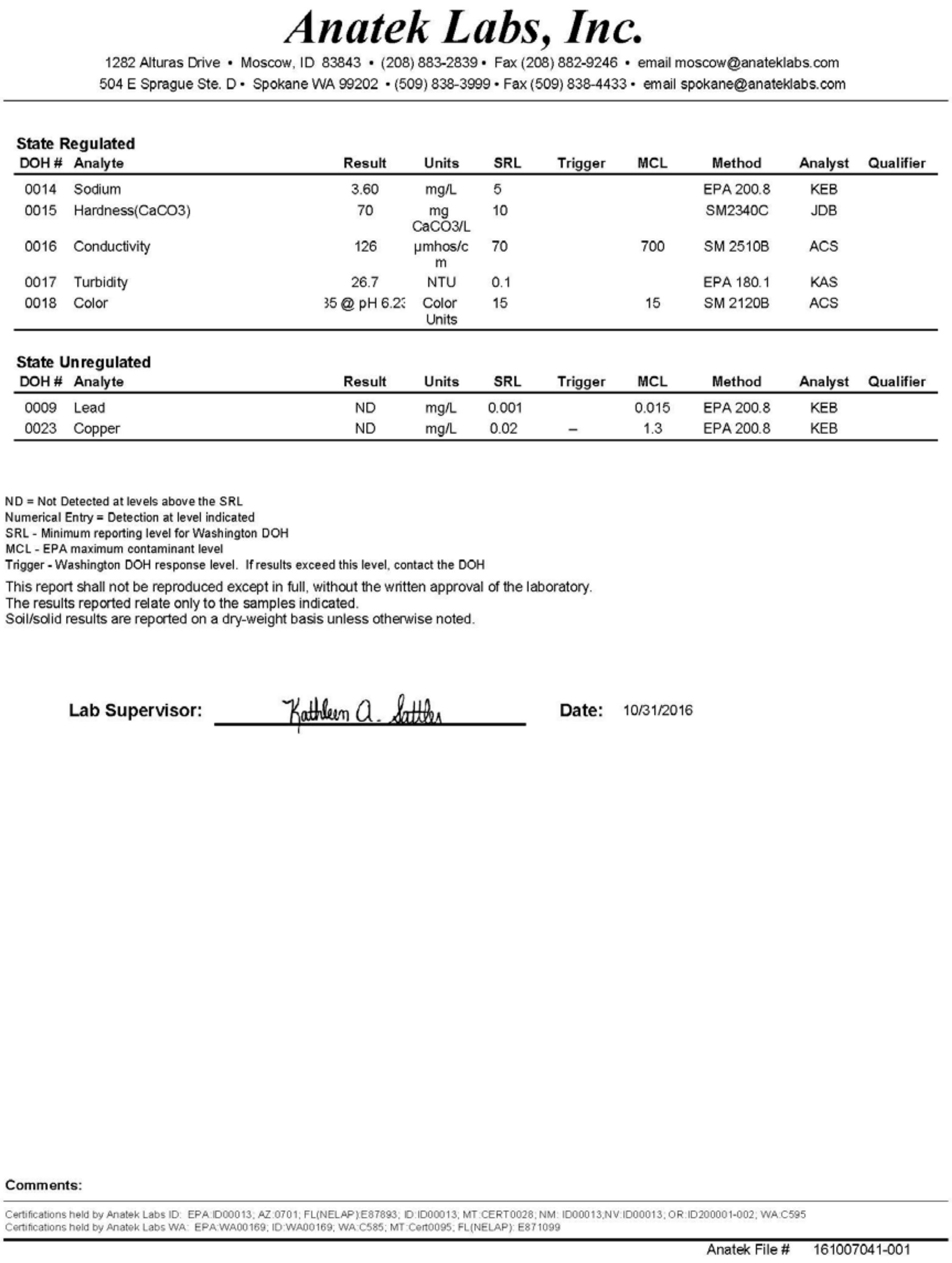
EPA Regulated (Secondary)

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0008	Iron	2.49	mg/L	0.1		0.3	EPA 200.8	KEB	
0010	Manganese	0.0298	mg/L	0.01		0.05	EPA 200.8	KEB	
0013	Silver	ND	mg/L	0.1		0.1	EPA 200.8	KEB	
0021	Chloride	2.62	mg/L	20		250	EPA 300.0	JDB	
0022	Sulfate	1.70	mg/L	50		250	EPA 300.0	JDB	
0024	Zinc	0.0240	mg/L	0.2		5	EPA 200.8	KEB	

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

Anatek File # 161007041-001



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State Regulated

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0014	Sodium	3.60	mg/L	5			EPA 200.8	KEB	
0015	Hardness(CaCO3)	70	mg CaCO3/L	10			SM2340C	JDB	
0016	Conductivity	126	µmhos/cm	70		700	SM 2510B	ACS	
0017	Turbidity	26.7	NTU	0.1			EPA 180.1	KAS	
0018	Color	35 @ pH 6.2	Color Units	15		15	SM 2120B	ACS	

State Unregulated

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0009	Lead	ND	mg/L	0.001		0.015	EPA 200.8	KEB	
0023	Copper	ND	mg/L	0.02	–	1.3	EPA 200.8	KEB	

ND = Not Detected at levels above the SRL
Numerical Entry = Detection at level indicated
SRL - Minimum reporting level for Washington DOH
MCL - EPA maximum contaminant level
Trigger - Washington DOH response level. If results exceed this level, contact the DOH

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The results reported relate only to the samples indicated.
Soil/solid results are reported on a dry-weight basis unless otherwise noted.

Lab Supervisor: Kathleen A. Sattler **Date:** 10/31/2016

Comments:

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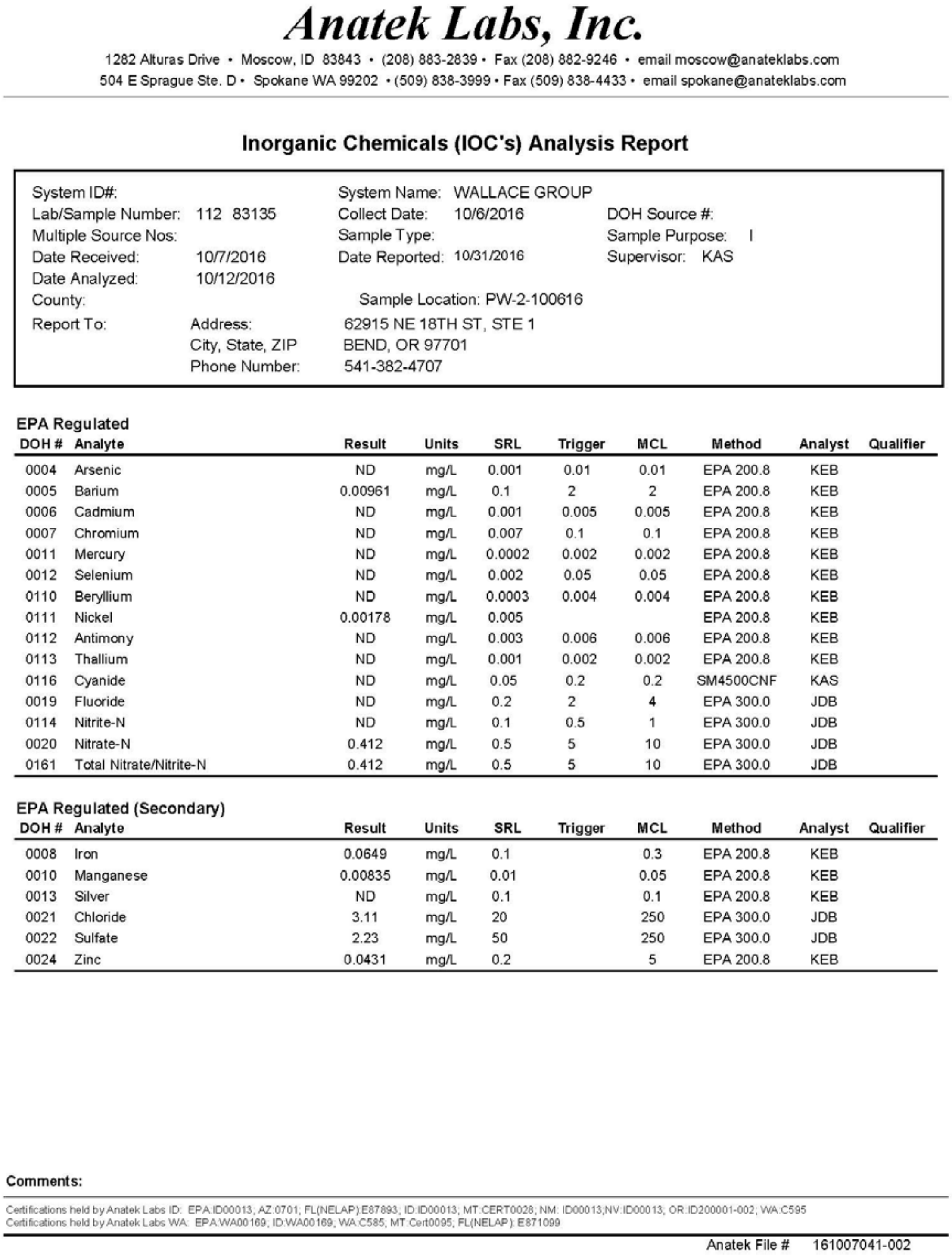
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

Anatek File # 161007041-001



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Inorganic Chemicals (IOC's) Analysis Report

System ID#:
Lab/Sample Number: 112 83135
Multiple Source Nos:
Date Received: 10/7/2016
Date Analyzed: 10/12/2016
County:
System Name: WALLACE GROUP
Collect Date: 10/6/2016
Sample Type:
Date Reported: 10/31/2016
Sample Location: PW-2-100616
DOH Source #:
Sample Purpose: I
Supervisor: KAS

Report To:
Address: 62915 NE 18TH ST, STE 1
City, State, ZIP BEND, OR 97701
Phone Number: 541-382-4707

EPA Regulated

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0004	Arsenic	ND	mg/L	0.001	0.01	0.01	EPA 200.8	KEB	
0005	Barium	0.00961	mg/L	0.1	2	2	EPA 200.8	KEB	
0006	Cadmium	ND	mg/L	0.001	0.005	0.005	EPA 200.8	KEB	
0007	Chromium	ND	mg/L	0.007	0.1	0.1	EPA 200.8	KEB	
0011	Mercury	ND	mg/L	0.0002	0.002	0.002	EPA 200.8	KEB	
0012	Selenium	ND	mg/L	0.002	0.05	0.05	EPA 200.8	KEB	
0110	Beryllium	ND	mg/L	0.0003	0.004	0.004	EPA 200.8	KEB	
0111	Nickel	0.00178	mg/L	0.005			EPA 200.8	KEB	
0112	Antimony	ND	mg/L	0.003	0.006	0.006	EPA 200.8	KEB	
0113	Thallium	ND	mg/L	0.001	0.002	0.002	EPA 200.8	KEB	
0116	Cyanide	ND	mg/L	0.05	0.2	0.2	SM4500CNF	KAS	
0019	Fluoride	ND	mg/L	0.2	2	4	EPA 300.0	JDB	
0114	Nitrite-N	ND	mg/L	0.1	0.5	1	EPA 300.0	JDB	
0020	Nitrate-N	0.412	mg/L	0.5	5	10	EPA 300.0	JDB	
0161	Total Nitrate/Nitrite-N	0.412	mg/L	0.5	5	10	EPA 300.0	JDB	

EPA Regulated (Secondary)

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0008	Iron	0.0649	mg/L	0.1		0.3	EPA 200.8	KEB	
0010	Manganese	0.00835	mg/L	0.01		0.05	EPA 200.8	KEB	
0013	Silver	ND	mg/L	0.1		0.1	EPA 200.8	KEB	
0021	Chloride	3.11	mg/L	20		250	EPA 300.0	JDB	
0022	Sulfate	2.23	mg/L	50		250	EPA 300.0	JDB	
0024	Zinc	0.0431	mg/L	0.2		5	EPA 200.8	KEB	

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
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Anatek File # 161007041-002

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State Regulated

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0014	Sodium	3.76	mg/L	5			EPA 200.8	KEB	
0015	Hardness(CaCO3)	65	mg CaCO3/L	10			SM2340C	JDB	
0016	Conductivity	132	µmhos/cm	70		700	SM 2510B	ACS	
0017	Turbidity	0.531	NTU	0.1			EPA 180.1	KAS	
0018	Color	<5 @ pH 6.53	Color Units	15		15	SM 2120B	ACS	

State Unregulated

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0009	Lead	ND	mg/L	0.001		0.015	EPA 200.8	KEB	
0023	Copper	ND	mg/L	0.02	–	1.3	EPA 200.8	KEB	

ND = Not Detected at levels above the SRL
Numerical Entry = Detection at level indicated
SRL - Minimum reporting level for Washington DOH
MCL - EPA maximum contaminant level
Trigger - Washington DOH response level. If results exceed this level, contact the DOH

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Lab Supervisor: Kathleen A. Sattler **Date:** 10/31/2016

Comments:

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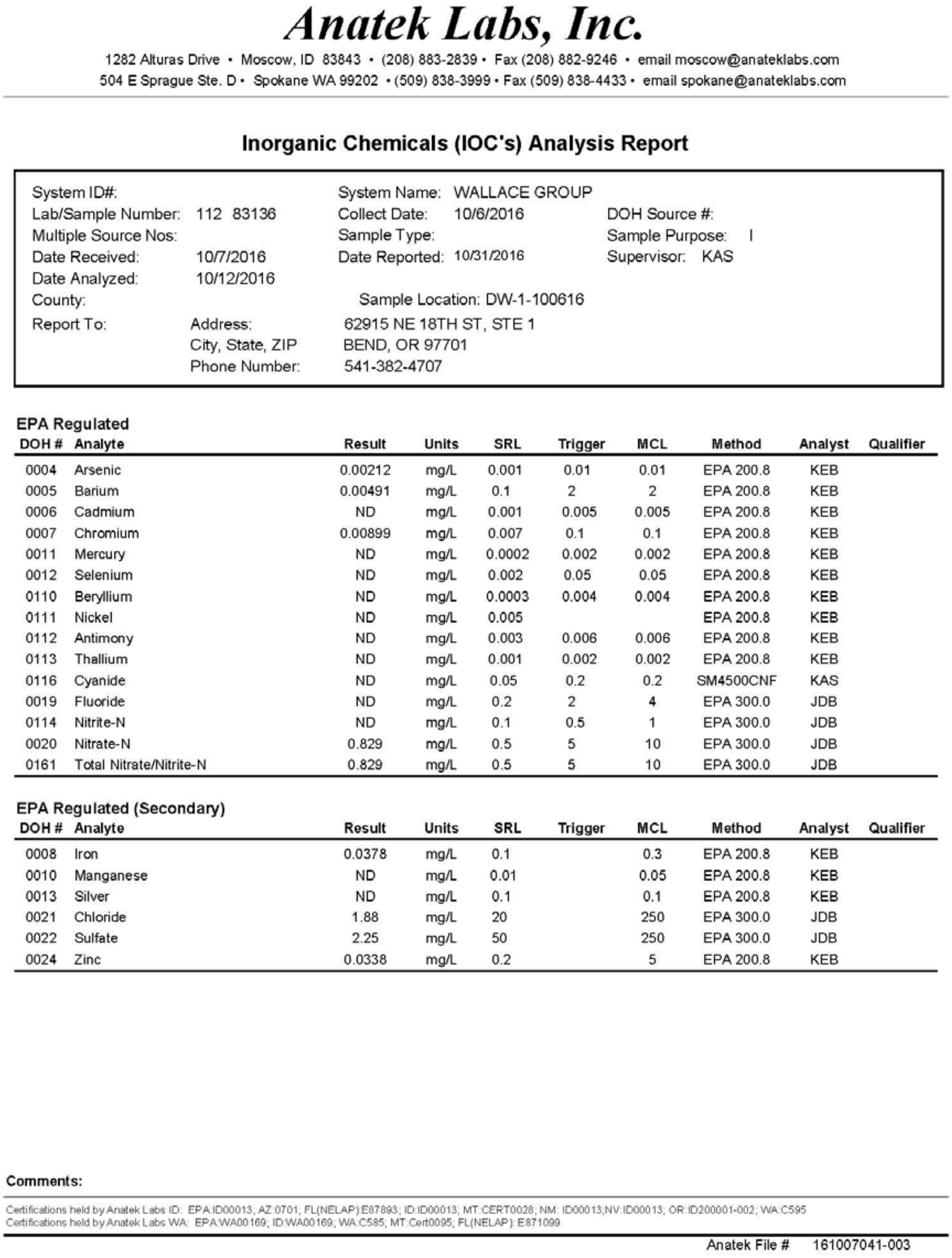
Anatek File # 161007041-002



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Inorganic Chemicals (IOC's) Analysis Report

System ID#:
System Name: WALLACE GROUP
Lab/Sample Number: 112 83136
Collect Date: 10/6/2016
DOH Source #:
Multiple Source Nos:
Sample Type:
Sample Purpose: I
Date Received: 10/7/2016
Date Reported: 10/31/2016
Supervisor: KAS
Date Analyzed: 10/12/2016
County:
Sample Location: DW-1-100616
Report To:
Address: 62915 NE 18TH ST, STE 1
City, State, ZIP: BEND, OR 97701
Phone Number: 541-382-4707

EPA Regulated

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0004	Arsenic	0.00212	mg/L	0.001	0.01	0.01	EPA 200.8	KEB	
0005	Barium	0.00491	mg/L	0.1	2	2	EPA 200.8	KEB	
0006	Cadmium	ND	mg/L	0.001	0.005	0.005	EPA 200.8	KEB	
0007	Chromium	0.00899	mg/L	0.007	0.1	0.1	EPA 200.8	KEB	
0011	Mercury	ND	mg/L	0.0002	0.002	0.002	EPA 200.8	KEB	
0012	Selenium	ND	mg/L	0.002	0.05	0.05	EPA 200.8	KEB	
0110	Beryllium	ND	mg/L	0.0003	0.004	0.004	EPA 200.8	KEB	
0111	Nickel	ND	mg/L	0.005			EPA 200.8	KEB	
0112	Antimony	ND	mg/L	0.003	0.006	0.006	EPA 200.8	KEB	
0113	Thallium	ND	mg/L	0.001	0.002	0.002	EPA 200.8	KEB	
0116	Cyanide	ND	mg/L	0.05	0.2	0.2	SM4500CNF	KAS	
0019	Fluoride	ND	mg/L	0.2	2	4	EPA 300.0	JDB	
0114	Nitrite-N	ND	mg/L	0.1	0.5	1	EPA 300.0	JDB	
0020	Nitrate-N	0.829	mg/L	0.5	5	10	EPA 300.0	JDB	
0161	Total Nitrate/Nitrite-N	0.829	mg/L	0.5	5	10	EPA 300.0	JDB	

EPA Regulated (Secondary)

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0008	Iron	0.0378	mg/L	0.1		0.3	EPA 200.8	KEB	
0010	Manganese	ND	mg/L	0.01		0.05	EPA 200.8	KEB	
0013	Silver	ND	mg/L	0.1		0.1	EPA 200.8	KEB	
0021	Chloride	1.88	mg/L	20		250	EPA 300.0	JDB	
0022	Sulfate	2.25	mg/L	50		250	EPA 300.0	JDB	
0024	Zinc	0.0338	mg/L	0.2		5	EPA 200.8	KEB	

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
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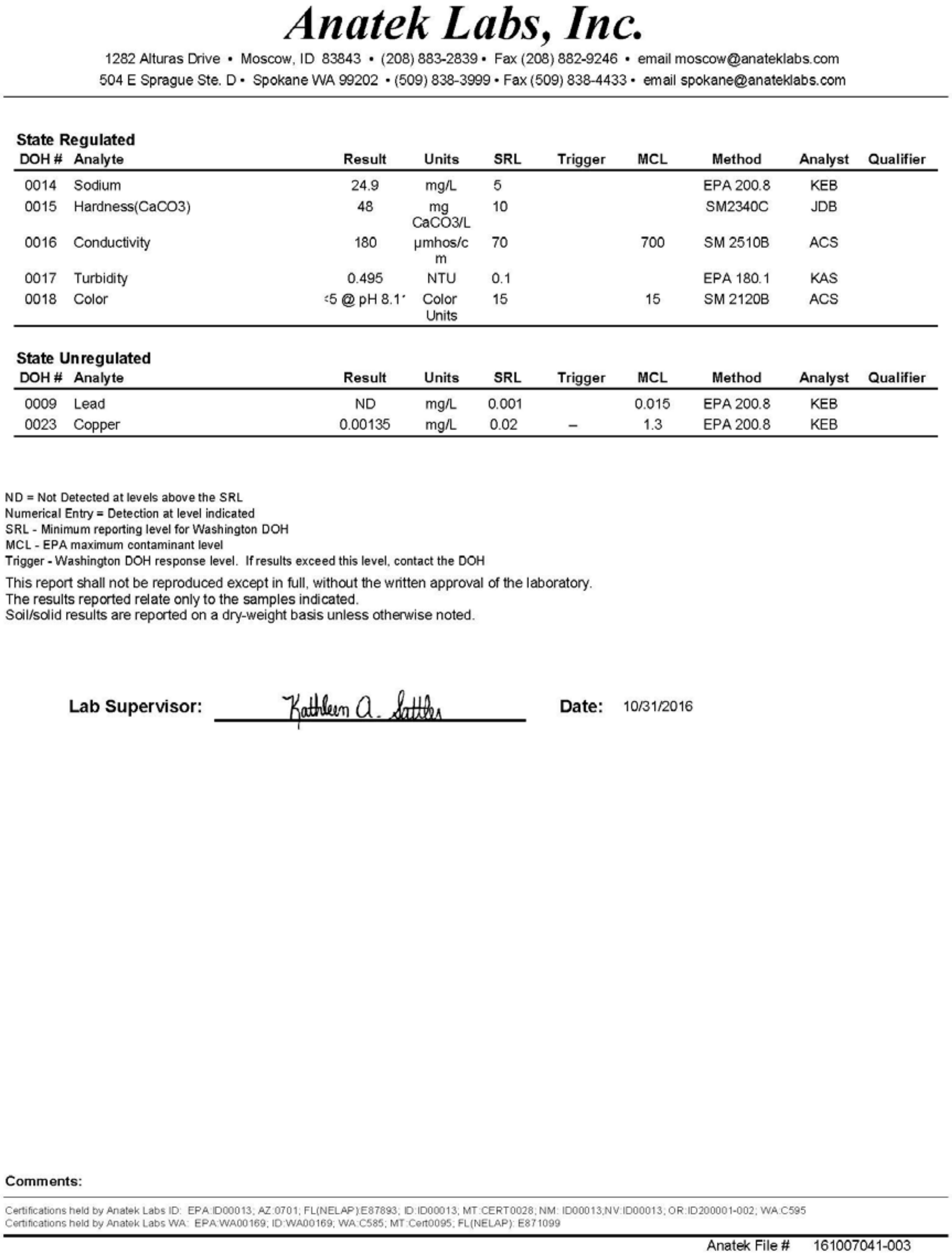
Anatek File # 161007041-003



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State Regulated

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0014	Sodium	24.9	mg/L	5			EPA 200.8	KEB	
0015	Hardness(CaCO3)	48	mg CaCO3/L	10			SM2340C	JDB	
0016	Conductivity	180	µmhos/cm	70		700	SM 2510B	ACS	
0017	Turbidity	0.495	NTU	0.1			EPA 180.1	KAS	
0018	Color	<5 @ pH 8.1	Color Units	15		15	SM 2120B	ACS	

State Unregulated

DOH #	Analyte	Result	Units	SRL	Trigger	MCL	Method	Analyst	Qualifier
0009	Lead	ND	mg/L	0.001		0.015	EPA 200.8	KEB	
0023	Copper	0.00135	mg/L	0.02	–	1.3	EPA 200.8	KEB	

ND = Not Detected at levels above the SRL
Numerical Entry = Detection at level indicated
SRL - Minimum reporting level for Washington DOH
MCL - EPA maximum contaminant level
Trigger - Washington DOH response level. If results exceed this level, contact the DOH

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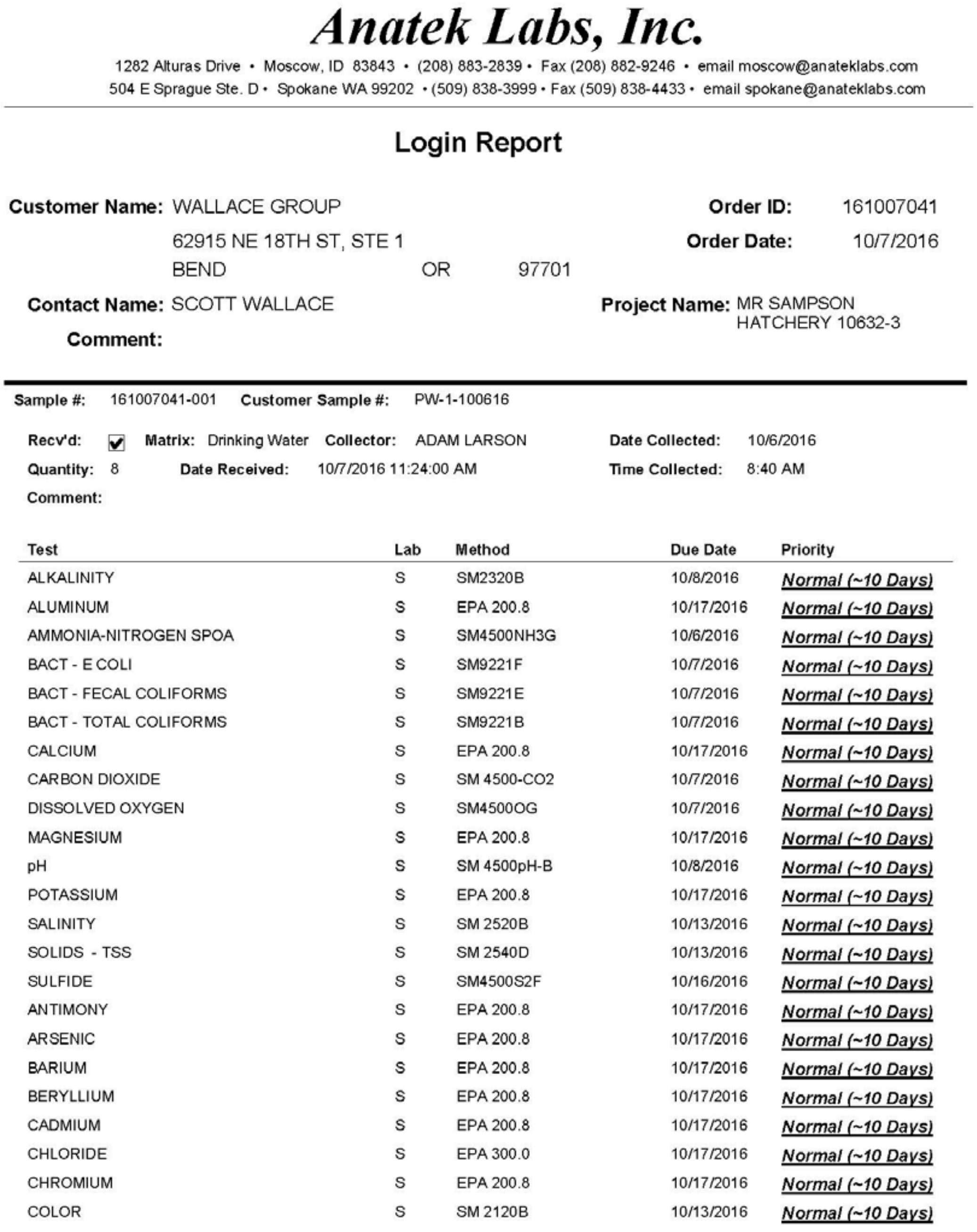
Lab Supervisor: Kathleen A. Sattler **Date:** 10/31/2016

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

Anatek File # 161007041-003



Anatek Labs, Inc.

1282 Alturas Drive • Moscow, ID 83843 • (208) 883-2839 • Fax (208) 882-9246 • email moscow@anateklabs.com
504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Login Report

Customer Name: WALLACE GROUP
62915 NE 18TH ST, STE 1
BEND OR 97701

Order ID: 161007041
Order Date: 10/7/2016

Contact Name: SCOTT WALLACE

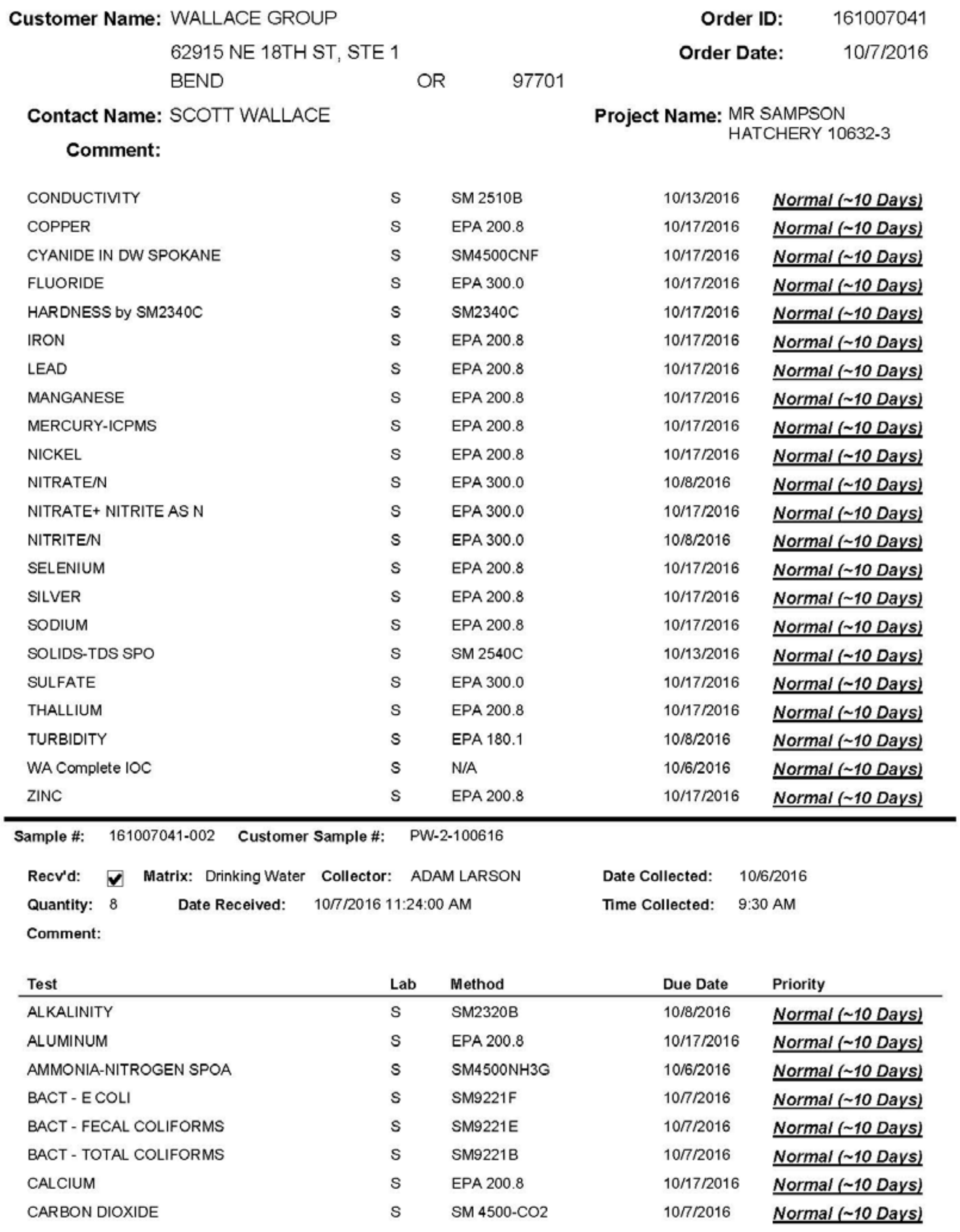
Project Name: MR SAMPSON HATCHERY 10632-3

Comment:

Sample #: 161007041-001 **Customer Sample #:** PW-1-100616

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** ADAM LARSON **Date Collected:** 10/6/2016
Quantity: 8 **Date Received:** 10/7/2016 11:24:00 AM **Time Collected:** 8:40 AM
Comment:

Test	Lab	Method	Due Date	Priority
ALKALINITY	S	SM2320B	10/8/2016	Normal (~10 Days)
ALUMINUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
AMMONIA-NITROGEN SPOA	S	SM4500NH3G	10/6/2016	Normal (~10 Days)
BACT - E COLI	S	SM9221F	10/7/2016	Normal (~10 Days)
BACT - FECAL COLIFORMS	S	SM9221E	10/7/2016	Normal (~10 Days)
BACT - TOTAL COLIFORMS	S	SM9221B	10/7/2016	Normal (~10 Days)
CALCIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
CARBON DIOXIDE	S	SM 4500-CO2	10/7/2016	Normal (~10 Days)
DISSOLVED OXYGEN	S	SM4500OG	10/7/2016	Normal (~10 Days)
MAGNESIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
pH	S	SM 4500pH-B	10/8/2016	Normal (~10 Days)
POTASSIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
SALINITY	S	SM 2520B	10/13/2016	Normal (~10 Days)
SOLIDS - TSS	S	SM 2540D	10/13/2016	Normal (~10 Days)
SULFIDE	S	SM4500S2F	10/16/2016	Normal (~10 Days)
ANTIMONY	S	EPA 200.8	10/17/2016	Normal (~10 Days)
ARSENIC	S	EPA 200.8	10/17/2016	Normal (~10 Days)
BARIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
BERYLLIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
CADMIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
CHLORIDE	S	EPA 300.0	10/17/2016	Normal (~10 Days)
CHROMIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
COLOR	S	SM 2120B	10/13/2016	Normal (~10 Days)



Customer Name: WALLACE GROUP
62915 NE 18TH ST, STE 1
BEND OR 97701

Order ID: 161007041
Order Date: 10/7/2016

Contact Name: SCOTT WALLACE
Project Name: MR SAMPSON HATCHERY 10632-3

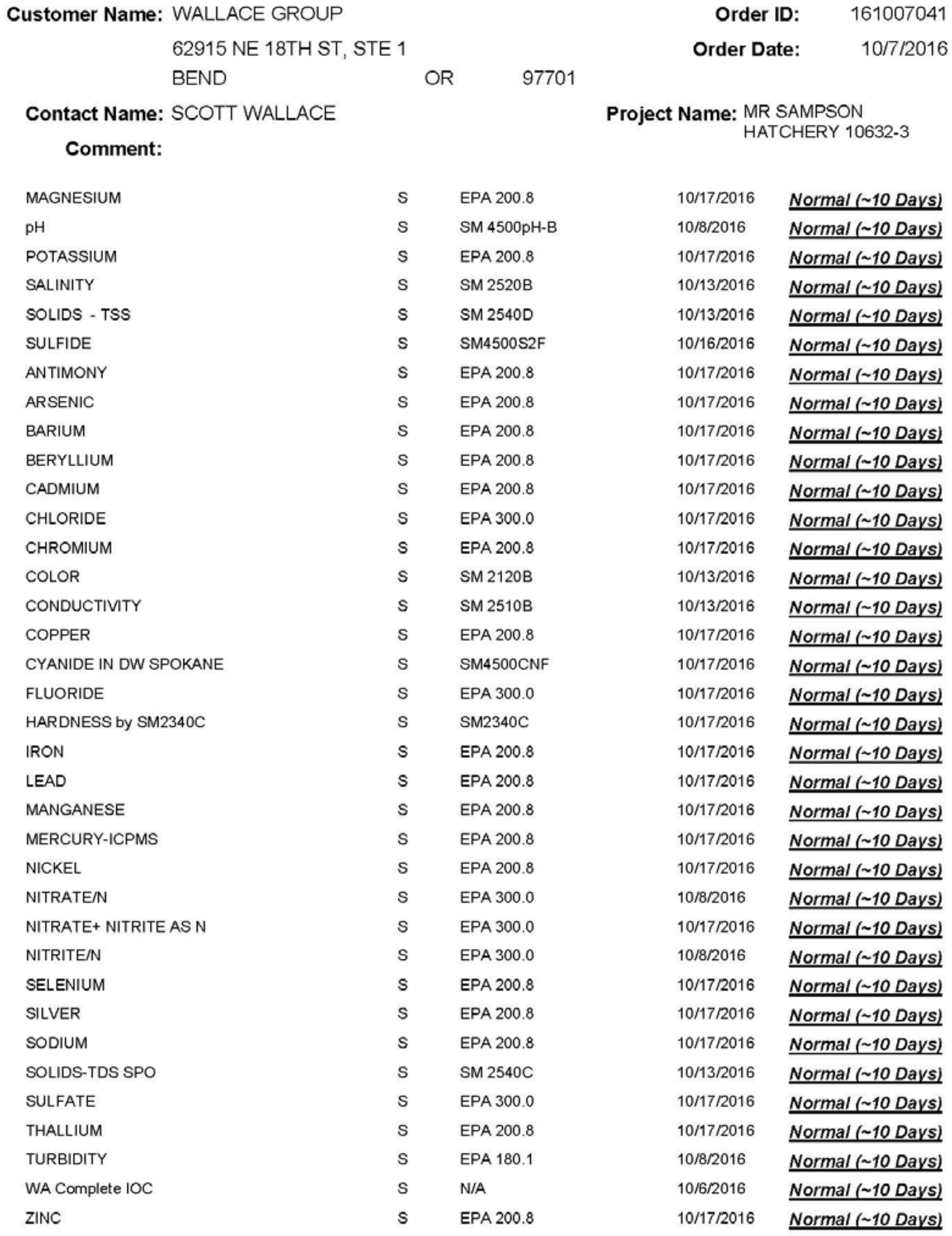
Comment:

CONDUCTIVITY	S	SM 2510B	10/13/2016	***Normal (~10 Days)***
COPPER	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
CYANIDE IN DW SPOKANE	S	SM4500CNF	10/17/2016	***Normal (~10 Days)***
FLUORIDE	S	EPA 300.0	10/17/2016	***Normal (~10 Days)***
HARDNESS by SM2340C	S	SM2340C	10/17/2016	***Normal (~10 Days)***
IRON	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
LEAD	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
MANGANESE	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
NICKEL	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
NITRATE/N	S	EPA 300.0	10/8/2016	***Normal (~10 Days)***
NITRATE+ NITRITE AS N	S	EPA 300.0	10/17/2016	***Normal (~10 Days)***
NITRITE/N	S	EPA 300.0	10/8/2016	***Normal (~10 Days)***
SELENIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
SILVER	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
SODIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
SOLIDS-TDS SPO	S	SM 2540C	10/13/2016	***Normal (~10 Days)***
SULFATE	S	EPA 300.0	10/17/2016	***Normal (~10 Days)***
THALLIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
TURBIDITY	S	EPA 180.1	10/8/2016	***Normal (~10 Days)***
WA Complete IOC	S	N/A	10/6/2016	***Normal (~10 Days)***
ZINC	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***

Sample #: 161007041-002 **Customer Sample #:** PW-2-100616

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** ADAM LARSON **Date Collected:** 10/6/2016
Quantity: 8 **Date Received:** 10/7/2016 11:24:00 AM **Time Collected:** 9:30 AM
Comment:

Test	Lab	Method	Due Date	Priority
ALKALINITY	S	SM2320B	10/8/2016	***Normal (~10 Days)***
ALUMINUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
AMMONIA-NITROGEN SPOA	S	SM4500NH3G	10/6/2016	***Normal (~10 Days)***
BACT - E COLI	S	SM9221F	10/7/2016	***Normal (~10 Days)***
BACT - FECAL COLIFORMS	S	SM9221E	10/7/2016	***Normal (~10 Days)***
BACT - TOTAL COLIFORMS	S	SM9221B	10/7/2016	***Normal (~10 Days)***
CALCIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
CARBON DIOXIDE	S	SM 4500-CO2	10/7/2016	***Normal (~10 Days)***



Customer Name: WALLACE GROUP
62915 NE 18TH ST, STE 1
BEND OR 97701

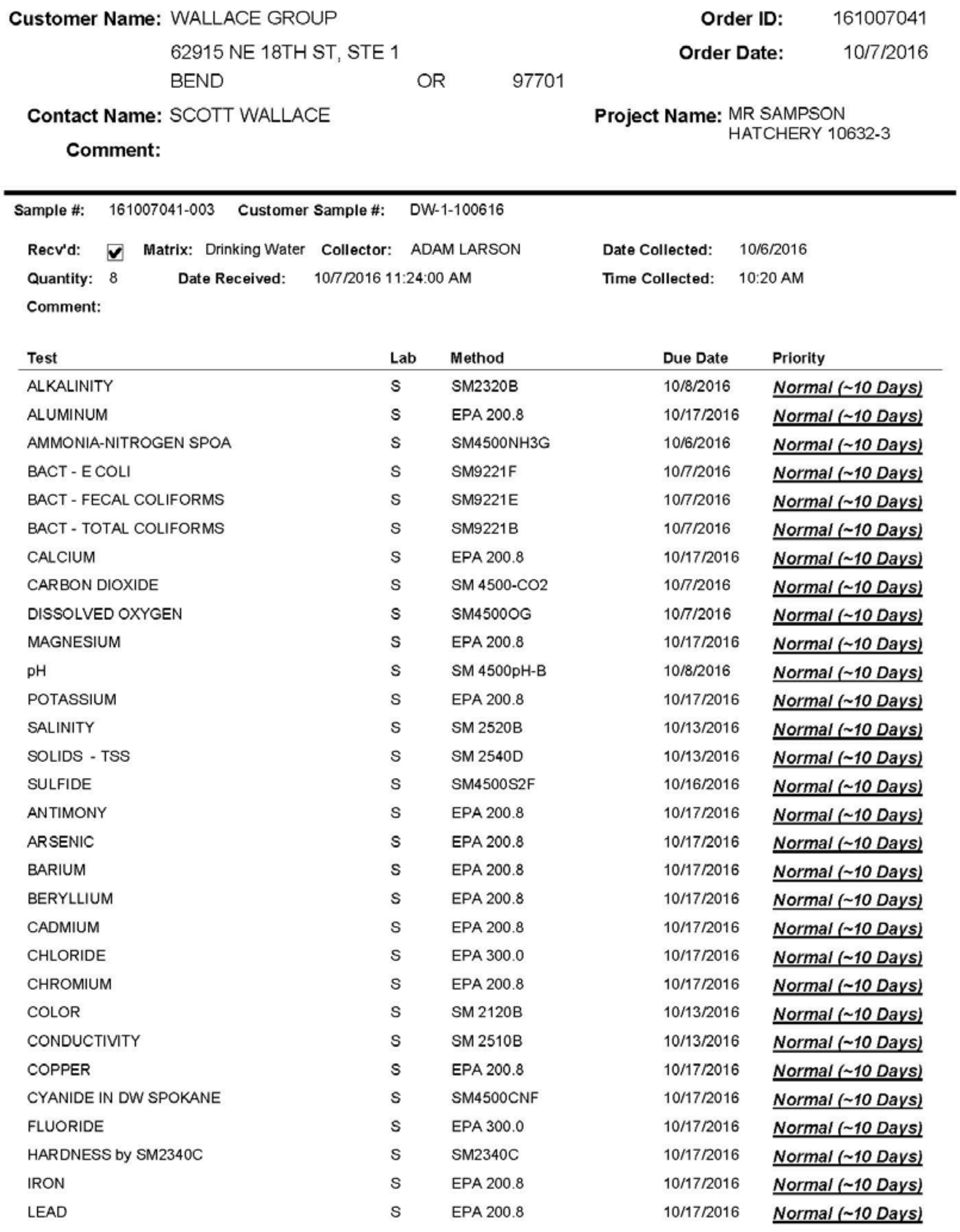
Order ID: 161007041
Order Date: 10/7/2016

Contact Name: SCOTT WALLACE

Project Name: MR SAMPSON HATCHERY 10632-3

Comment:

MAGNESIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
pH	S	SM 4500pH-B	10/8/2016	***Normal (~10 Days)***
POTASSIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
SALINITY	S	SM 2520B	10/13/2016	***Normal (~10 Days)***
SOLIDS - TSS	S	SM 2540D	10/13/2016	***Normal (~10 Days)***
SULFIDE	S	SM4500S2F	10/16/2016	***Normal (~10 Days)***
ANTIMONY	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
ARSENIC	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
BARIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
BERYLLIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
CADMIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
CHLORIDE	S	EPA 300.0	10/17/2016	***Normal (~10 Days)***
CHROMIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
COLOR	S	SM 2120B	10/13/2016	***Normal (~10 Days)***
CONDUCTIVITY	S	SM 2510B	10/13/2016	***Normal (~10 Days)***
COPPER	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
CYANIDE IN DW SPOKANE	S	SM4500CNF	10/17/2016	***Normal (~10 Days)***
FLUORIDE	S	EPA 300.0	10/17/2016	***Normal (~10 Days)***
HARDNESS by SM2340C	S	SM2340C	10/17/2016	***Normal (~10 Days)***
IRON	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
LEAD	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
MANGANESE	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
NICKEL	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
NITRATE/N	S	EPA 300.0	10/8/2016	***Normal (~10 Days)***
NITRATE+ NITRITE AS N	S	EPA 300.0	10/17/2016	***Normal (~10 Days)***
NITRITE/N	S	EPA 300.0	10/8/2016	***Normal (~10 Days)***
SELENIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
SILVER	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
SODIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
SOLIDS-TDS SPO	S	SM 2540C	10/13/2016	***Normal (~10 Days)***
SULFATE	S	EPA 300.0	10/17/2016	***Normal (~10 Days)***
THALLIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
TURBIDITY	S	EPA 180.1	10/8/2016	***Normal (~10 Days)***
WA Complete IOC	S	N/A	10/6/2016	***Normal (~10 Days)***
ZINC	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***



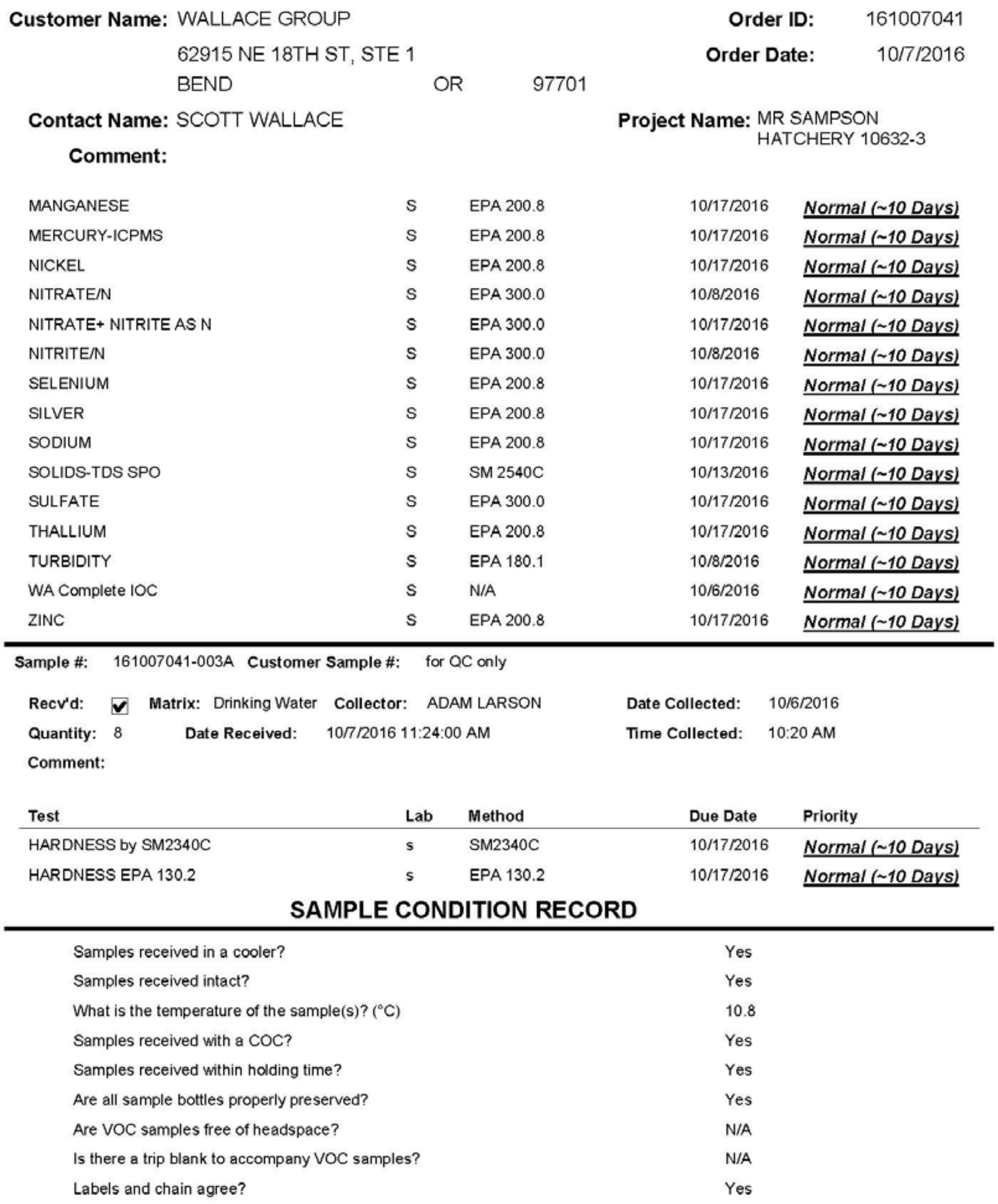
Customer Name: WALLACE GROUP
62915 NE 18TH ST, STE 1
BEND OR 97701
Contact Name: SCOTT WALLACE
Comment:

Order ID: 161007041
Order Date: 10/7/2016
Project Name: MR SAMPSON HATCHERY 10632-3

Sample #: 161007041-003 **Customer Sample #:** DW-1-100616

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** ADAM LARSON **Date Collected:** 10/6/2016
Quantity: 8 **Date Received:** 10/7/2016 11:24:00 AM **Time Collected:** 10:20 AM
Comment:

Test	Lab	Method	Due Date	Priority
ALKALINITY	S	SM2320B	10/8/2016	Normal (~10 Days)
ALUMINUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
AMMONIA-NITROGEN SPOA	S	SM4500NH3G	10/6/2016	Normal (~10 Days)
BACT - E COLI	S	SM9221F	10/7/2016	Normal (~10 Days)
BACT - FECAL COLIFORMS	S	SM9221E	10/7/2016	Normal (~10 Days)
BACT - TOTAL COLIFORMS	S	SM9221B	10/7/2016	Normal (~10 Days)
CALCIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
CARBON DIOXIDE	S	SM 4500-CO2	10/7/2016	Normal (~10 Days)
DISSOLVED OXYGEN	S	SM4500OG	10/7/2016	Normal (~10 Days)
MAGNESIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
pH	S	SM 4500pH-B	10/8/2016	Normal (~10 Days)
POTASSIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
SALINITY	S	SM 2520B	10/13/2016	Normal (~10 Days)
SOLIDS - TSS	S	SM 2540D	10/13/2016	Normal (~10 Days)
SULFIDE	S	SM4500S2F	10/16/2016	Normal (~10 Days)
ANTIMONY	S	EPA 200.8	10/17/2016	Normal (~10 Days)
ARSENIC	S	EPA 200.8	10/17/2016	Normal (~10 Days)
BARIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
BERYLLIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
CADMIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
CHLORIDE	S	EPA 300.0	10/17/2016	Normal (~10 Days)
CHROMIUM	S	EPA 200.8	10/17/2016	Normal (~10 Days)
COLOR	S	SM 2120B	10/13/2016	Normal (~10 Days)
CONDUCTIVITY	S	SM 2510B	10/13/2016	Normal (~10 Days)
COPPER	S	EPA 200.8	10/17/2016	Normal (~10 Days)
CYANIDE IN DW SPOKANE	S	SM4500CNF	10/17/2016	Normal (~10 Days)
FLUORIDE	S	EPA 300.0	10/17/2016	Normal (~10 Days)
HARDNESS by SM2340C	S	SM2340C	10/17/2016	Normal (~10 Days)
IRON	S	EPA 200.8	10/17/2016	Normal (~10 Days)
LEAD	S	EPA 200.8	10/17/2016	Normal (~10 Days)



Customer Name: WALLACE GROUP
62915 NE 18TH ST, STE 1
BEND OR 97701

Order ID: 161007041
Order Date: 10/7/2016

Contact Name: SCOTT WALLACE

Project Name: MR SAMPSON HATCHERY 10632-3

Comment:

MANGANESE	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
MERCURY-ICPMS	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
NICKEL	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
NITRATE/N	S	EPA 300.0	10/8/2016	***Normal (~10 Days)***
NITRATE+ NITRITE AS N	S	EPA 300.0	10/17/2016	***Normal (~10 Days)***
NITRITE/N	S	EPA 300.0	10/8/2016	***Normal (~10 Days)***
SELENIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
SILVER	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
SODIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
SOLIDS-TDS SPO	S	SM 2540C	10/13/2016	***Normal (~10 Days)***
SULFATE	S	EPA 300.0	10/17/2016	***Normal (~10 Days)***
THALLIUM	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***
TURBIDITY	S	EPA 180.1	10/8/2016	***Normal (~10 Days)***
WA Complete IOC	S	N/A	10/6/2016	***Normal (~10 Days)***
ZINC	S	EPA 200.8	10/17/2016	***Normal (~10 Days)***

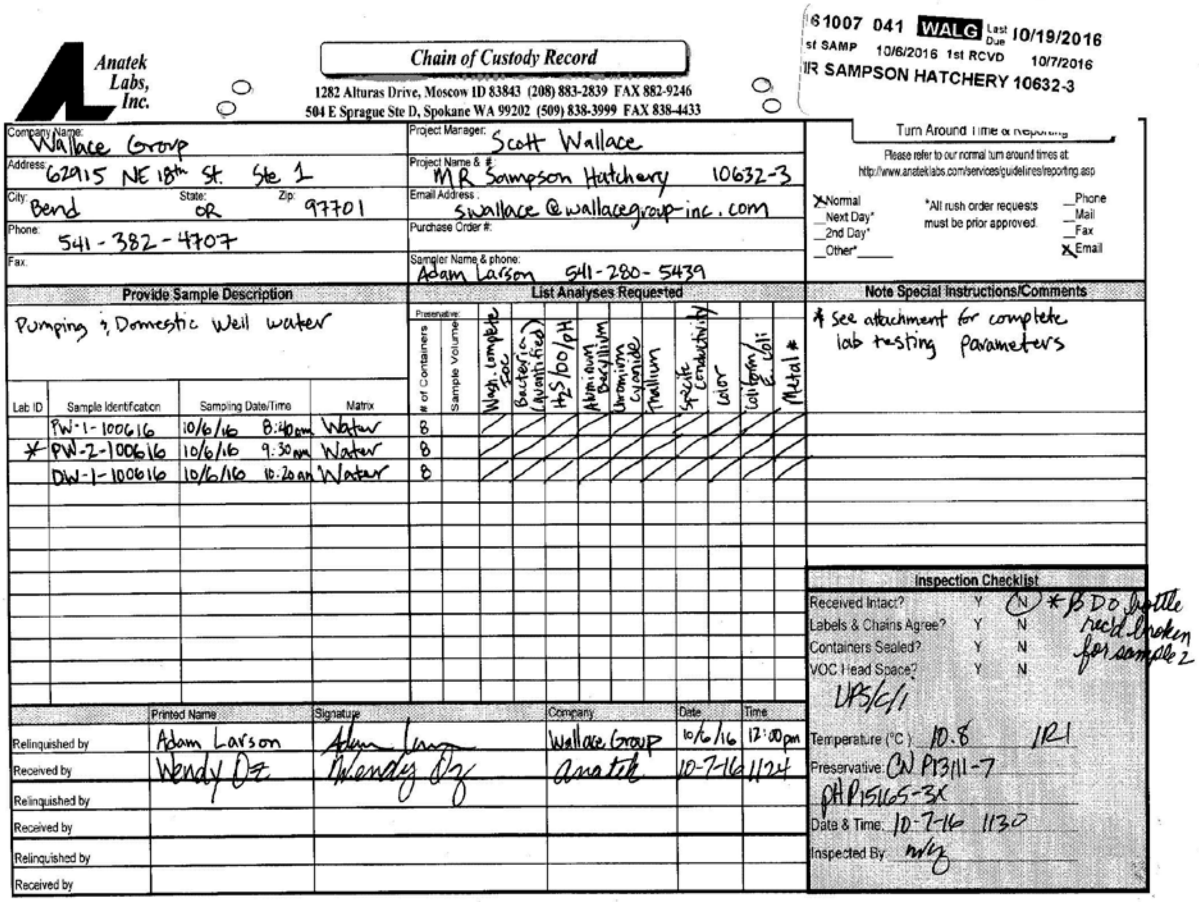
Sample #: 161007041-003A **Customer Sample #:** for QC only

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** ADAM LARSON **Date Collected:** 10/6/2016
Quantity: 8 **Date Received:** 10/7/2016 11:24:00 AM **Time Collected:** 10:20 AM
Comment:

Test	Lab	Method	Due Date	Priority
HARDNESS by SM2340C	s	SM2340C	10/17/2016	***Normal (~10 Days)***
HARDNESS EPA 130.2	s	EPA 130.2	10/17/2016	***Normal (~10 Days)***

SAMPLE CONDITION RECORD

Samples received in a cooler?	Yes
Samples received intact?	Yes
What is the temperature of the sample(s)? (°C)	10.8
Samples received with a COC?	Yes
Samples received within holding time?	Yes
Are all sample bottles properly preserved?	Yes
Are VOC samples free of headspace?	N/A
Is there a trip blank to accompany VOC samples?	N/A
Labels and chain agree?	Yes



Anatek Labs, Inc.

Chain of Custody Record

1282 Alturas Drive, Moscow ID 83843 (208) 883-2839 FAX 882-9246
504 E Sprague Ste D, Spokane WA 99202 (509) 838-3999 FAX 838-4433

61007 041 **WALG** Last Due 10/19/2016
st SAMP 10/6/2016 1st RCVD 10/7/2016
IR SAMPSON HATCHERY 10632-3

Company Name: Wallace Group
Address: 62915 NE 18th St. Ste 1
City: Bend State: OR Zip: 97701
Phone: 541-382-4707
Fax:

Project Manager: Scott Wallace
Project Name & #: MR Sampson Hatchery 10632-3
Email Address: swallace@wallacegroup-inc.com
Purchase Order #:
Sampler Name & phone: Adam Larson 541-280-5439

Turn Around Time & Reporting

Please refer to our normal turn around times at http://www.anateklabs.com/services/guidelines/reporting.asp

☒ Normal
☐ Next Day*
☐ 2nd Day*
☐ Other* ______

*All rush order requests must be prior approved.

☐ Phone
☐ Mail
☐ Fax
☒ Email

Provide Sample Description

Pumping & Domestic Well water

List Analyses Requested

Preservative:

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Wash. Complete IOC	Bacteria (quantified)	H_2S/DO/pH	Aluminum Beryllium	Chromium Cyanide	Thallium	Specific Conductivity	Color	Coliform/ E. Coli	Metal *
	PW-1-100616	10/6/16 8:40am	Water	8		/	/	/	/	/	/	/	/	/	/
*	PW-2-100616	10/6/16 9:30am	Water	8		/	/	/	/	/	/	/	/	/	/
	DW-1-100616	10/6/16 10:20am	Water	8		/	/	/	/	/	/	/	/	/	/

Note Special Instructions/Comments

* See attachment for complete lab testing parameters

	Printed Name	Signature	Company	Date	Time
Relinquished by	Adam Larson		Wallace Group	10/6/16	12:00pm
Received by	Wendy Oz	Wendy Oz	anatek	10-7-16	1124
Relinquished by					
Received by					
Relinquished by					
Received by					

Inspection Checklist

Received Intact? Y [✓ N] *BDO bottle rec'd broken for sample 2
Labels & Chains Agree? Y N
Containers Sealed? Y N
VOC Head Space? Y N

UPS/C/1

Temperature (°C): 10.8 IR1
Preservative: CN P13111-7
pH P15165-3X
Date & Time: 10-7-16 1130
Inspected By: mz

Quality Assurance/Quality Control Review of Analytical Data

PROJECT AND SAMPLE INFORMATION

Project Name: Aquifer Testing Report, M.R. Sampson Coho Facility
Project Number: 10632 (3)
Date of Review: November 1, 2016
Reviewer Name: Stephen Woodward, G.I.T.
Lab Name(s): Anatek Labs, Inc.
Report Date: October 31, 2016
Sample Date: October 6, 2016
Sample Numbers: See Anatek Labs, Inc. Laboratory Report
Lab Job ID No. 161007041-001, 002, 003

ANALYTICAL METHODS

EPA 180.1, EPA 200.8, EPA 300.0, SM 2120B, SM2320B, SM 2510B, SM 2520B, SM 2540C, SM 2540D, SM 4500-CO2, SM4500NH3G, SM 4500pH-B, SM9221B, SM9221E, SM9221F. SM4500CNF, SM4500OG, SM4500S2F, SM9221B

CHAIN OF CUSTODY DOCUMENTATION

Samples were transported under laboratory chain-of-custody with no discrepancies.

SAMPLE HOLDING TIMES

All samples were within their applicable holding times.

SAMPLE CONTAINERS

Containers were appropriate for the analyses performed, have legible labels, and were completely filled with sufficient volume for all requested analyses. The container for dissolved oxygen analysis in PW-2 was broken upon arrival at Anantek, and no information was obtained.

INSTRUMENT CALABRATION

No discrepancies noted

REPORTING NARRATIVE

The samples were received on October 7, 2016 at 11:24 pm; the samples arrived in good condition with the exception of the PW-2 dissolved oxygen sample, were properly preserved and, where required, on ice at a temperature of 10.8 degrees C. No other analytical or quality issues were noted.

DUPLICATE ANALYSIS

a) Field Dups.- Not collected

DATA USE LIMITATIONS

No information is available concerning the concentration of dissolved oxygen in PW-2. No other quality control issues were noted.

APPENDIX C

TABLE C-1: WATER QUALITY SAMPLING RESULTS
AQUIFER TESTING REPORT
M.R. SAMPSON COHO FACILITY
191 KLOCKE ROAD
ELLENSBURG, WASHINGTON

Water Quality Parameters	Sample Results (mg/L)								(MCL) (mg/L)	Salmonid Aquaculture Standards (mg/L)[a]
	PW-1 (Pumping Well)		PW-2 (Pumping Well)		DW-1 (Domestic Well)		YSC-1 (Yakima Side Channel)			
	22-Aug-16	6-Oct-16	22-Aug-16	6-Oct-16	22-Aug-16	6-Oct-16	22-Aug-16	6-Oct-16		
Alkalinity (as CaC03)	58.9	58.0	59.8	57.0	NA	81.0	28.1	NA	- -	- -
Aluminum	ND	ND	0.116	0.0197	NA	ND	ND	NA	0.05 - 0.2 +	0.01
Ammonia - Nitrogen	<0.4	<0.02	<0.4	<0.02	NA	<0.02	<0.4	NA	- -	0.0125
E. Coli	NA	<1.8 (MPN/100ml)	NA	<1.8 (MPN/100ml)	NA	<1.8 (MPN/100ml)	NA	NA	- -	- -
Fecal Coliform	NA	<1.8 (MPN/100ml)	NA	<1.8 (MPN/100ml)	NA	<1.8 (MPN/100ml)	NA	NA	- -	- -
Total Coliform	NA	<1.8 (MPN/100ml)	NA	<1.8 (MPN/100ml)	NA	<1.8 (MPN/100ml)	NA	NA	- -	- -
Calcium	13.8	12.1	15.6	12.4	NA	11.4	5.81	NA	- -	- -
Carbon Dioxide	NA	110	NA	133	NA	70.6	NA	NA	- -	1.0
Dissolved Oxygen	NA	1.70	NA	#	NA	3.94	NA	NA	- -	7.0
Magnesium	7.72	6.38	7.94	6.48	NA	20.1	3.11	NA	- -	15.0
pH	NA	6.23 (pH units)	NA	6.53 (pH units)	NA	8.11 (pH units)	NA	NA	6.5 -8.5 (pH units) +	6.5 -8.0 (pH units)
Potassium	0.57	0.515	0.64	0.626	NA	1.47	0.28	NA	- -	5.0
Salinity	NA	<1 (%)	NA	<1 (%)	NA	<1 (%)	NA	NA	- -	5.0 ppt
Total Suspended Solids	<1	3	6.4	<1	NA	<1	<1	NA	- -	80.0
Total Dissolved Solids	92	56	90	79	NA	87	45	NA	500 mg/L +	400.0
Hydrogen Sulfide	NA	<0.1	NA	<0.1	NA	<0.1	NA	NA	- -	0.003
EPA Regulated										
Arsenic	ND	ND	ND	ND	NA	0.00212	ND	NA	0.010	0.05
Barium	ND	0.00789	ND	0.00961	NA	0.00491	ND	NA	2.0	5.0
Cadmium	ND	ND	ND	ND	NA	ND	ND	NA	0.005	0.0005
Chromium (total)	NA	ND	NA	ND	NA	0.00899	NA	NA	0.1	0.03
Mercury	ND	0.00010	ND	ND	NA	ND	ND	NA	0.002	0.0002
Selenium	ND	ND	ND	ND	NA	ND	ND	NA	0.05	0.01
Beryllium	NA	ND	NA	ND	NA	ND	NA	NA	0.004	- -
Nickel	ND	0.00160	ND	0.00178	NA	ND	ND	NA	- -	0.01
Antimony	NA	ND	NA	ND	NA	ND	NA	NA	0.006	- -
Thallium	NA	ND	NA	ND	NA	ND	NA	NA	0.002	- -
Cyanide	NA	ND	NA	ND	NA	ND	NA	NA	0.2	- -
Fluoride	ND	ND	ND	ND	NA	ND	ND	NA	4.0	0.5
Nitrite - N	ND	ND	ND	ND	NA	ND	ND	NA	1.0	0.1
Nitrate - N	ND	0.167	ND	0.412	NA	0.829	ND	NA	10.0	1.0
Total Nitrate / Nitrite - N	ND	0.167	ND	0.412	NA	0.829	ND	NA	10.0	- -
EPA Regulated (Secondary)										
Iron	0.12	2.49	0.1160	0.0649	NA	0.0378	0.1200	NA	0.3 +	0.1
Manganese	ND	0.0298	ND	0.00835	NA	ND	ND	NA	0.05 +	0.01
Silver	ND	ND	ND	ND	NA	ND	ND	NA	0.10 +	0.003
Chloride	5.40	2.62	5.59	3.11	NA	1.88	ND	NA	250.0 +	4.0
Sulfate	ND	1.70	ND	2.23	NA	2.25	ND	NA	250.0 +	50.0
Zinc	0.0380	0.0240	ND	0.0431	NA	0.0338	ND	NA	5.0 +	0.005
State Regulated										
Sodium	3.43	3.60	3.25	3.76	NA	24.9	1.6	NA	- -	75.0
Hardness (CaCO3)	68	70	72	65	NA	48	28	NA	- -	- -
Conductivity	NA	126 (µmhos/cm)	NA	132 (µmhos/cm)	NA	180 (µmhos/cm)	NA	NA	700.0	- -
Turbidity	NA	26.7 (NTU)	NA	0.531 (NTU)	NA	0.495 (NTU)	NA	NA	1.0*	- -
Color	NA	35 @ pH 6.23	NA	<5 @ pH 6.53	NA	<5 @ pH 8.11	NA	NA	15 (color units)	- -
State Unregulated										
Lead	ND	ND	ND	ND	NA	ND	ND	NA	0.015*	0.02
Copper	ND	ND	ND	ND	NA	0.00135	ND	NA	1.3*	0.006

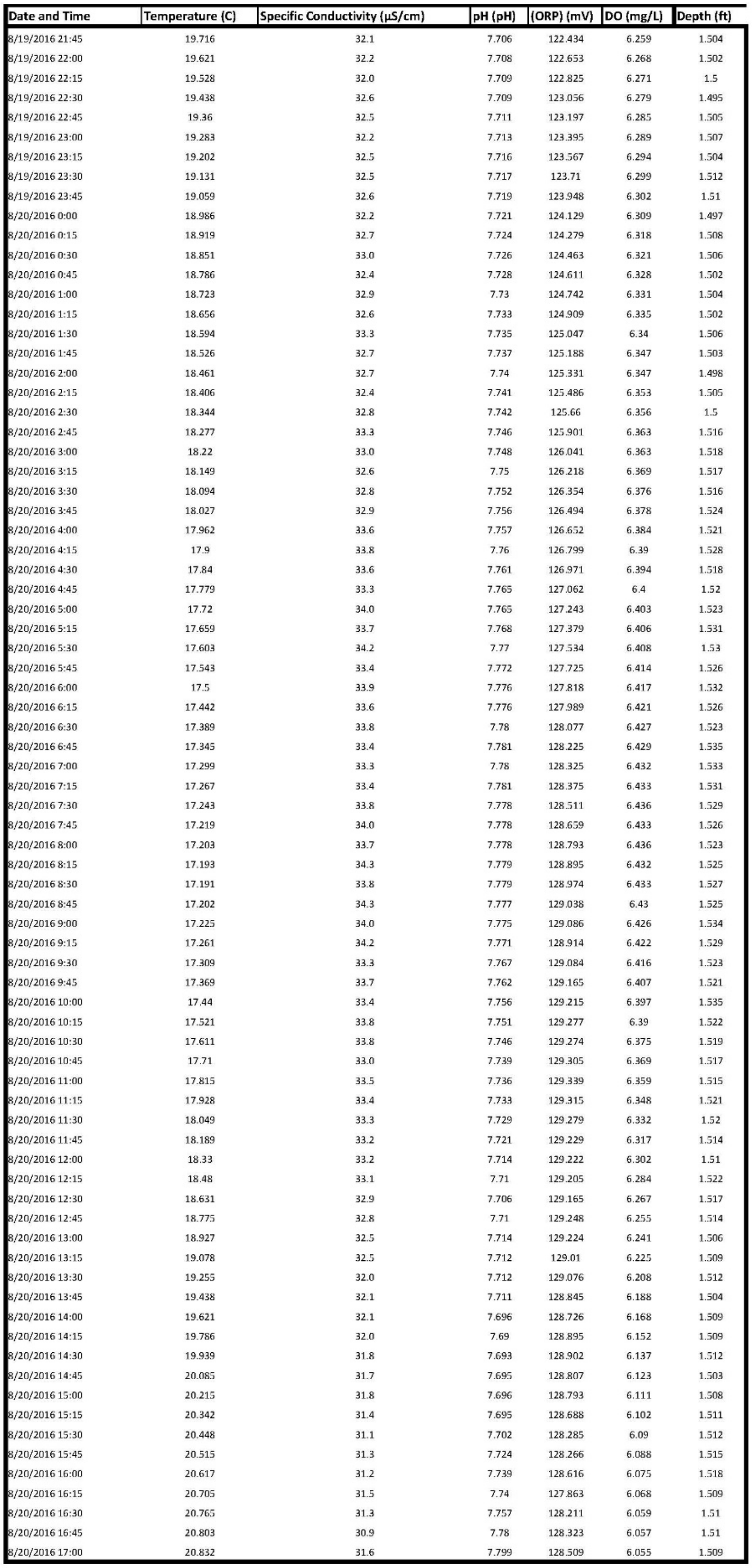
LEGEND

1. Samples were collected by Wallace Group on August 22 and October 7, 2016, with analytical testing conducted by Umpqua Research Company and Anatek Labs, Inc., respectively. Complete analytical reports, QA/QC summary, and chain-of-custody documentation is provided in Appendix B.
2. Sample locations are identified on Figure 3.
3. ND - Indicates the identified parameter was not detected above the corresponding laboratory reporting or detection limit.
4. NA - Not Analyzed
5. MCL - Indicates the Maximum Contaminant Level as determined by the Environmental Protection Agency National Primary Drinking Water Regulations.
6. mg/L - Milligrams/Liter (parts per million)
7. MPN / 100ml - Defined as Most Probable Number per 100 milliliter (ml).
8. NTU - Nephelometric Turbidity Unit. A measure of turbidity per EPA method 180.1.
9. µmhos/cm - Micro Ohms per centimeter.
10. a Fish Culture Manual, Alaska Department of Fish and Game, FRED Division, June 1983.
11. + The indicated MCL is a Secondary Drinking Water Standard.
12. ** The EPA requires repeat testing for samples positive for fecal coliform.
13. * The indicated MCL is a Treatment Technique Action Level.
14. - - Indicates no MCL or water quality standard established for this parameter.
15. # Not analyzed due to a broken sample container.
16. ppt Parts per thousand.

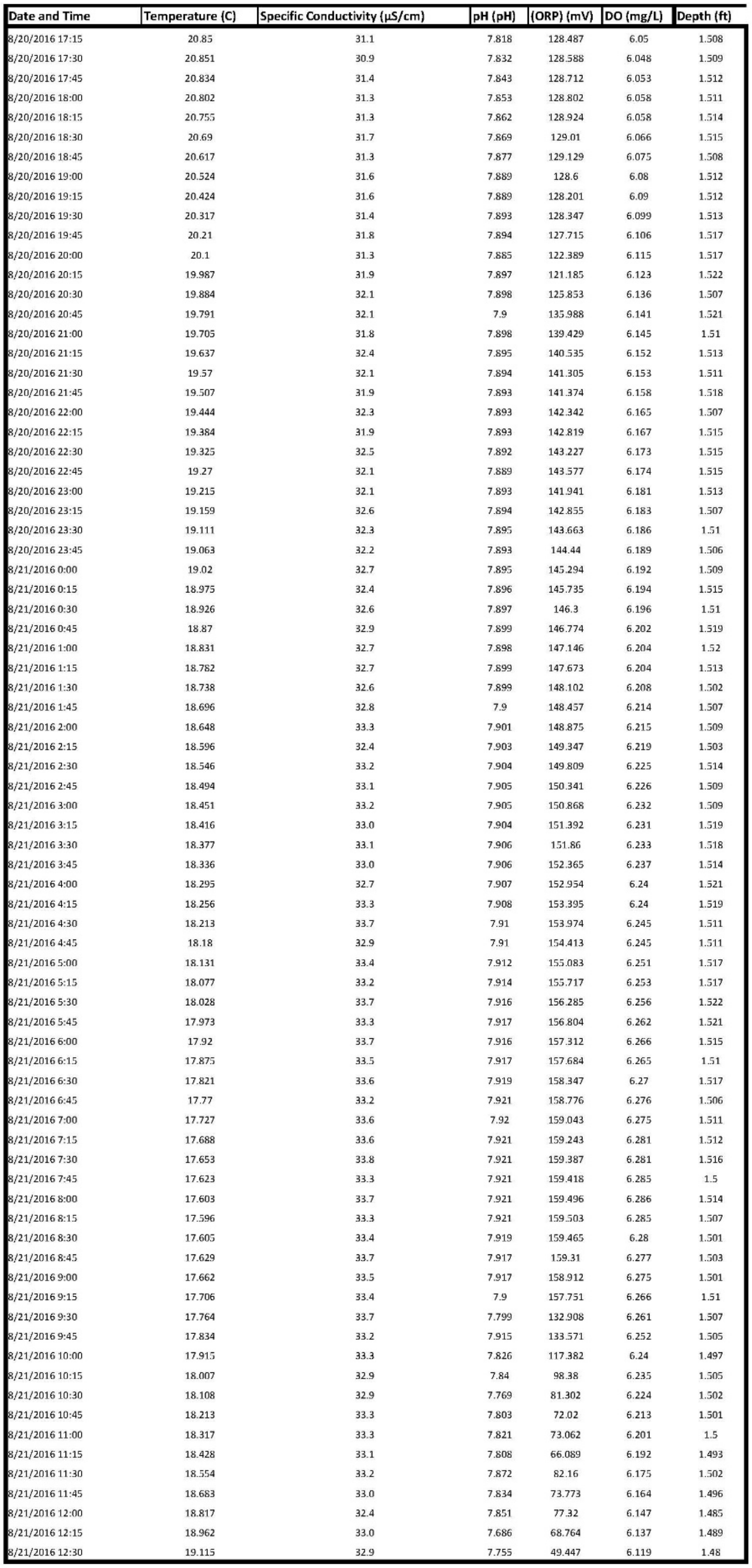
TABLE C-2
Yakima River Side Channel Monitoring Station (YSC-1)

Date and Time	Temperature (C)	Specific Conductivity (µmhos/cm)	pH (pH)	(ORP) (mV)	DO (mg/L)	Depth (ft.)
8/18/2016 7:15	17.92	33.3	6.912	152.72	6.754	1.399
8/18/2016 7:30	17.965	33.5	6.883	153.567	6.735	1.382
8/18/2016 7:45	17.958	33.3	6.88	153.431	6.729	1.386
8/18/2016 8:00	17.947	33.4	6.881	153.271	6.722	1.383
8/18/2016 8:15	17.942	33.2	6.898	153.059	6.719	1.381
8/18/2016 8:30	17.949	33.4	6.912	152.661	6.715	1.388
8/18/2016 8:45	17.966	33.5	6.916	151.519	6.708	1.386
8/18/2016 9:00	17.998	33.1	6.918	149.218	6.698	1.388
8/18/2016 9:15	18.045	33.1	6.917	146.581	6.693	1.398
8/18/2016 9:30	18.102	33.2	6.91	144.104	6.685	1.386
8/18/2016 9:45	18.169	32.9	6.902	142.077	6.668	1.383
8/18/2016 10:00	18.246	32.9	6.889	140.289	6.655	1.388
8/18/2016 10:15	18.335	32.5	6.87	138.761	6.647	1.378
8/18/2016 10:30	18.435	32.4	6.854	137.462	6.631	1.383
8/18/2016 10:45	18.546	32.7	6.839	136.336	6.618	1.381
8/18/2016 11:00	18.666	32.3	6.825	135.294	6.604	1.379
8/18/2016 11:15	18.791	32.7	6.813	134.336	6.585	1.375
8/18/2016 11:30	18.925	32.9	6.831	130.009	6.57	1.348
8/18/2016 11:45	19.063	32.4	6.79	128.437	6.553	1.379
8/18/2016 12:00	19.198	32.5	6.805	130.459	6.538	1.385
8/18/2016 12:15	19.334	32.7	6.766	130.454	6.523	1.388
8/18/2016 12:30	19.473	32.2	6.73	129.749	6.51	1.38
8/18/2016 12:45	19.617	31.9	6.705	129.267	6.485	1.393
8/18/2016 13:00	19.757	31.9	6.693	127.97	6.474	1.393
8/18/2016 13:15	19.917	31.9	6.686	125.5	6.459	1.393
8/18/2016 13:30	20.113	31.4	6.66	123.691	6.43	1.4
8/18/2016 13:45	20.284	31.9	6.632	122.978	6.413	1.393
8/18/2016 14:00	20.434	31.7	6.62	123.714	6.399	1.405
8/18/2016 14:15	20.591	31.2	6.604	119.585	6.378	1.4
8/18/2016 14:30	20.743	31.2	6.606	120.477	6.365	1.397
8/18/2016 14:45	20.875	31.1	6.601	119.759	6.355	1.401
8/18/2016 15:00	21.001	31.4	6.603	120.396	6.341	1.408
8/18/2016 15:15	21.114	30.7	6.616	119.466	6.33	1.408
8/18/2016 15:30	21.214	30.8	6.621	120.531	6.32	1.408
8/18/2016 15:45	21.322	30.7	6.64	120.014	6.308	1.402
8/18/2016 16:00	21.415	31.1	6.657	121.089	6.295	1.413
8/18/2016 16:15	21.503	30.6	6.674	121.182	6.287	1.406
8/18/2016 16:30	21.591	31.0	6.697	121.042	6.278	1.42
8/18/2016 16:45	21.659	30.7	6.719	120.953	6.268	1.42
8/18/2016 17:00	21.704	30.5	6.745	120.748	6.262	1.416
8/18/2016 17:15	21.721	30.5	6.777	120.458	6.26	1.417
8/18/2016 17:30	21.728	31.0	6.812	120.164	6.26	1.424
8/18/2016 17:45	21.723	30.5	6.847	119.773	6.26	1.417
8/18/2016 18:00	21.701	30.7	6.89	118.882	6.259	1.416
8/18/2016 18:15	21.662	30.7	6.931	119.096	6.264	1.418
8/18/2016 18:30	21.606	30.3	6.969	118.851	6.269	1.415
8/18/2016 18:45	21.534	30.7	7.02	118.822	6.27	1.413
8/18/2016 19:00	21.442	30.6	7.066	118.901	6.277	1.421
8/18/2016 19:15	21.349	31.2	7.111	118.948	6.282	1.415
8/18/2016 19:30	21.249	31.5	7.137	118.958	6.292	1.423
8/18/2016 19:45	21.142	31.2	7.152	119.008	6.301	1.426
8/18/2016 20:00	21.025	31.1	7.162	119.027	6.309	1.432
8/18/2016 20:15	20.902	31.1	7.172	119.044	6.319	1.43
8/18/2016 20:30	20.773	31.4	7.18	119.101	6.327	1.433
8/18/2016 20:45	20.649	31.8	7.189	119.182	6.335	1.424
8/18/2016 21:00	20.528	31.4	7.199	119.218	6.343	1.423
8/18/2016 21:15	20.414	31.3	7.209	119.292	6.355	1.435
8/18/2016 21:30	20.31	31.8	7.219	119.337	6.363	1.432
8/18/2016 21:45	20.211	31.8	7.23	119.42	6.368	1.44
8/18/2016 22:00	20.118	31.4	7.241	119.485	6.374	1.435
8/18/2016 22:15	20.034	32.3	7.25	119.525	6.378	1.432
8/18/2016 22:30	19.95	31.6	7.261	119.563	6.385	1.437
8/18/2016 22:45	19.871	32.3	7.27	119.611	6.389	1.438
8/18/2016 23:00	19.795	31.9	7.281	119.652	6.394	1.436
8/18/2016 23:15	19.729	32.3	7.287	119.709	6.398	1.434
8/18/2016 23:30	19.666	32.0	7.292	119.74	6.4	1.446
8/18/2016 23:45	19.605	32.4	7.297	119.773	6.406	1.448
8/19/2016 0:00	19.543	32.1	7.304	119.785	6.408	1.444
8/19/2016 0:15	19.478	32.1	7.31	119.807	6.411	1.444
8/19/2016 0:30	19.416	32.2	7.315	119.816	6.419	1.441
8/19/2016 0:45	19.358	32.3	7.321	119.847	6.421	1.438
8/19/2016 1:00	19.296	32.8	7.326	119.897	6.422	1.441
8/19/2016 1:15	19.236	32.1	7.332	119.933	6.428	1.442
8/19/2016 1:30	19.178	32.5	7.337	119.885	6.431	1.442
8/19/2016 1:45	19.117	32.3	7.342	119.909	6.431	1.439
8/19/2016 2:00	19.054	32.5	7.349	120.007	6.438	1.446

Date and Time	Temperature (C)	Specific Conductivity (µS/cm)	pH (pH)	(ORP) (mV)	DO (mg/L)	Depth (ft)
8/19/2016 2:15	18.993	32.4	7.353	120.105	6.442	1.443
8/19/2016 2:30	18.935	32.3	7.362	120.167	6.448	1.45
8/19/2016 2:45	18.879	32.6	7.369	120.169	6.449	1.451
8/19/2016 3:00	18.831	32.5	7.376	120.138	6.453	1.455
8/19/2016 3:15	18.777	32.8	7.382	120.186	6.454	1.447
8/19/2016 3:30	18.714	32.7	7.389	120.233	6.461	1.448
8/19/2016 3:45	18.666	32.6	7.395	120.219	6.461	1.444
8/19/2016 4:00	18.617	32.6	7.398	120.262	6.468	1.444
8/19/2016 4:15	18.569	33.1	7.399	120.343	6.469	1.45
8/19/2016 4:30	18.515	32.3	7.405	120.345	6.468	1.444
8/19/2016 4:45	18.464	32.7	7.411	120.419	6.471	1.456
8/19/2016 5:00	18.416	33.3	7.416	120.453	6.478	1.46
8/19/2016 5:15	18.365	32.1	7.421	120.574	6.481	1.459
8/19/2016 5:30	18.309	33.3	7.427	120.651	6.483	1.462
8/19/2016 5:45	18.247	33.0	7.432	120.758	6.49	1.46
8/19/2016 6:00	18.193	33.3	7.437	120.846	6.491	1.457
8/19/2016 6:15	18.143	33.2	7.441	120.951	6.492	1.469
8/19/2016 6:30	18.089	33.6	7.446	121.073	6.498	1.468
8/19/2016 6:45	18.042	33.2	7.45	121.173	6.501	1.457
8/19/2016 7:00	17.999	33.2	7.453	121.278	6.506	1.463
8/19/2016 7:15	17.956	33.3	7.457	121.442	6.504	1.464
8/19/2016 7:30	17.923	33.6	7.46	121.571	6.508	1.473
8/19/2016 7:45	17.897	33.4	7.463	121.697	6.51	1.468
8/19/2016 8:00	17.875	33.4	7.466	121.755	6.507	1.468
8/19/2016 8:15	17.866	33.2	7.468	121.84	6.505	1.47
8/19/2016 8:30	17.869	33.2	7.47	121.933	6.505	1.466
8/19/2016 8:45	17.885	33.2	7.471	121.952	6.506	1.462
8/19/2016 9:00	17.916	33.4	7.471	122.014	6.494	1.466
8/19/2016 9:15	17.961	33.1	7.469	122.031	6.491	1.464
8/19/2016 9:30	18.022	32.7	7.465	122.05	6.481	1.464
8/19/2016 9:45	18.089	33.3	7.461	121.871	6.473	1.454
8/19/2016 10:00	18.164	32.8	7.457	121.285	6.467	1.457
8/19/2016 10:15	18.246	33.0	7.453	120.376	6.457	1.458
8/19/2016 10:30	18.334	32.7	7.449	116.247	6.444	1.46
8/19/2016 10:45	18.428	32.7	7.423	116.14	6.437	1.457
8/19/2016 11:00	18.531	33.0	7.437	116.481	6.422	1.457
8/19/2016 11:15	18.64	32.8	7.427	116.846	6.41	1.46
8/19/2016 11:30	18.759	32.5	7.393	110.389	6.397	1.45
8/19/2016 11:45	18.891	32.5	7.406	109.011	6.386	1.459
8/19/2016 12:00	19.036	32.1	7.378	110.308	6.368	1.46
8/19/2016 12:15	19.166	32.2	7.394	107.674	6.353	1.455
8/19/2016 12:30	19.306	32.7	7.281	104.193	6.34	1.458
8/19/2016 12:45	19.444	32.5	7.371	101.804	6.324	1.464
8/19/2016 13:00	19.574	31.8	7.35	106.725	6.312	1.463
8/19/2016 13:15	19.716	31.7	7.403	106.601	6.297	1.459
8/19/2016 13:30	19.88	31.7	7.402	106.415	6.278	1.461
8/19/2016 13:45	20.049	31.5	7.382	107.602	6.26	1.467
8/19/2016 14:00	20.221	31.8	7.379	111.476	6.242	1.468
8/19/2016 14:15	20.368	31.3	7.371	112.07	6.226	1.462
8/19/2016 14:30	20.507	31.5	7.38	115.06	6.214	1.473
8/19/2016 14:45	20.635	31.8	7.392	115.618	6.2	1.473
8/19/2016 15:00	20.752	31.5	7.405	115.067	6.186	1.466
8/19/2016 15:15	20.856	31.6	7.419	116.137	6.179	1.472
8/19/2016 15:30	20.957	31.1	7.433	117	6.167	1.471
8/19/2016 15:45	21.042	31.3	7.454	117.413	6.158	1.472
8/19/2016 16:00	21.11	31.2	7.471	117.518	6.153	1.484
8/19/2016 16:15	21.152	31.0	7.497	117.053	6.15	1.475
8/19/2016 16:30	21.213	30.7	7.512	117.062	6.146	1.472
8/19/2016 16:45	21.246	31.0	7.518	110.222	6.138	1.477
8/19/2016 17:00	21.259	31.0	7.548	110.344	6.135	1.478
8/19/2016 17:15	21.254	31.0	7.561	110.444	6.137	1.48
8/19/2016 17:30	21.234	31.1	7.602	113.863	6.137	1.49
8/19/2016 17:45	21.2	30.8	7.606	114.442	6.145	1.481
8/19/2016 18:00	21.157	31.2	7.623	115.994	6.145	1.481
8/19/2016 18:15	21.099	30.9	7.637	117.027	6.153	1.487
8/19/2016 18:30	21.036	31.3	7.647	117.806	6.154	1.482
8/19/2016 18:45	20.959	30.9	7.656	118.412	6.164	1.493
8/19/2016 19:00	20.873	31.4	7.662	118.908	6.172	1.494
8/19/2016 19:15	20.788	31.5	7.669	119.358	6.177	1.488
8/19/2016 19:30	20.693	31.3	7.673	119.783	6.181	1.486
8/19/2016 19:45	20.589	31.5	7.679	120.14	6.195	1.5
8/19/2016 20:00	20.482	31.2	7.685	120.515	6.202	1.495
8/19/2016 20:15	20.361	31.7	7.69	120.844	6.21	1.5
8/19/2016 20:30	20.238	31.7	7.694	121.218	6.221	1.493
8/19/2016 20:45	20.122	32.0	7.698	121.516	6.23	1.502
8/19/2016 21:00	20.01	31.7	7.7	121.795	6.237	1.498
8/19/2016 21:15	19.907	31.9	7.703	121.998	6.242	1.499
8/19/2016 21:30	19.81	31.8	7.704	122.241	6.253	1.502



Date and Time	Temperature (C)	Specific Conductivity (µS/cm)	pH (pH)	(ORP) (mV)	DO (mg/L)	Depth (ft)
8/19/2016 21:45	19.716	32.1	7.706	122.434	6.259	1.504
8/19/2016 22:00	19.621	32.2	7.708	122.653	6.268	1.502
8/19/2016 22:15	19.528	32.0	7.709	122.825	6.271	1.5
8/19/2016 22:30	19.438	32.6	7.709	123.056	6.279	1.495
8/19/2016 22:45	19.36	32.5	7.711	123.197	6.285	1.505
8/19/2016 23:00	19.283	32.2	7.713	123.395	6.289	1.507
8/19/2016 23:15	19.202	32.5	7.716	123.567	6.294	1.504
8/19/2016 23:30	19.131	32.5	7.717	123.71	6.299	1.512
8/19/2016 23:45	19.059	32.6	7.719	123.948	6.302	1.51
8/20/2016 0:00	18.986	32.2	7.721	124.129	6.309	1.497
8/20/2016 0:15	18.919	32.7	7.724	124.279	6.318	1.508
8/20/2016 0:30	18.851	33.0	7.726	124.463	6.321	1.506
8/20/2016 0:45	18.786	32.4	7.728	124.611	6.328	1.502
8/20/2016 1:00	18.723	32.9	7.73	124.742	6.331	1.504
8/20/2016 1:15	18.656	32.6	7.733	124.909	6.335	1.502
8/20/2016 1:30	18.594	33.3	7.735	125.047	6.34	1.506
8/20/2016 1:45	18.526	32.7	7.737	125.188	6.347	1.503
8/20/2016 2:00	18.461	32.7	7.74	125.331	6.347	1.498
8/20/2016 2:15	18.406	32.4	7.741	125.486	6.353	1.505
8/20/2016 2:30	18.344	32.8	7.742	125.66	6.356	1.5
8/20/2016 2:45	18.277	33.3	7.746	125.901	6.363	1.516
8/20/2016 3:00	18.22	33.0	7.748	126.041	6.363	1.518
8/20/2016 3:15	18.149	32.6	7.75	126.218	6.369	1.517
8/20/2016 3:30	18.094	32.8	7.752	126.354	6.376	1.516
8/20/2016 3:45	18.027	32.9	7.756	126.494	6.378	1.524
8/20/2016 4:00	17.962	33.6	7.757	126.652	6.384	1.521
8/20/2016 4:15	17.9	33.8	7.76	126.799	6.39	1.528
8/20/2016 4:30	17.84	33.6	7.761	126.971	6.394	1.518
8/20/2016 4:45	17.779	33.3	7.765	127.062	6.4	1.52
8/20/2016 5:00	17.72	34.0	7.765	127.243	6.403	1.523
8/20/2016 5:15	17.659	33.7	7.768	127.379	6.406	1.531
8/20/2016 5:30	17.603	34.2	7.77	127.534	6.408	1.53
8/20/2016 5:45	17.543	33.4	7.772	127.725	6.414	1.526
8/20/2016 6:00	17.5	33.9	7.776	127.818	6.417	1.532
8/20/2016 6:15	17.442	33.6	7.776	127.989	6.421	1.526
8/20/2016 6:30	17.389	33.8	7.78	128.077	6.427	1.523
8/20/2016 6:45	17.345	33.4	7.781	128.225	6.429	1.535
8/20/2016 7:00	17.299	33.3	7.78	128.325	6.432	1.533
8/20/2016 7:15	17.267	33.4	7.781	128.375	6.433	1.531
8/20/2016 7:30	17.243	33.8	7.778	128.511	6.436	1.529
8/20/2016 7:45	17.219	34.0	7.778	128.659	6.433	1.526
8/20/2016 8:00	17.203	33.7	7.778	128.793	6.436	1.523
8/20/2016 8:15	17.193	34.3	7.779	128.895	6.432	1.525
8/20/2016 8:30	17.191	33.8	7.779	128.974	6.433	1.527
8/20/2016 8:45	17.202	34.3	7.777	129.038	6.43	1.525
8/20/2016 9:00	17.225	34.0	7.775	129.086	6.426	1.534
8/20/2016 9:15	17.261	34.2	7.771	128.914	6.422	1.529
8/20/2016 9:30	17.309	33.3	7.767	129.084	6.416	1.523
8/20/2016 9:45	17.369	33.7	7.762	129.165	6.407	1.521
8/20/2016 10:00	17.44	33.4	7.756	129.215	6.397	1.535
8/20/2016 10:15	17.521	33.8	7.751	129.277	6.39	1.522
8/20/2016 10:30	17.611	33.8	7.746	129.274	6.375	1.519
8/20/2016 10:45	17.71	33.0	7.739	129.305	6.369	1.517
8/20/2016 11:00	17.815	33.5	7.736	129.339	6.359	1.515
8/20/2016 11:15	17.928	33.4	7.733	129.315	6.348	1.521
8/20/2016 11:30	18.049	33.3	7.729	129.279	6.332	1.52
8/20/2016 11:45	18.189	33.2	7.721	129.229	6.317	1.514
8/20/2016 12:00	18.33	33.2	7.714	129.222	6.302	1.51
8/20/2016 12:15	18.48	33.1	7.71	129.205	6.284	1.522
8/20/2016 12:30	18.631	32.9	7.706	129.165	6.267	1.517
8/20/2016 12:45	18.775	32.8	7.71	129.248	6.255	1.514
8/20/2016 13:00	18.927	32.5	7.714	129.224	6.241	1.506
8/20/2016 13:15	19.078	32.5	7.712	129.01	6.225	1.509
8/20/2016 13:30	19.255	32.0	7.712	129.076	6.208	1.512
8/20/2016 13:45	19.438	32.1	7.711	128.845	6.188	1.504
8/20/2016 14:00	19.621	32.1	7.696	128.726	6.168	1.509
8/20/2016 14:15	19.786	32.0	7.69	128.895	6.152	1.509
8/20/2016 14:30	19.939	31.8	7.693	128.902	6.137	1.512
8/20/2016 14:45	20.085	31.7	7.695	128.807	6.123	1.503
8/20/2016 15:00	20.215	31.8	7.696	128.793	6.111	1.508
8/20/2016 15:15	20.342	31.4	7.695	128.688	6.102	1.511
8/20/2016 15:30	20.448	31.1	7.702	128.285	6.09	1.512
8/20/2016 15:45	20.515	31.3	7.724	128.266	6.088	1.515
8/20/2016 16:00	20.617	31.2	7.739	128.616	6.075	1.518
8/20/2016 16:15	20.705	31.5	7.74	127.863	6.068	1.509
8/20/2016 16:30	20.765	31.3	7.757	128.211	6.059	1.51
8/20/2016 16:45	20.803	30.9	7.78	128.323	6.057	1.51
8/20/2016 17:00	20.832	31.6	7.799	128.509	6.055	1.509



Date and Time	Temperature (C)	Specific Conductivity (µS/cm)	pH (pH)	(ORP) (mV)	DO (mg/L)	Depth (ft)
8/20/2016 17:15	20.85	31.1	7.818	128.487	6.05	1.508
8/20/2016 17:30	20.851	30.9	7.832	128.588	6.048	1.509
8/20/2016 17:45	20.834	31.4	7.843	128.712	6.053	1.512
8/20/2016 18:00	20.802	31.3	7.853	128.802	6.058	1.511
8/20/2016 18:15	20.755	31.3	7.862	128.924	6.058	1.514
8/20/2016 18:30	20.69	31.7	7.869	129.01	6.066	1.515
8/20/2016 18:45	20.617	31.3	7.877	129.129	6.075	1.508
8/20/2016 19:00	20.524	31.6	7.889	128.6	6.08	1.512
8/20/2016 19:15	20.424	31.6	7.889	128.201	6.09	1.512
8/20/2016 19:30	20.317	31.4	7.893	128.347	6.099	1.513
8/20/2016 19:45	20.21	31.8	7.894	127.715	6.106	1.517
8/20/2016 20:00	20.1	31.3	7.885	122.389	6.115	1.517
8/20/2016 20:15	19.987	31.9	7.897	121.185	6.123	1.522
8/20/2016 20:30	19.884	32.1	7.898	125.853	6.136	1.507
8/20/2016 20:45	19.791	32.1	7.9	135.988	6.141	1.521
8/20/2016 21:00	19.705	31.8	7.898	139.429	6.145	1.51
8/20/2016 21:15	19.637	32.4	7.895	140.535	6.152	1.513
8/20/2016 21:30	19.57	32.1	7.894	141.305	6.153	1.511
8/20/2016 21:45	19.507	31.9	7.893	141.374	6.158	1.518
8/20/2016 22:00	19.444	32.3	7.893	142.342	6.165	1.507
8/20/2016 22:15	19.384	31.9	7.893	142.819	6.167	1.515
8/20/2016 22:30	19.325	32.5	7.892	143.227	6.173	1.515
8/20/2016 22:45	19.27	32.1	7.889	143.577	6.174	1.515
8/20/2016 23:00	19.215	32.1	7.893	141.941	6.181	1.513
8/20/2016 23:15	19.159	32.6	7.894	142.855	6.183	1.507
8/20/2016 23:30	19.111	32.3	7.895	143.663	6.186	1.51
8/20/2016 23:45	19.063	32.2	7.893	144.44	6.189	1.506
8/21/2016 0:00	19.02	32.7	7.895	145.294	6.192	1.509
8/21/2016 0:15	18.975	32.4	7.896	145.735	6.194	1.515
8/21/2016 0:30	18.926	32.6	7.897	146.3	6.196	1.51
8/21/2016 0:45	18.87	32.9	7.899	146.774	6.202	1.519
8/21/2016 1:00	18.831	32.7	7.898	147.146	6.204	1.52
8/21/2016 1:15	18.782	32.7	7.899	147.673	6.204	1.513
8/21/2016 1:30	18.738	32.6	7.899	148.102	6.208	1.502
8/21/2016 1:45	18.696	32.8	7.9	148.457	6.214	1.507
8/21/2016 2:00	18.648	33.3	7.901	148.875	6.215	1.509
8/21/2016 2:15	18.596	32.4	7.903	149.347	6.219	1.503
8/21/2016 2:30	18.546	33.2	7.904	149.809	6.225	1.514
8/21/2016 2:45	18.494	33.1	7.905	150.341	6.226	1.509
8/21/2016 3:00	18.451	33.2	7.905	150.868	6.232	1.509
8/21/2016 3:15	18.416	33.0	7.904	151.392	6.231	1.519
8/21/2016 3:30	18.377	33.1	7.906	151.86	6.233	1.518
8/21/2016 3:45	18.336	33.0	7.906	152.365	6.237	1.514
8/21/2016 4:00	18.295	32.7	7.907	152.954	6.24	1.521
8/21/2016 4:15	18.256	33.3	7.908	153.395	6.24	1.519
8/21/2016 4:30	18.213	33.7	7.91	153.974	6.245	1.511
8/21/2016 4:45	18.18	32.9	7.91	154.413	6.245	1.511
8/21/2016 5:00	18.131	33.4	7.912	155.083	6.251	1.517
8/21/2016 5:15	18.077	33.2	7.914	155.717	6.253	1.517
8/21/2016 5:30	18.028	33.7	7.916	156.285	6.256	1.522
8/21/2016 5:45	17.973	33.3	7.917	156.804	6.262	1.521
8/21/2016 6:00	17.92	33.7	7.916	157.312	6.266	1.515
8/21/2016 6:15	17.875	33.5	7.917	157.684	6.265	1.51
8/21/2016 6:30	17.821	33.6	7.919	158.347	6.27	1.517
8/21/2016 6:45	17.77	33.2	7.921	158.776	6.276	1.506
8/21/2016 7:00	17.727	33.6	7.92	159.043	6.275	1.511
8/21/2016 7:15	17.688	33.6	7.921	159.243	6.281	1.512
8/21/2016 7:30	17.653	33.8	7.921	159.387	6.281	1.516
8/21/2016 7:45	17.623	33.3	7.921	159.418	6.285	1.5
8/21/2016 8:00	17.603	33.7	7.921	159.496	6.286	1.514
8/21/2016 8:15	17.596	33.3	7.921	159.503	6.285	1.507
8/21/2016 8:30	17.605	33.4	7.919	159.465	6.28	1.501
8/21/2016 8:45	17.629	33.7	7.917	159.31	6.277	1.503
8/21/2016 9:00	17.662	33.5	7.917	158.912	6.275	1.501
8/21/2016 9:15	17.706	33.4	7.9	157.751	6.266	1.51
8/21/2016 9:30	17.764	33.7	7.799	132.908	6.261	1.507
8/21/2016 9:45	17.834	33.2	7.915	133.571	6.252	1.505
8/21/2016 10:00	17.915	33.3	7.826	117.382	6.24	1.497
8/21/2016 10:15	18.007	32.9	7.84	98.38	6.235	1.505
8/21/2016 10:30	18.108	32.9	7.769	81.302	6.224	1.502
8/21/2016 10:45	18.213	33.3	7.803	72.02	6.213	1.501
8/21/2016 11:00	18.317	33.3	7.821	73.062	6.201	1.5
8/21/2016 11:15	18.428	33.1	7.808	66.089	6.192	1.493
8/21/2016 11:30	18.554	33.2	7.872	82.16	6.175	1.502
8/21/2016 11:45	18.683	33.0	7.834	73.773	6.164	1.496
8/21/2016 12:00	18.817	32.4	7.851	77.32	6.147	1.485
8/21/2016 12:15	18.962	33.0	7.686	68.764	6.137	1.489
8/21/2016 12:30	19.115	32.9	7.755	49.447	6.119	1.48

Date and Time	Temperature (C)	Specific Conductivity (µS/cm)	pH (pH)	(ORP) (mV)	DO (mg/L)	Depth (ft)
8/21/2016 12:45	19.252	32.1	7.856	56.75	6.11	1.496
8/21/2016 13:00	19.406	32.6	7.688	48.679	6.092	1.49
8/21/2016 13:15	19.558	31.7	7.783	40.161	6.077	1.489
8/21/2016 13:30	19.714	31.6	7.774	38.017	6.059	1.492
8/21/2016 13:45	19.85	31.9	7.808	37.187	6.045	1.497
8/21/2016 14:00	19.991	32.0	7.735	31.096	6.033	1.474
8/21/2016 14:15	20.139	32.2	7.767	36.088	6.019	1.49
8/21/2016 14:30	20.295	31.9	6.983	6.15	6.002	1.489
8/21/2016 14:45	20.43	31.8	7.775	36.217	5.991	1.489
8/21/2016 15:00	20.551	31.1	7.74	39.386	5.975	1.487
8/21/2016 15:15	20.616	31.2	7.761	42.271	5.972	1.484
8/21/2016 15:30	20.66	31.2	7.664	31.775	5.969	1.482
8/21/2016 15:45	20.568	31.5	7.774	36.997	5.977	1.489
8/21/2016 16:00	20.487	31.3	7.812	37.564	5.987	1.491
8/21/2016 16:15	20.373	31.5	7.819	38.349	5.996	1.487
8/21/2016 16:30	20.247	31.7	7.836	38.268	6.01	1.482
8/21/2016 16:45	20.116	32.3	7.873	48.059	6.023	1.49
8/21/2016 17:00	19.996	32.0	7.796	35.409	6.029	1.491
8/21/2016 17:15	19.87	32.2	7.827	37.724	6.038	1.5
8/21/2016 17:30	19.761	31.9	7.764	32.627	6.051	1.496
8/21/2016 17:45	19.748	32.5	7.834	35.225	6.04	1.499
8/21/2016 18:00	19.695	31.9	7.747	23.738	6.048	1.492

wallaceGROUP
applied earth &
environmental science

APPENDIX D

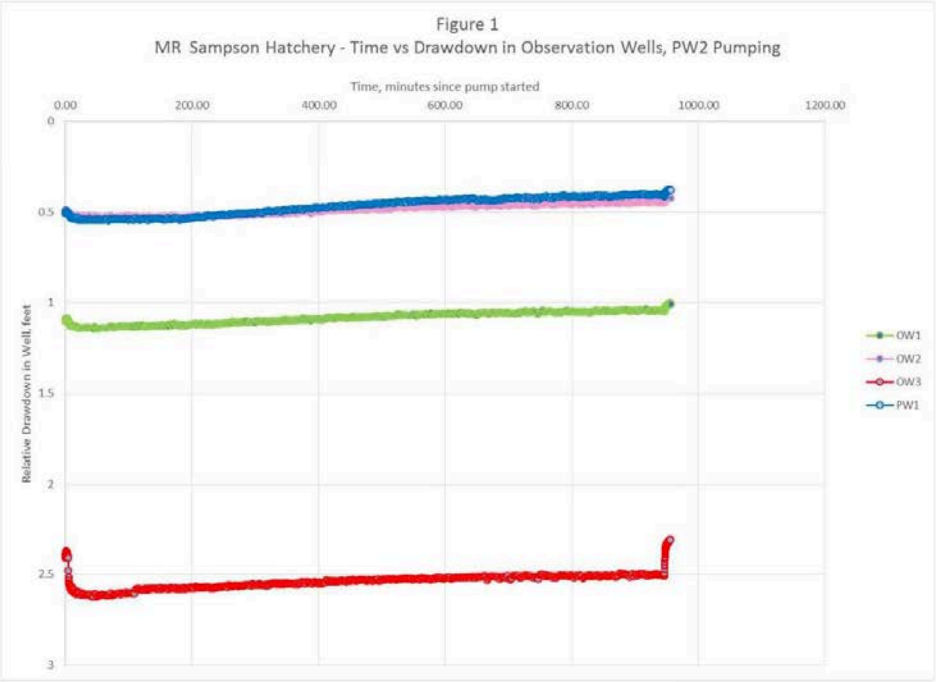


Figure 1
MR Sampson Hatchery - Time vs Drawdown in Observation Wells, PW2 Pumping

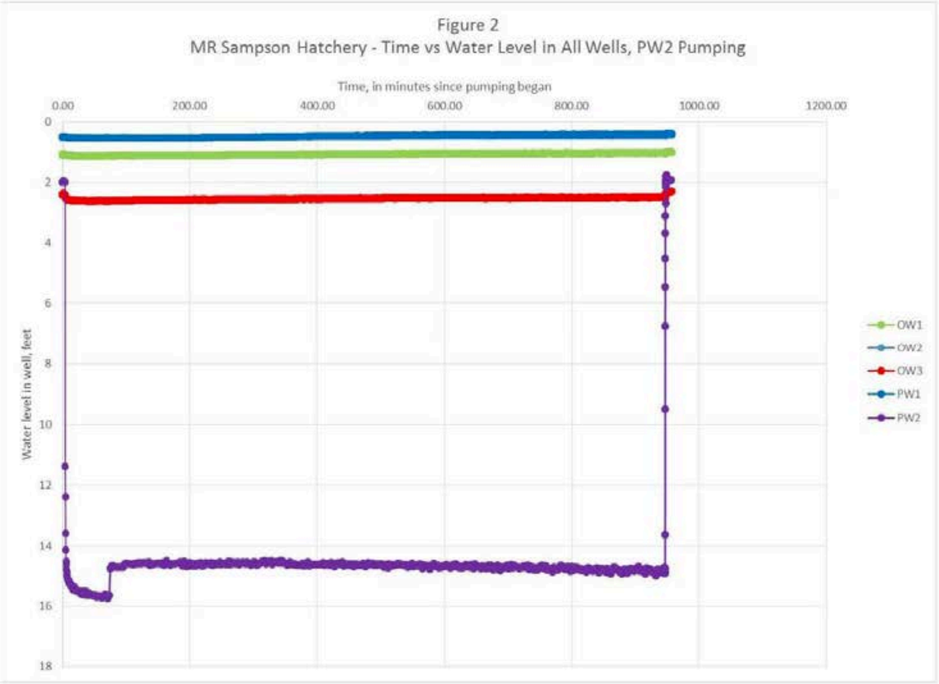
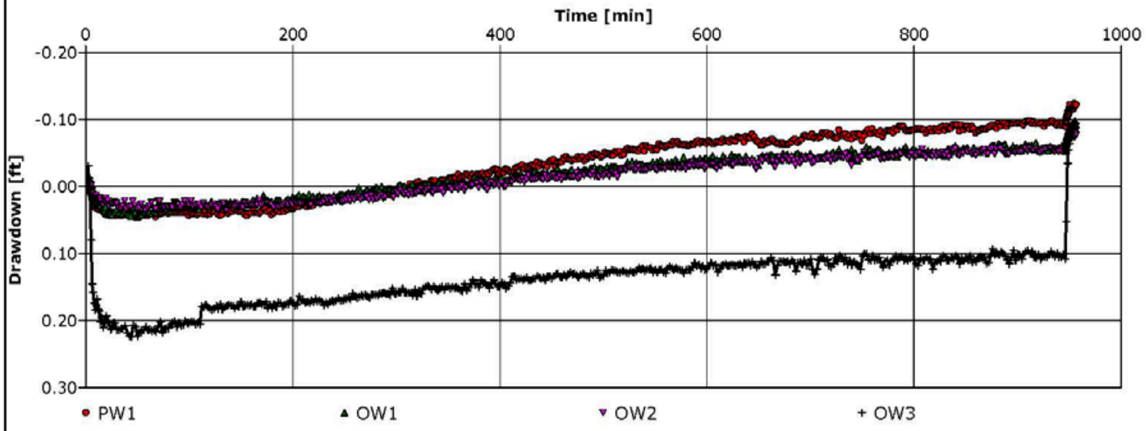


Figure 2
MR Sampson Hatchery - Time vs Water Level in All Wells, PW2 Pumping

Aegis Groundwater Consulting, LLC
3003 East Cornell Avenue
Fresno, California
559 801 1604

Pumping Test Analysis Report
Project: M.R. Sampson Hatchery
Number: 10632 (3)
Client: McMillen Jacobs Associates

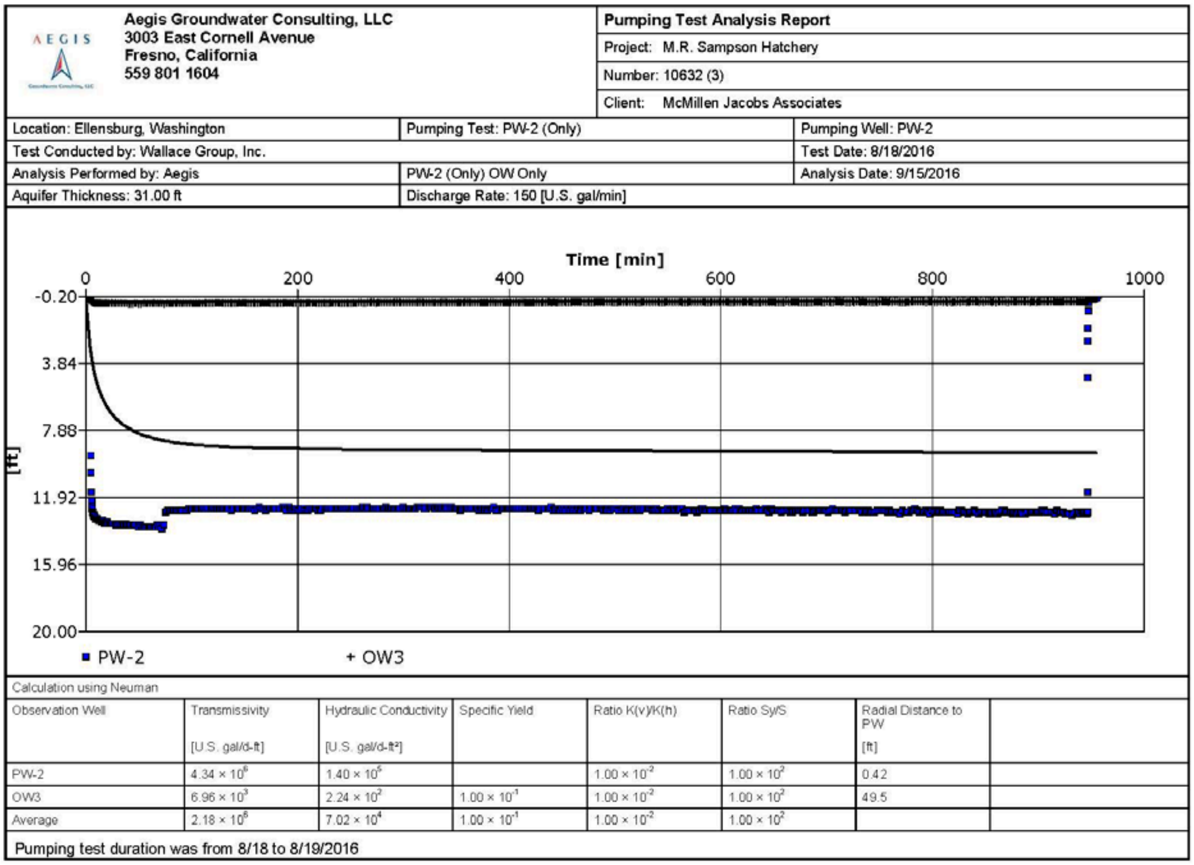
Location: Ellensburg, Washington	Pumping Test: PW-2 (Only)	Pumping Well: PW-2
Test Conducted by: Wallace Group, Inc.		Test Date: 8/18/2016
Analysis Performed by: Aegis	PW-2 (Only) OW Only	Analysis Date: 9/15/2016
Aquifer Thickness: 31.00 ft	Discharge Rate: 150 [U.S. gal/min]	



Pumping test duration was from 8/18 to 8/19/2016

Initial discharge was ~ 170 GPM, decreased to ~150 GPM at approximately 75 minutes to prevent pumping water level dropping below blank well casing.

Figure 3



Aegis Groundwater Consulting, LLC
3003 East Cornell Avenue
Fresno, California
559 801 1604

Pumping Test Analysis Report
Project: M.R. Sampson Hatchery
Number: 10632 (3)
Client: McMillen Jacobs Associates

Location: Ellensburg, Washington	Pumping Test: PW-2 (Only)	Pumping Well: PW-2
Test Conducted by: Wallace Group, Inc.		Test Date: 8/18/2016
Analysis Performed by: Aegis	PW-2 (Only) OW Only	Analysis Date: 9/15/2016
Aquifer Thickness: 31.00 ft	Discharge Rate: 150 [U.S. gal/min]	

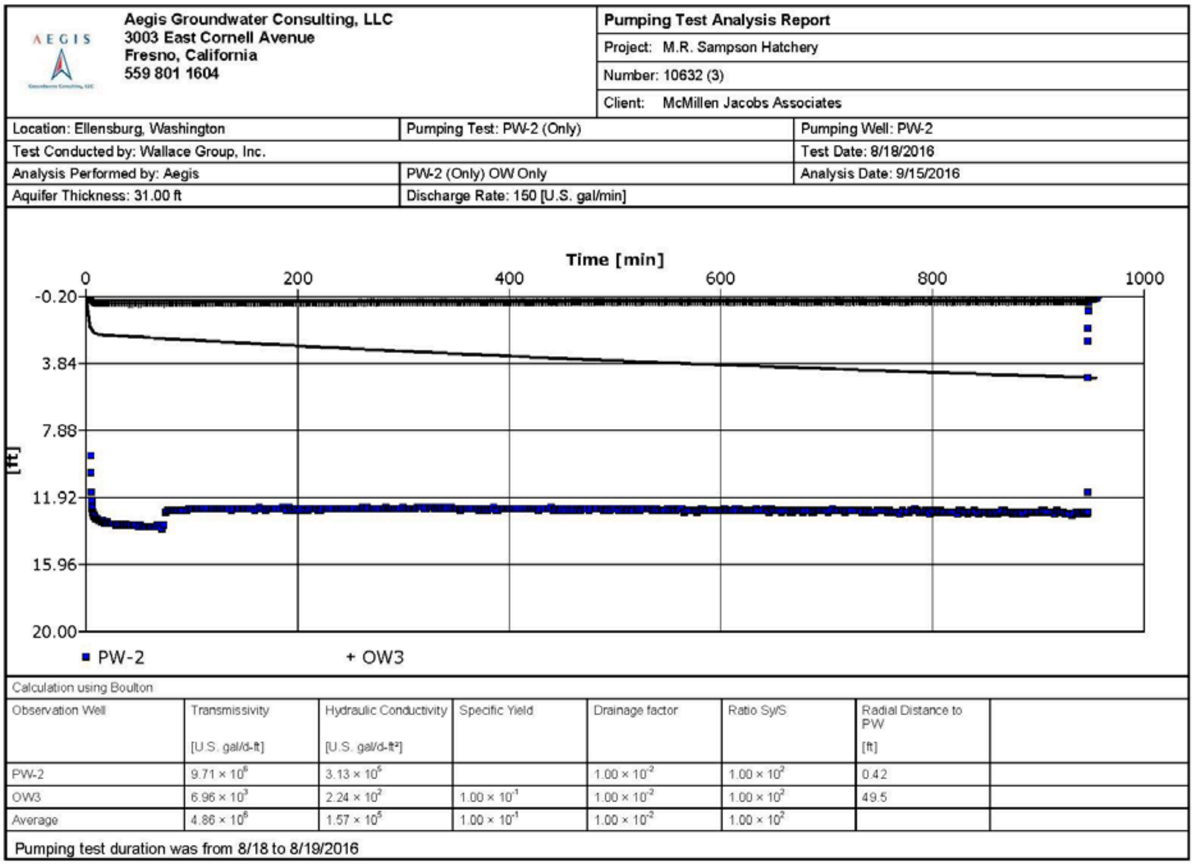
Calculation using Neuman

Observation Well	Transmissivity [U.S. gal/d-ft]	Hydraulic Conductivity [U.S. gal/d-ft²]	Specific Yield	Ratio K(v)/K(h)	Ratio Sy/S	Radial Distance to PW [ft]	
PW-2	4.34×10^{6}	1.40×10^{5}		1.00×10^{-2}	1.00×10^{2}	0.42	
OW3	6.96×10^{3}	2.24×10^{2}	1.00×10^{-1}	1.00×10^{-2}	1.00×10^{2}	49.5	
Average	2.18×10^{6}	7.02×10^{4}	1.00×10^{-1}	1.00×10^{-2}	1.00×10^{2}		

Pumping test duration was from 8/18 to 8/19/2016

Initial discharge was ~ 170 GPM, decreased to ~150 GPM at approximately 75 minutes to prevent pumping water level dropping below blank well casing.

Figure 4



Aegis Groundwater Consulting, LLC
3003 East Cornell Avenue
Fresno, California
559 801 1604

Pumping Test Analysis Report
Project: M.R. Sampson Hatchery
Number: 10632 (3)
Client: McMillen Jacobs Associates

Location: Ellensburg, Washington	Pumping Test: PW-2 (Only)	Pumping Well: PW-2
Test Conducted by: Wallace Group, Inc.		Test Date: 8/18/2016
Analysis Performed by: Aegis	PW-2 (Only) OW Only	Analysis Date: 9/15/2016
Aquifer Thickness: 31.00 ft	Discharge Rate: 150 [U.S. gal/min]	

Calculation using Boulton

Observation Well	Transmissivity [U.S. gal/d-ft]	Hydraulic Conductivity [U.S. gal/d-ft²]	Specific Yield	Drainage factor	Ratio Sy/S	Radial Distance to PW [ft]	
PW-2	9.71×10^{6}	3.13×10^{5}		1.00×10^{-2}	1.00×10^{2}	0.42	
OW3	6.96×10^{3}	2.24×10^{2}	1.00×10^{-1}	1.00×10^{-2}	1.00×10^{2}	49.5	
Average	4.86×10^{6}	1.57×10^{5}	1.00×10^{-1}	1.00×10^{-2}	1.00×10^{2}		

Pumping test duration was from 8/18 to 8/19/2016

Initial discharge was ~ 170 GPM, decreased to ~150 GPM at approximately 75 minutes to prevent pumping water level dropping below blank well casing.

Figure 5

Figure 6

MR Sampson Hatchery - Time versus Water Level, feet in all wells, PW1 and PW2 pumping

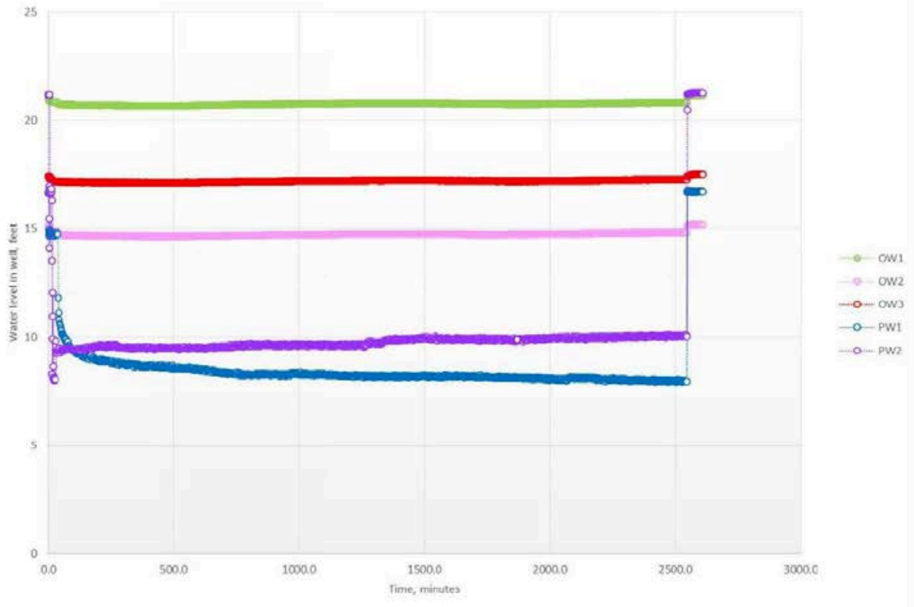
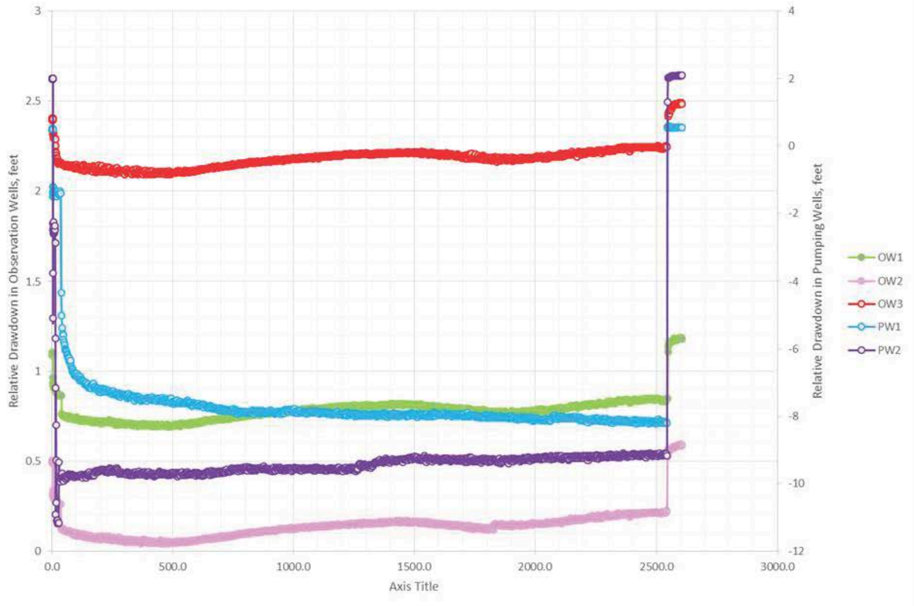
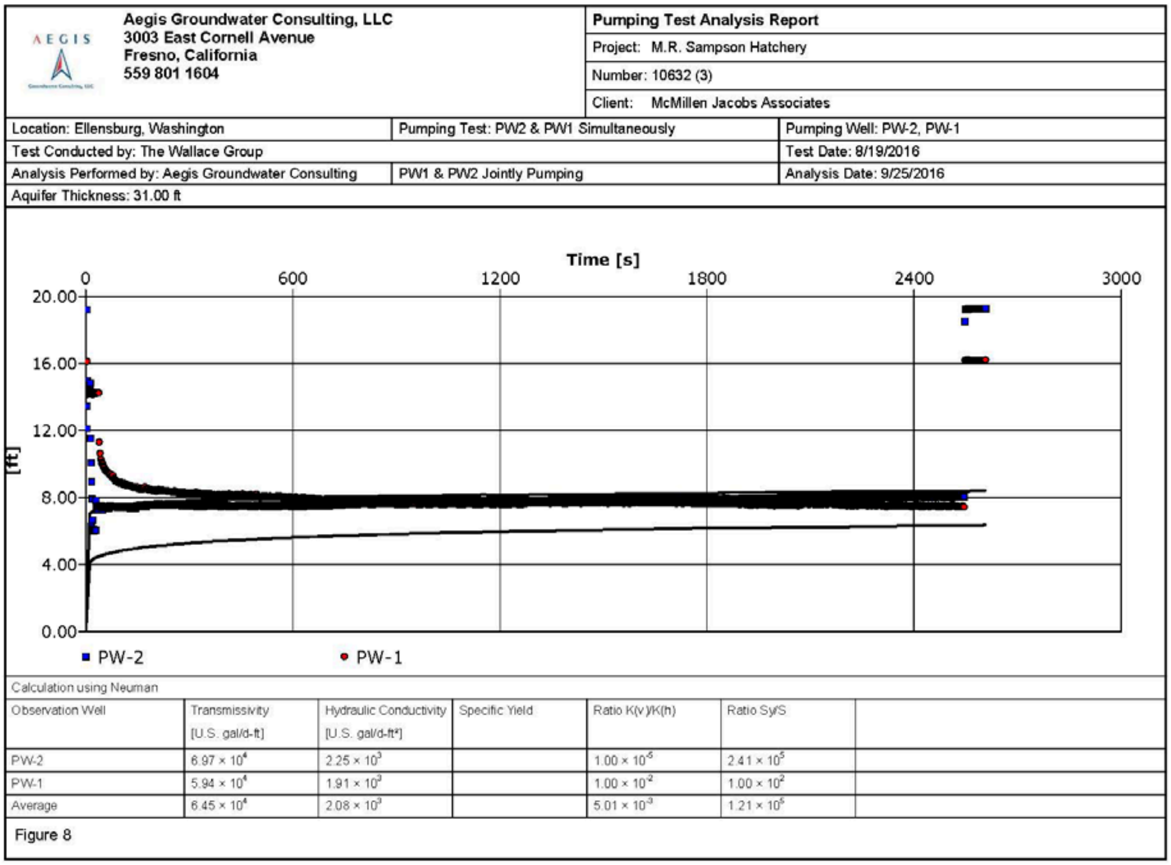


Figure 7

MR Sampson Hatchery - Time vs drawdown in wells, PW1 and PW2 pumping





Aegis Groundwater Consulting, LLC
3003 East Cornell Avenue
Fresno, California
559 801 1604

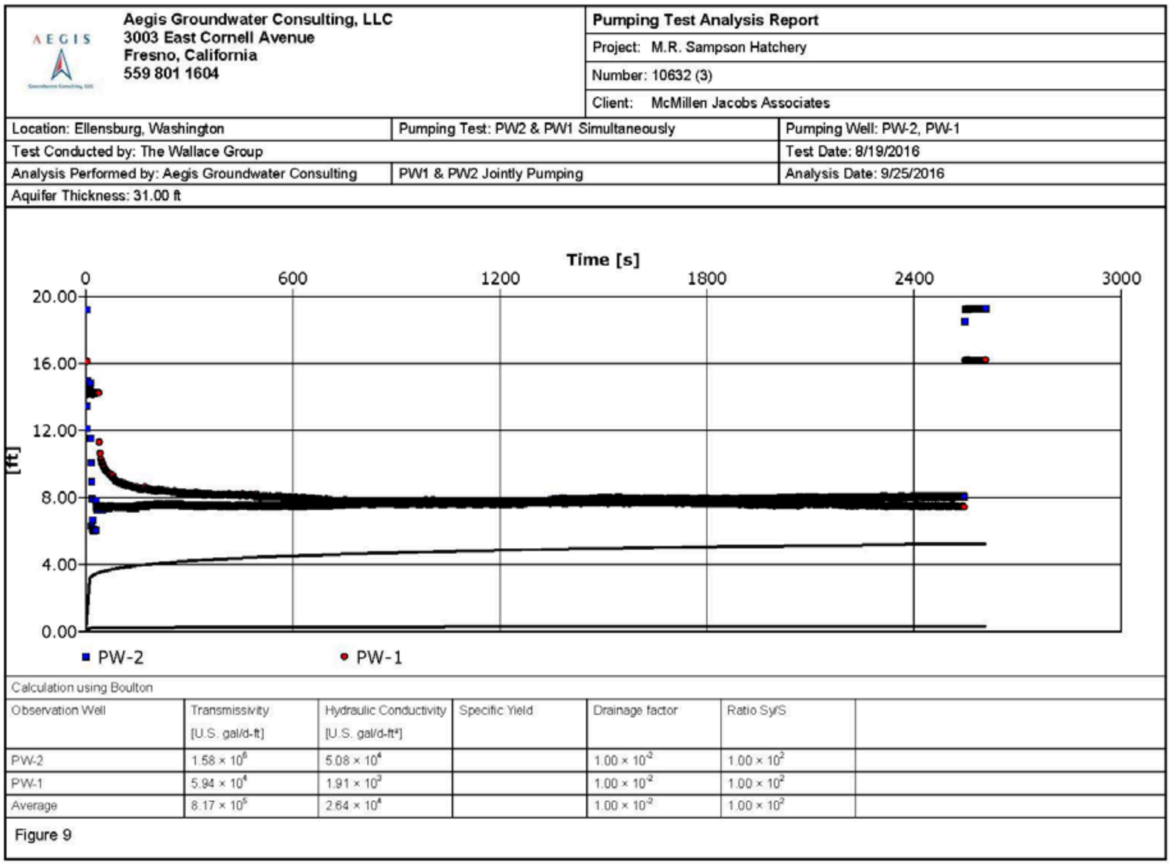
Pumping Test Analysis Report
Project: M.R. Sampson Hatchery
Number: 10632 (3)
Client: McMillen Jacobs Associates

Location: Ellensburg, Washington
Pumping Test: PW2 & PW1 Simultaneously
Pumping Well: PW-2, PW-1
Test Conducted by: The Wallace Group
Test Date: 8/19/2016
Analysis Performed by: Aegis Groundwater Consulting
PW1 & PW2 Jointly Pumping
Analysis Date: 9/25/2016
Aquifer Thickness: 31.00 ft

Calculation using Neuman

Observation Well	Transmissivity [U.S. gal/d-ft]	Hydraulic Conductivity [U.S. gal/d-ft²]	Specific Yield	Ratio K(v)/K(h)	Ratio Sy/S	
PW-2	6.97×10^4	2.25×10^3		1.00×10^{-5}	2.41×10^5	
PW-1	5.94×10^4	1.91×10^3		1.00×10^{-2}	1.00×10^2	
Average	6.45×10^4	2.08×10^3		5.01×10^{-3}	1.21×10^5	

Figure 8



Aegis Groundwater Consulting, LLC
3003 East Cornell Avenue
Fresno, California
559 801 1604

Pumping Test Analysis Report
Project: M.R. Sampson Hatchery
Number: 10632 (3)
Client: McMillen Jacobs Associates

Location: Ellensburg, Washington
Pumping Test: PW2 & PW1 Simultaneously
Pumping Well: PW-2, PW-1
Test Conducted by: The Wallace Group
Test Date: 8/19/2016
Analysis Performed by: Aegis Groundwater Consulting
PW1 & PW2 Jointly Pumping
Analysis Date: 9/25/2016
Aquifer Thickness: 31.00 ft

Calculation using Boulton

Observation Well	Transmissivity [U.S. gal/d-ft]	Hydraulic Conductivity [U.S. gal/d-ft²]	Specific Yield	Drainage factor	Ratio Sy/S	
PW-2	1.58×10^6	5.08×10^4		1.00×10^{-2}	1.00×10^2	
PW-1	5.94×10^4	1.91×10^3		1.00×10^{-2}	1.00×10^2	
Average	8.17×10^5	2.64×10^4		1.00×10^{-2}	1.00×10^2	

Figure 9

G3. Well Drawdown Alternatives Analysis

(Figures and attachments have been redacted.)

McMILLEN JACOBS ASSOCIATES

Technical Memorandum No. 7

To:	Bonneville Power Administration	Project:	MRS Coho Hatchery - EPC
From:	McMillen Jacobs Associates	cc: File	
Date:	02/22/17	Job No.:	16-012
Subject:	Melvin R. Sampson (MRS) Hatchery – Well Drawdown Alternatives Analysis		

Revision Log

Revision No.	Date	Revision Description
0	02/22/17	Well Drawdown Alternatives Analysis

1.0 Introduction and Purpose

McMillen Jacobs Associates (McMillen Jacobs) submitted the 50% design package for the MRS Coho Hatchery Project (Project) on November 18, 2016. Concurrent with the design development, Bonneville Power Administration (BPA) has been working with HDR, Inc. to develop the Environmental Impact Statement (EIS) for the Project. In reviewing the Administrative Draft EIS, concerns were raised about the potential impacts of the groundwater wells on the emergent wetland located on the southerly portion of the Project site. Although most of the proposed wells are located within the buildable area (defined by setbacks to wetlands, shorelines, and other sensitive areas), two of the proposed well locations were situated within the emergent wetland and one was located near the setback limit. The concern relates to the potential affects that groundwater withdrawal from the wellfield may have on the wetland.

The purpose of this Technical Memorandum (TM) is to evaluate the potential impacts to the wetland due to the operation of the well field; to identify and evaluate alternatives for the avoidance, minimization, or mitigation of potential impacts; and to propose a recommended alternative(s) for completing the wellfield design, as well as any additional studies or analysis required to prove out the recommended alternative.

1.1 Anticipated Wellfield Operations

The flow capacity of individual wells will not be known until construction begins in 2018, long after the design is completed. It is therefore important to build some level of operational flexibility into the design in order to allow the facility to maximize the discharge from highly productive wells. Doing so will help ensure that the flow rates required for hatchery operations are met, while allowing for variability in productivity from well to well. An additional benefit to this operational flexibility is the possibility of running only the productive wells, and turning off those wells that would otherwise impact wetlands. Operational flexibility has been incorporated into the design primarily by the specification of variable frequency drive (VFD) pumps and continuous aquifer monitoring by a supervisory control and data acquisition (SCADA) system to allow operators to pump the wells at different rates as the need arises. In addition, the proposed wells have been sized to allow pumping at rates beyond the anticipated average demand per well.

Table 1 below provides the monthly hatchery operational demands for both surface and groundwater sources. The peak monthly demand for groundwater is 937 gallons per minute (gpm), which occurs in March when both hatchery incubation and early rearing require groundwater supply. With nine wells operating, the uniform demand at each well is 104 gpm in March; with only seven wells operating, the uniform demand from each well increases to 134 gpm. Therefore, shutting off two wells would still allow the remaining wells to be pumped efficiently, with additional flexibility still available to pump the wells up to 150 gpm (or possibly more) to capitalize on highly productive wells. The groundwater system will also function as an important back-up supply in the event that there are water quality or mechanical problems with the surface water supply system.

Table 1. Monthly Hatchery Operational Demands by Source

Month	Surface Water Demand		Groundwater Demand	
	cfs	gpm	cfs	gpm
Jan	4.79	2,150	0.16	72
Feb	3.01	1,350	0.16	72
Mar	3.01	1,350	2.09	937
Apr	0.00	0	1.93	865
May	0.00	0	1.93	865
Jun	0.00	0	1.80	810
Jul	0.00	0	1.80	810
Aug	0.00	0	1.80	810
Sep	0.00	0	1.80	810
Oct	0.00	0	2.06	926
Nov	4.53	2,035	1.66	747
Dec	6.04	2,710	0.16	72

2.0 Well Drawdown Evaluation

In simple terms, withdrawal of groundwater from an unconfined aquifer can reduce the water table elevation in an area surrounding the well. This is referred to as the drawdown cone. To predict the approximate magnitude and extent of the drawdown over time, simple analytical solutions are commonly used in conjunction with monitoring results from nearby observation wells. Simple models such as the one used in this evaluation assume that ideal aquifer conditions exist, namely that the aquifer is homogeneous and isotropic.

This section describes the data sources and methods adopted to conduct the well drawdown evaluation for the Project site.

2.1 Data Sources

Well pump testing was conducted at the Project site in the summer of 2016 by the Wallace Group (TWG). The testing involved pumping from Pumping Well #2 (PW-2) and measuring drawdown in several observation wells, followed by pumping from PW-2 and Pumping Well #1 (PW-1) at the same time and measuring drawdown in the production wells and nearby observation wells. The configuration of the pumping and observation wells is provided in **Figure 1** along with results of pump testing from PW-2 in **Figure 2**. Based on this and earlier groundwater investigations, boring logs, and a review of published geologic maps and literature (TWG 2012; TWG 2016a), the thickness of the aquifer (b) was estimated to be approximately 30 feet. The aquifer was also characterized as unconfined and laterally extensive, with a specific yield of approximately 0.1 (TWG 2016b).

2.2 Model Development

Drawdown due to the production wells was estimated using the Theis equation (Theis 1935). Though Theis developed the equation for confined aquifers, the equations can be used for unconfined aquifers, as long as the drawdown is small compared with the saturated thickness and the vertical gradients to the well are not large (Freeze and Cherry, 1979).

Key inputs to the model include the transmissivity (the product of the aquifer thickness and hydraulic conductivity), specific yield, distances, time and pumping rate.

The aquifer transmissivity is a metric of water conveyance in the horizontal (e.g. toward a pumping well), and for each aquifer layer is given by:

$$T = kb \tag{1}$$

where T = transmissivity (ft^2/s)
k = hydraulic conductivity (ft/s)
b = aquifer thickness (ft)

Hydraulic conductivity was calculated in TWG (2016b) using both the Boulton and the Neuman methods. Here, however, the hydraulic conductivity is assumed to be a decision variable, and is systematically adjusted to achieve a drawdown value that matches what was measured in the field. The value of hydraulic conductivity resulting from this parameter estimation exercise is then compared to those supplied by TWG 2016b.

Per Freeze and Cherry (1979), for unconfined aquifers, the well function can be defined in terms of the specific yield, S_s, rather than the storativity, S. The specific yield is the volume of water that an unconfined aquifer releases from storage per unit surface area of aquifer per unit decline in the water table. As mentioned above, the specific yield was estimated at the Project site to be approximately 0.1 (TWG 2016b).

Using these estimates of aquifer characteristics, the water table drawdown due to pumping was estimated using the Theis equation. The Theis equation is commonly used for simple estimates of drawdown as a function of distance from the well and time of observation (e.g. Freeze and Cherry 1979):

$$h_0 - h(r,t) = \frac{Q}{4\pi T}\int_u^\infty \frac{e^{-u}du}{u} \qquad (2)$$

$$W(u) = \frac{Q}{4\pi T}\int_u^\infty \frac{e^{-u}du}{u} \qquad (3)$$

$$u = \frac{r^2 S_s}{4Tt} \qquad (4)$$

where h_0 = constant initial hydraulic head, taken as zero here
$h(r,t)$ = hydraulic head as a function of radial distance from the well and time
Q = constant pumping rate from the well (ft^3/s)
T = transmissivity (ft^2/s)
u = dimensionless time parameter (-)
r = radial distance from the well (ft)
S_s = specific yield (-)
t = time (s)

The integral in Equation 2 is known as the exponential integral or, in the case of the Theis equation, the well function, $W(u)$, as shown in Equation 3. Values of the well function can be readily obtained from tables; values of *u* are calculated using Equation 4 for varying distances from the well, *r*, and different times, *t*.

Per Freeze and Cherry (1979), calculation of drawdown at a location subject to the influences of a well field—rather than a single well—can be performed using the following distributive property of the Theis solution:

$$h_0 - h = \frac{Q}{4\pi T}\left(W(u_1) + W(u_2) + W(u_3) + \cdots + W(u_n)\right) \qquad (5)$$

where n is the number of wells in the well field.

The above equations were applied to PW-2 at the MRS site, assuming an initial hydraulic conductivity using the Boulton method from TWG (2016b) of 3.13×10^5 gal/day-ft^2, a flow rate of 150 gpm per the pump testing discharge rate, and an aquifer thickness of 30 feet. The assumed value of hydraulic conductivity from the Boulton method was a first approximation, after which further adjustments of the hydraulic conductivity took place so that the model results for drawdown matched those observed in the field.

Matching model results to those observed in the field also required defining a steady-state time for the model. According to Strack (1989), "[t]he Theis solution is ideally suited for pumping test analysis. It is important in view of groundwater modeling applications to understand fully the implications of the boundary conditions. This condition implies that the head at infinity is maintained at a constant level at all times. The well therefore draws all of its water from removal from storage, and none from other sources. In the steady-state solution for a single well in an infinite aquifer, these other sources are lumped together at infinity. As a result, the Theis solution does not converge to the steady-state solution; it will eventually draw the water levels throughout the aquifer below the aquifer base." In order to avoid this, then, it is important to choose a suitable steady-state time for the model. The steady-state time assumed for the model was taken from Figure 1 of Appendix D in TWG (2016b), which is attached here as **Figure 2**. From that figure, the time at which the lowest drawdown occurred in Observation Well #3 (OW-3) before aquifer rebound was observed—approximately 33.3 minutes—was taken as the steady state time of the Theis model. The hydraulic conductivity was then systematically adjusted to achieve a drawdown of 0.3 feet at a distance of 50 feet from PW-2 in order to mimic measurements taken at OW-3 during the site investigation. The resulting cone of depression is depicted in **Figure 3**. From the figure, the radius of influence extends to approximately 75 feet out from the well, after which the steady-state drawdown is shown to be negligible.

It should be noted that the resulting calibrated hydraulic conductivity is 450 gal/day-ft^2. The soils found at the Project site have been classified as well-graded alluvial sand, gravel and cobble to a depth of approximately 15 feet below ground surface (bgs), with higher percentages of silt and clay particles below 15 feet. Geophysical investigations at the site indicate buried sinuous stream channels where the gravel and cobble substrates extend to a depth of 30 feet bgs. According to Bear (1972), a bulk hydraulic conductivity of 450 gal/day-ft^2 would suit a pervious aquifer of clean sand or sand and gravel. This matches quite well what has been observed in the field. The calibrated hydraulic conductivity is therefore considered to have a reasonable value. Furthermore, the hydraulic conductivities estimated using the Boulton and Neuman methods are three orders of magnitude larger than what was calibrated. These values describe an aquifer composed of clean gravels that would result in a much shallower cone of depression than that shown in **Figure 3**. The model inputs adopted here are therefore considered conservative.

3.0 Alternatives Development

This section describes the following alternatives for meeting groundwater supply targets in consideration of potential impacts to the emergent wetlands:

1) Proceed with the well layout as proposed through the 50% design submittal,
2) Develop an alternative well layout based upon wetlands location, geologic, and groundwater flow considerations,
3) Develop a well layout where critical wells access a deeper aquifer,
4) Avoidance of impacts by purchasing alternative water rights,
5) Mitigation of impacts through water augmentation,
6) Mitigation through use of a mitigation bank, and
7) Compensation of impacts through onsite wetland creation or enhancement.

3.1 Alternative 1: 50% Design Proposed Locations

Alternative 1 consists of the currently proposed well configuration provided in the 50% design package. The currently proposed well locations for the Project are depicted in **Figure 4**, which also shows the estimated radius of influence around each well. The figure also indicates the wetland boundary, the 50-foot setback from this boundary that forms the southwest portion of the buildable area, and the total anticipated area of wetlands impacted by drawdown. The total area impacted is approximately 0.9 acres, calculated by measuring the area of overlap between the identified emergent wetland and the radius of influence of each of the wells (see **Figure 4**). From the figure, only Wells #1, #3 and #9 would be expected to impact the groundwater level within the wetland area.

3.2 Alternative 2: Minimization: Relocated Wells

Alternative 2 is depicted in **Figure 5**. This alternative consists of relocating two of the three wells that show an impact to the wetland area according to **Figure 4,** namely Wells #3 and #9. Well #1 is already in place, such that utilizing it for Project operations would represent less construction disturbance and less permanent ground surface footprint than replacing it. Furthermore, the area impacted by the drawdown from Well #1 is expected to be approximately 0.03 acres of transitional emergent wetland. This area is not large enough to warrant mitigation, but would be addressed in further consultation with stakeholder agencies.

Well #3 is proposed to be relocated to the southern portion of the buildable area, such that the zone of influence still falls outside the wetland boundary. This location is expected to be relatively productive, in terms of water supply, since geophysical explorations have indicated the presence of a buried stream channel in the vicinity (see **Figure 1**). Also, under this alternative, Well #9 has been relocated to the northwest of the property, between Wells #6 and #7. This location is outside the influence of nearby wells, is set back from the proposed drainfield locations, and should not impact wetlands.

3.3 Alternative 3: Minimization: Deeper Wells

Alternative 3 is depicted in **Figure 6**. This alternative is identical to Alternative 1 – the currently proposed well configuration – except that Wells #3 and #9 would extend down to a deeper isolated aquifer. The deeper aquifer would be that water-bearing stratum from which the potable water well draws water, approximately 150 feet bgs. In the case that the deeper aquifer is separated from the unconfined aquifer above by an aquiclude, no drawdown would be associated with these wells. In the case that the two aquifers are separated by an aquitard, the drawdown cone would be substantially less extensive in respect to surficial area and in terms of depth. For these reasons, the zone of influence is not indicated for these wells on **Figure 6**. Well #1 is already in place, such that utilizing it for Project operations would represent less construction disturbance and less permanent ground surface footprint than replacing it. Furthermore, the area impacted by the drawdown from Well #1 is expected to be approximately 0.03 acres at the north boundary of the transitional emergent wetland.

3.4 Alternative 4: Avoidance: Alternative Water Rights

Alternative 4 would consist of purchasing alternative water rights so that Wells #3 and #9 would not have to be installed. This would consist of identifying obtainable year-round surface water rights that meet the flow quantity and water quality required for hatchery operations.

3.5 Alternative 5: Mitigation: Water Augmentation

Alternative 5 would consist of augmenting the water to the emergent wetland from the wells when they are not providing water to hatchery operations. This water augmentation could consist of opening a valve on the well head and dispersing water into the ground. A conveyance channel system would be excavated in the 0.9 acres of impact so that water would infiltrate into the top 12 inches of the soil profile to provide adequate hydrology to continue support of wetland conditions. This water augmentation would be required since it is not expected that the groundwater profile would be able to recover quick enough when wells are switched off-line to support wetland hydrology requirements. The wells would only be required to augment water during the wetland growing season, which is anticipated to be between April and October of any given year.

Water augmentation from the wells could be controlled by hand operation or via a timer system. Maintenance and inspection of this system would be required on a regular basis to make sure that the wetland is receiving adequate hydrology to continue to support the wetland parameters.

3.6 Alternative 6: Mitigation: Mitigation Bank

Alternative 6 would consist of buying mitigation credits at a mitigation bank to compensate for the 0.9 acres of emergent wetland impact. The area of water drawdown around Wells #1, #3, and #9 would lose hydrology and is assumed to transition into an upland condition.

3.7 Alternative 7: Mitigation: Wetland Creation or Enhancement

Compensatory mitigation is the restoration, creation, enhancement, or in exceptional circumstances, preservation of wetlands and/or other aquatic resources for the purpose of compensating for unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization measures have been achieved.

The project site contains large open upland areas that are used to produce grass hay. These areas will no longer be used for agricultural purposes and provide an opportunity for on-site wetland creation or enhancement. The existing emergent wetland could be expanded by excavating soil until the water table is within 12 inches of the ground surface and planting with wetland vegetation. Enhancement could consist of planting wetland shrubs or trees in the existing wetland area and/or providing an open water component (pond or stream channel) to add complexity to the existing monotypic stand of emergent grasses.

Mitigation ratios for 0.9 acres of emergent wetland impact vary, but are assumed to be either 2:1 or 3:1. Further coordination would be required with the United States Army Corps of Engineers and the Washington Department of Ecology.

4.0 Alternatives Evaluation

4.1 Evaluation of Alternative 1: 50% Design Proposed Locations

Advantages of Alternative 1 are that it requires no modifications to the design drawings, it has no construction cost impact, and it does not affect the present water rights application. Also, the well configuration of Alternative 1 has been selected because the hydrogeology at the wells is thought to be conducive to groundwater production. However, without any form of mitigation for the impacts of drawdown in the emergent wetland, Alternative 1 is not considered feasible due to the potential loss of hydrology of 0.9 acres of emergent wetland.

4.2 Evaluation of Alternative 2: Relocated Wells

Advantages of Alternative 2 are that it requires only minor modifications to the design drawings, it has little construction cost impact, it does not affect the present water rights application, and the wellfield configuration is expected to be productive based on the hydrogeological investigation carried out for the Project. In addition – and importantly in this context – this alternative provides a wellfield configuration that is not expected to impact the emergent wetland. Coupled with the operational flexibility of the wellfield VFDs, this alternative is expected to provide the groundwater needed to operate the facility without drawing down the water table of the emergent wetland.

4.3 Evaluation of Alternative 3: Deeper Wells

Advantages of Alternative 3 are that it requires no modifications to the design drawings, it has only minor construction cost impact, and it has the potential to minimize drawdown impacts to wetlands. This alternative has three potentially significant issues associated with it, however.

Firstly, the productivity of the underlying confined or semi-confined aquifer is questionable. According to the groundwater investigations conducted for the Project (TWG 2012, 2016a, and 2016b), a much deeper aquifer at approximately 1,000 feet bgs was determined to be productive enough to meet the Project water right. However, due to temperatures between 60 and 65 degrees Fahrenheit, it was considered much too warm for fish production purposes. Alternatively, well logs in the vicinity of the Project indicate much tighter subsurface formations at about 100 to 150 feet of depth, i.e. the hydraulic conductivity of the potable water stratum is low enough to impede the productivity of the aquifer such that the wells would not be productive enough to warrant development.

Second, the process for obtaining groundwater rights (which is already underway), is simplified if the wells access a single aquifer. That is, wells that produce water from different aquifers require a separate water rights application process. Applying for a separate water right may have significant schedule and budget impacts. Furthermore, restrictions on granting water rights due to over-allocation of the deep aquifer may apply.

Thirdly, sourcing groundwater from both shallow and deep aquifers will likely require different levels and/or types of water quality treatment. Because the combined flow of water from both sources can only take place after treatment from the respective sources, redundant equipment and materials may be required (e.g. pumps, yard piping).

4.4 Evaluation of Alternative 4: Alternative Water Rights

Advantages of Alternative 4 are that it would successfully avoid impacts to wetlands because no drawdown would occur, and operations and maintenance costs associated with pumping would be slightly diminished. Disadvantages include: potentially significant modifications to the design drawings, potentially significant cost impacts due to the need for added water treatment equipment for incubation and early rearing, and higher risk with the bioprogram due to the surface water source. As noted above, obtaining additional surface water rights may also not be possible, and could pose cost-prohibitive delays to the Project.

4.5 Evaluation of Alternative 5: Water Augmentation

Advantages of Alternative 5 are that it requires only minor modifications to the design drawings, it does not affect the present water rights application, and it has the potential to successfully mitigate for drawdown impacts to wetlands. Disadvantages of this alternative are that it would increase the construction impact outside the buildable area and within the emergent wetland, it would have some construction cost impacts, and it represents a separate system that must be operated and maintained by facility managers.

4.6 Evaluation of Alternative 6: Mitigation Bank

Advantages of Alternative 6 are that it would successfully mitigate against impacts to wetlands by paying into a mitigation bank. However, there are no wetland mitigation banks within the serviceable area for the Project.

4.7 Evaluation of Alternative 7: Wetland Creation or Enhancement

Advantages of Alternative 7 are that it would successfully mitigate against impacts to wetlands by creating or enhancing existing onsite wetlands. Disadvantages of this alternative are that it would have construction cost impacts, and it would require additional design work effort.

4.1 Alternatives Evaluation Summary

Table 2 summarizes the alternatives evaluation conducted for the well drawdown analysis. The evaluation consists of a scoring system, whereby advantages and disadvantages of each alternative are given positive and negative scores, respectively. The total score from each alternative is provided in the right column. The alternative with the highest score represents the recommended alternative. Scores of zero are shown explicitly so that no double counting takes place, e.g. if the alternative requires no design modification, a score of zero is assigned to that advantage, whereas is design modifications are required, a score of -5 is assigned to that disadvantage. When comparing efforts to address impacts to wetlands, those alternatives that *avoid* impacts altogether (50 points) are considered better than those that *minimize* impacts (40 points), while those alternatives that *minimize* impacts are considered better than those that *mitigate* against impacts (30 points), all else being equal. Some of the alternatives presented were not feasible – namely, Alternatives 1 and 6. In these cases, no further comparison with other alternatives is required and a score is considered not applicable

From the table, the highest scoring alternative is Alternative 2 (Minimization: Relocated Wells). This alternative is the recommended alternative for the Project due to the fact that the well locations proposed for this alternative are expected to greatly reduce the impacts to wetlands from the anticipated drawdown at each well. Furthermore, in combination with the operational flexibility built into the design of the Project (i.e. VFDs with a reasonably broad operational range), the relocated wells can also be operated to provide the optimal operational configuration throughout the year. Finally, monitoring of the water table elevation within the wetland will allow operators to make adjustments to the operational configurations to achieve that optimum (see Section 5.0 below).

Table 2. Comparison of Advantages and Disadvantages for Each Alternative

Alt	Descriptor	Advantages	Disadvantages	Score
1	50% Design	No design modification. (0) No construction cost impact. (0) No effect on water rights application. (0) Well configuration considered productive. (10)	Not feasible (does not address impacts to wetlands).	N/A
2	Relocated Wells	Minor design modification. (0) Minor construction cost impact. (0) No effect on water rights application. (0) Well configuration considered productive. (10) Minimizes impacts to wetlands. (40)	No noticeable disadvantages. (0)	50
3	Deeper Wells	No design modification. (0) Minor construction cost impact. (0) Potential to minimize impacts to wetlands. (40)	Questionable productivity. (0) Difficulty and cost of obtaining water rights. (-5) Equipment costs associated with multiple aquifer sources. (-10)	25
4	Alternative Water Rights	Avoids impacts to wetlands. (50) No water supply risks. (10)	Significant design modification. (-5) Higher costs for water treatment equipment. (-10) Higher risk to bioprogram. (-15) Difficulty and cost of obtaining water rights. (-15)	15
5	Water Augmentation	Minor design modification. (0) No effect on water rights application. (0) Mitigates against drawdown impacts. (30) Well configuration considered productive. (10)	Increased construction cost. (-5) Increased footprint outside buildable area and in emergent wetland. (-5) Separate system to be operated and maintained. (-5)	25
6	Mitigation Bank	Mitigates against drawdown impacts. (30) Well configuration considered productive. (10)	Not feasible (no mitigation banks available).	N/A
7	Wetland Creation / Enhancement	Mitigates against drawdown impacts. (30) Well configuration considered productive. (10)	Construction cost impacts. (-5) Additional design work effort. (-5)	30

5.0 Further Work Required

Based on the work performed to-date, the subsurface strata at the Project site appear to be composed of several braided stream channels in a complex depositional environment, that varies laterally from permeable sand, gravel and cobble within the channels, to finer lithologies ranging from sandy-gravel to clay. The degree that the buried stream channels are interconnected will play a vital role in determining the quantity of water, and duration of pumping that can be sustained from a specific well location. To further assess the subsurface environment at the site, the following field investigative tasks are recommended for the Project as discussed with BPA and Yakama Nation in the 50% design review meeting:

- **Geophysical Survey:** This task includes subsurface resistivity mapping to a depth of approximately 40 feet over previously identified buried stream channels at the site. This will be an “infill survey” of the southeastern and northwestern portions of the site with closer grid spacing in an effort to better define channel locations.

- **Geotechnical Drilling, Logging, Sampling and Gradation Analysis:** Due to the dense nature of the near-surface alluvial deposits at the site, drilling equipment will be used to drill and sample 12 borings to depths of approximately 35-40 feet bgs. The borehole locations will be based upon the results of the above geophysical survey and will target interpreted buried stream channel locations to obtain formation samples to test and evaluate formation lithology, aquifer thickness and depth.

- **Installation of Wetland Piezometers:** A few piezometers will be installed in the emergent wetland area to provide monitoring during the presently proposed groundwater investigation and after Project commissioning. The pressure readings will be calibrated to provide readings of water table elevations to determine drawdown during testing and Project operations. During Project operations, the readings should prove useful in assessing the impact of a particular pumping configuration for the well field, allowing the operations staff to adaptively manage drawdown across the Project site.

- **Long-Term Pumping Test and Water Quality Analysis:** An extended, 30-day, simultaneous aquifer pumping test of on-site pumping wells PW-1 and PW-2 will be conducted. Pumped water will be discharged down-gradient (southwest) of the pumping wells into an on-site wetland area adjacent to the Yakima River side channel. Based on previous, shorter duration pumping tests, pumping the wells between 125 and 150 gpm, or at a constant rate(s) that sustains groundwater drawdown above the screened section of the pumping wells, is anticipated.

The cost for these field services and associated reporting is $133,863 per the attached proposal from The Wallace Group (see Attachment A).

6.0 Conclusions and Recommendations

Based on the Theis solution and well testing data obtained for Project, the anticipated steady state radius of influence for each of the wells is approximately 75 feet. Beyond 75 feet from each of the wells, the drawdown is expected to be negligible. This radius of influence provides a point of departure for the evaluation of a variety of alternatives to avoid, minimize, or mitigate for the impacts to wetlands from drawdown. The evaluation included the following alternatives:

1) The well layout as proposed through the 50% design submittal,
2) An alternative well layout based upon wetlands location, geologic, and groundwater flow considerations,
3) A well layout where critical wells access a deeper aquifer,
4) Avoidance of impacts by purchasing alternative water rights,
5) Mitigation of impacts through water augmentation,
6) Mitigation through use of a mitigation bank, and
7) Compensation of impacts through onsite wetland creation or enhancement.

Alternatives 1, 4, and 6 were eliminated from comparison because they were considered infeasible. The remaining alternatives were scored according to their relative advantages and disadvantages. Avoidance measures received the highest score, followed by minimization measures, and finally mitigation measures. Other features of the alternatives that affected scoring included whether the alternative represented more design work, higher construction costs, a greater footprint, a productive well configuration, higher risk to the bioprogram, and modifications to the water rights application. From the evaluation, Alternative 2: Minimization: Relocated Wells is recommended along with the longer term 30-day pump test of existing wells PW-1 and PW-2.

7.0 References

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FIGURES

ATTACHMENT A: THE WALLACE GROUP PROPOSED SCOPE OF SERVICES

ATTACHMENT B: CALCULATION SHEETS

Appendix H. Comments Received on Draft EIS and BPA's Responses

To solicit comments on the draft EIS, the EIS or a notice of its availability was e-mailed or mailed to over 100 entities—individuals, organizations, tribes, interest groups, and government agencies. In addition, BPA posted the draft EIS on the project website. The comment period ran from March 10, 2017, through May 1, 2017.

BPA received comments from nine entities in writing through letters, comment forms, and the website. Each comment submittal was assigned an identifying number that corresponds to the order it was received. Table 1 provides the comment number and the associated author and affiliation. The comments are reproduced in their entirety.

Table H-1. Draft EIS Comment Submittals

Comment Number	Comment Author / Affiliation
MSHDEIS17 0001	Unidentified
MSHDEIS17 0002	Pace
MSHDEIS17 0003	Tardiff
MSHDEIS17 0004	Clear/Ecology
MSHDEIS17 0005	Nogi/EPA
MSHDEIS17 0006	O'Brien/U.S. Department of the Interior
MSHDEIS17 0007	Stewart
MSHDEIS17 0008	Nelson WDFW
MSHDEIS17 0009	Lyyski/City of Ellensburg

Comment MSHDEIS17 0001

You are a bunch of greedy dogs when you keep increasing the rates on poor fixed income people.

Response to Comment MSHDEIS17 0001

The MRS Hatchery project would not result in increased rates for power. Potential BPA funding for the project has been identified based on mitigation requirements for operating the power system associated with the Northwest Power Act and commitments to the Yakama Nation associated with the 2008 Columbia Basin Fish Accords Memorandum of Agreement.

Comment MSHDEIS17 0002 Pace

Problems with the draft EIS begin with the statement of need; there is not one. Rather there is a section titled "Need for Action" that speaks of many things: (1) the extirpation of coho in the Yakima River basin by the early 1980s, when the Power Act was passed; (2) the goal(s) of the Yakama Nation with respect to genetics, reintroduction, etc.; (3) the location of the property upon which the hatchery, if approved, would be located; and (4) when the property last changed hands, i.e., 2005. All of these are of some interest, however, none go to the NEED for this action at this time. Everything--by which I generally mean the totality of the circumstances--suggests, or seems to suggest, that the ONLY need this project will meet is for BPA to make good on its promise(s) in 2008 ("accords") to draw down and divert resources in the Bonneville Fund that were collected from ratepayers into payments of "hush money" to the Yakama Nation and other signatories to the so-called accords. I know this is ... BORING ... and, since the reign of Steve Wright, how the basin conducts its affairs. But if all of this is just payoff to the tribe to muzzle its biologists in every forum from speaking the truth about what is happening to fish, there is a FAR BETTER way to meet the need: give the money directly to the tribal members. There is no justification for making payments that only benefit relatives of individual members who hold elected office. Give the money directly to the people. They are the ones that need it. Also, what do you need biologists for if all they can do is sit around with duct tape (is it Duck tape?) over their mouth and cash in their 401k. What good are they? Get rid of them and give the money directly to tribal members. I hope I haven't understated my concern in this regard. Yakama Nation is demanding its loot NOW! So, apparently, BPA needs to give it to them. Respond to their request for funding straight up. Mail tribal members a check. Everyone will sleep better that way.

Response to Comment MSHDEIS17 0002 Pace

As described in the purpose and need statement of the EIS, BPA is considering funding the Melvin R. Sampson Hatchery through its responsibilities under the Northwest Power Act. The Act created the Northwest Power and Conservation Council for the purposes of developing a program to protect, mitigate, and enhance fish and wildlife in response to the development and operation of hydroelectric facilities on the Columbia River and its tributaries. As described in Section 1.4.1 of the EIS, the Council undertakes a project approval process for all proposed hatcheries within the Columbia River Basin. Step 1 of the Council's approval process was completed with the development of the Yakama Nation's 2012 Master Plan and subsequent ISRP review. The purpose of the proposed actions as described in the Master Plan was to increase harvest levels, natural spawning abundance, and spatial/temporal distribution of coho in the Yakima River basin. The ISRP review required that the Master Plan be consistent with the Council's artificial production policies for it to be considered for NEPA analysis. This EIS, a component of Steps 2 and 3 of the Council's approval process, was only initiated after the Council reviewed and approved conceptual designs and proposed strategy for the hatchery.

Furthermore, the hatchery proposal is consistent with BPA's commitments to the Yakama Nation to provide funding for habitat and hatchery actions associated with the 2008 Memorandum of Agreement among the Umatilla, Warm Springs, and Yakama tribes; BPA; U.S. Army Corps of Engineers; and U.S. Bureau of Reclamation (2008 Fish Accords). The 2008 Fish Accords addressed the direct and indirect effects of the construction, inundation, operation, and maintenance of the Federal Columbia River Power System on fish resources of the Columbia River Basin. As written, the 2008 Fish Accords recognize that hatcheries can provide important benefits to the Tribes (including the Yakama Nation) in support of their treaty fishing rights. Construction of a Yakima River basin coho production facility was specifically identified as a hatchery commitment agreed to in the 2008 Fish Accords. Discussion about the 2008 Fish Accords is outside of the scope of this EIS.

Comment MSHDEIS17 0003 Tardiff

Great Information!

Response to Comment MSHDEIS17 0003 Tardiff

Thank you for taking the time to respond. We appreciate your comment.

Comment MSHDEIS17 0004 Clear/ Ecology

I've attached the formal letter. Thank you for the opportunity to comment on the Draft Environmental Impact Statement for Melvin R Sampson Hatchery, Yakima Bain Coho Project. We have reviewed the documents and have the following comments. WATER QUALITY The NPDES Construction Stormwater General Permit from the Washington State Department of Ecology is required if there is a potential for stormwater discharge from a construction site with disturbed ground. This permit requires that the SEPA checklist fully disclose anticipated activities including building, road construction and utility placements. Obtaining a permit may take 38-60 days. This permit requires that a Stormwater Pollution Prevention Plan (Erosion Sediment Control Plan) shall be prepared and implemented for all permitted construction sites. These control measures must be able to prevent soil from being carried into surface water and storm drains by stormwater runoff. Permit coverage and erosion control measures must be in place prior to any clearing, grading, or construction. More information on the stormwater program may be found on Ecology's stormwater website at: http://www.ecy.wa.gov/programs/wq/stormwater/construction/. Please submit an application or contact Lloyd Stevens at the Dept. of Ecology, with any questions about this permit. You can reach Lloyd at llst461@ecy.wa.gov or (509) 574-3991.

Additionally, the proposed project is in the upper Yakima River watershed, which has a Total Maximum Daily Load (TMDL) water quality improvement program that focuses on reducing suspended sediment, turbidity and organochlorine pesticides in the watershed. This proposed project will need to protect the waters from further degradation. Project planning, development, and use of the site needs to include water quality protection. Contact Jane Creech at jton461@ecy.wa.gov or (509) 454-7860 if you have any questions about this TMDL program. The MR Sampson Coho Fish Hatchery has already began the process for permitting under the Upland Fin-Fish Hatching and Rearing General Permit. The documents submitted were incomplete for the engineering analysis. Ecology has been working directly with the consulting engineers (McMillen Jacobs Associates) in making sure those documents are submitted after the plans are stamped "final." The Ecology Technical Unit is currently determining if the facility will have to do a receiving water quality study based upon impairments being present on the Yakima River. The consulting engineers will be contacted directly if that study is required. The coverage cannot be issued until after a 30 day public *comment period is completed. If comments are received there may be additional delays. If you have any questions concerning the above Water Quality Technical Unit comments, please contact Marcia Porter via email at marcia.porter@eyc.wa.gov or (509) 454-7864.*

Comment MSHDEIS17 0004 Clear/ Ecology

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
1250 W Alder St • Union Gap, WA 98903-0009 • (509) 575-2490

April 25, 2017

Bonneville Power Administration
Public Affairs -DKE-7
PO Box 14428
Portland, OR 97293-4428

Re: Melvin R Sampson Hatchery, Yakima Basin Coho Project

To whom it may concern:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement for Melvin R Sampson Hatchery, Yakima Bain Coho Project. We have reviewed the documents and have the following comments.

WATER QUALITY

0004-1

The NPDES Construction Stormwater General Permit from the Washington State Department of Ecology is required if there is a potential for stormwater discharge from a construction site with disturbed ground. This permit requires that the SEPA checklist fully disclose anticipated activities including building, road construction and utility placements. Obtaining a permit may take 38-60 days.

This permit requires that a Stormwater Pollution Prevention Plan (Erosion Sediment Control Plan) shall be prepared and implemented for all permitted construction sites. These control measures must be able to prevent soil from being carried into surface water and storm drains by stormwater runoff. Permit coverage and erosion control measures must be in place prior to any clearing, grading, or construction.

More information on the stormwater program may be found on Ecology's stormwater website at: http://www.ecy.wa.gov/programs/wq/stormwater/construction/. Please submit an application or contact Lloyd Stevens at the Dept. of Ecology, with any questions about this permit. You can reach Lloyd at llst461@ecy.wa.gov or (509) 574-3991.

0004-2

Additionally, the proposed project is in the upper Yakima River watershed, which has a Total Maximum Daily Load (TMDL) water quality improvement program that focuses on reducing suspended sediment, turbidity and organochlorine pesticides in the watershed. This proposed project will need to protect the waters from further degradation. Project planning, development, and use of the site needs to include water quality protection. Contact **Jane Creech** at jton461@ecy.wa.gov or (509) 454-7860 if you have any questions about this TMDL program.

0004-3 The MR Sampson Coho Fish Hatchery has already began the process for permitting under the Upland Fin-Fish Hatching and Rearing General Permit. The documents submitted were incomplete for the engineering analysis. Ecology has been working directly with the consulting engineers (McMillen Jacobs Associates) in making sure those documents are submitted after the plans are stamped "final."

0004-4 The Ecology Technical Unit is currently determining if the facility will have to do a receiving water quality study based upon impairments being present on the Yakima River. The consulting engineers will be contacted directly if that study is required.

The coverage cannot be issued until after a 30 day public comment period is completed. If comments are received there may be additional delays.

If you have any questions concerning the above Water Quality Technical Unit comments, please contact **Marcia Porter** via email at Marcia.porter@eyc.wa.gov or (509) 454-7864.

Sincerely,

Gwen Clear

Gwen Clear
Environmental Review Coordinator
Central Regional Office

(509) 575-2012
crosepacoordinator@ecy.wa.gov

6294

Response to Comment MSHDEIS17 0004 Clear/ Ecology

0004-1

Thank you for reviewing the EIS and working with BPA, the Yakama Nation, and the engineering contractors on addressing potential water quality issues and the permits required for the construction and operation of the hatchery. The EIS describes the potential effects of stormwater discharge from the construction site in Section 3.5.2.1.4. Section 4.1.3.1.2 of the EIS explains the need to obtain an NPDES Construction Stormwater General Permit, which will include preparation and implementation of a Stormwater Pollution Prevention Plan.

Sections 3.3.2.5, 3.5.2.1.4, and 3.5.2.5 of the EIS have been updated to emphasize the need for the Yakama Nation to obtain an NPDES Construction Stormwater General Permit prior to construction, and prepare and implement a Stormwater Pollution Prevention Plan.

0004-2

Information on the TMDL water quality improvement program associated with the upper Yakima River has been added to the description of water quality (affected environment) in Section 3.5.1.4.2 of the EIS.

The BMPs in the EIS address general measures to protect water quality (see Sections 3.5.2.1.4, 3.5.2.1.5, 3.5.2.2.4, and 3.5.2.5). Sediment and turbidity will be managed through the Upland Fin-Fish Hatching and Rearing General NPDES Permit. The MRS Hatchery is not anticipated to be a source of organochlorine pesticides, however, these compounds may be present in groundwater, attributable to nearby farming practices. As noted in Section 3.5.2.2.4 of the EIS, removing suspended solids in effluent would minimize concentrations of these compounds prior to its discharge.

0004-3

The Yakama Nation's consulting engineers will continue to coordinate with Ecology in preparing documentation for coverage under the Upland Fin-Fish Hatching and Rearing General NPDES Permit.

0004-4

The Yakama Nation and its consulting engineers will continue to coordinate with the Ecology Technical Unit regarding the requirement for a receiving water quality study.

Comment MSHDEIS17 0005 Nogi/EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10
1200 Sixth Avenue
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL REVIEW
AND ASSESSMENT

April 18, 2017

Mr. Dave Goodman, Environmental Specialist
Bonneville Power Administration
Box 3621
Portland, Oregon 97208-3621

Dear Mr. Goodman:

0005-1

The U.S. Environmental Protection Agency has reviewed the March 2017 Draft Environmental Impact Statement, which analyzes impacts of the Melvin R. Sampson Hatchery, Yakima Basin Coho Project. The DEIS was prepared by the Bonneville Power Administration in cooperation with the Washington State Department of Ecology (EPA Regional Project Number 15-0058-BPA). Our review of the DEIS was conducted in accordance with the EPA's responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act. Section 309 directs the EPA to review and comment in writing on the environmental impacts associated with all major federal actions. Our review also considered the expected environmental impacts of the project and the adequacy of the EIS in meeting the procedural and public disclosure requirements of NEPA.

Project Summary and Background

In accordance with the Pacific Northwest Electric Power Planning and Conservation Act of 1980, the purpose of the Project is to support efforts to protect, mitigate, and enhance fish and wildlife affected by the development and operation of the Federal Columbia River Power System. The Northwest Power and Conservation Council Fish and Wildlife Program recommended this Project to the BPA. The BPA, Bureau of Reclamation, and the U.S. Army Corps of Engineers signed a 2008 Columbia Basin Fish Accords Memorandum of Agreement with the Yakama Nation. The MOA includes funding for the Project, subject to compliance with the NEPA and other environmental review requirements. Therefore, the BPA, in cooperation with Ecology, prepared the DEIS for decision makers and the public.

The DEIS informs federal agencies, hatchery operators, and the public about the anticipated direct, indirect, and cumulative environmental effects of operating a Coho salmon (Oncorhynchus kisutch) hatchery program along the Yakima River located approximately 5 miles northwest of Ellensburg, Washington. The DEIS analyzes two alternatives: (I) A Proposed Action - construction and operation of a 700,000 coho parr/smolt hatchery program and (2) No Action -representing the current or 'status quo' investments in coho restoration in the Yakima Basin using a combination of artificial production and habitat improvements. The DEIS explains that adaptive management conservation measures would be applied under the action alternative.

EPA Review and Comments

Our August 15, 2015 scoping letter included several earlier comments regarding aspects of the project and environmental impact analysis, which we recommended that BPA consider in developing the DEIS. We appreciate that BPA thoughtfully considered many of our scoping comments. Our DEIS comments are based on: (1) issues raised in our scoping letter that should receive consideration at this time and (2) our assessment of the DEIS in meeting procedural and public disclosure requirements of the NEPA. We are rating the DEIS as an "EC-2, Environmental Concerns - Insufficient Information." The rationale for this rating is given below and a copy of our rating system is attached. In order to address our environmental and information disclosure concerns to date, we recommend that the Final EIS:

- further describe the Project impact assignment methodology;
- quantitatively demonstrate how the proposed action will achieve applicable water quality standards and comply with antidegradation requirements;
- analyze additional altemative(s);
- provide more information regarding the impacts of water withdrawals and diversions; and
- further consider our comments provided during the scoping phase of the Project.

Our enclosed comments provide more detailed information regarding these issues. Thank you for this opportunity to comment on the Melvin R Sampson Hatchery DEIS. If you have questions regarding our comments, please contact Chris Zell, of my staff at (206) 553-1353, or by email at zell.christopher@epa.gov or contact me at (206) 553-1841, or by email at nogi.jill@epa.gov.

Sincerely,

Jill A. Nogi, Manager

Environmental Review and Sediment Management Unit

Enclosures:

1. Detailed EPA Region 10 Comments on the DEIS
2. U.S. Environmental Protection Agency Rating Sheet for Draft Environmental Impact Statements

U.S. Environmental Protection Agency
Melvin R. Sampson Hatchery, Yakima Basin Coho Project
Draft EIS Detailed Comments

Environmental Concerns

- **Impact Assessment Methodology**

0005-2

0005-3

[We recommend BPA further describe the methodology[8] used to assign the degree of environmental impacts in the Final EIS. It is currently challenging for the reader to understand how the degree of impact was determined and assigned in the DEIS document.] [For example, Table ES-I in the DEIS characterizes coho release activities as having a low impact to an Endangered Species Act listed fish (i.e., Bull Trout, Salvelinus corifluentus). However, Appendix A describes that certain coho release activities will likely result in an adverse effect to Bull Trout. Therefore, it would be helpful for readers of the Final EIS to understand how BPA determined that a low impact to Bull Trout was concluded despite the adverse effects reported in Appendix A.] [We recommend that BPA provide a more detailed rationale for the impact analysis and conclusions[9] made in the Final EIS. Such rationale will better inform decision-makers and the public regarding the importance of design features, mitigation measures, and best management practices. Should modifications to the impact analysis methodology be considered in the Final EIS, our recommendation includes those features of the analysis that will result in a more quantitative, objective, transparent, and reproducible assignment of the environmental impacts to be expected as a result of moving forward with this proposed project.]

- **Water Quality**

0005-4

We believe that an additional assessment of water quality impacts should be provided in the Final EIS. For example, hatchery effluent may contain elevated concentrations of nutrients, such as phosphorus, which can accelerate eutrophication processes in freshwaters. Eutrophication can lead to multiple impacts such as: low dissolved oxygen, high pH, high ammonia, excess turbidity, and reduced aesthetics, among other water quality issues. Additional information in the Final EIS is recommended in order to disclose information to decision makers and the public regarding the eutrophication response that may occur in the receiving waterbody and downstream waters as a result of hatchery effluent discharges. We note that the waterbody receiving effluent (Yakima River Side Channel) may be sensitive to hatchery discharges because of limited flow and assimilative capacity, use by a re-established coho run,[10] and proximity to core summer salmonid habitat.[11] We recommend that the Final EIS analytically (i.e., mathematical/computational modeling) demonstrate how the facility will comply with all applicable State of Washington water quality

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[8] See 40 CFR 1502.2(a) that encourages a more analytic approach to EIS development.

[9] See guidance from CEQ regarding cumulative impacts (1997), among other guidance, for examples of impact criteria methods. https://energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQ-ConsidCumulEffects.pdf. Accessed on March 22, 2017.

[10] See scoping letter dated January 4, 2016 submitted by Washington Department of Fish and Wildlife

[11] Core summer salmonid habitat having lower temperature and higher dissolved oxygen water quality standards are depicted as occurring downstream of proposed outfall within Ecology's water quality atlas map here: https://fortress.wa.gov/ecy/waterqualityatlas/map.aspx accessed on March 22, 2017.

standards[12] (e.g., dissolved oxygen, pH, ammonia, turbidity, aesthetics, temperature) including the state's antidegradation policy and implementing procedures. The EPA welcomes an opportunity to discuss with the BPA those modeling approaches that may be needed to demonstrate compliance with water quality standards, should you be interested in further discussions. The Walla Walla Basin Spring Chinook Hatchery Program EIS prepared by the BPA includes or references receiving water modeling approaches that could be used to determine if the project discharges will achieve water quality standards in the Yakima Side Channel and downstream waters.

Insufficient Information

- **Range of Alternatives**

0005-5

We note that the DEIS includes only one action alternative (i.e., the proposed action) and thus does not provide a range of alternatives as a means to potentially reduce the project- related environmental impacts and fully disclose a number of available options for project implementation to decision makers and the public. According to National NEPA regulations,[13] all reasonable project alternatives should be rigorously explored and objectively evaluated. In considering further project implementation alternatives for inclusion in the Final EIS, the EPA directs preparers to regulations that may be pertinent.[14] Other reasonable alternatives could include those eliminated from consideration[15] such as the implementation of a segregated program at the existing Prosser hatchery. Factors that could be considered in developing additional alternatives include, but are not limited to: various levels of parr/smolt production, habitat improvements, reductions in water withdrawals, wastewater treatment technologies, water reuse technologies, hatchery permanency or location, fish release locations, proportions of natural-origin fish in hatchery broodstock, use of green infrastructure, and/or use of the best available practices recommended by the Hatchery Scientific Review Group (HSRG).[16]

- **Effects of Water Withdrawals**

0005-6

Additional information regarding the effects of groundwater pumping and surface water withdrawal should be included in the Final EIS. For example, the DEIS indicates that wetlands (particularly Wetland A) and nearby private residential wells may potentially be impacted but provides limited description as to the intensity or

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[12] Water quality standards applicable at the point of discharge and downstream waters should be confirmed with Ecology water quality standards unit and further explained as appropriate in the Final EIS. For example, temperature criteria listed on DEIS page 3.5-5 derived from 173-201A WAC Table 602 differ from those criteria listed at WAC 173-201A-200, Table 200(1)(c) and Ecology's water quality atlas accessed on March 22, 2017.

[13] Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. March 23, 1981.

[14] 40 CFR 1502.2(1), 40 CFR 1502.2(g), and 40 CFR 1502.14(c)

[15] See DEIS Section 2.4 for alternatives that focus on habitat improvement or increased production at existing (Prosser) hatchery. Additional information should be provided to justify elimination of these alternatives from analysis.

[16] See http://hatcheryreform.us/reports/. Accessed online on March 22, 2017.

extent of the impact. In addition, it is unclear if lowered river elevations concomitant with surface withdrawal could negatively affect the adjacent riparian wetlands or nearby wells.[17] We recommend a more quantitative discussion (see comment above regarding impact criteria) regarding water withdrawal impacts of the proposed project. Quantitative analyses are recommended to fully disclose important information that could support the selection of a preferred alternative and subsequent mitigation measures necessary for the project design following completion of the Final EIS.

- **Responsiveness to Comments**

  The following comments provided in our December 15, 2015 scoping letter could be further considered in the Final EIS.
  Reiterated scoping comments include:

  1. 0005-7 Further disclose the basis for the recommendation that this proposed hatchery program is needed for the mitigation and recovery of the target salmon stocks, and how it would relate to efforts being taken to mitigate and recover coho salmon through habitat restoration, harvest limitations, and hydroelectric power operations. As there exists a re-established coho run in the Project area,[3] the Final EIS should further describe the need and justification for additional hatchery coho production.
  2. 0005-8 Further discussion of how hatchery reforms, per the principles, standards, and recommendations of the HSRG, will be integrated into the proposed action, including but not necessarily limited to: hatchery-related fish passage barriers, hatchery intakes, broodstock management, water quality, and watershed-specific plans to implement hatchery reform.
  3. 0005-9 The disclosure of the criteria or objectives that will be used by the Yakama Nation to evaluate the effectiveness of the proposed Project hatchery program.
  4. The Final EIS should include information that identifies:
     - 0005-10 Source water/drinking water protection areas within the project area;
     - Activities related to the proposed project that could potentially affect sources of drinking water located within the project area (e.g., waste treatment pond, see DEIS page 2-5);
     - Potential contaminants impacting sources of drinking water that may result from the proposed project; and,
     - Measures that would be taken as part of project implementation to protect source water protection areas.
  5. 0005-11 The description of the project monitoring program should be expanded in the Final EIS by consolidating monitoring-related issues that are dispersed throughout the DEIS (see pages 2-5). The monitoring program should be able to evaluate the effectiveness of the Project Hatchery in meeting the intended purpose, as well as the effectiveness of the overall program in maximizing natural spawning

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[17] For example, see Johnson et al. (1999) here: http://link.springer.com/article/10.l007/BF0316l735 accessed on March 23, 2017.

populations throughout the region. Clear monitoring goals, data quality objectives, and details should be described in the Final EIS including:

- the specific questions to be answered by the monitoring;
- the parameters to be monitored;
- where and when monitoring would take place;
- who would be responsible for the monitoring;
- what specific information collected would be evaluated and reported to the public;
- the adaptive management actions (contingencies, corrections to future actions) that would be taken based on the monitoring information, such as data showing failed mitigation;
- how to ensure that the mitigation commitments made by the project proponent are implemented;
- how to monitor the effectiveness of the mitigation commitments; and
- how the public could obtain information on the monitoring results.

Response to Comment MSHDEIS17 0005 Nogi/EPA

0005-1

Thank you for your thorough review and comment on the EIS. In addition, we appreciate you taking the time to further explain and discuss your comments over the phone. The following sections respond to each of the issues that were raised.

0005-2

Regarding methodologies used to assign impact levels, please note that Chapter 3 of the EIS provides full descriptions of the potential impacts of the proposal on various resources based on specialists' data searches, field surveys, studies, and consultations. Those descriptions provide reasoning for the impacts described. Chapter 7, of the EIS lists the references that are cited throughout the document. In addition, the specialists provided a summary of the impact level (high, moderate, low, no impact) for each resource discussed in the EIS that was intended to help the reader digest the density of information. Specialists considered both the context and intensity when analyzing the impacts; the reasoned summary levels are a natural recap of the discussions provided. The following text has been added to the introduction of Chapter 3 of the EIS to help clarify the intent of the impact levels:

> Along with the detailed descriptions of the impacts described in this chapter, the overall impacts to each resource are generally summarized into four impact levels—high, moderate, low, and no impact—to help recap the effects. The impact levels are based on the reasoned analysis provided, which incorporates the consideration of context and intensity as defined in Council of Environmental Quality Regulations (40 C.F.R. 1508.27).

Table ES-1 is intended to provide a quick summary of the impacts discussed in Chapter 3 and it also includes the summary impact level for each resource; this is to help the reader quickly grasp the extent to which a resource would be impacted. The sentence in the Table ES-1 referencing low impacts of coho release on Bull Trout has been updated to provide a concise reasoning (summarized from the analysis in Chapter 3).

0005-3

Regarding the differentiation of how impacts to coho are characterized in the Chapter 3 analysis of the EIS compared to Appendix A of the EIS, please note that Appendix A is included as a supplement to focus on potential effects on Bull Trout through the lens of in the context of Endangered Species Act (ESA) Section 7 consultation. Consistent with NEPA impact assessments, the assessment of project impacts on Bull Trout in the EIS considers the level of impact on the Bull Trout population as a whole in the Yakima River basin, whereas ESA requires an assessment of effects on a species at the individual level. As described in Sections 3.7.2.1.7, 3.7.2.2.7, and 3.7.2.3 of the EIS, the potential for the project to affect large numbers of Bull Trout is unlikely and measurable effects on Bull Trout populations in the Yakima River basin are not anticipated (so overall impacts to Bull Trout would below).

Appendix A describes the potential for any element of the Proposed Action to result in the "take" of federally-listed Bull Trout, on an individual level. Under the Proposed Action, individual Bull Trout may be subject to "take" as defined under the ESA (i.e., an action that may harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any threatened or endangered species). Although the potential for take is low, it is not entirely discountable. Therefore, under ESA, and as presented in Appendix A, the project has the potential to adversely affect Bull Trout on an individual level.

0005-4

Section 3.5.2.2.4 has been updated to include additional information on water quality impacts from hatchery operations, including effluent temperature, phosphorus loads, dissolved oxygen concentrations, and amounts of suspended solids.

MRS Hatchery coho production and subsequent effluent discharge would comply with discharge thresholds of the Upland Fin-Fish Hatching and Rearing General NPDES Permit. Under the permit, MRS Hatchery operators would abide by required effluent discharge monitoring requirements. The Yakama Nation has begun the process for permitting under the Upland Fin-Fish Hatching and Rearing General NPDES Permit with Ecology. The Ecology Technical Unit is currently determining if the facility requires a receiving water quality study based on impairments being present on the Yakima River. The Yakama Nation would operate the MRS Hatchery to abide by all terms and conditions of issued permits for water quality and effluent discharge. Water quality modeling is not required because past evaluations by Ecology have found that facilities with comparable operations and treatment systems do not have a reasonable potential to exceed dissolved oxygen or water temperature criteria[1,2]. If there is not reasonable potential for the facility to impair dissolved oxygen, and Ecology is not requiring it, then a mechanistic model of the river and modeling the impact from the MRS Hatchery are not necessary (Ecology 2017).

Section 3.5.1.4 of the Final EIS includes information about Washington’s antidegradation policy and implementing procedures.

[1] Ecology 1988. Quality and Fate of Fish Hatchery Effluents During the Summer Low Flow Season.

[2] Ecology 2015. Upland Fin-Fish Hatching and Rearing NPDES General Permit. Fact Sheet. December 16, 2015.

0005-5

As described in Section 2.4 of the EIS, two alternatives to the MRS Hatchery were considered during the development of the Yakama Nation’s Master Plan. One alternative considered in the Master Plan would have involved eliminating hatchery production and focusing on improving habitat in the Yakima River basin; the other alternative considered in ithe Master Plan was a program to produce smolts at the Prosser Hatchery. Both of these alternatives were eliminated through the Master Plan process because neither would meet the conservation objectives for restoring natural production and sustainable coho runs in the Yakima River basin.

As described in Section 1.2 of the EIS, BPA needs to respond to the Yakama Nation’s request to fund the proposal to construct and operate a coho hatchery. The proposal was recommended to BPA for funding by the Northwest Power and Conservation Council (Council) after it conducted staged review of the Yakama Nation’s 2012 *Yakima Basin Summer- and Fall-Run Chinook and Coho Salmon Hatchery Master Plan.* In that document, the Holmes Ranch property was identified, the developable area of the property was outlined, and the proposed facility improvements were described. This conceptual design was approved through Step 1 of the Council’s project approval process, which included review by the Independent Scientific Review Panel.

During the development of the EIS, the Proposed Action was updated based on resource concerns and in order to minimize impacts and increase project efficiency. Numerous measures intended to minimize environmental impacts have been incorporated into updated project designs, including water reuse systems, rooftop solar panels, and the location and number of groundwater wells.

Additionally, the Proposed Action, as described in Section 2.2 of the EIS, includes an adaptive management approach for the rearing and releasing of juvenile coho. The initial plan for the hatchery is to rear and release up to 500,000 parr and up to 200,000 smolts. However, if adult return objectives are not being met, the strategy could be converted to a full smolt release strategy. (See also response to Comment 0005-11.)

Although no specific additional alternatives were suggested by the public or identified for consideration during scoping for the EIS, comments received during the public scoping process were incorporated into the Proposed Action. For example, during public scoping, some members of the public requested information on acclimation and release locations for hatchery-raised fish. In response, the EIS incorporated adaptive management principles for acclimation and release and a comprehensive list of release locations along with an initial prioritization of such locations throughout the Yakima River basin (see Table 2.2-4 of the EIS). In response to public comments about water use and impacts, a process water reuse system was identified that would treat and reuse approximately 75 percent of effluent flow to minimize overall water demand (see Section 2.2.3.4 of the EIS).

0005-6

The EIS has been updated with additional information to better describe groundwater characteristics at the MRS Hatchery site (see Section 3.5.1.1). In addition, the Aquifer Pumping Test Reports (Wallace Group Inc. 2012; Wallace Group Inc. 2016c) and Well Drawdown Alternatives Analysis (McMillen 2017) have been added as Appendix G, providing greater detail of the analysis of groundwater withdrawal.

Sections 3.5.2.2.1 and 3.6.2.2 of the EIS have been updated to explain that the aquifer pump tests indicate localized effects relative to the point of groundwater withdrawal (i.e., impacts of pumping would be limited to a 75-foot zone of influence around each well). The proposed groundwater supply wells for the hatchery have been sited at least 75 feet from any wetland, including Wetland A. Thus, drawdown effects on wetland hydrology would be low.

The discussion of the effect of the proposed Yakima River diversion on vegetation and wetlands has been expanded in Sections 3.4.2.2 and 3.5.2.2. Up to 10 cfs would be diverted from the Yakima River during the nonirrigation season (November-March). As discussed in Section 3.5.2.2, this diversion is relatively small compared to total flows in the Yakima River and would occur outside of the growing season, thus the effect on wetlands would be low.

0005-7

As described in the Purpose and Need for Action (Chapter 1 of the EIS), BPA is considering funding the MRS Hatchery through its responsibilities under the Northwest Power Act. The Act created the Northwest Power and Conservation Council for the purpose of developing a program to protect, mitigate, and enhance fish and wildlife in response to the development and operation of hydroelectric facilities on the Columbia River and its tributaries. As described in Section 1.4.1 of the EIS, the Council undertakes a project approval process for all proposed hatcheries within the Columbia River Basin. Step 1 of the Council's approval process was completed with the development of the Yakama Nation's 2012 Master Plan and subsequent Independent Scientific Review Panel review of the Master Plan. This review required consistency with the Council's artificial production policies to be carried forward for detailed NEPA analysis. The purpose of the Proposed Action as described in the Master Plan is to increase harvest levels, natural spawning abundance, and spatial/temporal distribution of coho in the Yakima River basin.

Furthermore, the hatchery proposal is consistent with BPA's commitments to the Yakama Nation to provide funding for habitat and hatchery actions associated with the 2008 Fish Accords. The 2008 Fish Accords addressed the direct and indirect effects of the construction, inundation, operation, and maintenance of the Federal Columbia River Power System on fish resources of the Columbia River Basin. The 2008 Fish Accords recognize that hatcheries can provide important benefits to the signatory tribes (including the Yakama Nation) in support of their treaty fishing rights. Construction of a Yakima River basin coho production facility was specifically identified as a hatchery commitment in the 2008 Fish Accords.

Because it will require decades of work before basin habitat is able to produce coho at sufficient levels to meet harvest and natural production goals, artificial production will continue to be used in the short-term to produce coho for re-colonizing stream habitat and to meet tribal harvest needs (see Section 1.4.3).

While the coho population has been successfully re-established in the Yakima River basin under the YKFP, as described in Sections 1.2 and 2.5 of the EIS, construction and operation of the MRS Hatchery would allow full in-basin rearing of coho population levels similar to the existing program. Under the Proposed Action, coho reared on Yakima River water would fulfill production goals and thus replace those coho that are currently imported to the Yakima River basin after having been reared in other watersheds. This action would achieve compliance with the Washington State Fish Health Manual policies that prohibit out-of-basin fish transfers in an effort to reduce the spread of diseases from different basins. Further, in-basin rearing would allow for a transition to locally adapted broodstock at ever increasing rates because fish would be reared on Yakima River water (more broodstock equates to more natural-origin fish in the basin).

0005-8

The EIS has been revised to include additional discussion on how hatchery reforms are integrated into the Proposed Action. See Section 1.4.4 of the EIS for a description of the HSRG and recommendations for hatchery design and operation for Yakima River coho. With regard to the elements identified in the comment:

- Fish passage barriers: The MRS Hatchery intake would be passable to juvenile salmonids in the New Cascade Bypass. Surface water withdrawals from the mainstem Yakima River for the MRS Hatchery would not result in dewatering of any portion of the 6,900-foot diversion reach and therefore would not affect fish passage. Similarly, withdrawal from the Bypass would not impact fish passage because surface water use would be limited to the nonirrigation season when water is not typically diverted into the Bypass. Finally, mobile acclimation sites would operate during high flow periods in the spring and divert a small portion of each system's flow for a diversion reach of about 50 feet. The acclimation sites are flow-through facilities and diverted water is used for rearing nonconsumptively, meaning all water diverted into the acclimation sites will be returned to each subject waterbody about 50 feet downstream of the diversion point. No impacts on fish passage are anticipated.

- Hatchery intakes: The proposed MRS Hatchery intake screen has been designed to meet NMFS 2011 criteria for screening to prevent impingement and entrainment of juvenile salmonids. During informal ESA consultation for the project, NMFS engineers reviewed the Biological Assessment (NMFS 2017) and evaluated proposed intakes and screening facilities. During further discussions with design engineers, NMFS engineers determined that hatchery-related infrastructure meets current NMFS criteria for screening and passage.
- Broodstock management: The HSRG recommends that the highest hatchery program priority should be to develop the capability of collecting local broodstock (HSRG 2009), an action that would increase fish survival and therefore the likelihood of meeting harvest and conservation goals. HSRG recommendations to convert to local broodstock are included as part of the Proposed Action.
- Water quality: See response to previous comment on water quality (Comment 0005-4).

0005-9

Section 2.2.6 of the EIS has been expanded to include more details on specific monitoring objectives of the larger YKFP. These objectives are modified on an annual basis by the Yakama Nation and WDFW, as co-managers of the YKFP.

0005-10

Additional information has been added to Section 3.5.1.1 of the EIS regarding the three source water wells of the City of Ellensburg. The protected source water system that includes the project area is associated with the Columbia River and covers over half of Washington, extending into Idaho, Oregon, and British Columbia. Potential effects to these drinking water sources are evaluated in Section 3.5.2.2.1 of the EIS. No contaminants are expected to affect drinking water sources as a result of the Proposed Action; therefore, no measures would be needed to protect surface water sources from the MRS Hatchery construction or operations.

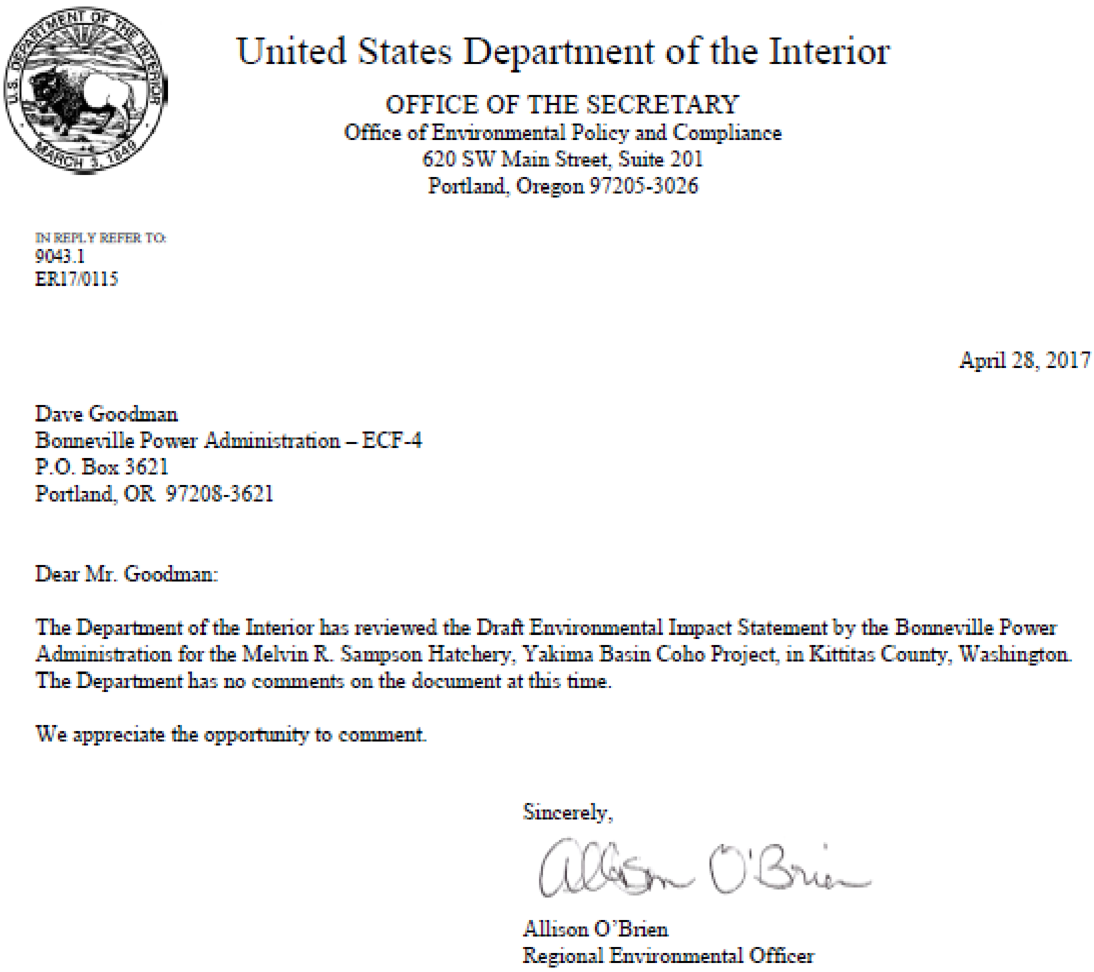
0005-11

Section 2.2.6 of the EIS, Monitoring, Research and Evaluation (MR&E) has been expanded to describe all on-going and proposed MR&E activities that are part of the Proposed Action. The expanded text provides overall objectives for monitoring, the timing and location of specific MR&E activities, and parameters to be evaluated by each study. The Yakama Nation and WDFW, as co-managers of the coho restoration portion of the YKFP, jointly conduct MR&E activities and are responsible for monitoring and reporting. Information is compiled into annual reports, which are available for public viewing online on the YKFP website: http://ykfp.org/publications/pubjumpmenu.htm.

Monitoring facilitates the application of adaptive management to achieve the goals and objectives of the program. Adaptive management follows the protocols established in Section 2.2 of the Yakima Fisheries Project Final EIS (BPA 1996), and requires review of MR&E results by the Science and Technical Advisory Group (STAG). The STAG consists of WDFW and Yakama Nation biologists that review and make recommendations on YKFP operations. The STAG also provides scientific oversight on planning and monitoring activities.

The Yakama Nation endorses an adaptive management policy, which allows for production objectives and strategies to change as new information becomes available from monitoring and evaluation. For the coho portion of the YKFP, biologists from Yakama Nation and WDFW identified Non-Target Taxa of Concern and impact containment levels for those species. Risk containment levels vary with the sensitivity of each species to impact, its importance in the region, and other factors. When monitoring and evaluation suggest that Non-Target Taxa of Concern populations are declining in areas of coho concentration, studies are implemented to determine whether coho might be the cause of the decline as part of the overall monitoring and evaluation program.

Comment MSHDEIS17 0006 O'Brien/U.S. Department of the Interior



MARCH 3, 1849

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
620 SW Main Street, Suite 201
Portland, Oregon 97205-3026

IN REPLY REFER TO:
9043.1
ER17/0115

April 28, 2017

Dave Goodman
Bonneville Power Administration – ECF-4
P.O. Box 3621
Portland, OR 97208-3621

Dear Mr. Goodman:

The Department of the Interior has reviewed the Draft Environmental Impact Statement by the Bonneville Power Administration for the Melvin R. Sampson Hatchery, Yakima Basin Coho Project, in Kittitas County, Washington. The Department has no comments on the document at this time.

We appreciate the opportunity to comment.

Sincerely,

Allison O'Brien

Allison O'Brien
Regional Environmental Officer

Response to Comment MSHDEIS17 0006 O'Brien/U.S. Department of the Interior

Thank you for taking the time to respond. We appreciate your review of the Draft EIS.

Comment MSHDEIS17 0007 Stewart/Physicist

There are currently high voltage lines insulated causing damage to the populace. Also the Cell Phone towers in the region are a threat to all Human residing in these two cities, and including Chewelah. All Power need to be turned of in kettle falls Wa, Colville Wa, and the cell phone towers need to be turned of in Chewelah. Recommended immediate cease of electricity to the town mentioned, Exception Hospital need to have their power remained on. The cell phone towers and dish towers are not regulated or controlled and the power times the frequency output is damaging to all humans in these three cities. sincerely, Ron O Stewart BS Physics

Please shut off all power to Kettle falls WA, Colville WA, and Chewelah WA. High power lines insulated and no buried are a threat to the populace and supports the power of cell pone towers and dish tower that transmit a frequency x power output, E/m wave that is damaging to all humans that reside in these three cities. Keep the power on at the hospitals if you are able. I might be in one as my boy has been damaged. sincerely Ron O Stewart, BS Physics dated 1:22 Pm, 05/01/2017

Response to Comment MSHDEIS17 0007 Stewart/Physicist

Thank you for your comment. The project would not modify or result in any impacts to high voltage transmission lines or cell phone towers. The cities of Kettle Falls, Colville, and Chewelah, Washington, are more than 200 miles from the MRS Hatchery site and would not be affected by the project.

Comment MSHDEIS17 0008 Nelson/WDFW

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
South Central Region • Ellensburg District Office • 201 N. Pearl St, Ellensburg, WA
98926 Telephone: (509) 962-3421 • Fax: (509) 575-2474

May 1, 2017

Dave Goodman

Environmental Protection Specialist
Bonneville Power Administration –
KEC-4 PO Box 3621

Portland, OR 97208-3621

RE: Melvin R. Sampson Hatchery, Yakima Basin Coho Project

Dear Mr. Goodman,

Thank you for the opportunity to provide comments for the Draft Environmental Impact Statement (DEIS) on the proposed construction and operation of the Melvin R. Sampson (MRS) Hatchery, Yakima Basin Coho Project. The Washington Department of Fish and Wildlife (WDFW) is supportive of the proposed MRS coho hatchery and its role in watershed restoration promoting locally adapted coho. We have reviewed the information provided and have the following comments for consideration in the Final EIS.

0008-1

- Historically, the proposed hatchery location would have been within the active floodplain of the Yakima River. Infrastructure now limits much of the potential channel migration zone, but large scale restoration actions to improve floodplain habitat and connectivity through this reach should not be limited or precluded with construction of this project. Much of the property is still in hyporheic connectivity with the mainstem Yakima River (as shown in your hydrological study) such that large scale restoration of floodplain connectivity is possible despite it not being included in FEMA's FIRM maps. Please ensure all new construction is done such that it will not preclude future restoration actions and/or the establishment of beavers in the side channel or the Cascade bypass channel. This may require elevating the base level of the buildings or other techniques common to frequently flooded areas.

0008-2

- The site is adjacent to a historic river channel that functions as a side channel, providing spawning and rearing habitat for juvenile salmonids and providing the return pathway to the river for fish diverted at the Cascade Canal irrigation diversion and fish screen facility. Over the years, YN-Fisheries has re-established a run of coho to this waterway, installed fish/wildlife habitat features and re-established native woody riparian plants. YN showcases these improvements in a number of ways including on- site environmental education activities for school children that highlight the value of restoring salmon habitat in the Yakima Basin. Please ensure the MRS hatchery facilities are well integrated with the site such that the fish and wildlife values of the site and the educational values of the site are preserved and enhanced. Minimizing the paved areas to those that are most critical and installing permeable pavement or gravel surfaces will reduce stormwater runoff to sensitive waterbodies and wetlands nearby. The use of rooftop solar, preserving and using native vegetation for landscaping, and/or the use of xeriscaping will provide additional educational opportunities for the Yakama Nation and BPA while demonstrating their environmental stewardship of the site.

0008-3

- The proposed site has several wetland complexes nearby that appear to be in hydraulic connectivity with the Yakima River. These waterbodies provide valuable fish and wildlife habitat as well as water quality benefits. It's imperative that these functions are not negatively impacted by the proposed construction and operation of this hatchery facility. The information presented indicates the shallow groundwater wells will have minimal impacts of short duration on surrounding wetlands or the historic side channel, but WDFW recommends continued monitoring of these sensitive habitats once the MRS is operational and adaptive management if wetlands or other surface water bodies are negatively impacted by the operation. More information on well location and the operation of the eight wells would be helpful in consideration of potential impacts.

0008-4

- The proposed hatchery location is located in an area rich with wildlife habitat. The surrounding water bodies and wetlands are home to beavers whose workings can alter groundwater elevations and channel morphology as well as interfere with facilities, intakes and screens. The area is home to other riparian wildlife of importance but that may also prey on fish and be problematic at fish hatcheries (e.g. river otters, black bears, bald eagles, osprey, king fishers, great blue herons, etc.). Ensure that structures are built with this in mind such that beavers can continue to restore fish and wildlife habitat while improving water quality. Beavers are a keystone species helping to build and maintain habitat for numerous aquatic species, including coho salmon. Please ensure that extra measures are taken to minimize impacts to resident and migratory birds as well as other wildlife that will be drawn to the concentrated food source (juvenile coho salmon). Facilities should be well designed so that lethal control measures are not needed for native mammals and birds.

0008-5

- A Hydraulic Project Approval (HPA) will be required for work that affects the bed or flow of waters of the state (including construction and the maintenance and operation of the fish screen intake for the hatchery from surface waters). We strongly encourage BPA and the YN to work with local WDFW staff when developing designs for the work in and near the fish bearing portions of the Cascade Canal, the canal bypass, the historic side channel, and the Yakima River. An HPA will also be required for each acclimation site where surface water is diverted. WDFW has experts in fish screening and passage and we should be consulted early in the intake/fish screen design components of the proposed facilities. Early coordination and design review will ensure a more streamlined permitting process.

0008-6

- WDFW supports the Monitoring Implementation Planning Team (MIPT) and a robust monitoring effort that compliments the operation of the hatchery such that potential impacts can be detected and adaptively managed for. WDFW's Ecological Interactions Team (EIT) associated with the Yakima/Klickitat Fisheries Project is located in Ellensburg close to the proposed facility and is particularly well suited to continue this monitoring and expand their scope if warranted.

Again, thank you for the opportunity to provide comments for the proposed Melvin R. Sampson Hatchery, Yakima Basin Coho Project. If you have questions about these comments, please contact me at (509) 962-3421 or Jennifer.nelson@dfw.wa.gov and please ensure I receive formal notification and a hard copy of the FEIS.

Sincerely,

Jennifer Nelson

Jennifer Nelson

Area Habitat Biologist

Responses to Comment MSHDEIS17 0008 Nelson/WDFW

0008-1

With the exception of the intake and outfall, construction of the MRS Hatchery would occur outside of the ordinary high water mark and FEMA mapped floodplain. No encroachment into the existing Holmes acclimation ponds, where beavers may be active, is proposed. The Yakama Nation has worked over the past decade to improve riparian and in-channel habitat for fish and other aquatic species in the Yakima River basin. This has included planting the riparian corridor with dense canopy vegetation and installing various large wood structures to provide instream habitat complexity. There is no intention to affect those restoration areas, and the Yakama Nation would continue to improve habitat as coho return in greater numbers to the side channel and bypass to spawn and rear. The Proposed Action would not preclude future restoration actions.

0008-2

The MRS Hatchery project would support the Yakama Nation’s legacy of environmental stewardship by providing educational opportunities that highlight the value of restoring salmon habitat in the Yakima River basin. The hatchery facilities would be well integrated with the surrounding landscape and natural features, including wetlands, streams, and riparian areas. Once constructed, the MRS Hatchery would provide a unique educational opportunity for the Yakama Nation to showcase examples of riparian and instream habitat, hatchery processes, and representative salmonid life-cycles for student tour groups.

Native vegetation would be used for all landscaping and restoration of disturbed areas. Pavement would be limited to the access road to the site and the hatchery building pad.

0008-3

The discussion of potential impacts from groundwater withdrawal on the wetland in the area has been updated to further clarify why low impacts are expected; see Section 3.6.2.2 of the EIS. Wetlands may be affected by groundwater drawdown from hatchery water supply wells; however, the zone of influence for pumping wells has been determined to be 75 feet (McMillen 2017) and none of the wells would be within 75 feet of wetlands. The hydraulic connectivity between Wetland A and the Yakima River would not be affected by proposed groundwater withdrawals.

In addition, the well locations have been updated and are presented in Figure 3.5-4 of the EIS.

0008-4

No hatchery-related construction would occur near the existing Holmes acclimation ponds, which provide beaver habitat. All coho salmon rearing would occur under cover, within enclosed buildings; therefore, avian attraction and predation would not be an issue.

0008-5

Section 4.2.3 of the EIS acknowledges the need for a Hydraulic Permit Approval (HPA) for the project elements requiring in-water construction activities and has been updated to describe the applicability of the HPA to maintenance and operation of the New Cascade Canal Fish Screen.

The Yakama Nation has initiated the permitting process related to in-water infrastructure that may affect the bed and bank of waters of the State of Washington. Modifications to screening structures, if requested during design review, would be addressed during the permitting process. During the Section 7 Endangered Species Act (ESA) consultation process, engineers with the National Marine Fisheries Service (NMFS) reviewed all intake and screening infrastructure and worked with design engineers to modify designs while maintaining compliance with all juvenile salmonid passage and screening criteria. NMFS issued a Section 7 ESA concurrence letter for the Proposed Action on March 22, 2017, in fulfillment of consultation requirements.

0008-6

Thank you for this comment. Future monitoring of coho salmon produced at the MRS Hatchery will be incorporated into on-going YKFP monitoring efforts. Monitoring protocols and the decision framework will continue to operate under the purview of the Monitoring Implementation Planning Team. Section 2.2.6 has been updated in the Final EIS to more thoroughly describe proposed monitoring and evaluation activities associated with the MRS Hatchery, including timing and waterbodies to be evaluated.

Comment MSHDEIS17 0009 Lyyski/City of Ellensburg

It was great meeting with you and the staff assembled April 12th at Hal Holmes to discuss the proposed fish hatchery. The primary concern from the City of Ellensburg Public Works Department would be the withdrawal of groundwater and its potential effect on the City's well sites just upriver from this location. I was happy to learn that your consultants looked into this issue, as it was brought up in earlier comments from the City. It sounds like your withdrawal depths will be approximately 35 feet deep. The City just wants confirmation that the wells will not impact the City's existing wells upstream. Thanks again for the open house and the opportunity to comment.

Response to Comment MSHDEIS17 0009 Lyyski/City of Ellensburg

The potential effects of groundwater withdrawal have been further evaluated and the results of that evaluation are presented in Section 3.5.2.2.1 of the EIS. The evaluation indicates that impacts to groundwater associated with proposed hatchery withdrawals would be localized (within 75 feet) and temporary, and that aquifer drawdowns would recover to pre-pumping elevations within minutes after pumping is concluded. No impacts are expected to existing City of Ellensburg wells, which are up-gradient from the proposed MRS Hatchery wells sites.

BONNEVILLE POWER ADMINISTRATION
DOE/BP – 4804 ▪ November 2017