US Army Corps
of Engineers ®
Portland District

Environmental Assessment

Minto Fish Collection Facility Rebuild
Willamette River Basin
North Santiam River, Oregon

Minto Fish Collection Facility on the North Santiam River

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ABBREVIATIONS AND ACRONYMS

APE	Area of Potential Effect
BiOp	Biological Opinion
BLM	Bureau of Land Management
BMP	best management practices
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
cy	cubic yard(s)
DEQ	Oregon Department of Environmental Quality
D/S	downstream
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FONSI	Finding of No Significant Impact
FR	Federal Register
ft	foot or feet
HEC-RAS	Hydrologic Engineering Center - River Analysis System (model)
hp	horsepower
IPS	Intake and Pump Structure
IWW	in-water work
MLLW	mean lower low water
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
ODFW	Oregon Department of Fish and Wildlife
O&M	operation and maintenance
PDT	Product Development Team
RM	river mile
RPA	Reasonable and Prudent Alternatives
TDG	total dissolved gas
U/S	upstream
USFWS	U.S. Fish and Wildlife Service
UWR	Upper Willamette River

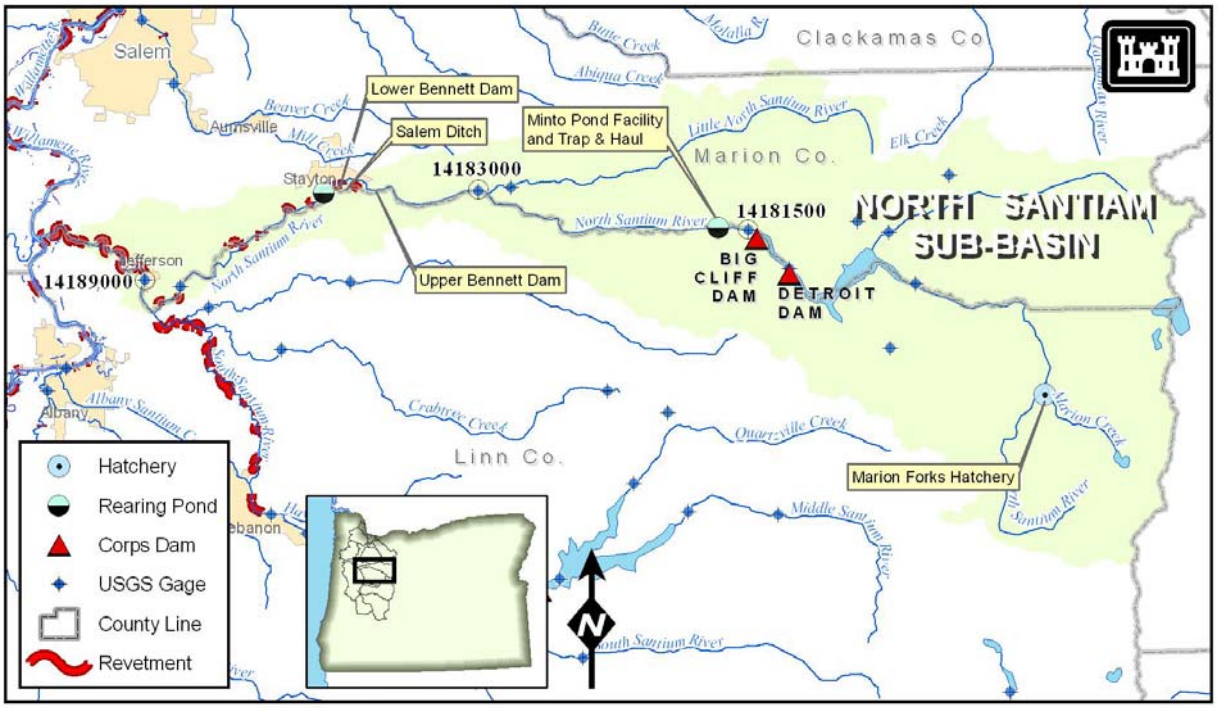
1. INTRODUCTION

The U.S. Army Corps of Engineers (Corps) operates 13 dams and reservoirs in Oregon's Willamette River Basin (Willamette Project). The Willamette Project was authorized principally by three separate successive Flood Control Acts: 1938, 1950, and 1960. House Document 531, authorized by the Flood Control Act of May 17, 1950 (81st Congress, 2nd Session) remains the overall guiding legislation pertaining to operation and maintenance of the project. The Willamette Project was authorized with the full recognition that it would cut off extensive areas of upstream habitat. To compensate, fish hatcheries and other measures were authorized. In the North Santiam subbasin (Figure 1), the Marion Forks Hatchery was constructed in 1951 to compensate for the lost salmon habitat caused by the construction of Detroit Dam and Big Cliff Reregulating Dam. The Minto fish collection facility is a satellite facility for the Marion Forks Hatchery and was constructed to collect adult Chinook salmon as broodstock to supply eggs for Marion Forks. The Corps funds the majority of the operating costs at Marion Forks and Minto as part of the Willamette Basin Fish Mitigation Program, with the Oregon Department of Fish and Wildlife (ODFW) operating both the Marion Forks Hatchery and the Minto facility.

In July 2008, the National Marine Fisheries Service (NMFS) issued their Biological Opinion (BiOp) on the effects of continued operations and maintenance of the Willamette Project to species under their jurisdiction that are listed under the Endangered Species Act (ESA). The NMFS concluded that the Corps proposed action was not sufficient to avoid jeopardy or adverse modification of designated critical habitat for two fish species: Upper Willamette River (UWR) Chinook salmon (*Oncorhynchus tshawytscha*) and UWR steelhead (*O. mykiss*). The NMFS 2008 BiOp included reasonable and prudent alternatives (RPAs) to the Corps proposed action that, if implemented, would avoid the likelihood of jeopardy to listed species or adverse modifications to their critical habitats. The RPAs include measures for fish passage, water quality, flows, water contracts, habitat improvements, and hatcheries. Specifically, RPA 4.6, requires the Corps (as the lead Action Agency) to design, construct, install, operate and maintain new or rebuilt adult fish collection facilities in affected Willamette River subbasins that incorporate current anadromous salmonid passage facility design criteria (NMFS February 2008), and the best available technologies.

This Environmental Assessment (EA) evaluates the environmental effects of rebuilding the Minto fish collection facility. The Minto facility is used for adult UWR Chinook and UWR steelhead collection, spawning of hatchery broodstock, juvenile acclimation, out-planting UWR spring Chinook, and recycling summer steelhead; the Marion Forks Hatchery is used for egg incubation and rearing of Chinook salmon. The Marion Forks Hatchery program is a harvest program used to mitigate loss of fishing and harvest opportunities due to loss of habitat and migration blockage resulting from the construction of hydroelectric projects in the Willamette River Basin. Following completion of the Minto rebuild, the new facility will be a state-of-the-art fish collection facility designed to minimize handling and stress of Chinook salmon and steelhead, while facilitating the Corps' fish mitigation program in the Willamette River Basin in coordination with the ODFW.

Figure 1. North Santiam Subbasin



1.1. Purpose and Need

The purpose of the proposed project is to provide a new fish collection facility that meets NMFS criteria for upstream passage and collection facilities for ESA-listed fish and that provides a safe working environment for operators. The parameters used to establish the design criteria for the fish ladder, pre-sort pool, holding/acclimation ponds, and sorting facility pertain specifically to Chinook salmon, winter steelhead, and summer steelhead. The facility also is designed to allow other fish species to enter and negotiate the trap, including Pacific lamprey, cutthroat trout, and resident rainbow trout.

A rebuild of the Minto facility is needed because it was originally designed as a broodstock collection facility, and not for the collection, handling, and sorting of ESA-listed UWR spring Chinook and winter steelhead that are released upstream of the Minto barrier, transported upstream of Detroit Dam, or transported to another stream to improve production of naturally produced spring Chinook. The facility was not designed to accommodate safe handling, sorting, and loading of fish that must survive to spawn in the wild. At the existing facility, fish are often directly injured or physically handled in a manner that likely contributes to the high levels of pre-spawning mortality observed in the North Santiam subbasin. The existing facility does not meet current NMFS criteria for trapping and is unable to acclimate juveniles during higher flows.

The 2008 NMFS BiOp states a new fish collection facility must be built at Minto that complies with NMFS criteria for upstream passage/collection facilities. The existing facility does not comply with NMFS criteria and cannot be operated year-round because the holding ponds become inundated during high flows. In addition, the Minto facility is needed for the collection and holding of hatchery spring Chinook broodstock. This allows the Corps and ODFW meet the fish mitigation requirements

and will help the Action Agencies (Corps, Bonneville Power Administration, and Bureau of Reclamation) to comply with the Willamette Project Hatchery Genetic Management Plan. The facility also provides acclimation ponds for the Marion Forks hatchery stock prior to their release. This will help natal homing of hatchery produced fish and reduce straying and hatchery/wild fish interaction.

The facility also does not meet current safety requirements for the operators of the Minto fish facility. A safety inspection conducted in March 2006 by the Corps' Portland District revealed a number of serious safety hazards, including inadequate or missing guardrails, unsafe access to the intake, unsafe access to weir, and electrocution hazards. This places employees and members of the public at risk for falls, drowning, and other serious accidents. The Minto facility is currently closed to the public due to safety concerns.

A new fish collection facility at Minto is needed that meets NMFS criteria for upstream passage and collection facilities, and will provide a safe working environment for the operators. Rebuilding the facility to safely handle, sort, and load adult fish will likely decrease pre-spawning mortality of all fish handled at the facility. This should result in significant improvements in survival of fish released upstream of the Minto barrier, upstream of Detroit Reservoir, or into the Little North Santiam River.

1.2. Project Description

The Minto fish collection facility is located on the north bank of the North Santiam River at RM 55, about 4 miles downstream of Big Cliff Reregulating Dam and 7 miles downstream of Detroit Dam (see Figure 1). The Minto facility is located in Marion County, Oregon. The Corps owns the Minto fish facility and the 21.3 acres surrounding it. The facility was designed as an adult salmon collection facility and not designed for live sorting of adult fish. This facility also handles adult winter and summer steelhead, which are returned to the river to spawn naturally, recycled downstream to increase harvest opportunities, or given to local food banks. Migrating adults are blocked by the barrier dam and guided to the fish ladder entrance. Attraction water is provided from an intake and 36-inch in diameter pipe located upstream of the barrier dam. The trap consists of a short fish ladder, pre-sort holding pool, a fish lock and brail, an anesthetic tank, and a sorting table. Sorted fish are routed via polyvinyl chloride tubes to various locations, including a concrete post-sort holding pond that measures 164-feet long by 32-feet wide, and is 6-feet deep. The holding pond was constructed in 1975, but was recently divided into four alleyways with vertical aluminum poles. The roof of the sorting and spawning facility has been retrofitted to facilitate transfer of fish from the anesthetic tank to the rooftop where they are loaded via a tube onto a truck for transportation.

2. ALTERNATIVES

Various alternatives for overall project siting and facility layout for the Minto fish collection facility rebuild project were considered as discussed in this section.

2.1. Screening of Alternatives

2.1.1. Site Location

Three locations considered for siting the new fish facility – Packsaddle Park, Big Cliff Dam, and the existing Minto site, all of which are on Corps lands and located along the North Santiam River downstream of Big Cliff Dam. The Packsaddle Park site is adjacent to and west of the existing Minto site. The land is leased from the Corps by Marion County. Packsaddle Park is open to the public and a boat launch and hiking trails are located on the site. The Big Cliff Dam site is downstream of and immediately adjacent to Big Cliff Dam. After consideration of the advantages and disadvantages of each site, it was determined to locate the new facility at the existing Minto site because the existing 4-mile native fish sanctuary between Minto and Big Cliff would be preserved, and Minto has existing facilities available for reuse including a barrier dam, holding ponds, and a well. Of the site locations, the existing Minto site was the best alternative because it has the largest amount of clear space available for construction of a new facility. Big Cliff did not have adequate space for the number and size of holding ponds required. Packsaddle Park is densely forested and the site is very narrow, which would not support the required holding pond footprint.

2.1.2. Facility Layout

The following four facility layout alternatives were considered for the new Minto fish facility.

Alternative 1 - Water Supply from Pumps Layout. The distinguishing element for this alternative is that the main water supply is from two 200 horsepower (hp) pumps. The main features of the facility include a fish ladder, pre-sort pool, sorting and spawning facility, loading facility for transfer of fish into truck mounted tanks, short and long term holding ponds, pumps and pump station, screened water intake, barrier dam, juvenile acclimation pond, office, host site, and maintenance building. The two 200 hp pumps will run all year and a third 200 hp pump is provided as backup. A backup diesel generator would be on site for operation of pumps during power outages. Attraction water at the fishway entrance is augmented with additional gravity flow water from the upstream side of the barrier dam.

Alternative 2 - Gravity Water Supply from Big Cliff Layout. The distinguishing element of this alternative is that the main water supply is from a pipeline from the forebay of Big Cliff Dam, 4 miles upstream of the Minto site. The facility layout and main features are the same as Alternative 1, except that the water supply will be from Big Cliff. The underground 36-inch diameter water pipeline would be located along the existing railroad grade. Attraction water at the fishway entrance would be augmented with additional gravity flow water from the upstream side of the barrier dam. A backup diesel pump is required to supply water to the holding ponds. A screened, multilevel intake is required at Big Cliff for temperature control. An aeration structure at Minto will be required to mitigate for total dissolved gas (TDG).

Alternative 3 - Fish Lock Layout. The distinguishing element of this alternative is that a fish lock will be used to raise the fish to the sorting elevation. This layout will minimize the size of pumps needed. The fish ladder and pre-sort pool will be placed at an elevation that allows for a gravity flow water supply from just upstream of the barrier dam. Due to water elevations in the river during higher flows, the holding ponds require a pumped water supply during low river elevations. A relatively small, pumped water supply will be needed of operate the fish lock. Attraction water at the fishway entrance will be augmented with additional gravity flow water from the upstream side of the barrier dam. Except for pump size, all main features of Alternative 1 are included. A fish lock tower, elevated walkways and platforms, and a flood wall are also required for this layout. Two 100 hp pumps will run all year and a third 100 hp pump is provided as backup.

Alternative 4 – Crane Layout. The distinguishing element of this alternative is that a crane will be used to raise fish in hoppers to the sorting elevation. This layout minimizes the footprint of the facility and the size of pumps needed. The fish ladder and pre-sort pool are placed at a lower elevation than in Alternative 1, but cannot be gravity fed from local water. The hoppers cannot be placed low enough, so the pre-sort pool still requires a pumped water supply. Due to water elevations in the river during higher flows, the holding ponds require a pumped water supply during low river elevations. Attraction water at the fishway entrance is augmented with additional gravity flow water from the upstream side of the barrier dam. Except for pump, all main features of Alternative 1 are included. A crane, custom hoppers for fish handling, and flood wall also are required. Two 150 hp pumps will run all year and a third 150 hp pump is provided as backup.

The four alternatives were evaluated on the basis of biological criteria, hydraulic criteria, power requirements, real estate, capital construction cost, operation and maintenance (O&M) cost, existing facility operation constraints, and risk/precedence (Table 1). The alternatives were evaluated by the Minto Product Development Team (PDT; Table 2) and then given a numerical rating (Table 3).

Table 1. Description of Evaluation Parameters for Facility Layout Alternatives

Parameter	Description
Biological Criteria	How well does it accommodate all species? Are agency concerns addressed? Does facility have the potential to negatively impact pre-spawning mortality?
Hydraulic Criteria	Does it effectively operate over the range of expected flows? Facility must be designed to provide effective attraction, holding, and passage of fish from the river into the facility under all normal operating conditions. At no time shall fish become stranded as a result of water supply failure, inability to meet passage velocity criteria, or lack of adequate water quality.
Power Requirements	Does the facility require a large amount of power to operate? Are pumps required to run all year long? Facility must be designed to minimize power consumption due to limited power at site.
Real Estate	Does facility require real estate actions? What is the time requirement for any real estate actions?
Environmental	Are there any environmental concerns?
Capital Construction Cost	What are the construction costs? Does it include expensive excavation, power upgrades, real estate acquisitions, structural components? The capital construction costs should be minimized if possible. This includes limiting impacts to existing facilities, minimizing earth and rock excavation, and facilitating the use of small cofferdams.
O&M Cost	What are life cycle costs? Does O&M require a lot of labor and materials?
Existing Operational Constraints	Can the facility continue to collect and acclimate fish during construction? The fish collection facility should be designed, constructed, and operated to minimize impacts to existing operations.
Design Complexity	Is this a complex design? Does the design require any extensive computer or physical modeling?
Construction Risk	How long will construction take? Are large excavations required? Are there any risks that could delay or prolong construction?
Performance Risk	Is it a new concept? Has it been done before? Are there personnel safety issues? Is a prototype required to demonstrate performance?

Table 2. Evaluation of Facility Layout Alternatives

Alt.	Biological Criteria	Hydraulic Criteria	Power Required	Real Estate	Environmental	Construction Cost
1	The ladder, pre-sort, and holding ponds rely on a pumped water supply, but a backup pump, backup generator, and alarms are provided. No concern with water quality because interim temp. control will occur at Detroit & Big Cliff. This type of passage technology is standard in modern facilities.	Ladder attraction flow is gravity fed from above the barrier (same in all alts.). The ladder, pre-sort, sorting flumes, and holding ponds have pumped water supply; 45 cfs required. All pumped portions are at greater elevation than the other alts and must be pumped against a greater head (requires larger pumps).	Requires two 200 hp pumps. Electrical service upgrade needed. This alt. given lowest rating because it requires most power.	No real estate actions needed.	Pumps run continuously year round, thus environmental impact not insignificant. Up to 5.8 tons of CO_2 generated daily. Wetlands at Minto preserved. The seep on rock face removed.	$19.7 million Annualized cost w/O&M over 35 years = $1.181 million
2	Possible problems with water quality since Big Cliff used to help with temp. control. This requires two intakes, high and low in elevation, so proper temp. can be mixed from hypo and epilimnetic waters. Screened intakes required. Interim temp. control causes TDG levels to be exceeded; TDG will need mitigation. A gravity system has greatest reliability for fish. If all water quality issues are resolved, Alt. 2 receives highest rating since it is most reliable for fish.	Entire facility gravity fed. A 30" pipe required to provide 45 cfs for ladder, pre-sort, sorting flumes, and holding ponds. Ladder attraction flow is gravity fed from above barrier (same in all alts.). Max pressure in pipe is 25 psi (no factor of safety included). Fully filled, pressurized pipe. Alt. 2 given the highest rating because it provides the most desirable hydraulic conditions.	No pumps needed. Due to hoists & air compressors, a line extension by Pacific Power may be needed. This alt. given highest rating because it requires least amount of power.	Real estate actions needed for easements along 4 mi. of railroad grade between Minto & Big Cliff. This alt. given lowest rating due to unknowns in railroad right-of-way; delays if neighbors contest work. Structures & driveways may be in right-of-way. Minimum 1-2 year negotiation with homeowners.	Unknown wetland impacts, terrestrial habitat impacts, ESA setbacks, and potential mitigation costs. Need cultural and environmental reports along 4 mile stretch. Possible hazardous, toxic waste issues. The seep on rock face removed. This alt. given lowest rating because of unknowns & potential impacts to environment.	$31.4 million Annualized cost w/O&M over 35 years= $1.503 million (cost of foregone power not included)
3	Unknown risk with use of lifts & pre-spawn mortality (may increase impacts over Alts. 1&2). Holding ponds rely on a pumped water supply, but backup pump, backup generator, and alarms provided. No concern with water quality because interim temp. control will occur at Detroit & Big Cliff. Fish lock cycle times are a concern. Alt. 3 given the lowest rating due to unknown risks with pre-spawn mortality.	Ladder and pre-sort and attraction flow gravity fed from above the barrier. Holding ponds have pumped water supply; 25 cfs required. Due to shortened ladder length, there is < 0.1 foot of head drop over 5 of 10 weirs at high flows (a flat water surface leading to finger weir); it is only evident at upper end of operating range and only for this alt. Alt 3 is given the lowest rating due to this issue.	Requires two 100 hp pumps. Electrical service upgrade needed.	No real estate actions needed.	Pumps run continuously year round, thus environmental impact not insignificant. Up to 3.1 tons of CO_2 generated daily. Wetlands not disturbed.	$20.6 million Annualized cost w/O&M over 35 years = $1.126 million
4	Holding ponds rely on pumped water supply; a backup pump, backup generator, and alarms are provided. No concern with water quality because interim temp. control occurs at Detroit & Big Cliff. Least proven technology for this application. Crane cycle times are a concern.	The attraction flow is gravity fed from above the barrier (same as all alts). The ladder, pre-sort, sorting flumes and holding ponds have a pumped water supply; 45 cfs required.	Requires two 150 hp pumps. Electrical service upgrade needed.	No real estate actions needed.	Pumps run continuously year round, thus environmental impact not insignificant. Up to 4.4 tons of CO_2 generated daily. Wetlands not disturbed. The seep on rock face removed.	$24.0 million Annualized cost w/O&M over 35 years = $1.375 million

Table 2 (continued). Evaluation of Facility Layout Alternatives

Alt.	O&M Cost	Existing Operational Constraints	Design Complexity	Construction Risk	Performance Risk
1	Pumping O&M costs. Requires 3 people to operate facility @ $105,000/year. Electricity for pumps up to $198,600/year.	The existing facility would not be operational during the entire 2 year construction duration.	This alt. was given the highest ranking because it is the least complex of all alts. Portland District has designed a number of fish ladders in the past. The ladder design uses many features and lessons learned from the Cougar fish ladder.	Local power company may not have enough capacity during construction and additional time/costs may be required to upgrade substation. 2-year construction duration. This alt. given highest rank because has the least amount of risk during construction.	Fish ladder design criteria well documented and Corps has designed many fish ladders. The facility relies on pumped water supply, but will have backup pump and generator. This alt. given highest rank because it presents very low risk to the potential of increasing Chinook pre-spawning mortality, and the water supply system has a backup pump & generator.
2	Water line O&M cost very high & escalates over time. On-site maintenance crew not skilled in this type of work so requires add'l expertise, either contracted or new hires. Requires 3 people to operate facility @ $105,000/year. This alt. was given lowest rating because water line O&M costs are high and require the work to be contracted.	The existing facility would not be operational during the entire 2 year construction duration.	Pipeline requires additional survey work and explorations along the pipeline. Additional design time for the intake structure. Prototype testing may be needed for aeration structure. Intakes at Big Cliff, screen cleaners, and aeration structure adds complexity to the design. This alt. was given lowest rank because of additional time required for surveys, explorations, intake, and aeration structure designs.	Unknown how much rock excavation required. Unknown what is built over the top of railroad right-of-way (i.e., roads, buildings, etc). Unknown environmental impacts and mitigation. 2 year construction duration. Construction of intake through dam poses a risk/unknown. This alt. was given lowest ranking because it has highest risk during construction due to unknown real estate issues, environmental impacts, and rock excavation quantities.	Fish ladder design criteria well documented and Corps has designed many fish ladders. This alt. provides low risk to increasing pre-spawning mortality and reduces risk further by use of a gravity water supply. Water quality issues increase risk if mitigation measures used do not work as intended. A gravity water supply is also a low risk to fish compared to pumped water supply (assumes water quality issues resolved). If there is a pipe failure, the facility would be down until pipe was repaired. The likelihood of pipe failure is low if pipeline is maintained. If the pipe fails, there are large consequences since backup pumps not provided.
3	Lock O&M costs. Pumping O&M costs. Requires 3 people to operate facility @ $105,000/year. Electricity for pumps up to $104,300/year.	Existing facility not operational during most of construction. This alt. given lowest rating because facility would be down for the longest amount of time since the ladder cuts through existing facility.	Will take a longer time to get to a 90% design than Alternative 1 since the fish lock has not yet been designed to 60%. Will require substantially more design work for the mechanical design section.	Local power company may not have enough capacity during construction and additional time/costs may be needed to upgrade substation. 2-year construction duration. Large amount of excavation. Diffuser structure is more complex.	This alt. given a lower ranking because relationship between use of a lock and pre-spawning mortality is unknown. Previous lifts used in Willamette Valley caused direct mortality. Considerable design effort required to develop a design that eliminates direct mortality. Holding ponds rely on pumped water supply and backup pump and generator provided.
4	Crane O&M cost. Pumping O&M cost. Requires 4 people to operate facility @ $157,000/year. Electricity for pumps up to $149,900/year.	The existing facility would not be operational during the entire 2 year construction duration.	Will take a longer time to get to a 90% design than Alternative 1 since the crane has not yet been designed to 60%. Will require substantially more design work for the mechanical design section.	Local power company may not have enough capacity at the time of construction and additional time/costs may be needed to upgrade substation. 2 year construction duration. Large amount of excavation.	Hoppers used at many facilities to move fish. This alt. given the lowest rank because no known examples of moving large amounts of fish with hoppers and a crane. Holding ponds rely on pumped water supply and backup pump & generator provided. Potential for crane to breakdown and mobile crane needed to move fish until crane repaired. Safety issues with a crane and equipment overhead. ODFW needs to have licensed crane operators.

Table 3. Numerical Rating for Facility Layout Alternatives

Alt.	Biological Criteria	Hydraulic Criteria	Power Required	Real Estate	Environmental	Construction Cost
1	3	3.5	2	4	2	4
2	4	4	4	0	1	1
3	1.5	3	3	4	3	4
4	2	3.5	3	4	2	3

Numerical rating descriptions: 4 = excellent, 3 = good, 2 = fair, and 1 = poor.

Table 3 (continued). Numerical Rating for Facility Layout Alternatives

Alt.	O&M Cost	Existing Operational Constraints	Design Complexity	Construction Risk	Performance Risk	Composite Rating (sum all ratings)	Rank
1	3	2	4	4	4	35.5	1st
2	1	2	1	1	3.5	22.5	4th
3	4	1.5	3	2	2	31	2nd
4	2	2	3	3	1.5	29	3rd

Numerical rating descriptions: 4 = excellent, 3 = good, 2 = fair, and 1 = poor.

The numerical and composite ratings shown in Table 3 were used to select Alternative 1 as the proposed action for rebuilding the Minto fish facility, which is described in detail in the following section.

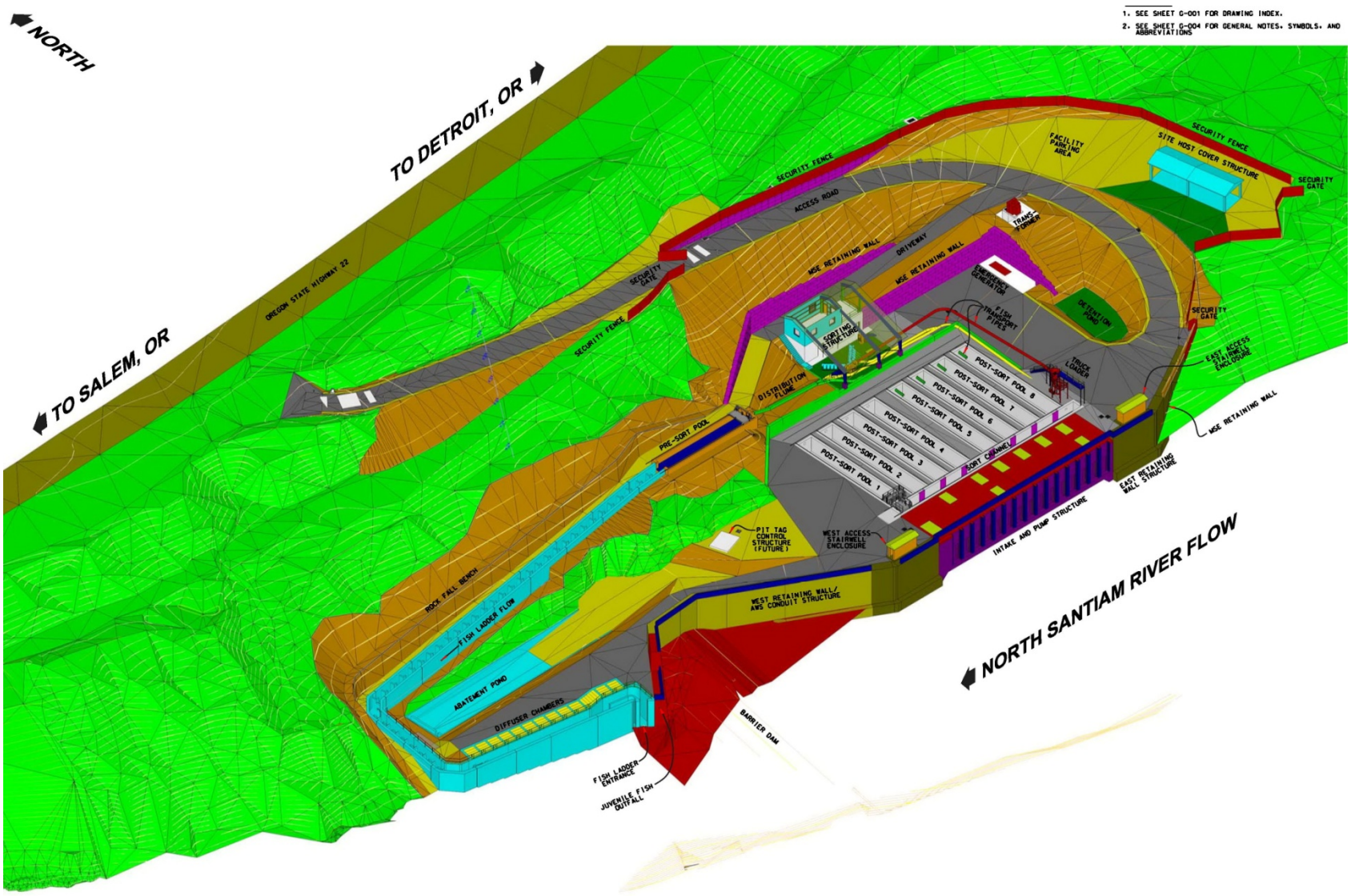
2.2. Proposed Action

The proposed action is to construct a fish collection facility at Minto that meets NMFS criteria for upstream passage/collection facilities. Because the existing Minto site will not be operational during construction, fish collection activities by ODFW will take place at Upper Bennett Dam. The following major features of the proposed action are discussed below (Figure 2).

- Fish ladder;
- Pre-sort pool;
- Sorting and spawning facility including fish crowders, holding/acclimation ponds, flumes, anesthetic tank, and recovery tank;
- Intake and Pump Structure;
- Barrier dam;
- Abatement pond;
- Access, host pad, maintenance building, security fencing, other amenities; and
- Kayak landings and portage trail
- Minto North staging and disposal area, and drain-field.

In addition, modifications will be made to the Upper Bennett Dam fish trap in order to collect adult fish for broodstock during the 2-year construction period.

Figure 2. Proposed Action for the Minto Fish Collection Facility



2.2.1. Fish Ladder

The fish ladder is located on the north shore of the river just downstream of the barrier dam (see Figure 2). The fish ladder is designed for Chinook salmon and steelhead and will also allow other native fish species, such as Pacific lamprey and trout, to enter and negotiate the facility. The fish ladder includes the ladder entrance and the ladder pools. The total fish ladder lift height is larger than the height of the barrier dam. The additional lift height over the barrier dam minimizes the amount of excavation that would be required for the holding ponds.

The fish ladder is a weir and orifice ladder more commonly referred to as an Ice Harbor ladder type. In this specific instance, the ladder is a one-half Ice Harbor design as only one weir, one orifice, and a non-overflow wall is located between the fishway pools. The ladder is 6-feet wide and has a 3-foot weir with a 15- by 12-inch orifice located on the floor underneath a 3-foot non-overflow section. The ladder entrance will be positioned about 5 feet farther out into the river and about 3 feet upstream as compared to the existing entrance. The entrance jet will be directed 30 degrees from the perpendicular to the axis of the barrier dam. The fish ladder has two entrances, one for juvenile fish (0.75 feet of head drop) and one for adult fish (1.5 feet of head drop). The entrances are adjacent to each other and both lead to the fish ladder. The entrance velocity and flow is controlled by a regulating gate, and the minimum and maximum flow rates are controlled by the entrance geometry and the head above the tailwater. The head for both entrances will be controlled by separate automated regulating gates that normally will operate in sync but have the capability of operating separately. As the adult entrance opening must be larger and will operate at twice the entrance head, there will be an average 85% to 15% flow split between the adult and juvenile entrances, respectively.

2.2.2. Pre-sort Pool

The pre-sort pool is the last pool in the fish ladder (see Figure 2). A depth of 6 feet will be maintained by the standard weir crest at the downstream end of this pool. To prevent adult fallback, a finger weir will be installed on the outlet weir of this pool. There will be no orifice in this weir and the full ladder flow of 17 cubic feet per second (cfs) will discharge over the weir. The ladder flow will be introduced into the pre-sort pool by two floor diffusers supplied from the facility water supply (FWS) pumps at opposite ends of the pool. The fish will be attracted to depart the pre-sorting pool by a false weir. The pre-sort pool is being sized for the maximum daily run size (750 fish). The ODFW managers plan to operate the sorting facility at least twice daily; however, the pool is sized for a contingency operation of once daily. A design water temperature of 56°F and a fish weight of 16 pounds equates to a minimum volume of 3,900 cubic feet or a pre-sort pool that is 65-feet long by 10-feet wide by 6-feet deep.

2.2.3. Sorting and Spawning Facility

The sorting and spawning facility will include fish crowders, holding/acclimation ponds, flumes, anesthetic tank, sorting and spawning tables, and recovery tank. A covered structure to protect fishery workers and associated fish handing/sorting equipment from the weather will be provided. An office also will be provided inside this structure. This covered structure will be constructed of structural steel framing with a sheet metal roof.

A fish crowder with V-shaped brail will be used to crowd fish into the false weir. The crowder will travel the length of the pre-sort pool and the brail will act as a guide to facilitate moving fish over the false weir. The facility will have the capability to visually sort fish. Once fish jump over the false weir, they enter a flume system. Fish initially slide down a portion of the flume to allow for visual identification. At this point, an operator decides the destination of the fish and either activates one of three switch gates (to a transport truck, a pond, or back into the river) or does nothing and lets the fish slide into the anesthetic tank. From this tank, the fish go onto a sorting table and can be sent to any of eight holding ponds, back into the river (upstream of the barrier), or to a hopper to be loaded onto a transport truck. The facility design allows for future upgrade to include passive integrated transponder or coded wire tag detectors in the sorting system.

Eight holding ponds (post-sort pools) that are 75-feet long by 10-feet wide by 6-feet deep will be constructed just north of the pump intake structures (see Figure 2). These ponds will be used to temporarily hold adult Chinook and steelhead prior to transport above Detroit Dam; to acclimate Chinook smolts hatched at Marion Forks prior to release into the North Santiam, and to temporarily hold Chinook broodstock until spawning time. Wild Chinook also will be temporarily held for out-planting above Detroit Dam. Although operations will facilitate volitional passage by winter steelhead during winter months, some winter steelhead may be held temporarily during other times of the year prior to release above Minto Dam or out-planted above Detroit Dam. Summer steelhead may also be temporarily held prior to re-release downstream as part of ODFW's fishery management program. In addition, hatchery juvenile Chinook hatched and raised at Marion Forks will be held at Minto for acclimation purposes during January to April. These fish will be released from the Minto facility via a discharge pipe that returns them to the river downstream of the barrier dam.

2.2.4. Intake and Pump Structure

The water supply for the facility will be withdrawn from the river upstream of the barrier dam through the Intake and Pump Structure (IPS). The intake and pump structure will be located between the south end of the holding ponds and north bank of the river. All direct river withdrawals must be screened to prevent the entrainment of downstream migrating juvenile fish or unwanted debris into the water supply system. The intake and pump structure will be located on the north shore and the downstream end of the intake will be located approximately 150 feet upstream of the barrier dam. The structure will be upstream of the eddy that forms upstream of the flashboards at lower flows to ensure better sweeping velocities.

The entire intake and pump structure will be 132-feet long. There will be 15 juvenile fish screens, each 6-feet wide by 10-feet high. The screen panels are vertical with a total screen area of 900 square feet with maximum opening widths of 1.75 millimeters; per NMFS criteria. The invert will be set at elevation 967 feet and the top of the screens will be at elevation 977 feet. At high design forebay (elevation 977.5 feet), the screens will be entirely submerged, so the average approach velocity into the screens will be about 0.34 feet/second. At low design flow, the forebay will be at 974.1 feet so the submerged screen area will be about 639 square feet and the average screen velocity will be 0.21 feet/second.

The screens will be cleaned by an airburst system. The cleaning will occur on a daily schedule or whenever water level sensors record an excessive differential between the forebay and the level just behind the screens. Porosity plates will be installed approximately 12 inches downstream of each fish screen to create sufficient head loss to even out the velocities through the fish screen. The porosity of the plates will vary from about 10% at the downstream (where there will be more water

level drawdown) to about 13% at the upstream end. At maximum, there will be a combined head loss of about 0.9 feet through each screen and porosity plate unit.

Behind the screens and porosity plates, there will be a two sided channel. Each side will be 10-feet wide. The river side (adjacent to the screens) will be 10-feet high; the other side will be 5-feet high to allow room for the lower mezzanine (the upper mezzanine will be above the first channel). The two channels will be separated by vertical structural columns so water can pass freely between them. The pump motors will be placed in the lower mezzanine so that the pumps can draw from the second channel roughly in the northwest corner of the structure. The auxiliary water supply (AWS) conduit will also start directly from the first channel at the west end of the structure and near the general pump area. Since all of the flow is being directed toward the west end of the intake structure, the water surface elevation behind the screen will be about 0.3 feet lower than at the upstream east end. This explains the purpose of the lower porosity in the porosity plates at the west end.

The water supply for the fish facility must provide sufficient flow to meet all facility water needs (entrance attraction flow and sorting needs, as well as holding pond requirements (Table 4)). The IPS has intakes to provide the additional discharge for fish attraction to the entrance; the water is added to the fish ladder via wall diffusers. The facility water supply system will provide pumped water for the ladder, sorting, and holding requirements. The entrance discharge will be composed of two separate sources: ladder flow (from pumps) and auxiliary water supply (gravity fed).

Table 4. Facility Water Requirements

Feature Flow Requirements	Low Tailwater Design (cfs)	High Tailwater Design (cfs)
Entrance	93	269
Trapping and Sorting	8	8
Holding Ponds	20	20
Total System	121	297

2.2.5. Barrier Dam

The existing barrier dam was constructed in 1951 and has undergone several interim repairs. Drawings show the crest to be 192-feet long (± 2.5 feet). The south side of the barrier has approximately 35 feet of flashboards that include 20 feet at an elevation of 3.75 feet above the crest and 15 feet at an elevation of 5.25 feet above the crest. The north side of the barrier has approximately 51 feet of flashboards that include 30 feet at an elevation of 3.75 feet above the crest and 21 feet at an elevation of 5.25 feet above the crest. This leaves 104 feet of undisturbed crest in the center.

It was decided not to make major modifications to the barrier dam in order to minimize impacts on current hydraulic conditions immediately downstream of the barrier. The NMFS exclusion barrier criteria call for either a velocity barrier or a vertical drop structure. The current barrier dam does not meet either criteria. It currently uses a combination of velocity and vertical drop (approximately 10 feet from forebay to tailrace for most flows) to prevent fish from passing. However, the barrier dam performs as an adequate barrier for the facility's design range of 895 to 5,370 cfs river flows; when flows exceed 5,370 cfs, the barrier dam does not completely exclude fish passage along the south shore.

The south shore adjacent to the barrier contains several notches in the exposed bedrock that at higher flows acts as a natural fish ladder (resting pools or deeper water) which allows fish to get up behind the flashboards. From here it is suspected that they can swim around the edge of the flashboards and ascend above the barrier. To prevent fish from ascending the barrier dam in the future, the bedrock notches will be filled with concrete and a small wall will be installed perpendicular to the axis of the dam near the end of the flashboards (on both sides). The wall will force any fish attempting this passage route to turn into the high velocity, supercritical flow down the face of the dam instead of the deeper, slower water found at the edge of the flashboards.

2.2.6. Abatement Pond

An abatement pond will be used for final treatment of water during treatment of fish while holding. The abatement pond will dilute the hydrogen peroxide and formalin used for treatment from the water. The Oregon Department of Environmental Quality (DEQ) established special status for the North Santiam because it is an important drinking water source; this is known as the "Three Basin Rule" and limits new or increased point source discharges. The facility will dilute hydrogen peroxide- and formalin-treated water in a manner that is consistent with the DEQ's 401 Water Quality Certificate requirements. The abatement pond will be drained during October in most years for cleaning purposes. A 12-inch diameter pipe will be used to convey the drainage into discharge point just downstream from the abatement pond. The pipe exit will be flared at the exit to reduce the velocities into the bed. At a median tailwater level for October, the pond will take about 2-4 hours to drain.

2.2.7. Access, Host Pad, Maintenance Building, Security Fencing, and Other Amenities

The facility is accessed from Highway 22. The existing facility is closed to public and the new facility will accommodate visitors by appointment only. The new facility access will be very similar to the existing access; it will drop down into the site along the same hillside alignment and have a flatter curve on the lower end. Gravel parking and camp host RV pad will be located on the outside of this curve and the new facility will begin on the inside of the curve. A one-lane gravel access road begins at a locked bar gate located at the highway right-of-way. The access road will remain unchanged from the bar gate to the beginning of road re-alignment just after the railroad corridor. The re-aligned road will be remain single lane due to hillside slope, but will be paved and have gravel shoulders with guardrail along top of excavation for the new facility.

The road curve into the facility has been flattened to make space along the outside of the curve for employee parking and camp host RV pad. Road grade has been increased to 12% maximum to obtain this space. Access beyond the parking area is extremely limited and will be used for facility vehicles as is the current practice. A camp host pad and cover will be provided. The host pad will be a concrete slab and the cover will be a metal cover structure. A security fence will be constructed around the perimeter of the facility. The existing maintenance building will be reused. The existing water well will be used.

2.2.8. Kayak Landings and Portage Trail

A kayak take-out landing, portage trail, and put-in will be constructed to facilitate safe kayak portage around the barrier dam. The take-out will be located on the north shore of the North Santiam River approximately 400 feet upstream of the barrier dam. The take-out will consist of a cleared area

along the bank and the installation of a steel staircase connecting the trail to the water. The portage will traverse the perimeter of the project along the outside of the security fencing from the take out to the railroad grade and then follow the fencing back down to the river downstream from the facility with a steel staircase descending the final step portion of the hillside to the put-in landing on the river.

2.2.9. Minto North staging and disposal area, and drain-field

The Corps will use the 5.66 acre property across Highway 22 from Minto (Minto North) for construction staging, disposal of excavation material, and to construct a drain field for disposal of wastewater generated at the new Minto facility. Disposal of excavated material will occur primarily on 1.5 acres of the western side of the property, avoiding most of the existing wetlands, but some filling of wetlands will occur. The drain field is proposed to be constructed on the eastern "panhandle" portion of the property and will be accessed by an existing roadbed; this road briefly meanders onto lands owned and managed by the Bureau of Land Management (BLM) before reentering Corps-owned lands near the location of the proposed drain field. The wastewater pipe will be installed within the existing roadbed with no habitat impacted except in the direct vicinity of the drain field. The Corps has obtained a Right-of-Way permit from the Salem District BLM to access their lands and install the wastewater pipe in the existing roadbed where the road crosses onto their lands prior to reentering Corps-owned lands.

2.2.10. Construction Considerations

Overview. Construction duration is approximately 24 months. Construction at Minto is anticipated to begin in early 2011 with a completion in early 2013; the project is anticipated to be operational in the spring of 2013. The ODFW preferred in-water work (IWW) period is July 15 through August 31. In order to complete construction in December 2012, two long-term cofferdams above and below the barrier dam will need to be constructed in 2011 (during the preferred IWW period) and will remain in place until the IWW period of 2012 when they will be removed. All other work within or over the river is required to be performed during the IWW period.

Cofferdams. Prior to beginning demolition and site preparation, and during construction, cofferdams will be needed to isolate work areas below the high water level from the North Santiam River. This isolation will minimize the amount of sediment and debris entering the North Santiam River during construction and allows for removal of fish from the work area. A plan is being developed in coordination with ODFW and NMFS to address fish salvage during installation of the cofferdams.

There will be two long-term cofferdams constructed, one below the barrier dam and isolated from the second cofferdam constructed above the barrier dam (downstream and upstream facility cofferdams shown in Figure 3). Cofferdam requirements will be to different river elevations and conditions above and below the barrier dam. The downstream (D/S) facility cofferdam will be designed by the construction contractor. This cofferdam will be approximately 200 feet long and 10 feet high and constructed out of gravel filled super sacks, Portadam, Aqua Dam, or concrete blocks. The upstream (U/S) facility cofferdam will be designed by the construction contractor. This cofferdam will be approximately 600 feet long and 10 feet high and constructed out of gravel filled super sacks, Portadam, Aqua Dam, or concrete blocks. These two cofferdams will be constructed in 2011 during the IWW period and removed during the IWW period in 2012. These two cofferdams

will not block any portion of the barrier dam and will remain in the river until the structures abutting the river are completed.

Figure 4. General Location of Cofferdams

Short-term cofferdams crossing the barrier dam will only be used during the 2011 and 2012 IWW periods to conduct inspection of the barrier dam and then execute repairs as needed (north and south cofferdams shown in Figure 3). The north cofferdam will be designed by the construction contractor. This cofferdam will be approximately 300 feet long and 7 feet high and constructed out of gravel filled super sacks, Portadam, Aqua Dam, or concrete blocks. It will be installed and removed during the 2011 IWW period. The south cofferdam will be designed by the construction contractor. This cofferdam will be approximately 300 feet long and 7 feet high and constructed out of gravel filled super sacks, Portadam, Aqua Dam, or concrete blocks. It will be installed and removed during the 2012 IWW period.

Excavation and Demolition. The existing facility will be demolished with two exceptions: the access road will remain in place but will be improved and paved with asphalt, and the holding pond will be converted into an abatement pond for the new facility.

Excavated material will consist of overburden material composed of sandy gravels and boulders, and bedrock materials consisting of igneous rock. Excess overburden, rock, and concrete will be disposed at the Minto North property; although the contractor will likely need to seek an additional disposal location due to the large volume of excavation. Disposal will comply with all federal, state, and local laws and regulations. Excavation of overburden could occur anytime throughout the duration of the construction anywhere above the ordinary high water elevation. Conventional excavation methods will be employed and are expected to consist of using a tracked excavator.

It will be necessary to excavate bedrock (igneous rock) for the alignment of the fish ladder and west retaining wall plus potential minor trenching for pipelines and utilities, and some blasting may be required. All blasting work will be performed in the dry with most of the blasting being above ordinary high water. Work conducted below the ordinary high water elevation will be conducted in a dewatered state behind cofferdam(s) separating the work from the river. Controlled blasting will limit fly rock, air blast, and ground vibration, and because the work will be in the dry, water over pressure will be negligible. All blasting will be conducted after secession of operations at the existing facility. It is anticipated that approximately 2,000 cy of bedrock will be removed below the ordinary high water elevation, and the remainder of the blasting will be above the ordinary high water elevation and will require removal of approximately 8,000 cy of bedrock. The blasting will follow a controlled technique that limits the amount of explosives firing time and will limit the air blast decibels, and ground vibration. There will be about 20 blasting actions required in order to excavate all of the *in situ* rock, which will be performed over a period of 60-80 days near the beginning of the construction period.

Additional excavation will occur in the railroad bed near the small unnamed stream that flows near the western edge of the main Minto property to install a culvert or similar pipe under the existing fills. Currently water discharged from the highway culvert flows towards the south, encounters the railroad fills, and is diverted slightly to the west then flows over and under (in a small, undersized culvert) the railroad grade. There is substantial infiltration of water into and through the railroad fills, resulting in the formation of a small (0.017 acre) wetland. The water flows in two directions on the down slope side of the railroad grad; some of this water flows down a small channel and enters the North Santiam River just west of the existing facility, with some of the flow seeping along the slope and rock cut above the existing facility, where it ultimately discharges to the facility below or infiltrates into rock crevices. The water that flows over the rock cuts above the facility needs to be controlled to minimize infiltration in the area which could lead to slope stability problems above the new fish ladder and proposed rock cuts.

To control the water that flow that seeps along the slope and rock cut above the facility, the small stream will be captured in a tight-lined system (i.e. culvert) immediately above the railroad (possibly at the outfall of the highway culvert) and piped past (through) the railroad alignment, and discharged to the existing stream channel that flows to the west of the facility.

River Bank Revetment. The river bank along the length of the facility is fish ladder, IPS, and retaining wall at the existing barrier dam. Riprap revetment will be required at the upstream and downstream contacts between natural bank and along the toe of these concrete structures. This riprap will also provide both transition and protection for adjoining natural vegetation and woody structure. The transition from revetment to natural bank will be done with least disturbance possible to protect existing natural bank structure and will use woody vegetation where existing vegetation and woody material does not provide transition.

Stormwater and Erosion Control. During construction, stormwater will be collected and sediment removed before being released into the river. Disturbed work areas will be mulched and unused material stockpiles will be covered during rain to reduce runoff. Disturbed ground and stockpiles held over the winter will be protected with fiber bonded mulch. Sediment and erosion control measures will be renewed until permanent vegetation and permanent storm runoff control measures are effective. Post-construction stormwater runoff from soil cut slopes, roads, and facility work areas will be treated using bio-infiltration cells.

Post-Construction. The site will initially be seeded with sterile erosion control grass to allow both soil seed bank and windblown seeds to re-establish natural vegetation. Sterile seed will be mixed with an erosion control fiber mulch to protect cut slopes and disturbed areas until natural vegetation is established. Slope cover of low vegetation will be placed to monitor soil slopes, for visual site security, and to minimize leaves and branches blowing in the fish ladder and ponds. Finally, native vegetation will be planted and some will naturally establish where growing conditions permanently support it and hatchery operations allow.

Interim Adult Fish Trap at Upper Bennett Dam. The ODFW requested that the existing facility continue fish collection and spawning activities during construction. However, due to limited space for construction staging, an aggressive construction schedule, and safety concerns, the existing Minto facility will be shut down for the entire 2-year construction period. Therefore, during construction at Minto, ODFW will collect adult fish at the Upper Bennett Dam trap (Figure 3). The Bennett Dam and associated fish ladder and trap facilities are owned by the city of Salem and located on the North Santiam River a few miles southeast of Stayton. The trap is currently an empty concrete box with a one way entrance that allows fish to enter the trap from the ladder, but not reenter the ladder. The trap also has a fish exit that is also the inlet for water moving through the trap and down the fish ladder. In order to move the trapped fish from the trap into an ODFW live haul truck some improvements to this concrete box are required. Modifications include, installing a false floor and pickett leads to create functional areas for sorting the fish, transporting brood stock, and releasing the fish not kept for brood stock. A crane and hopper will be used to transport the brood stock from the trap into an ODFW live haul tuck. The construction of these improvements will begin in fall 2010 and will be completed no later than March 1, 2011. Construction methods will include off-site metal fabrication and then on-site installation. Existing roads will be used to access the site and no ground-disturbing activities will be necessary to complete the modifications at Bennett trap or operate the temporary trap and haul facility.

Figure 3. Existing Fish Ladder and Trapping Facility at Upper Bennett Dam.

2.3. No Action Alternative

Under the no action alternative, the Minto fish collection facility would not be rebuilt and the existing facility would continue to be operated. The original facility was designed in 1951 as a broodstock collection facility and was not designed to accommodate live sorting of adult fish. It now collects, handles, and sorts ESA-listed UWR spring Chinook salmon and UWR winter steelhead that are released upstream of the Minto barrier, transported upstream of Detroit Dam, or transported to another stream in efforts to improve production of naturally produced UWR spring Chinook. The facility was not designed to accommodate safe handling, sorting, and loading of ESA-listed fish that must survive to spawn in the wild. At the existing facility, ESA-listed fish are often directly injured or physically handled in a manner that contributes to the high levels of pre-spawning mortality observed in the North Santiam subbasin. The existing facility does not meet many of NMFS criteria for trapping and is unable to acclimate juveniles during higher flows.

The no action alternative is not consistent with RPA 4.6 in the 2008 NMFS BiOp, which requires the Action Agencies (Corps, Bonneville Power Administration, and Bureau of Reclamation) to update and refurbish the Minto facility by 2012 to meet NMFS criteria for upstream passage/collection facilities. Compliance with the RPAs in the BiOp is necessary to avoid jeopardizing ESA-listed fish species in the Willamette River Basin. Under the no action alternative, the existing Minto facility would continue to not be in compliance with NMFS criteria and could not be operated year-round because the holding ponds become inundated during high flows. In addition, the existing facility does not provide a safe working environment for the operators. There are a number of safety hazards at Minto including inadequate or missing guardrails, unsafe access to the intake, unsafe access to weir, and electrocution hazards. This places employees at risk for falls, drowning, and other serious accidents.

3. AFFECTED ENVIRONMENT

3.1. Regional Setting and Physical Processes

The North Santiam River is located within the Willamette River Basin on the west side of the Cascade Mountains in northwestern Oregon. The North Santiam River drains approximately 766 square miles of land. The watershed is characterized by steep forested uplands and flat alluvial lowlands. The lower North Santiam River drains mainly agricultural areas. The North Santiam River meets the South Santiam River and forms the Santiam River approximately 12 miles upstream from the confluence with the Willamette River. The Minto fish collection facility is located on the north bank of the North Santiam River at RM 55, about 4 miles downstream from Big Cliff Dam.

3.1.1. Geology and Soils

The geologic profile for the area upstream of the Minto facility consists of terrace and stream gravels overlying porphyritic (containing large, isolated crystals in a mass of fine texture) andesite bedrock. The top of rock contact between bedrock and the alluvium is variable, based on the existing topography that has high bedrock exposures with minimal overburden to the west and lower, sloping overburden terraces to the east. The bedrock contact is expected to be irregular and somewhat undulating with as much as 10 feet of relief from north to south along the hillside down to the river, and a gradual slope eastward from where the bedrock outcroppings disappear beneath the alluvium.

The 1972 soil survey for Marion County shows that the Minto site has Salem gravelly silty loam soil. This is a well drained soil that is nearly level and has formed in gravelly alluvium of mixed mineralogy with a large amount of basalt pebbles. The surface layer is usually very dark brown. The soils observed at Minto typically match the description provided for this soil (Tetra Tech 2008).

Based on LiDAR interpretation and preliminary landslide mapping, the entire landslide complex may be at least one to two thousand years old. However, the morphology of the landslide indicates that portions of the landslide have been active within the past several hundred years. There are also areas of active, secondary ground movement to depths estimated at 10 to 30 feet deep in the landslide complex. The landslide deposits north of the site, immediately upslope of Highway 22, appear to consist of large, relatively intact blocks; whereas the deposits to the west are more disturbed and broken up.

The main rock cut at the facility, above the existing holding ponds, appears to be in-place, and does not appear to be part of the ancient landslide mass. Rock exposed immediately above the river, west of the facility, also appears to be in-place. However, materials mantling these rock exposures consist of rock rubble with various amounts of silt and sand matrix, indicative of colluvium and landslide debris. Large rock exposures, up to 15 feet diameter, in the area of the old railroad grade above the facility, may also be large blocks sitting on landslide debris.

No stability modeling has been completed for this complex landslide feature, due to its size and complexity. Any modeling would require extensive geologic mapping, geotechnical exploration, testing and analysis; most of which would need to be completed outside the property boundaries. However, based on preliminary landslide observations, it is very unlikely that the designed excavation and construction at the site would adversely impact the stability of the main landslide mass. The colluvium and landslide deposits in the area of the site are relatively thin in comparison

with the main landslide mass, and these thin deposits do not appear to provide substantial support to the main slide mass. Undercutting these thin, loose deposits may cause localized instability, if not mitigated for, but will not likely cause larger failures that propagate upslope beyond the site boundaries.

3.1.2. Hydrology and Hydraulics

The North Santiam River in the vicinity of the Minto fish facility has been modified from its natural condition in this reach hydrologically by the two Corps dams constructed upstream and hydraulically by the construction of the fish passage barrier at the Minto site. Data collected from U.S. Geological Survey gage #14184500 (North Santiam River at Niagara, OR), located 3.4 miles upstream from the Minto barrier dam, provided a high quality source of data with minimal watersheds entering the river between the gage and the project area. General hydrologic criteria is shown in Table 5.

Table 5. General Hydrologic Criteria

Criteria	Value (cfs)	Comments
95% exceedance of daily flow measured at Niagara for previous 25 water years (1984-2008)	895	Design low flow for fishways per NMFS criteria
5% exceedance of daily flow measured at Niagara for previous 25 water years (1984-2008)	5,370	Design high flow for fishways per NMFS criteria
Regulated 1% annual exceedance probability flood (100-year)	21,100	Facility designed for a flood event of this magnitude
50% exceedance of October outflow for previous 25 water years (1984-2008)	2,400	Abatement pond invert designed for gravity drainage below this flow

3.1.3. Water Quality

The North Santiam River is one of three in Oregon governed by the "Three Basin Rule" (OAR 340-041-0470). This rule was designed to protect the North Santiam as a municipal water source (for Salem) and greatly restricts the issuance of National Pollutant Discharge Elimination System (NPDES) permits in the basin. No new individual discharge permits are allowed for industrial, domestic, or animal feeding operations unless there is no discharge to surface water, and all applicable groundwater rules have been met. In addition, existing permit holders are not allowed any increase in mass load allocation.

The Santiam River and mainstem North Santiam River are water quality limited for temperature up to the mouth of the Little North Santiam River. A total maximum daily load (TMDL) for temperature was developed for the North Santiam subbasin; this TMDL is part of a larger TMDL developed for the mainstem Willamette in 2006 and approved by the U.S. Environmental Protection Agency (EPA).

The DEQ currently maintains three sites (Table 6) on the North Santiam River as part of their ambient water quality monitoring network.

Table 6. Water Quality Monitoring Sites on North Santiam River

Site	STORET Number	LASAR Number	River Mile	Samples per Year
North Santiam River at Coopers Ridge Rd.	405325	12559	63.8	8
North Santiam River at Gates School Rd.	405319	12553	39.0	8
North Santiam River at Greens Bridge	402469	10792	2.9	8

Source: North Santiam Watershed Council (2002a)

3.2. Vegetation

The vegetation around the existing facility contains some trees, with the grounds mowed regularly around the host pad, storage areas, and around the ladder and holding ponds. According to Tetra Tech (2008), the upslope areas and the wetlands area on the eastern edge of the Minto fish facility is forested with Douglas fir (*Pseudotsuga menziesii*), western red cedar (*Thuja plicata*), and a variety of deciduous tree and shrub species.

The 1.5 acres of Minto North that will be used for equipment staging, and excavated material stockpiling is mostly an open field that is primarily covered in Himalayan blackberry and other weedy, non-native species. Upslope from this area, including the eastern "panhandle" portion of the property, the vegetation changes to a more typical Doulas fir - western red cedar forest that has been harvested in the past; most of the forest can be considered second or even third-growth forest. Understory species include sword fern, lady fern, skunk cabbage, and blackberry. The surface of the existing road where the wastewater pipe will be installed is gravel with sparse herbaceous (i.e. small herbs, mosses, lichens, etc.) vegetation in places but no trees or shrubs. Vegetation within the proposed drain field area is mostly grass, small trees and shrubs growing

The project area directly surrounding the fish trap and loading area at the Upper Bennett Dam is already developed (Figure 3). No ground disturbing activities will occur as all activities are proposed to occur either within existing facilities or on existing gravel roadways; no improvements to the roadways or surrounding areas are required

3.3. Wetlands

One wetland of 0.46 acres, contiguous with a perennial stream of about 500 square feet, is present on the northeast corner of the Minto site. The wetland community is generally classified as a western red cedar – skunk cabbage (*Thuja plicata – Lysichiton americanum*) forested wetland. Other dominant species include Himalayan blackberry (*Rubus discolor*), lady fern (*Athyrium filix femina*), bittersweet nightshade (*Solanum dulcamara*), and cascara (*Rhamnus purshiana*). The upland community is generally classified as a Douglas fir – salal – swordfern (*Pseudotsuga menziesii – Gaultheria shallon – Polystichum munitum*) community. Other dominant species included big leaf maple (*Acer macrophyllum*), hazel (*Corylus cornuta*), vine maple (*Acer circinatum*), Himalayan blackberry, and trailing blackberry (*Rubus ursinus*).

There is a small stream that enters the Minto property just west of the access roadway to the fish facility from Highway 22. The area is heavily forested with Douglas fir, western red cedar, and a variety of deciduous species, and is located approximately 150 feet above the north bank of the

North Santiam River, just downstream from the barrier dam. The stream enters the site via a culvert under Highway 22 a briefly spreads out to create a wetland area of approximately 740 square feet (0.017 acres) before entering a small channel and descending to the North Santiam River.

On the Minto North site, three seep areas and a perennial stream are present. The three seeps were similar in that they largely shared common vegetation species, soils, and primary hydrology indicators. All three seeps were located on relatively steep hillsides, and it appears they are intermittently surficial and subsurface as they come down through the watershed and surface near the toe of the slope. Vegetation at the three seeps dominated by Douglas fir, vine maple, skunk cabbage, Himalayan blackberry, white clover, and sword fern; reed canary grass was dominant in those areas without canopy cover. On the eastern portion of the parcel, water from the two easternmost seeps combine and drains to a culvert that passes under Highway 22 and drains to the wetlands on the eastern portion of the main Minto property. Also on the Minto North parcel is a small perennial stream that crosses the eastern portion of property before descending into a culvert that diverts the flow under Highway 22 and discharges into property adjacent (to the east) to the main Minto Property; a small (approximately 0.06 acre) wetland forms in the area before the stream enters the culvert.

3.4. Fish and Wildlife

According to the North Santiam Watershed Council (2002a), of the 16 native fish species in the Willamette Basin, 13 are known to occur in the Santiam or North Santiam rivers, such as Pacific lamprey, Oregon chub, peamouth, redside shiner, sculpin, speckled dace, threespine stickleback, and largescale sucker. Eight introduced fish species also occur in these rivers, such as bullhead, pumpkinseed, mosquitofish, and warmouth.

Native salmonids in the North Santiam River watershed include spring-run Chinook salmon and winter-run steelhead populations. There are also introduced fall-run Chinook and summer-run steelhead populations. Although details of their life history and habitat requirements differ, all spawn in fresh water, migrate downstream, and rear for varying lengths of time in the ocean before returning to their natal streams to complete their life cycle.

Wildlife species likely to frequent the Minto project area include deer, waterfowl, cavity nesting birds, raptors, and numerous species of small birds and mammals. The peregrine falcon may occur in the area as a migrant and winter visitor. Prey is available in the form of avian species such as band-tailed pigeons and passerine birds. Suitable cliff habitat for nesting is present in the vicinity of Rocky Top located north of the Minto project area (North Santiam Watershed Council 2002b).

According to the North Santiam Watershed Council (2002b), there is a known bald eagle nest site in the lower North Santiam Watershed near the confluence of the Santiam River with the Willamette River. Bald eagles appear to be most common in the vicinity of Big Cliff Dam and near the confluence with the Willamette River. Bald eagles seen during the nesting season at Big Cliff Dam are thought to be birds nesting in the Detroit Lake area. There also have been a number of bald eagle sightings downstream in the vicinity of Stayton Island. There are no known bald eagle nests or winter roosts in the vicinity of the Minto project; however, they are expected to be present in small numbers as migrants and winter visitors.

3.5. Threatened and Endangered Species

3.5.1. Species under NMFS Jurisdiction

The two Pacific salmon evolutionarily significant units (ESU) that occur in the Minto project area under the jurisdiction of the NMFS are shown in Table 7. In September 2005, critical habitat was designated for these species (70 FR 52630) and occurs from the Columbia River to the confluence of the Clackamas and Willamette rivers.

Table 7. ESA-listed Species under NMFS Jurisdiction

Species/ESU	Status	Life History Type	Federal Register (FR) Citation
UWR Chinook Salmon *Oncorhynchus tshawytscha*	Threatened	Ocean	70 FR 37160; June 28, 2005
UWR Steelhead *Oncorhynchus mykiss*	Threatened	Stream	71 FR 834; January 1, 2006

UWR Chinook Salmon

The North Santiam UWR Chinook population's limited abundance and productivity pose a very high risk of extinction (McElhany et al., 2007). Pre-spawn mortality rates are high, abundances of successful natural-origin (wild) spawners are low, and recent use of natural spawning areas has been dominated by fish of hatchery origin (Schroeder et al., 2006). The wild component of the spawning population is not thought to be self-sustaining (Good et al., 2005). Adult UWR Chinook returning to the North Santiam River are counted as they pass over Bennett Dam (at RM 31.5) and later if they are captured in the Minto fish trap. Figure 4 shows the numbers of adult Chinook counted at the Minto trap each year from 1981-2006.

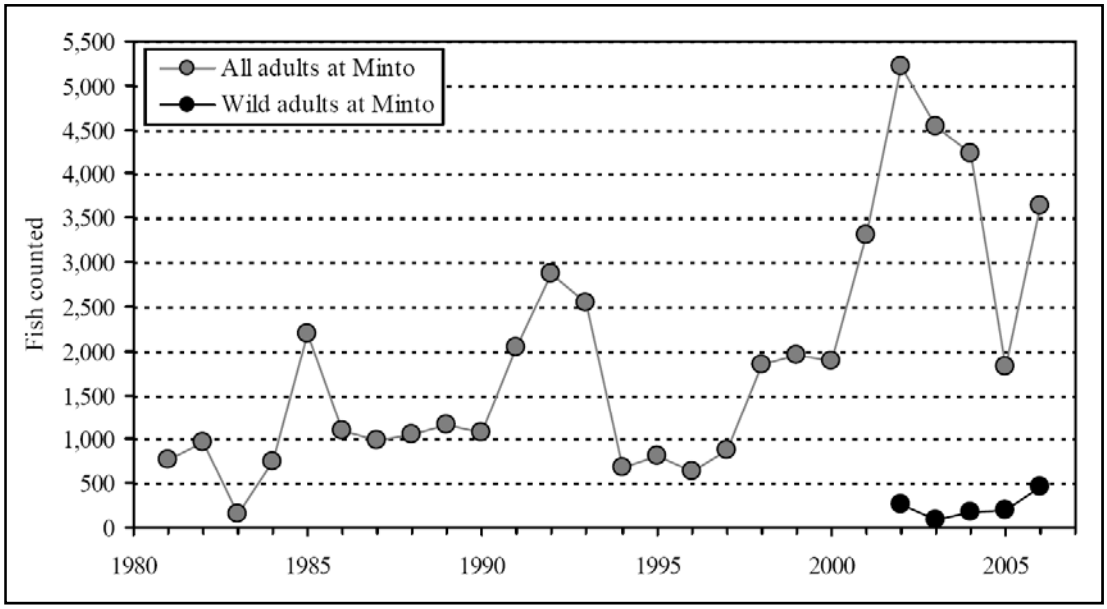
Fish arriving at the trap are primarily hatchery fish, but the extent to which hatchery fish outnumber natural-origin (wild) ones at the trap has only become certain within the last decade as improvements have been made to fish marking and monitoring efforts in the Willamette Basin. Annual counts of adult UWR Chinook at Minto have risen erratically since the early 1980s, perhaps in part due to more effective fish collection at the barrier dam, and averaged 3,887 fish during the most recent 5-year period. An average of 239 (6%) of fish counted at the trap during this period were classified as wild (McLaughlin et al., 2008).

During 2001-2005, the most recent 5-year period for which annual counts of UWR Chinook passing over Bennett Dam are available, numbers of wild adults ranged from 220 to 667 and averaged 450 fish (McLaughlin et al., 2008). These wild fish accounted for an average of 6% of all adults passing the dam during this period, the same fraction seen recently in the catch at the Minto trap. Wild fish passing Bennett Dam but not later counted at the Minto trap either spawn successfully in the North or Little North Santiam Rivers or die prior to doing so.

Since 2001, ODFW has conducted intensive monitoring of the spawning grounds of UWR Chinook in the North Santiam and Little North Santiam rivers. Monitoring results from 2001 through 2006 showed that annual pre-spawn mortality rates of these fish were high in both the North Santiam (mean = 59%) and Little North Santiam (mean = 51%), and that an average of 90% of the spawners along the mainstem and 49% of those in the Little North Santiam were of hatchery origin (McLaughlin et al., 2008). Further, the numbers of successful spawners appear likely to have included an average of fewer than 100 wild adults in each river. Extended over the long term, the

combination of low abundance of wild adults, high pre-spawn mortality, and high percentages of hatchery fish in spawning areas, would make it improbable that the river's "wild" run could include many individuals more than a few generations removed from the hatchery.

Figure 4. Annual Returns of Spring Chinook to the Minto Trap, 1984-2006*



*2002-2006 estimates of the wild adults were developed by McLaughlin and others (2008).

Counts of UWR Chinook redds (nests) from 1997 to 2006 in known spawning areas on the North Santiam and Little North Santiam rivers show a 10-year average of 272 redds (range 134- 630) for the North Santiam River (Stayton to Minto) and a 10-year average of 31 redds (range 10- 61) for the Little North Santiam River (ODFW 2007a).

The reduced access of spring Chinook in the North Santiam to high quality habitats reflects a high or very high extinction risk. Mattson (1948) estimated that 71% of the spring Chinook production in the North Santiam occurred above the current Corps dam sites. In 2005, the ODFW (2005) estimated that 42% of the historically suitable habitat for spring Chinook was inaccessible.

UWR Steelhead

McElhany and others (2007) classified the UWR winter steelhead population in the North Santiam as facing a low extinction risk based on its abundance and productivity, though they expressed a high degree of uncertainty. The population is relatively large, with a long-term (1980-2005) mean abundance of 2,722 natural-origin spawners and a short-term (1990-2005) mean abundance of 2,109 spawners (McElhany et al., 2007). In 2008, the UWR steelhead run was the second lowest ever counted at Willamette Falls (2,813 fish, ODFW). Although information specific to the North Santiam is not available, it is reasonable to assume that the North Santiam run was also very low since all North Santiam UWR steelhead are counted at Willamette Falls. The continued decline of the species in recent years is of grave concern.

North Santiam winter steelhead abundance has been monitored effectively by counting redds within a sub-sample of available spawning areas. Figure 5 gives estimates that Chilcote (2007) developed

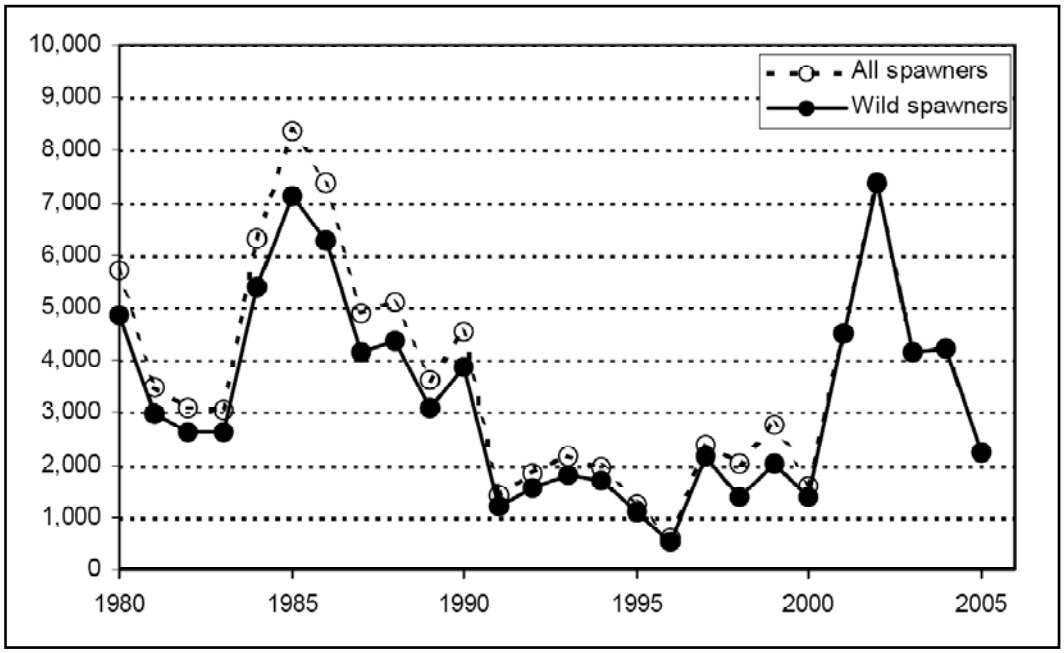
of the annual abundance of spawners from 1980 through 2005 that are somewhat uncertain but form the basis of viability analyses by McElhany and others (2007). The estimates suggest a mean annual abundance of 4,499 spawners during the most recent 5 years in the time series after a period of relatively lower abundance during the 1990s. An additional index of the annual abundance of winter steelhead adults in the North Santiam is available from counts made at Bennett Dam, downstream of most natural spawning areas. Bennett Dam counts may exhibit negative bias related to how passage estimates are expanded to account for days when fish movements through the fish ladder are not monitored (Firman et al., 2005). The Bennett counts suggest an average of 2,396 adults passing the dam during the same 2000-2004 period, for which the Chilcote (2007) time series suggests an average of 4,367 wild adults in the subbasin as a whole.

McElhany and others (2007) classified the current spatial structure of the North Santiam steelhead population as most likely reflective of a population with a moderate to high risk of extinction, due substantially to blocked access to historically important habitats above Corps dams. Since 1953, winter steelhead have been restricted to that portion of the North Santiam below Big Cliff Dam. The fish now spawn in the mainstem above Minto weir (to Big Cliff Dam) and downstream of the weir, as well as in the Little North Santiam River, Mad Creek, and Rock Creek. Tributaries to the upper Little North Santiam River, such as Elkhorn Creek and Sinker Creek, are also used extensively. The ODFW (2005) estimates that 46% of the historically suitable habitat is now inaccessible. The blocked areas include some of the most productive habitats for this species (McElhany et al., 2007).

Limiting Factors and Threats to Recovery of UWR Chinook and UWR Steelhead

Factors unfavorably affecting the status of the North Santiam populations of UWR Chinook and UWR steelhead have been summarized by ODFW (2007b). Key limiting factors and threats to both species include a variety of dam effects, large hatchery programs developed partly to help offset dam effects, and the cumulative effects of multiple land and water use practices on aquatic habitat. For spring Chinook in particular, Corps dams that lack effective passage facilities prevent wild fish from using historically important habitats on federal lands in upper portions of the subbasin and force a severely diminished population to rely upon habitats below Big Cliff Dam that have been structurally, hydrologically, and thermally altered. These altered habitats often contain hatchery produced salmonids, or their direct offspring, that may compete or interbreed with the wild fish.

Figure 5. Estimates of Annual Number of Native Winter Steelhead of All Origins and Wild Origin that Spawned in North Santiam Subbasin Streams, 1980-2005

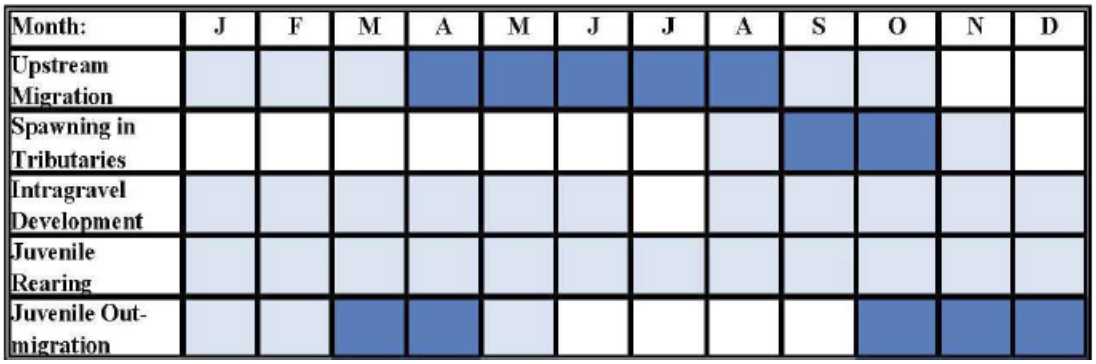


Data Source: Chilcote 2007

Salmon Ecology in the Willamette Basin

Life history timing for UWR Chinook salmon is shown in Figure 6. Adult UWR Chinook begin entering the Willamette River in February. The run peaks in April and entry is essentially completed by the end of May. Spawning occurs from August to early November. Spawning peaks around the third week in September through the first week in October. After spawning, spring Chinook salmon eggs remain buried in the gravel for 1 to 4 months, depending on stream temperatures. The alevins, or yolk-sac fry, remain in the gravel for 2 to 3 weeks after hatching. Juvenile Chinook appear to emigrate soon after emergence in late winter and spring to mainstem areas of major subbasins, including sections of the Willamette River, to rear until smoltification. Some juveniles may use mainstem reservoirs as rearing areas. Willamette spring Chinook are "Gulf of Alaska" migrants; they migrate to the north upon ocean entry and are subject to harvest in British Columbia and southeast Alaska ocean fisheries (taken from Corps 2000).

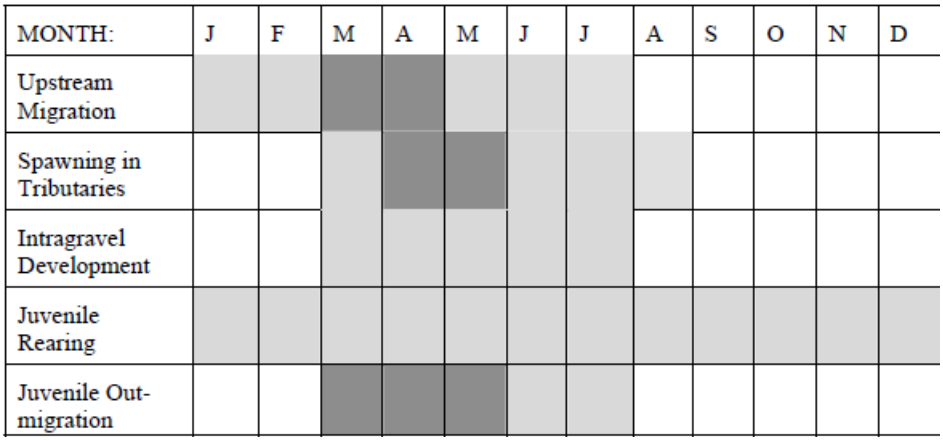
Figure 6. UWR Chinook Salmon Life History Timing



Light shading represents low-level abundance and dark shading represents higher abundance; upstream migration refers to adult presence in the mainstem Willamette River and tributaries. Source: NMFS July 2008

Life history timing for UWR steelhead is shown in Figure 7. Most UWR steelhead spend 2 years in the ocean before entering fresh water to spawn. Passage over Willamette Falls begins in early February, peaks throughout the month of March, and ceases in late May. Spawning activity peaks in April and occurs primarily high in the upper tributaries. Incubation rates vary with water temperature with eggs hatching anywhere between 18 and 101 days. Fry emergence of Willamette winter steelhead is thought to occur predominantly in June. Juvenile steelhead rear both within their native tributaries and in the mainstem Willamette River. Emigration of native steelhead smolts occurs from late March to late May, generally after their second winter in freshwater. About 88% of naturally produced adults from the North Santiam River during 1957-1959 had smolted at age 2 and 12% at age 3. Smolt migration past Willamette Falls begins in early April and extends through early June, with peak migration occurring in early to mid-May (taken from Corps 2000).

Figure 7. UWR Steelhead Life History Timing



Light shading represents low-level abundance and dark shading represents higher abundance.
Source: NMFS July 2008

3.5.2. Species under USFWS Jurisdiction

The ESA-listed threatened and endangered species that may occur in the Minto project area under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) are shown on Table 8. These species are discussed below.

Table 8. ESA-listed Species under USFWS Jurisdiction

Species	Status	Federal Register (FR)Citation
Northern spotted owl *Strix occidentalis caurina*	Threatened	55 FR 26114, June 26, 1990
Oregon chub* *Oregonichthys crameri*	Threatened	58 FR 53800, October 18, 1993 (endangered); Status change*
Golden paintbrush *Castilleja levisecta*	Threatened	62 FR 31740, June 11, 1997
Willamette daisy *Erigeron decumbens var. decumbens*	Endangered	65 FR 3875, January 25, 2000
Water howellia *Howellia aquatilis*	Threatened	59 FR 35860, July 14, 1994
Bradshaw's desert parsley *Lomatium bradshawii*	Endangered	53 FR 38448, September 30, 1988
Kincaid's lupine *Lupinus sulphureus spp. kincaidii*	Threatened	65 FR 3875, January 25, 2000
Nelson's checker-mallow *Sidalcea nelsoniana*	Threatened	58 FR 8235, February 12, 1993

* The Oregon chub was listed as endangered in 1993. A recovery plan was published in 1998. Critical habitat was designated on March 10, 2010. The species' status recently improved and on April 23, 2010, the USFWS changed the Endangered Species Act classification of Oregon chub from endangered to threatened.
Source: USFWS Oregon Office list for Marion County last updated 5/29/2010.

Northern Spotted Owl. According to the USFWS (2008), the spotted owl inhabits structurally complex forests from southwest British Columbia through the Cascade Mountains and coastal ranges in Washington, Oregon, and California as far south as Marin County. Spotted owls are mostly nocturnal. The diet varies and generally, flying squirrels are the most prominent prey in Douglas-fir and western hemlock forests in Washington and Oregon. Other important prey include deer mice, tree voles, wood rats, birds, and insects. Spotted owls generally rely on older forested habitats because such forests contain structure and characteristics required for nesting, roosting, and foraging. Features that support nesting and roosting include a moderate to high canopy closure (60% to 90%); a multilayered, multi-species canopy with large overstory trees (diameter > 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly. Foraging habitat generally has attributes similar to those of nesting and roosting habitat. Dispersal habitat, at a minimum, consists of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities. Female spotted owls typically lay eggs in late March or April. After they leave the nest in late May or June, juvenile spotted owls depend on their parents until they are able to fly and hunt on their own. Parental care continues after fledging into September.

In 1992, the USFWS designated critical habitat within 190 critical habitat units in these states (nearly 6.9 million acres with 3.3 million acres in Oregon; 57 FR 1796). In 2008, the USFWS revised the designated critical habitat for the spotted owl (73 FR 47325, August 13, 2008). The Western Oregon Cascades North Unit (Unit 9) consists of approximately 335,600 acres in Linn, Marion, Clackamas, Hood River, and Multnomah counties in Oregon, and is composed of lands managed by the Mt. Hood and Willamette National Forests (334,700 acres) and Salem BLM District (900 acres). This unit includes five areas that, with approximately 151,500 acres of habitat or habitat-capable areas in the adjacent wilderness, meet the size requirement of large habitat blocks and one area wholly within critical habitat that meets the size requirement of a small habitat block.

A single northern spotted owl nest (Bad Banks) is documented approximately one mile northeast of the proposed project area; the current status of this nest site is unknown. However, no habitat modification is proposed and installation of the wastewater pipeline oat Minto North will occur after October 1 to ensure that there is no effect from construction noise to nesting owls that may be present in the area. No other threatened or endangered species are known to be present within or near the proposed project area.

Oregon Chub. Oregon chub are found in slack water off-channel habitats such as oxbows, side channels, backwater sloughs, low gradient tributaries, and flooded marshes. These habitats usually have little or no water flow, silty and organic substrate, and aquatic vegetation as cover for hiding and spawning. The average depth of Oregon chub habitats is typically less than 6 feet and summer water temperature typically exceeds 61°F. Oregon chub are endemic to the Willamette River Valley. Historical records indicate that Oregon chub were collected from the Willamette River from Oregon City to Eugene, and from the Clackamas, Molalla, South Santiam, North Santiam, Long Tom, Luckiamute, McKenzie, Mary's, Coast Fork Willamette, and Middle Fork Willamette rivers. The current distribution is limited to about 20 known naturally occurring populations and four recently reintroduced populations found in the Santiam, Middle Fork Willamette, Coast Fork Willamette, and McKenzie rivers, and several tributaries to the Willamette River downstream of the Coast Fork/Middle Fork confluence (from http://www.fws.gov/oregonfwo/Species/Data/OregonChub/). In 2010, the USFWS designated critical habitat for Oregon chub with the following critical habitat units located in the North Santiam River watershed (75 FR 11010, March 10, 2010):

- Unit 1B(1), Geren Island North Channel: About 1.9 acres located on the grounds of a water treatment facility owned by the City of Salem.
- Unit 1B(2), Stayton Public Works Pond: About 1.0 acre owned by the City of Stayton.
- Unit 1B(3), South Stayton Pond: About 0.2 acre and is owned by ODFW.
- Unit 1B(4), Gray Slough: About 6.2 acres and is privately owned.

Oregon chub and suitable habitat are not known to occur in the vicinity of the Minto fish facility.

Golden Paintbrush. This perennial herb occurs in upland prairies and on generally flat grasslands, including some that are characterized by mounded topography. Low deciduous shrubs are commonly present as small to large thickets. Eleven populations are currently known to exist in Washington and British Columbia. In Oregon, golden paintbrush historically occurred in the grasslands and prairies of the Willamette Valley in Linn, Marion and Multnomah counties; the species has been extirpated from all of these sites as the habitat has been changed or modified by urbanization or agriculture. The last sighting of golden paintbrush in Oregon was in 1938 in Linn County (taken from http://www.fws.gov/oregonfwo/Species/Data/GoldenPaintbrush/). Habitat for this plant does not occur in the Minto project area.

Willamette Daisy. This endangered perennial herb is endemic to the Willamette Valley and historically was likely widespread in native prairie habitat. This plant blooms between June and early July and is known to occupy grasslands and open places at elevations below 1,000 feet. There are three known locations of this species in the North Santiam watershed: one is currently being protected on private land, another population is in a roadside ditch on private land, and the third population is extirpated (North Santiam Watershed Council 2002b). No known populations of this species occur in the Minto project area.

Water Howellia. Water howellia is an annual aquatic species found in small, vernal, freshwater wetlands, glacial pothole ponds, or former river oxbows that have an annual cycle of filling with water over the fall, winter and early spring, followed by drying during the summer months. These habitats are generally small (< 2.5 acres) and shallow (< 3 feet deep). Bottom surfaces are reported as firm, consolidated clay, and organic sediments. Water howellia is known to occur sporadically in Washington, Idaho, Montana, and California. There are no known extant occurrences in Oregon. The historic Oregon sites were all located in the Columbia River floodplain or the Willamette River valley (taken from http://www.fws.gov/oregonfwo/Species/Data/WaterHowellia/). Habitat for this plant does not occur in the Minto project area.

Bradshaw's Desert Parsley. This perennial herb occurs on seasonally saturated or flooded prairies, adjacent to creeks and small rivers in the southern Willamette Valley. Soils at these sites are dense, heavy clays, with a slowly permeable clay layer located 6-12 inches below the surface. This clay layer results in a perched water table during winter and spring, and is critical to the wetland character of these grasslands. Endemic to and once widespread in the wet, open areas of the Willamette Valley, this plant is now limited to a few sites in Lane, Marion, and Benton counties. The greatest concentrations of remaining sites where plants occur are in and adjacent to the Eugene, Oregon metropolitan area (taken from http://www.fws.gov/oregonfwo/Species/Data/BradshawsLomatium/). A population of this species is being protected and managed at the Nature Conservancy's Kingston Prairie Preserve in Stayton (North Santiam Watershed Council 2002b). No known populations of this species occur in the Minto project area.

Kincaid's Lupine. This perennial plant is found mainly in the Willamette Valley where it occupies native grassland habitats. Dry, fescue prairies make up the majority of habitat for Kincaid's lupine (taken from http://www.fws.gov/oregonfwo/Species/Data/KincaidsLupine/). Critical habitat was proposed on November 2, 2005 (70 FR 66492). Critical habitat units were proposed for Benton, Douglas, Lane, Polk, and Yamhill Counties, Oregon, and Lewis County, Washington. Habitat for this plant does not occur in the Minto project area.

Nelson's Checker-mallow. This plant generally inhabits open habitats with moist soils and is associated with other early seral plant species. There are three known sites for this species in the North Santiam watershed: one was plowed and the population is believed extirpated, and the other two sites are on private property and threatened by competition from trees, weeds, and management practices like mowing and spraying of herbicides. No areas in the North Santiam watershed are included in the nine recovery zones in the 1998 Recovery Plan (North Santiam Watershed Council 2002b). No known populations of this species occur in the Minto project area.

3.6. Cultural and Historic Resources

Section 106 of the National Historic Preservation Act requires that federally assisted or federally permitted undertakings account for the potential effects on sites, districts, buildings, structures, or objects that are listed in or eligible for the National Register of Historic Places. An archival search of the general Minto project area was made using the State Archaeological Database in Salem in September 2008 during feasibility investigations for potential fish hatcheries and facilities improvement projects. No recorded archaeological sites were found to be within or adjacent to the Minto site. Following an initial reconnaissance of the Minto facility in January 2009, an intensive pedestrian cultural resources survey of 8-acres of the real estate parcel south of the Santiam Highway was conducted by a Registered Professional Archaeologist in February and March 2009.

Shovel probes in the wetland area in the southeast portion of the parcel yielded negative results for the presence of prehistoric or significant historic materials, and the highly organic nature of the matrix suggested that it is a fairly recent deposit formed from accumulated silts and organics during historic times. Shovel probing in the developed areas and on the slopes proved problematical as the masking soil is composed of a large percentage of tightly packed angular basalt gravels and penetration with a spade was limited to approximately 20 centimeters below the surface.

The two tiers along the river and lower slopes of the developed portion of the existing project were closely examined through remnant cuts into the fill in these areas from remodeling of the project area from its original 1950s configuration. The surface of the basalt cliff near the present pens and dam showed clear evidence of blast marks from explosives and pneumatic hammers testifying to its origin in the original project construction. Fill is at least 5 feet thick on the western portion of the property near the river on the lower tier. Boulder sized fill with a layer of hearting stone fist sized and larger is overlain with angular basalt gravel and soil seems to be the predominate type of construction. The upper tier may have basalt bedrock closer to the surface than the lower tier. The entire developed area has been massively disturbed and reworked and the wetland, in all probability, is a product of the slope and bedrock being blasted during the 1950s construction and the area to the east was simply not filled up to the level of the western parcel.

Some native soil may be extant above the second tier upslope, but this is difficult to judge, as surface patination of large rocks is the only clue. The upper portion of the slope has been altered by railroad bed construction in the past. A railroad spur line operated from 1929 to 1943 primarily for the use in the lumber industry. The Corps acquired the railroad spur along with the rest of the parcel in 1947. The rails, ties and hardware have been removed from the railroad bed and only the crushed rock berm remains. To the east outside the government holdings, the bed has deteriorated, apparently as concrete culverts failed in washes and the slope, composed of large boulder fill and gravels de-stabilized.

A subsequent addition to the project was acquisition of an approximately 6 acre parcel on the north side of the Santiam Highway. This area was to be used for staging, a septic drain field, and disposal of excavated material from blasting in the Minto south parcel. Because the Minto north parcel was purchased for the project the entire six acres were added to the APE, though only 1.5 acres will be directly impacted by construction activities. A check of the state archives covering the north parcel was performed August 2010 and no cultural resources were recorded in the north parcel, the nearest investigation being a timber sale survey over a mile to the northwest. Further consultation was initiated with Erik Thorsgard of the Confederated Tribes of the Grand Ronde cultural resources staff, who confirmed there were no tribal concerns regarding cultural resources in the north parcel or within several miles of it. The new parcel was examined by pedestrian survey at 10 meter intervals by the Cultural Resources Team, and in addition, subsurface tests, including 10 shovel test probes, and 8 backhoe test trenches were placed. No significant cultural deposits were found in the area, though prior disturbances from leveling, water well drilling and two access roads placed by private developers were noted.

No prehistoric materials were identified during the cultural resources survey. The only historic feature identified was the remnant bed of the 1929-1943 railroad lumber spur line consisting of only a partial berm on the government property on the contour below Highway 22. This historic feature does not appear to be eligible for the National Register, but for the purposes of this project it does not require evaluation as it lies outside the Area of Potential Effect (APE). This historic feature was reported to the Oregon SHPO for review and assigned Smithsonian trinomial of 35MA291. The SHPO concurred with the Corps determination that the site did not meet National Register criteria, as

it lacked integrity, was not unique among railroad and lumber industry sites, and was not associated with significant historic events.

3.7. Socio-economic Resources

Several small communities are situated along the mainstem of the North Santiam River near the Minto fish facility. Highway 22 is the major transportation route that runs through the area and has had a substantial influence on settlement patterns. North Santiam Canyon extends about 30 miles along the North Santiam River and includes six small communities: Lyons, Mill City, Gates, Detroit, Mehama, and Idanha. The populations of Marion County and these communities from 1960 to 2000 are shown in Table 9. The Canyon serves as a tourist destination and a major corridor for commerce and transportation to central Oregon; 1.7 million vehicles annually use Highway 22 (taken from North Santiam Watershed Council 2002a).

Table 9. Population Data from 1960 to 2000

Area	2000	1990	1980	1970	1960
Marion County	284,834	228,483	204,692	151,309	120,888
Stayton	6935	5011	4396	3170	2108
Jefferson	2565	1805	1702	936	716
Mill City	1670	1555	1565	1451	1289
Lyons	1125	938	877	645	463
Gates	555	499	455	250	189

Source: North Santiam Watershed Council (2002a)

Forest products and tourism support diversifying economies of many North Santiam Canyon communities. The economic base has been disrupted by mill closings, including the recent closing of a mill in Idanha that employed about 100 people. The local communities are initiating economic development strategies to adjust to a different future. Tourism is an important part of the local economies. Detroit Lake, which is located just above the study area, ranks third in use among Oregon's lakes. It attracts over 500,000 visitors each year, mostly from the Portland metropolitan area and mid-Willamette Valley (North Santiam Watershed Council 2002a).

The North Santiam watershed is important for economic reasons (timber harvest, agriculture, industrial and urban development), dispersed recreation use (fishing, hunting, sightseeing, etc.), and generation of clean water for downstream beneficial uses, including drinking water and fish and wildlife. Water storage and the amount and timing of water flow also have important effects on the people who live and recreate within the area.

3.7.1. Transportation/Circulation

The North Santiam Highway (OR Hwy 22) is the major transportation infrastructure in the project area. It links the cities of Salem, Stayton, Mill City, and others to the west and Detroit and Idanha to the east and connects locally to a number of private, county and Forest Service roads. Highway 22 terminates at Santiam Junction where it merges with US Highway 20 and Oregon Highway 126; these highways continue east to central Oregon. As a principle access route to recreational opportunities in the Cascade Mountains and beyond to central Oregon, the North Santiam Highway can at times carry significant traffic volume.

The Annual Average Daily Traffic (AADT) counts for the North Santiam Highway at Mile Post (MP) 33.69 (Minto Park) is 4,500 and at MP 43.3 (Detroit Dam) it is 3,700 (http://www.oregon.gov/ODOT/TD/TDATA/tsm/docs/2008_TVT.pdf). The AADT do not represent peak traffic counts and it is expected that traffic volume would be higher at certain times of the year and on weekends and/or holidays when more people are traveling.

3.7.2. Recreation

The North Santiam River is popular for recreational fishing and boating. Currently, boating activity on the river above the barrier dam at Minto is primarily limited to small personal watercraft such as kayaks, although some rafting has been identified. Most frequently, larger boats are launched at Packsaddle Park, which is below the Minto barrier dam. Smaller boats, particularly kayaks, launch at above Niagara County Park and take out at Packsaddle Park, typically portaging around the barrier dam by walking through the existing fish facility. It is not clear where rafts would launch upstream of the Minto facility (likely Niagara County Park), but these vessels would have to portage around the dam by traversing the existing facility as well. Some bank fishing occurs above the barrier dam where access is available, however, in the vicinity of the project, most occurs downstream of the project at Packsaddle Park. Most of the lands adjacent to the North Santiam River between the Minto facility and Big Cliff Dam are in private ownership, however some public access is available at Niagara County Park and where the North Santiam Highway runs adjacent to the river.

4. ENVIRONMENTAL CONSEQUENCES

4.1. Physical Processes

4.1.1. Geology and Soils

Bedrock is expected to be encountered in the downstream area near the fish ladder entrance, the fish ladder, and potentially the downstream portion of the water supply conduit near the existing barrier dam. Top of bedrock drops below foundation grade for structures towards the east and is expected to be below the foundation for the post-sort pools. A portion of the pre-sort pool may also be founded on alluvium. At the Minto facility, approximately 1.6 acres of vegetated area will be disturbed along the alluvial terrace will be disturbed during excavation and demolition of the existing facility. Overall, a total of 2.6 acres will be disturbed to construct the new facility.

At the Minto North property, a range of about 10,000 cy to 22,000 cy of material excavated for the construction of the new Minto facility will be disposed of on-site depending on whether the drain field is built. If the drain field is built in the eastern portion of the property, the amount of space available for disposal will be much less. The contractor would then need to locate an alternative disposal area for excess excavated material; no disposal of excavated material in waters of the United States, including wetlands, would be permitted.

Based on preliminary landslide observations, it is very unlikely that the designed excavation and construction at the site would adversely impact the stability of the main landslide mass. The colluvium and landslide deposits in the area of the site are relatively thin in comparison with the main landslide mass, and these thin deposits do not appear to provide substantial support to the main slide mass. Undercutting these thin, loose deposits may cause localized instability, but will not likely cause larger failures that propagate upslope beyond the site boundaries.

No ground disturbing activities will occur at the temporary fish trap at Upper Bennett; therefore no impacts to geology or soils are expected.

4.1.2. Hydrology and Hydraulics

Flood profiles at the Minto project site were developed using a Hydrologic Engineering Center-River Analysis System (HEC-RAS) model calibrated to recently collected water surface data. It was determined that a minimum freeboard of 2 feet be used with the 1% annual exceedance probability (AEP) flood flow (100-year) at the project site. The proposed construction will impact flood profiles upstream of project site for approximately 4,000 feet at the 1% AEP flow with a maximum rise of 0.39 feet calculated 370 feet upstream of the Minto weir. The change in inundated area would be minimal as flows are contained within the steep walled canyon section upstream of the weir.

4.1.3. Water Quality

As discussed in Section 2.2.9, cofferdams will be used to isolate work areas from the North Santiam River to minimize the amount of sediment and debris entering the river during construction and to allow for blasting of bedrock below ordinary high water elevation to occur in the dry. Impacts to water quality in the North Santiam River may from increased suspended sediments during

installation and/or removal of the four cofferdams as well as from incidental sediment/debris entering the river during construction. Increased suspended sediments can injure aquatic organisms, reduce primary and secondary production due to increased turbidity, and may alter migration patterns of some fish species. High levels of suspended sediments are known to smother salmon redds. The coffer dams will isolate the project area from the river and minimize the amount of sediment and debris entering the North Santiam River during construction. Further, installation and removal of these structures will occur during the preferred in-water work period identified in the *Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources* (2008) developed by the ODFW, to minimize impacts to aquatic species. Therefore, other than the extremely localized area directly within or adjacent to the cofferdams, impacts to water quality and associated aquatic habitat is minor.

Operation of construction equipment requires use of fuel and lubricants that could harm aquatic organisms if spilled into the river. The Corps will require the Contractor to provide a spill prevention plan to include measures to minimize the potential for spills and to respond quickly should spills occur. The contractors will also be required to comply with conditions in the 401 Water Quality Certification and the NPDES permit from Oregon. These will include best management practices (BMPs) to avoid and minimize impacts to water quality from construction activities. Due to preventative and response measures required, it is unlikely that spills would adversely affect water quality and aquatic species.

During construction, stormwater will be collected and sediment removed before being released into the river. Disturbed work areas will be mulched and unused material stockpiles will be covered during rain to reduce runoff. Disturbed ground and stockpiles held over the winter will be protected with fiber bonded mulch. Sediment and erosion control measures will be renewed until permanent vegetation and permanent storm runoff control measures are effective. Post-construction stormwater runoff from soil cut slopes, roads, and facility work areas will be treated using bio-infiltration cells.

Following construction, the facility will be operated in a manner to manage stormwater runoff. Post-construction stormwater management features, among several, includes an absorption pond and small check dams along the access road ditch. These features will significantly reduce stormwater inputs by facilitating infiltration rather than direct runoff to the North Santiam River and should result in a net (although minor) water quality improvement in the vicinity of the Minto facility.

4.1.4. Air Quality/Noise/Light

There would be a small, localized reduction in air quality due to emissions from construction equipment. There also would be localized increases in noise levels from construction equipment. These impacts would be minor and temporary in nature, and would cease once construction is completed. Some limited security lighting will be used at the facility, however all lighting will have covers on them that direct the light downward and would be limited to areas away from the fish ladder; therefore, the proposed action would not significantly affect natural light conditions.

4.2. Vegetation

Approximately 1.6 acres of forested habitat will be removed to construct the new Minto fish facility. Approximately 150 trees will be removed to facilitate construction; the larger trees will be salvaged and used for fish enhancement and restoration projects. This loss of forested habitat is minor

compared to the amount forested habitat surrounding the project, which is heavily forested (see Figure 9).

A total of 400 linear feet of riparian vegetation will be removed to facilitate the pump intake structures, fish ladder, associated infrastructure, and riprap to transition these structures into the native bank material.

Following construction, the new Minto fish facility site will be seeded with sterile erosion control grass to allow both soil seed bank and windblown seeds to re-establish natural vegetation. Sterile seed will be mixed with an erosion control fiber mulch to protect cut slopes and disturbed areas until natural vegetation is established. Slope cover of low native vegetation will be placed to monitor soil slopes, for visual site security, and to minimize leaves and branches blowing in the fish ladder and ponds. Larger native vegetation will be planted and naturally establish where growing conditions permanently support it and hatchery operations allow.

Following completion of construction activities, the disposal area at North Minto, as well as the remaining upland area not currently forested and covered in non-native vegetation, particularly blackberry will be removed and re-planted with a native seed blend.

4.3. Wetlands

The larger, high quality wetland on the eastern portion of the Minto property will be avoided and not be impacted by construction of the new facility. The small (0.017 acre), low quality wetland associated with the small stream on the western portion of the property will be affected due to diversion of the intermittent, secondary channel into the main channel to prevent water from flowing over the hill-slope and into the Minto Facility. By creating a single channel near the railroad grade, it is likely that this small wetland will simply dry up due to water moving past the area to the North Santiam River.

On the North Minto parcel, two small, low quality wetlands will be filled during disposal of excavation spoils. The total area of fill is approximately 0.022 acres. The remaining wetlands associated with the two perennial streams will be avoided by avoiding the wetland on the western end of property and constructing a retaining wall out of excavated material (comprised of large boulder or similar materials to prevent “spill over” into the wetland on the eastern portion of property. All other wetlands will be avoided.

The Corps initially proposed to restore approximately 0.22 acres of wetlands along the western edge of the North Minto property. During discussion with the Oregon Department of State Lands (DSL) regarding Oregon Removal-Fill requirements, they indicated that when wetland impacts are less than 0.20 acres, they prefer that mitigation be accomplished through the use of wetland mitigation banks or their Payment in Lieu program. The Corps, in its regulatory capacity under Section 404 of the Clean Water Act, does not currently recognize the DSL Payment in Lieu program as sufficient to meet Clean Water Act mitigation requirements; however, the Corps would not require compensatory mitigation under the Clean Water Act because total loss of wetlands is less than 0.10 acres (72 FR 11193). Therefore, it was decided that because the impacted wetlands were of very low habitat quality and the acreage of wetland impacted so small that mitigation under the Clean Water Act is not required, it was appropriate to use the Payment in Lieu program to meet DSL requirements only.

4.4. Fish and Wildlife

Cofferdams will be used to isolate work areas from the North Santiam River and will allow for removal of fish from the work area. Cofferdam installation and removal is not expected to cause mortality to adult or juvenile fish; it is more likely that fish could be displaced during cofferdam installation/removal by disturbance from workers and equipment entering the water. Some benthic habitat will be temporarily lost due to cofferdam installation. There may be some minor and temporary effects to adjacent benthic areas due to settling of suspended sediments. Because much of the construction work would be completed above ordinary high water or on existing submerged concrete, most benthic habitat would not be adversely affected.

It is estimated that shallow water habitat affected by the proposed action totals about 0.55 acres (approximately 800 linear feet along the north bank of the North Santiam River). This is a temporary impact, and once construction is completed and the cofferdams removed, the area should recover to pre-project conditions.

During construction, upland wildlife species may be temporarily displaced by construction activities and blasting of bedrock. Vegetation removal for site preparation may displace some wildlife found in the area until natural vegetation is re-established after construction and significant higher quality habitat near the wetlands on the eastern portion of the Minto property will remain intact.

4.5. Threatened and Endangered Species

4.5.1. Species under NMFS Jurisdiction

The portion of the proposed action that will have a negative impact on ESA-listed salmonid species in the North Santiam River is the in-water installation and removal of the four cofferdams. This portion of the river does not provide spawning habitat, but instead is a migratory corridor for adult salmonids moving upstream to spawn and juveniles moving downstream to the ocean. The timing of cofferdam construction so that disturbance is done during the designated IWW period for the North Santiam River minimizes impacts to salmonid species because fewer fish would be moving through the area during this time. The most likely impacts would be to juveniles and sub-adults that use the shoreline area for migration, resting, and rearing. The construction activities will cause an in-water disturbance. The short-term, temporary environmental impacts due to construction such as noise, ground disturbance, and increased turbidity will likely cause avoidance behavior by fish migrating through the area. These activities would be temporary and minimal in effect, only lasting for the duration of the construction. The construction contractor will be required to implement a work isolation plan that will exclude fish from the in-water cofferdam sites. Fish will be removed from the enclosed areas. Erosion control and stormwater management plans are incorporated into the project design to minimize impacts to the river and will also protect salmonid species.

4.5.2. Species Under USFWS Jurisdiction

As discussed in Section 3.4.2, Oregon chub, golden paintbrush, Willamette daisy, water howellia, Bradshaw's desert parsley, Kincaid's lupine, and Nelson's checker-mallow are not expected to occur in the Minto project area. Oregon chub are present on Geren Island, which is on the other side of the Bennett Dam; however, no actions are proposed to occur there. The proposed action is not located in designated critical habitat for the northern spotted owl. The habitat in the project area could potentially be used by spotted owls as foraging/dispersal habitat, but is unlikely given the current

level of human activity and use at the facility. It is expected that construction activities will have no effect on spotted owls or their habitat.

4.6. Cultural and Historic Resources

Following archival research, consultation with the cultural resources staff of the Confederated Tribes of the Grand Ronde , and cultural resources survey and subsurface testing on the Minto and Minto North parcels, only one archaeological site was identified, a historic railroad berm feature. This site was determined to be ineligible for the National Register by the Portland District Cultural Resources Team. After review by the Oregon SHPO, this site was assigned Smithsonian trinomial number 35MA291, and SHPO concurred that the site was not eligible for the Register, since the railroad remnant feature did not display integrity, and was a temporary line, a site type hardly unique among the logging industry and not associated with significant events. The Minto project will, therefore, have no effect on any historic properties eligible for the National Register of Historic Places.

4.7. Socio-economic Resources

The proposed action will not cause changes in population, economics, or other indicators of social well being. The proposed action also will not result in a disproportionately high or adverse effect on minority populations or low-income populations. The proposed action would have no effect on utilities and public services in the area.

4.7.1. Transportation/Circulation

The construction traffic traveling into and out of the Minto site should have a minimal impact to other traffic using Highway 22. However, some short-term temporary impacts are expected during removal of the excavated material and during delivery of materials, particularly concrete. During peak construction, it is estimated that approximately 47 construction-related vehicles per day may need to access and leave the Minto site. To improve public safety during these operations, the contractor will be required to develop a Traffic Control Plan that is approved by the Oregon Department of Transportation. Any potential delays are expected to be short term and temporary. If traffic control is necessary, it is possible that flaggers would be deployed to temporarily halt traffic to facilitate safe entrance and/or exit of heavy equipment and vehicles at the site.

4.7.2. Recreation

The proposed action would have a temporary, adverse impact to recreational boaters that currently use the North Santiam River upstream from the Minto site. The North Santiam River will be closed to navigation from Niagara County Park to Packsaddle (approximately 1.6 miles) during the two-year construction window because it is not safe for boaters to take out and portage around the barrier dam by walking through the active construction site. Some limited boating opportunities will continue above Niagara County Park during construction and there will be no impact to boating downstream of Packsaddle Park. The proposed closure is being coordinated with the Oregon State Marine Board. However, rebuilding the Minto facility is expected to have a long-term, positive impact on recreational vessel safety once new signage is installed and the boat take-out above the facility and put-in below the facility are improved. Bank fishing will be unaffected by the construction activities.

4.8. Cumulative Effects

Cumulative effects are defined as, "The impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 Code of Federal Regulations, Section 1508.7). Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. The past and present actions that have occurred in and near the Minto site are identified below. Together, these actions have resulted in the existing conditions of the project area (see Section 3).

- 1830s-1970: European settlement and modification of the North Santiam watershed up until the passing of the Clean Water Act.
- Highway 22 construction in North Santiam River corridor.
- Authorization and construction of the Corps' Detroit and Big Cliff projects.
- Operation and maintenance of the Detroit and Big Cliff projects.
- Construction of a railroad system including a spur line on the Minto site.
- Construction of the existing Minto fish facility.
- Construction of Upper and Lower Bennett dams.
- Recreational facilities established by federal, state, and local agencies.
- Residential, commercial, and industrial development that occurred in upland areas.
- Natural area acquisition, protection and restoration in the North Santiam watershed; these land uses have been established and are owned and operated by a variety of public entities.

The reasonably foreseeable future actions under consideration in this analysis are identified below. The listing includes relevant foreseeable actions in and near the Minto site including those by the Corps, other federal agencies, state and local agencies, and private/commercial entities.

- Operation and maintenance of the Detroit/Big Cliff projects for authorized project purposes.
- Operation and maintenance of other dams in the North Santiam subbasin.
- Protection and restoration of existing natural areas and potential acquisition, restoration and protection of natural areas in the North Santiam watershed by federal, state, and local agencies.
- Operation and maintenance of existing recreational facilities along the North Santiam River.
- Continued use and development of the North Santiam watershed for residential, commercial and industrial uses in proportion to future increases in population throughout the area.
- Water quality improvements with implementation of more stringent non-point source pollution standards, such as the Three Basin Rule and TMDLs.
- Operational or structural downstream fish passage at Detroit Dam to comply with RPAs in the 2008 NMFS BiOp; measures could include head of reservoir collection, fish screen/bypass system, or fish passage through existing dam outlets.
- Operational or structural changes to address water temperature and TDG concerns at Detroit/Big Cliff to comply with RPAs in the 2008 NMFS BiOp.
- Habitat improvements above and below Detroit/Big Cliff to comply with RPAs in the 2008 NMFS BiOp; improvements could include addition of spawning gravels/engineered in-stream structures for fish spawning habitat, and addition of large woody debris/engineered log jams to provide cover and rearing habitat for juvenile fish.

The potential cumulative effects associated with the proposed action were evaluated with respect to each of the resource evaluation categories in this Environmental Assessment. For the proposed action, water quality impacts (turbidity increases) are expected to be localized and short-term and are not expected to be cumulatively significant. Water quality in the North Santiam River is currently

limited for water temperature. Project operations at Detroit Dam have altered the pre-dam seasonal thermal regimes in the river, and this altered temperature regime has negatively affected the productivity of ESA-listed fish. In addition, at times the operations at Detroit/Big Cliff increase TDG production in the lower North Santiam River to saturations above state standards. There are a number of actions that are ongoing or planned in the watershed with a focus of improving water quality. These include operational or structural changes to the Detroit and Big Cliff projects currently under investigation by the Corps and the implementation of more stringent non-point source pollution standards by the state, such as the Three Basin Rule and TMDLs. These actions and stricter controls placed on foreseeable future projects would reduce short-term, adverse impacts and are anticipated to provide a long-term, cumulative benefit to the water quality in the watershed.

Future development, construction activities, and other foreseeable future projects, in combination with population growth, would produce changes in the amount of impervious surfaces and associated runoff in the watershed. However, all projects are required to adhere to local, state, and federal stormwater control regulations and best management practices that are designed to limit surface water inputs.

Biological resources include fish and wildlife, vegetation, wetlands, federal threatened and endangered species, other protected species, and natural resources management. While historic development in the watershed has caused losses of aquatic and riparian habitats, especially in the lower watershed, with resulting adverse impacts to fish and wildlife resources, these actions occurred in a regulatory landscape that is very different from that which exists today. While future development will likely have localized impacts on these resources, under the current regulatory regime these resources are unlikely to suffer significant losses. Moreover, initiatives by federal, state, and local agencies and groups will operate to mitigate the unavoidable environmental impacts of any future development. In addition, there are a number of actions that are ongoing or are planned that will provide a cumulative, long-term improvement to fish resources and habitat, especially for ESA-listed salmonid species, including the implementation of the RPAs specified in the 2008 NMFS BiOp and more stringent non-point source pollution standards, such as TMDLs. Any future federal actions would require additional evaluation under the National Environmental Policy Act at the time of their development.

Some short-term interference to recreation could occur during the proposed action and future activities. However, these conflicts are expected to be an inconvenience rather than a direct impact to recreational activity. The proposed action and future activities are not expected to cause a cumulative adverse change to population or other indicators of social well being, and should not result in a disproportionately high or adverse effect on minority populations or low-income populations. No cultural and historic resources are expected to be impacted by the proposed action. Reasonably foreseeable future actions will be subject to review and approval by State Historic Preservation Officer.

In conclusion, this cumulative effects analysis considered the effects of implementing the proposed action in association with past, present, and reasonably foreseeable future Corps' and other parties' actions in and near the Minto site. The potential cumulative effects associated with the proposed action were evaluated with respect to each resource evaluation category and no cumulatively significant, adverse effects were identified. However, there are a number of actions ongoing or planned in and near the Minto site that would provide a long-term, cumulative improvement to water quality and fishery resources in the North Santiam watershed.

5. COORDINATION

The draft Environmental Assessment was issued for a 30-day public review period. Review comments were requested from federal and state agencies, as well as various interested parties. The Public Notice was sent to interested persons, agencies, and groups, including, but not limited to those parties shown below. The draft Environmental Assessment was available for review on the Portland District's website (http://www.nwp.usace.army.mil/environmental).

National Marine Fisheries Service
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Forest Service
Bureau of Land Management
Confederated Tribes of the Warm Springs Reservation
Yakama Indian Nation
Confederated Tribes of the Umatilla Indian Reservation
Nez Perce Tribe
Confederated Tribes of Siletz Indians
Confederated Tribes of the Grand Ronde Community of Oregon
Columbia River Inter-Tribal Fish Commission
Oregon Department of Environmental Quality
Oregon Department of Land Conservation and Development
Oregon Department of State Lands
Oregon Department of Transportation
Oregon Department of Fish and Wildlife
Oregon Department of Parks and Recreation
Oregon State Historic Preservation Office
Oregon State Marine Board

A total of eight comment letters were received during the public comment period addressing a number of concerns related to the proposed project.

Six comments requested that the Corps modify the existing barrier dam to accommodate watercraft (i.e. rafts, kayaks, drift boats) passage through the structure by constructing a boat chute or similar structure. The proposed action includes repairing the barrier dam, if necessary, but does not include major modification. This effort would entail completely rebuilding the barrier dam, which would result in significant additional project costs and environmental impacts. Further rebuilding the barrier dam is not within the scope of the current proposed action, prohibitively expensive, and does not appear to be consistent with current authorized project purposes and may require additional authorizations to include a recreational project element to the existing hatchery project. Further, creating boat passage has the very real potential to allow fish passage, thus reducing the efficiency of the projects purpose of fish collection. Therefore, given the constraints identified above, particularly the additional expense and environmental impact, and given the relatively small user group affected, including boat passage through the dam was not included in the preferred alternative.

There were six comments expressing concern that the proposed portage trail was too long and should include additional features to better facilitate portage of rafts. Several portage trail options were evaluated during the project development; however given the steep terrain, security requirements, and existing wetlands, there is limited space for the boater portage trail. The current proposal of a five foot-wide trail will be an improvement over current conditions which require boaters to portage around the dam without improved take-out or put-in locations and to trespass through the existing facility. While the portage trail does require boaters to hike the perimeter of the facility, which is longer than cutting through the facility, it is simply unsafe to have random, unsupervised access to this year-round operational facility. The Corps recognizes that this may be a slight inconvenience for some users; however, to ensure facility security and for the safety of the facility operators and recreational boaters, only trained personnel or supervised visitors will be allowed access to the facility grounds. Additional improvements were considered (such as widening the portage trail and adding rails), but are not feasible given the constraints identified above as well as the additional expense and environmental impact given the relatively small user group affected.

Two comments suggested that the facility be constructed in a way that would screen the facility from the surroundings. The facility will remain out of sight from the highway because it is screened by a buffer of trees and sits at the bottom of a steep canyon. The facility was already visible to properties directly across the river or from the river itself. Over time the concrete will weather and begin to resemble the exposed rock typical of the canyon, minimizing the visual impact to the surrounding area.

A single suggestion was made to improve downstream safety measures in the event of a water rescue below the barrier dam. The proposed action includes upstream signage warning boaters of the barrier dam and an improved boat landing on the north bank of the North Santiam River; this should significantly improve boater awareness and safety on the North Santiam River.

Finally, one comment was received expressing concerns about construction and operations impacts (primarily noise and lighting) to wildlife and surrounding environment. All lighting at the facility will have covers so that they shine down and not onto to neighboring properties. The suite of equipment used during construction will likely include, but not limited to backhoes, cranes, cement trucks, dump trucks, excavators, graders, etc. Typical construction noise can be expected, however, contract specifications have placed maximum noise levels at 86 decibels (dB) for continuous noise and 140 dB for peak noise levels at the project site. The 86 dB level is higher than ambient highway noise created by a typical two-lane highway (63dB) and the higher peak noise level will only happen periodically during construction. Further, due the degenerative nature of sound as it travels away from the source will result in sound attenuation to a reasonable “background” level at a distance of 500 to 1,000 feet from the source. Finally, the noise from operation of the facility is not expected to be discernable from background dB levels once construction is completed.

All of the comments received were considered, and where applicable, incorporated into the final project design.

6. COMPLIANCE WITH LAWS AND REGULATIONS

6.1. National Environmental Policy Act

This Environmental Assessment satisfies the requirements of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.).

6.2. Clean Air Act

The Clean Air Act of 1970, as amended, established a comprehensive program for improving and maintaining air quality throughout the United States. Its goals are achieved through permitting of stationary sources, restricting the emission of toxic substances from stationary and mobile sources, and establishing National Ambient Air Quality Standards. Title IV of the Act includes provisions for complying with noise pollution standards. For the proposed action, there would be an intermittent and short-term reduction in air quality during construction due to emissions from construction equipment. There also would be an intermittent and short-term increase in noise levels from construction equipment and blasting. Blasting will take place over a 60- to 80-day period in the beginning of the construction contract. Use of stemming will minimize most of the noise impacts during rock blasting. Noise impacts would be minor and temporary in nature and would cease once blasting and construction are completed.

6.3. Clean Water Act

Section 401 of the Clean Water Act of 1977, as amended, requires certification from state or interstate water control agencies that a proposed water resources project is in compliance with established effluent limitations and water quality standards. The Corps received a Section 401 Water Quality Certification from DEQ which states that "DEQ does not anticipate any long-term violations of State Water Quality Standards, including *Oregon Administrative Rule (OAR) 340-41-0004, Antidegradation Policy for Surface Waters*, provided the applicant strictly adheres to the conditions…" as found in the Water Quality Certification. A Section 404(b)(1) Evaluation was prepared for the proposed action prior to construction. In addition, a 1200-C National Pollutant Discharge Elimination System (section 402) permit was received from DEQ which addresses stormwater discharges during construction.

6.4. Endangered Species Act

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species. Information on federally listed fish and wildlife species and designated critical habitat is presented in this EA. This project is a requirement of RPA 4.6 of NMFS' 2008 Willamette BiOp. Construction activities are consistent with the proposed action identified in NMFS' Standard Local Operating Procedures for Endangered Species programmatic biological opinion (BiOp) and construction activities will adhere to the terms and conditions identified in that document as well. On December 6, 2010, the NMFS confirmed that the Minto Project was consistent with the proposed action and approved the design. Operation of the facility, and associated ESA requirements are addressed and covered in the Willamette BiOp. A "no

effects" determination was made for species under the jurisdiction of the U.S. Fish and Wildlife Service based on the lack of presence of these species in the project area and timing of specific project elements.

6.5. Fish and Wildlife Coordination Act

This Act states that federal agencies involved in water resource development are to consult with the USFWS concerning proposed actions or plans. The proposed action has been coordinated with the USFWS in accordance with the Act.

6.6. Migratory Bird Treaty Act and Migratory Bird Conservation Act

These acts require that migratory birds not be harmed or harassed. Under the Migratory Bird Treaty Act, "migratory birds" essentially include all birds native to the U.S. and the Act pertains to any time of the year, not just during migration. The Migratory Bird Conservation Act aims to protect game birds. The initial site preparation will remove some possible habitat for migratory birds; however, natural vegetation will be reestablished on the site. Construction-related noise could displace birds by causing flushing, altering flight patterns, or causing other behavioral changes, but it is not expected that effects would rise to the level of harm or harassment.

6.7. National Historic Preservation Act

Section 106 of the National Historic Preservation Act requires that federally assisted or federally permitted projects account for the potential effects on sites, districts, buildings, structures, or objects that are included in or eligible for inclusion in the National Register of Historic Places. No historic properties will be affected by the project. A historic railroad grade identified following cultural resources survey and sub-surface testing and assigned Smithsonian trinomial number 35MA291 was the only site identified on either the Minto or Minto North parcels. After review by the Oregon State Historic Preservation Officer (SHPO), they concurred with the Corps that site 35MA291 was not eligible for the National Register of Historic Places therefore the proposed project will have no effect on eligible historic properties.

6.8. Native American Graves Protection and Repatriation Act

This Act provides for the protection of Native American (and Native Hawaiian) cultural items, established ownership and control of Native American cultural items, human remains, and associated funerary objects to Native Americans. It also establishes requirements for the treatment of Native American human remains and sacred or cultural objects found on federal land. This Act also provides for the protection, inventory, and repatriation of Native American cultural items, human remains, and associated funerary objects. There are no recorded historic properties within the immediate project area and the probability of locating human remains in this area is low. However, if human remains are discovered during construction, the Corps and/or the Contractor will be responsible for following all requirements of the Act.

6.9. Environmental Justice

Executive Order 12898 requires federal agencies to consider and minimize potential impacts on subsistence, low-income, or minority communities. The goal is to ensure that no person or group of people should shoulder a disproportionate share of the negative environmental impacts resulting from the execution of domestic and foreign policy programs. The proposed action is not expected to disproportionately affect low income and/or minority populations, and is in compliance with Executive Order 12898.

6.10. Executive Order 11988, Floodplain Management

Executive Order 11988, Floodplain Management requires federal agencies to consider how their actions may encourage future development in floodplains, and to minimize such development. The proposed action would not affect development of floodplains or the management of floodplains. This is because the project area is in a steep canyon with limited floodplain in the area and the majority of the facility will be located above the 100-year flood elevation. Due to the nature and purpose of the facility (adult fish collection), some of the project must extend through the floodplain and into the river. Also, given the steep topography of the area, and the fact that the Corps owns the lands surrounding the facility, no future development in the near-by vicinity of the project are expected. Finally, this project and site selection occurred after extensive consideration by the Corps and was chosen, for among other reasons, for the fact that the area was already impacted and alternative locations would likely result in additional impacts.

6.11. Executive Order 11990, Protection of Wetlands

Executive Order 11990 provides that Federal agencies shall avoid construction located in wetlands unless the agency finds that there are no practicable alternatives to the construction and that the proposed action includes all practicable measures to minimize harm to wetlands. Wetlands on the Minto and Minto North properties will be filled for the proposed action. It was determined that the logistics and cost associated with transferring excavated materials from the Minto project to an alternative location other than the North Minot property was not feasible. Given that the wetlands impacted are low quality and providing limited ecological function and that the area is so small (less than 0.10 acre) that mitigation is not required under the Clean Water Act, the impacts to wetlands associated with the Minto project is not significant.

6.12. Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance

Executive Order 13514 requires Federal agencies to increase energy efficiency; measure, report, conserve and reduce their greenhouse gas emissions from direct and indirect activities; conserve and protect water resources through efficiency, reuse, and stormwater management; eliminate waste, recycle, and prevent pollution; leverage agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products, and services; design, construct, maintain, and operate high performance sustainable buildings in sustainable locations; strengthen the vitality and livability of the communities in which Federal facilities are located; and inform Federal employees about and involve them in the achievement of these goals.

Prior to demolition of the existing facility, materials suitable for recycling, primarily aluminum piping used to sort and crowd fish, will be removed and recycled in coordination with the Corps' Willamette Project staff. Further, the trees that will be removed to accommodate the larger facility will be stockpiled and reused for in-stream habitat projects and is being coordinated with the Santiam Watershed Council and Willamette Project Staff. Also, a comprehensive post-construction stormwater management plan was developed to manage stormwater on-site and significantly reduce runoff. Finally, during the project siting alternative analysis, all other potential locations would require significant modification of existing in-stream and riparian habitat that was generally intact at those locations; by rebuilding the Minto facility at the current location only minimal additional impacts to in-stream and riparian habitats were required.

6.13. Prime and Unique Farmlands

There are no prime and unique farmlands in the Minto project area.

6.14. Comprehensive Environmental Response, Compensation, and Liability Act and Resource Conservation and Recovery Act

There is no indication that any hazardous, toxic, and radioactive wastes are in the vicinity of the Minto fish facility or the Minto North property. Any presence of these types of wastes would be responded to within the requirements of the law and Corps' regulations and guidelines.

7. LITERATURE CITED

Chilcote, M. 2007. Viability status of Oregon salmon and steelhead populations in the Willamette and Lower Columbia Basins. Appendix B: Oregon abundance time series. Prepared for Oregon Department of Fish and Wildlife and National Marine Fisheries Service, Portland, OR.

Corps (U.S. Army Corps of Engineers). 2000. Willamette Project Biological Assessment. Portland District, Portland OR.

Corps. 2009a. Willamette Valley Projects Configuration/Operation Plan (COP). Phase I Report. Portland District, Portland, OR.

Corps. 2009b. Design Documentation Report No. 1, Minto Fish Collection Facility Rebuild, Willamette River Basin, North Santiam River, Oregon. Portland District, Portland, OR.

Firman, J., M. Buckman, R. Schroeder, and K. Kenaston. 2005. Work completed for compliance with the Biological Opinion for hatchery programs in the Willamette Basin. Oregon Department of Fish and Wildlife, Corvallis.

Good, T.P., R.S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. NOAA Tech. Memo., NMFS-NWFSC-66.

Mattson, C.R. 1948. Spawning ground studies of Willamette River spring Chinook salmon. Research Briefs of the Oregon Fish Commission 1(2):21-32.

McElhany, P., M. Chilcote, J. Myers, and R. Beamesderfer. 2007. Viability status of Oregon salmon and steelhead populations in the Willamette and Lower Columbia Basins. Prepared for Oregon Department of Fish and Wildlife and National Marine Fisheries Service. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, WA.

McLaughlin, L. K. Schroeder, and K. Kenaston. 2008. Interim Activities for Monitoring Impacts Associated with Hatchery Programs in the Willamette Basin. Oregon Department of Fish and Wildlife, Salem.

NMFS (National Marine Fisheries Service). February 2008. Anadromous Salmonid Passage Facility Design. NMFS Northwest Region, Portland, OR.

NMFS. July 2008. Endangered Species Act Section 7(a)(2) Consultation, Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation, Consultation on the Willamette River Basin Flood Control Project. Log Number F/NWR/2000/02117, National Marine Fisheries Service Northwest Region, Seattle, WA.

North Santiam Watershed Council. 2002a. North Santiam River Watershed Assessment. Prepared by E&S Environmental Chemistry, Inc.

North Santiam Watershed Council. 2002b. Watershed Assessment Appendix: Upland Terrestrial Systems and Socio-Economic Conditions. Provided by the Bureau of Land Management.

ODFW (Oregon Department of Fish and Wildlife). 2005. 2005 Oregon Native Fish Status Report, Volume 1. ODFW, Salem.

ODFW. 2007a. Middle Fork Willamette Chinook HGMP 2007. Middle Fork Willamette Spring Chinook (Stock 22). Salem.

ODFW. 2007b. Upper Willamette Chinook and Steelhead Recovery Plan. Draft. ODFW, Corvallis.

Schroeder, R., M. Wade, J. Firman, M. Buckman, B. Cannon, M. Hogansen, K. Kenaston, and L. Krentz. 2006. Compliance with the biological opinion for hatchery programs in the Willamette Basin. Final Report. Oregon Department of Fish and Wildlife, Corvallis.

Tetra Tech, Inc. October 2008. Wetland and Delineation Report for the Wetland/Water of the U.S. Delineation of Minto Fish Facility and Marion Forks Hatchery, Marion County, Oregon. Prepared for the U.S. Army Corps of Engineers, Portland District, Portland, OR.

USFWS (U.S. Fish and Wildlife Service). May 2008. Final Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*). U.S. Fish and Wildlife Service Region 1, Portland, OR.

8. APENDICIES

8.1. Appendix A – Pre- and Post-Project Conditions

8.2. Appendix B – Wetland Delineation Maps

Appendix A – Pre- and post-project condition

Figure 8. Minto and Minto North pre-project condition

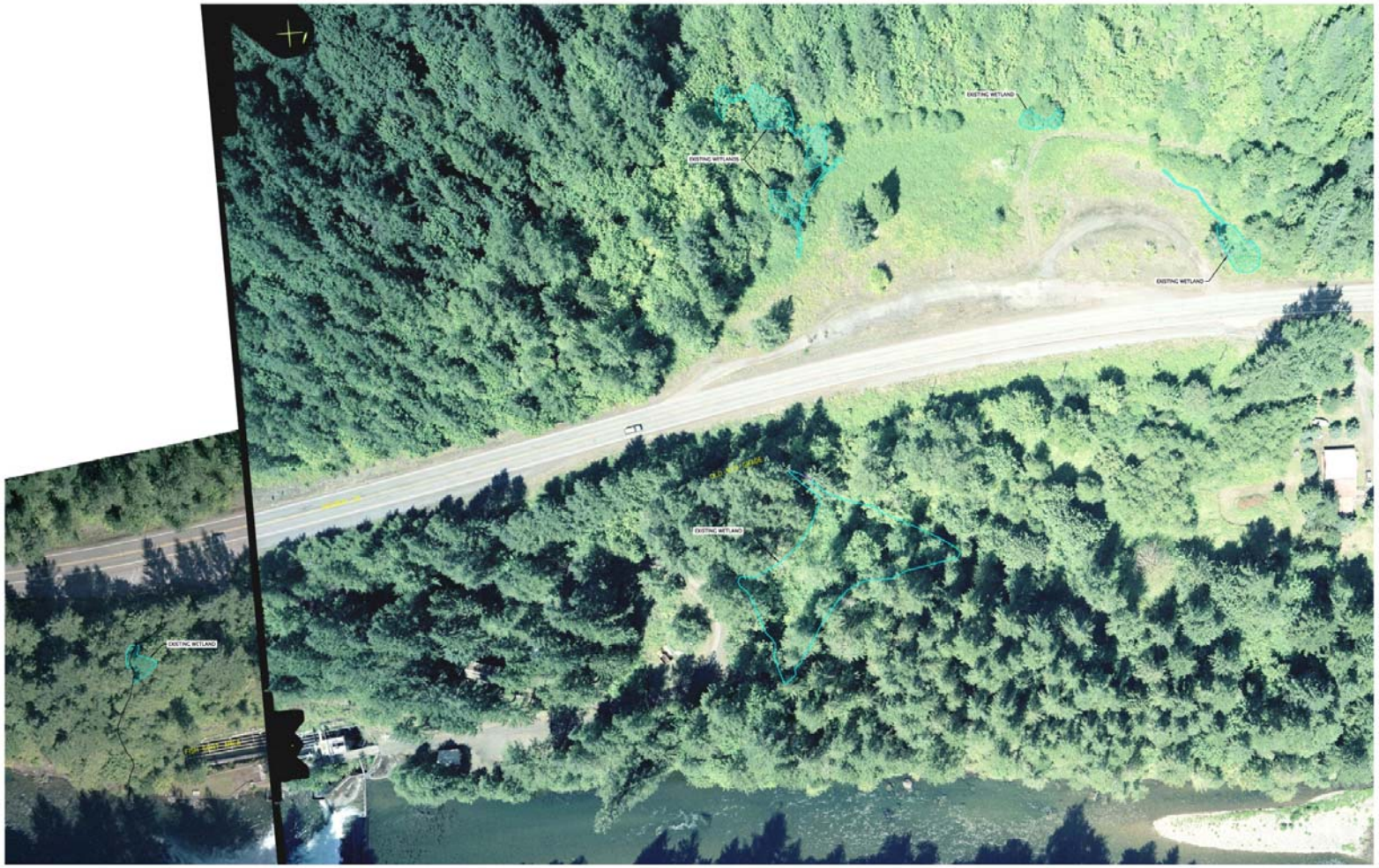
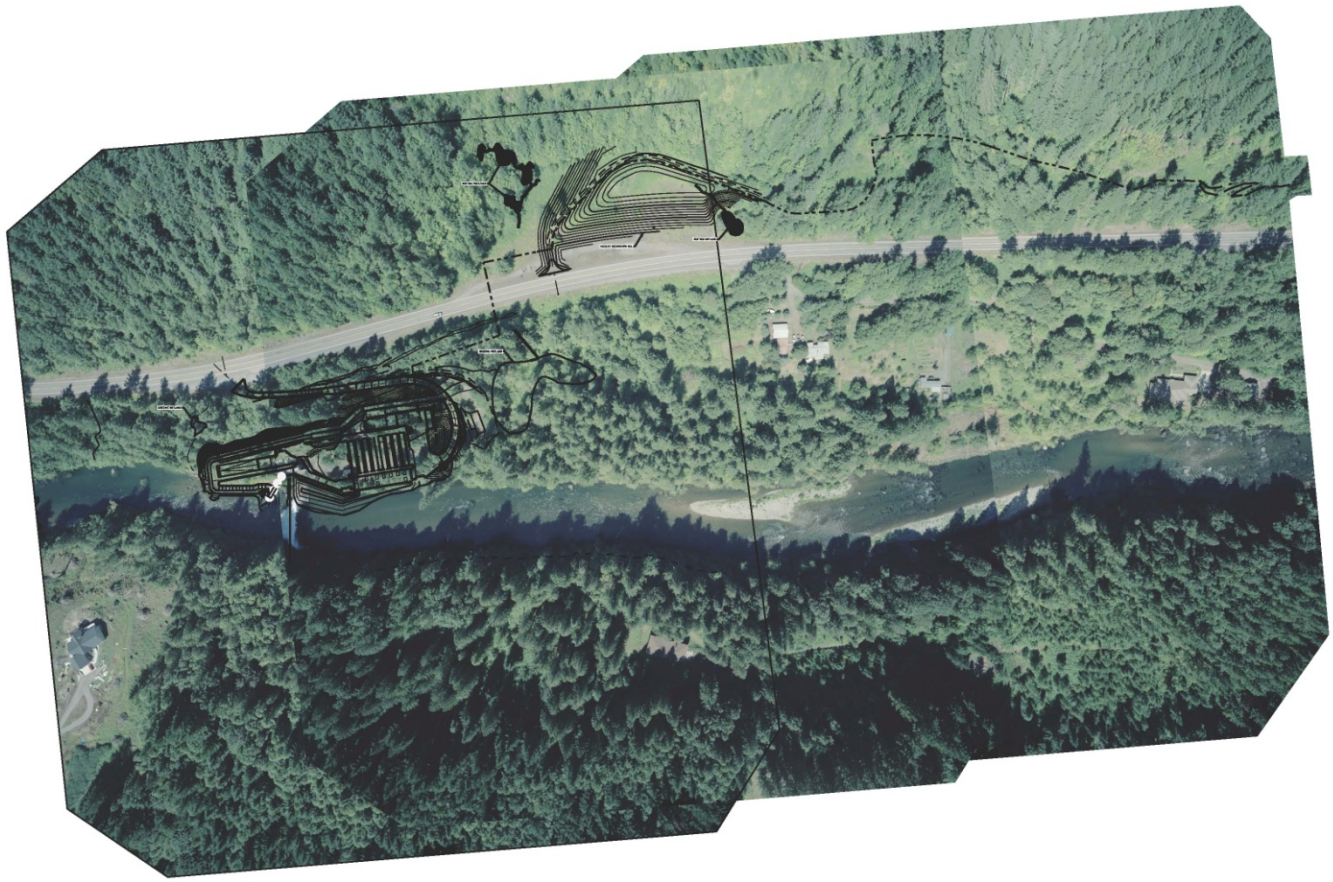


Figure 9. Minto and Minto North post-project condition



Appendix B – Wetland Delineation Maps

Figure 10. Minto wetland delineation

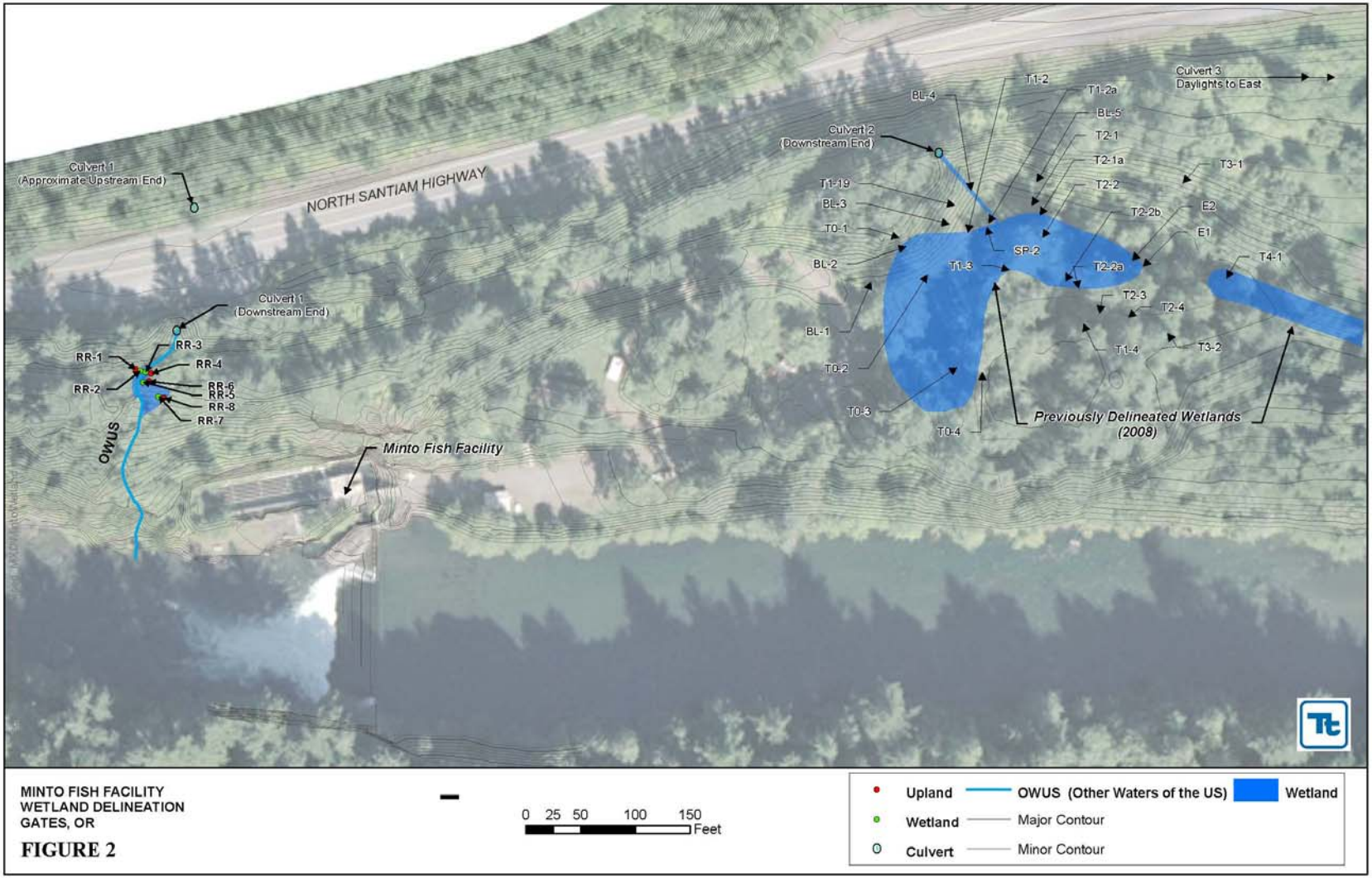


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Figure 11. Minto North wetland delineation