Lostine River/City of Lostine diversion Structure Replacement

Completion Report
For

Bonneville Power Administration Project Number 1992-026-01
Contract #56216
Performance Period March 1, 2012 – February 28, 2013
&
Oregon Department of Fish & Wildlife
Fish Screening and Passage Program
Grant No. 53300-703818-01
Project No. P-08-0065
Performance Period March 12, 2012 – December 31, 2012

By R. Coby Menton, Grande Ronde Model Watershed

February 2013

Photo 1: Looking upstream at the completed fishway and passage restoration project. Photo by R. Coby Menton.

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Abstract

Located 1-¼ miles south of the town of Lostine on the Lostine River is a fish ladder owned by Oregon Department of Fish and Wildlife (ODFW). This fishway was built in the early 1960's for the purpose of improving fish passage on the Lostine River at the City of Lostine irrigation diversion. When built the structure served a dual purpose. The first to provide adult Chinook salmon and steelhead passage both up and downstream at the point of diversion and the second to eliminate an annually built gravel push-up dam constructed by the irrigation ditch company. Push-up dams are a method by which streambed material is piled instream to check water and divert it down the irrigation canal. This method while effective at diverting irrigation water is disruptive to the stream, causes erosion and sedimentation, and if they span the channel cause a barrier to aquatic organism movement both up and downstream. Push-up dams are usually washed out during high spring flows and have to be re-built annually. The upstream end of the fishway checks water elevation sufficient for the irrigation company to divert water without a push-up dam.

The ladder built consisted of 5 channel crossing concrete walls that provided an approximate 15-inch jump between each of them. Each wall had several notches cut to provide for low flow and a more attractive area for fish to navigate the ladder. Some years after construction a sixth structure consisting of concrete, rock and metal on hand was built on the downstream end to remedy the lowest wall being undercut at high flows and help ensure favorable passage conditions.

Photo 2: This photo taken on August 2, 2012 before project construction shows the fish ladder from the downstream side. What looks like piled rocks at the bottom is the rock, concrete and metal used to shore up the lowest wall. Low flow notches are visible in the 5 walls and the elevation difference between each wall is 15-inches.

Problems with this fish ladder include its deteriorating condition, passage for all ages of aquatic organisms was not provided for and it does not meet current fish passage criteria as directed from both the State and Federal fish management agencies. Including the above pictured sixth structure the concrete walls had to be stabilized at least one other time following initial construction. This temporary fix required an excavator to push the walls back to a vertical position and shore them with large boulders. Due to high flow and age the walls were tipping over and becoming increasingly unstable. Had the structure washed out the ditch company would have had no provisions to divert irrigation water except by once again constructing a push-up dam.

Fish passage structures built in the 1960's are much different than today. Decades ago passage improvement efforts largely focused on adult salmonids, specifically Chinook salmon and steelhead in our area. Less consideration was given to juvenile Chinook and steelhead and any life stage of other resident fish species. While adult fish were able to navigate the fish ladder younger fish could not and this is why the structure did not meet current fish passage criteria. Current fish passage rules call for no more than a 6-inch jump height between structures in steams that are home to bull trout. Bull trout inhabit the Lostine River and any project addressing or affecting fish passage in the Lostine must meet this criteria.

In cooperation with Oregon Department of Fish and Wildlife the GRMW developed a project that would restore aquatic organism passage to all species and life stages, maintain the necessary physical characteristics of the stream channel to accommodate irrigation practices and result in a river channel natural in appearance and function. After several design and review iterations by agencies charged with managing fisheries, permitting in-stream work or funding restoration activities the design solution became a project that would reduce slope and jump heights at the fishway. The focus of the design was to implement a project that would restore both up and down stream passage and construct a project that would be durable, require no maintenance and return this 350-foot section of the Lostine River to a natural functioning condition.

Construction began on August 2, 2012 and ended on September 14, 2012. During this time 11 channel spanning rock structures known as cross-vanes were installed in the project area. The intent of the cross-vanes is to maintain the river channel grade and elevation during erosive high flows and focus low flows in the channel center during times of low flow. Each vane is constructed from large rock and in this case rock size ranged from 3-foot to 5-foot. Slope reduction through the reach was accomplished by spacing each vane approximately 30-feet apart resulting in a project length of 300-feet compared to the prior fishway that was just over 100-feet long. For several reasons including stability, maintaining irrigation diversion capabilities and providing additional structure the old fishway was left in place except for small modifications to install the vanes. The new rock structure has been incorporated into and on top of the 5 concrete walls.

A second component of construction was the placement of river gravel between each of the vanes. This process is necessary to simulate a natural stream bottom and stabilize the cross-vanes. The size of this material ranged from sand to medium sized cobbles and was installed by a process called blending. Blending is a method by which the material is installed is small amounts, incorporated with existing material, compacted with heavy equipment and sealed with high-pressure water. Blending results in keeping river flow on the surface rather than subsurface as could happen in loose unconsolidated material.

Photo 3: Photo taken on September 5, 2012 near the upstream end of the project looking upstream. In this photo the contractor is blending channel bottom material to prevent flow from going subsurface. The excavator places the material, provides compaction and the high-pressure water seals the channel bottom. To implement instream projects flow is diverted around the work area and in this case flow has been moved to one side of the river channel and isolated with the white sand bags and plastic tarps.

The final construction phase of the project was to install fish habitat enhancing large wood features. Two were installed and they consist of 3 trees with rootwads intact, pinned together, held in place with large rock and buried into the stream banks. At completion the rootwads extend into the river channel and the tree trunks are buried into the bank. Large wood provides a multitude of benefits including hiding cover, resting pools and habitat diversity for fish.

Photo 4: This photo taken on September 13, 2012 is from the same location as photo number 2. At the time of the photo water had been running through the newly constructed project for 2 days and flow did not go subsurface. The fishway built in the 1960's has been overtopped with a natural channel design fishway that gives the river a more natural appearance as well as restoring fish passage.

Steve Lindley Construction, Inc. was awarded the construction contract and from August 2nd to September 14th they hauled and installed 1,467 cubic yards of boulders and 1,370 cubic yards of river gravel and backfill material. They did this on time and to specification in 42 days. The construction crew implemented a variety of tactics to reduce impact at the construction site. Original plans called for two access points to the project site but with an innovative use of a temporary bridge access was reduced to one point. This not only reduced cleanup and reclamation of disturbed areas but also preserved valuable streamside vegetation. The crew also paid extra attention to the preservation of riparian vegetation during construction. Very few trees were removed and where the rock structures key into the stream banks trees and shrubs were left undisturbed to the maximum extent possible. In an attempt to reduce disturbance to neighbors' rock delivery times were scheduled after 7 in the morning, the crew worked Monday through Thursday and no work occurred on weekends.

Bonneville Power Administration funded the majority of this project through their Environment Fish and Wildlife Program. Other cost share partners included ODFW and the Lostine Ditch Company. Many agencies provided technical assistance but

none more than ODFW. The Nez Perce Tribe provided valuable fish tracking data through the project area to monitor passage conditions during construction. The US Fish and Wildlife Service observed construction over a period of 2 days to ensure that all terms and conditions of construction were being followed.

Introduction

With the cooperation of the Lostine Ditch Company, technical assistance from ODFW, and engineering services of Anderson Perry (AP) the GRMW completed this fish ladder replacement project during the instream work window in the summer of 2012. AP provided survey and design and acquired removal/fill permits and the GRMW accomplished all other environmental compliance requirements. The GRMW is the project sponsor and responsible for all contracting and AP supplied construction engineering and inspection. The resulting project is a diversion structure and fishway that requires minimal annual instream maintenance, reduces erosion and sedimentation, and improves aquatic passage conditions.

Pre Project Condition

The concrete diversion structure and fishway was built in the early 1960's, has been repaired in the past and was an upstream barrier to all fish at high flow and juvenile anadromous fish at all flows. Below the diversion is the fishway, the walls span the width of the river and each has two to three notches approximately 3 feet wide. The elevation difference between each wall was approximately 15 inches, which exceeds fish passage criteria. Past repairs included shoring the walls with rock and piling debris below the structure to improve stability and reduce scour at high flow. These efforts improved stability but were temporary until a permanent solution could be constructed.

The Lostine Ditch Diversion is used during the Wallowa Valley irrigation season, which starts on May 1st and ends on September 30th. At all times of the year this ditch delivers stock water at a much lower rate than during irrigation season. An ODFW operated fish screen composed of three paddle wheel operated drums is located below the diversion and in the irrigation ditch.

A bridge is located approximately 400 feet downstream of the diversion head gate and was considered a project constraint. The river cannot be altered below the bridge without compromising the stability of the bridge. Another project constraint was that the irrigators served by the ditch requested no modifications to the most upstream wall of the fishway. This top wall is used to check water for delivery to the irrigation ditch and any modification would have altered this capability. Final design revealed that no modification to this wall was necessary.

Fish that are native to the Lostine River include spring Chinook, summer steelhead, rainbow trout, and bull trout as well as other resident species. Design criteria to

pass spring Chinook, bull trout, and steelhead are the most stringent and were used for design purposes. Spring Chinook migrate through the Lostine system to their spawning areas between July and mid-September. Summer steelhead migrate to their spawning areas in late winter and spring. Bull trout are very sparse in the area and mainly forage during winter and early spring. However, bull trout use this reach as a migration corridor to access spawning areas in the upper Lostine River from June through September. The main factors affecting fish movement are temperature and turbidity. As temperatures start to rise, fish tend to move upstream into cooler waters. Turbidity causes fish to hold up and not move much.

The Grande Ronde Subbasin Plan Supplement identifies the importance of this project in the following sections for the Lostine River:

1. 5.2.2.1, page 37, GRSBP. Provide connectivity between functioning habitats.
2. 5.2.4.1, page 38, GRSBP. Protect high quality habitat and protect and restore connectivity of functioning habitats.
3. Table 5.4, Wallowa – Lostine River, page 40, GRSBP. Priority attribute sediment (reduction)
4. Table 5.6, page 50, GRSBP. Grande Ronde Subbasin watersheds listed in order of potential impact to steelhead and spring Chinook populations (abundance and productivity) from comprehensive habitat restoration: Wallowa – Lostine is the highest ranked watershed.

Project Objectives

1. Improve year round passage for all life stages of aquatic organisms in the Lostine River at the project site at project completion.
2. Eliminate sediment producing maintenance activities due to diversion structure maintenance at project completion.
3. Restore natural bedload and sediment transport through the project reach at project completion by converting from the unnatural step-pool structure to a roughened channel habitat type.

Methods and Materials

Proposed Actions

1. Coordination –GRMW is the project sponsor, ODFW owns the facility and is providing technical assistance. GRMW will coordinate funding, environmental compliance, engineering and stakeholders.
2. Design & Engineering – GRMW contracted AP to complete initial design concept and final engineering complete with construction specification. The deliverable is final design with construction specification.

3. Environmental compliance –ESA Section 7 Consultation will be completed with USFWS through the Partners for Wildlife Programmatic process that covers consultation for both USFWS and NMFS. GRMW will contract with AP to complete removal/fill permit applications. The first deliverable is biological clearance for the project as stated in the letter of concurrence from USFWS complete with terms and conditions of project construction. The second deliverable is removal/fill permits from both Oregon DSL and Army Corps' of Engineers complete with terms and conditions of project construction. Cultural resources clearance is not necessary due to prior archaeological surveys of the project site.
4. Contracting – GRMW will contract with BPA for funds to implement the project. GRMW will also advertise for and retain a construction contractor and materials provider assistance to build the project. All contracts will be in place by June 15th, 2012.
5. Construction – The project will be constructed during the in-stream work window for this reach of the Lostine River during the summer of 2012. Anticipated work includes mobilization, delivery of rock & large wood material, installation of the roughened channel, site cleanup and final grading, planting and demobilization. The construction phase is expected to last no longer than the instream work window. The project will be complete by November 15, 2012. Construction elements include the following:
    a. Cross Vanes – Construction of the roughened channel over the 350 foot project length includes installation of 9 cross vanes. These vanes are built using 36 to 48-inch boulders, are keyed into each streambank and angle upstream. The primary purpose of the cross vanes is to maintain grade and stabilize the channel.
    b. Boulder Clusters – In the project reach and between the cross vanes boulder clusters will be installed. These features are each built with three 36 to 48-inch rocks, placed in groups near the surface and buried 60% to achieve hydraulic roughness and resting locations for fish.
    c. Low Flow Channel - A low flow channel will be constructed to concentrate flow and provide passage during low flow times of the year. The low flow channel is implemented by building notches in the cross vanes.
    d. Pools - Two pools will be constructed at each of the woody debris features. The two pools will provide resting areas for fish as they pass through the project area.
    e. Stream Simulation Material – This material is a mix of fine to course rock material that will be used to meet grade through the project reach. The fine material will fill the interstitial space between the course rocks and prevent flow from going subsurface in the project area.
    f. Woody Material – Three woody debris features will be installed. These features provide some bank stability and enhance fish habitat value in the area. The woody debris structures are built using three

rootwads with a length of 20 feet and a diameter of no less than 18 inches 10 feet from the root wad. The logs are woven together, pinned, keyed into the bank 15 feet, and held in place with large boulders.

g. Planting – All disturbed area will be restored with native grass seed material. Native live stakes will be planted along the streambank using an excavator-mounted stinger. The bottom of each live stake will be planted into the saturation zone enhancing survival rates. Planting will occur in the fall during the dormant season and prior to the ground freezing.

Implemented Actions

This project was implemented as designed, on time and to engineered specification. From proposal to implementation 3 design changes were suggested. The first was the addition of two cross-vanes. This lengthened the project footprint resulting in reduced slope and was suggested through the design review process. The second revision was the additions of rock-ribs between the vanes. This resulted in increased structural stability and was again a suggestion during the design review process. The final revision was the location and number of the woody debris features. This was a design change that occurred during construction and was suggested by the landowners. Three features were proposed and two were installed and the change resulted in reduced riparian vegetation removal, provided habitat complexity on bare streambanks, and large wood and its benefits were maintained as a project result. Had the third woody debris feature been installed additional mature riparian vegetation would have been removed.

Steve Lindley Contracting, LLC of Union, Oregon was awarded the construction contract. They were awarded the contract after the lowest qualified bidder declined to perform the project. Lindley Contracting started work on July 2, 2012 and demobilized from the project area on September 14, 2012. All work was completed during an extended in-stream work window for this section of the Lostine River. A 30-day time extension was granted due to high flow conditions in early July. The normal work window for the Lostine River is from July 15 to August 15 and in 2012 flow in the river remained high until the end of July. For this reason and after consultation with State and Federal regulatory agencies the in-water work was extended to September 15 to ensure that work could be completed in 2012. Reseeding occurred at the end of construction and willow stakes were installed during the week of November 12. Live stakes were planted in the dormant season and prior to ground freeze-up to maximize planting success. This restoration project was not implemented 100% according to the proposal but the design changes resulted in a project that will be more stable and further meet fish passage requirements. The following table indicates what was accomplished compared to what was proposed:

Deliverable Table

Action	Proposed	Contracted	Delivered	Difference
Pre-Implementation activities including design, permitting, consultation and coordination	100 hours of GRMW staff time and contractual agreements. ODFW contributed $727.54 for engineering.	As proposed	Coordination, removal/fill permits, Section 7 consultation and cultural resource clearance.	None
Project management including GRMW staff time, inspection engineering and agency administration	65 hours of GRMW staff time and inspection engineer support ($4,000 from ODFW)	As proposed	As proposed	None
In house personnel including fiscal management and office assistant	30 hours of in-kind support. ODFW contributed $3,473.88 in administration.	As proposed	As proposed	None
Contracted Services	$173,741 total. ODFW contributed $75,000.	$175,741	$175,741	+$2,000
Mobilization	$7,000	$7,000	As bid.	None
Remove concrete weirs	$12,000	$14,000	As specified following change order during construction.	+$2,000
Clearing and grubbing	$4,000	$4,000	As bid.	None
Grade control structures	$89,991 (9)	$89,991 (11)	As specified following review comment.	+2 vanes
Rock Ribs	$18,000 (not proposed)	$18,000	As specified following review comment.	+10 ribs
Woody debris structure	$3,000 (3)	$3,000 (2)	As negotiated during construction.	-1 feature
Streambed simulation material	$13,500	$13,500	As specified.	None
Rock clusters	$10,750	$10,750	As specified.	None
Seeding and planting	$500	$500	As specified.	None
Water control	$15,000	$15,000	As bid.	None
Construction easement & payment to Richard and Jennifer Hobbs. The easement was specified by ODFW and the Hobbs family.	Not proposed	$5,000. Lostine Ditch Company paid $3,000 and GRMW paid $2,000	Construction easement.	+$5,000

Discussion

Initial conversations and inception of this project began nearly 10-years ago and both ODFW and the Nez Perce Tribe have recognized the Lostine diversion fishway as a passage barrier for many years. At least one attempt was made to modify the structure to meet state and federal fish passage criteria. This effort in 2007 did not come to fruition due to inadequate design engineering and therefore lack of funding.

In 2009 the GRMW assumed leadership and over the next 3-years several design iterations were generated, stakeholders were consulted, and in early 2012 a final approved design was issued. It was reviewed by no less than 10 fish management agency personnel and based on the number of design changes recommended the final design was the only project that could have been permitted and approved through ESA consultation. The main design challenge was to engineer a structure that would meet both state and federal fish passage criteria for jump height and water velocity. At final the designed jump height was met 100% of the time and velocity standards are met for all but 95% and greater excedence flows. Structure stability, high probability of reduced maintenance and a return to natural sediment transport processes were also considered and approved in the final design.

The project area is a very popular location for locals and passers-by to view migrating Chinook salmon. For this reason in addition to the work window coinciding with Chinook spawning migration season the construction site was very busy with onlookers. This caused significant discomfort for the construction contractor, the GRMW and other project stakeholders. Another added complexity was the landowner. The Hobbs family took it upon themselves to monitor the project from a fish passage and turbidity perspective. Monitoring for the most part was visual, which caused them certain anxiety, and this discomfort was relayed to project management. Rather than cause further discomfort the GRMW requested that US Fish and Wildlife Service inspect construction, environmental conditions and fish passage efficacy. This occurred over a 2-day period and while work site conditions were not ideal they recommended no violation or corrective actions. Following this assessment, work progressed to completion without delay.

Coordination was by far the most challenging aspect of the project. Up until solicitation for construction bids the GRMW operated under the assumption that the project would be completed within the State of Oregon easement boundary for the fish passage structure. Due to several design changes the project footprint expanded outside of this boundary and this was not understood until the later stages of pre-construction activities. This was a clear oversight, coordination was less than adequate and the result of this oversight was many weeks of easement negotiation between the Hobbs family and ODFW the easement holder. The resultant revised easement allowed for construction as designed, provided for future maintenance if necessary, and cost the project an additional $5,000 in easement fees to the Hobbs family. This cost was not budgeted and was unprecedented on GRMW projects. The Lostine Ditch Company and the GRMW paid

the easement fee. All construction occurred on Hobbs property, staging was located on property owned by the City of Lostine and access to the area was from a County road.

It was not possible to divert the Lostine River around the construction site as a County road borders the project on one side and a wetland borders the other. The solution was to dewater the work area in the river rather than around it. This required two construction phases where one side was completed followed by dewatering and construction on the other. Because of this constraint, the porous substrate of the river and high channel gradient both phases remained wet and impossible to completely dewater. The construction contractor provided extra sediment mitigation by installing two sediment-settling basins and a floating silt fence at the bottom of the project area. This significantly reduced turbidity but did not completely eliminate cloudy water from flowing below the area. Monitoring was done with a turbidity meter and when turbidity was high, the contractor voluntarily worked 45-minutes on, and 15-minutes off to reduce impacts. The main cause of turbidity was water "pumping" through the work site, a process by which subsurface water from upstream enters the surface in the work area. This combined with blending fine-grained material into the channel bottom while installing the channel simulation material resulted in high turbidity levels

<u>Lessons learned</u>

1. Fish passage projects in the State of Oregon are subject to additional scrutiny and approval. For this reason it is of paramount importance that State and Federal fisheries regulatory agencies be included early and often from project inception to final design development. Without this inclusion and assistance in project development passage projects will experience delay, increased cost, and unnecessary re-design work.
2. Efforts need to be made to educate the public and surrounding landowners in high visibility project areas. Without this public outreach locals and passers-by will cause undue concern for project management and construction contractors. Methods of outreach include the local newspaper, interpretive signs and handouts available at the project site. In the past the GRMW has relied upon public comment periods for removal/fill permits for public outreach. In many cases this is adequate but in high visibility areas it may not be.
3. Coordination of stakeholders is essential in any project requiring permits, ESA consultation and other documents required for use of public funds, in areas with endangered species and on privately owned land. The lesson for this project, stated in simple terms is, confirm what is thought to be true. Coordination with the landowners did not occur due to an easement boundary oversight. Had knowledge of the project footprint been compared to the ODFW easement boundary coordination with the landowners would have been done much earlier in the process, anxiety would have been reduced, and project cost may have been less.

4. Projects implemented at the GRMW are always constructed according to terms and conditions of all permits. This practice provided the GRMW security during disagreements at construction between the GRMW and the Hobbs family. Any deviation from these terms and conditions would have left the GRMW and possibly Lindley Construction liable for damages and corrective actions.
5. An additional lesson learned from this project is to implement turbidity management plans, inform the landowners of turbidity potential, and to engage stakeholders in the mitigation of turbidity issues.

Fish Salvage

Two fish salvage efforts were required due to the phased approach to construction. Each effort was coordinated with Lindley Construction and flow reduction in the areas to be dewatered was sequenced. Each time and over a 2-day period flow was reduced by thirds in an effort to encourage fish to leave the dewatered reach. In past projects the GRMW with guidance from ODFW has employed this approach as it significantly reduces the amount of fish handled in an area to be dewatered. A block net was installed at the lower end of the project site to preclude fish swimming into the work area and no barrier was necessary at the top end due to non-connectivity with the river. Capture consisted of using fish shockers, dip nets and transport buckets outfitted with aerators. The first salvage occurred on August 10, 2012 and the second on August 31, 2012. Salvage results are detailed below.

Salvage 1:

- Date: August 10, 2012.
- Supervisory fish Biologist
    1. Name: Jeff Yanke, District Fish Biologist, Oregon Department of Fish and Wildlife.
    2. Address: ODFW Enterprise, OR. 97828
    3. Telephone Number: 541.426.3279
- Two shocking passes were conducted one downstream and the second upstream. Prior to shocking the reach was surveyed for adult Chinook.
- Number of fish captured:
    - Chinook = 20
    - Steelhead = 32
    - Bulltrout = 0
    - Adults = 0
    - Chinook mortality = 1
    - Steelhead mortality = 0
- Release site: The release site was the live flowing undisturbed Lostine River below the work site.
- Condition at release: Clear, continuous flowing non-turbid water.
- Salvage Crew: GRMW (5) and ODFW (5)

Photo 5: Photo taken on August 10. Standing under the bridge at the bottom of the project. The flow on the left is the fish passage channel and the block-netted portion on the right is the side of the river that was salvaged.

Salvage 2:

- Date: August 31, 2012.
- Supervisory fish Biologist
  1. Name: Jeff Yanke, District Fish Biologist, Oregon Department of Fish and Wildlife.
  2. Address: ODFW Enterprise, OR. 97828
  3. Telephone Number: 541.426.3279
- Two shocking passes were conducted one downstream and the second upstream. Prior to shocking the reach was surveyed for adult Chinook.
- Number of fish captured:
  - Chinook = 30
  - Steelhead = 34
  - Bulltrout = 1 adult. Netted and released below the work site.
  - Adults = 2. Not shocked, netted and released below the work site.
  - Chinook mortality = 0
  - Steelhead mortality = 2
- Release site: The release site was the live flowing undisturbed Lostine River below the work site.

- Condition at release: Clear, continuous flowing non-turbid water.
- Salvage Crew: GRMW (2), ODFW (4), Lindley Construction (1), Observers (2).

Photo 6: Photo taken on August 31, 2012. Standing on the west bank of the Lostine River at the downstream end of the project. The second salvage has been completed, the bypass channel is in the foreground and the salvaged area is in the background.

Objectives Assessment

This project was built as detailed in the design sheets attached to this report and they serve for the as-built drawings. The only exception is the placement of the woody debris features. Their placement will not affect the project intent and will provide additional habitat, which is their purpose. At completion all site improvements are serving their intended purposes and project objectives are being met. Improved passage conditions and a return to normal sediment transport processes are immediate results and project objectives. Reduced maintenance and sediment producing activities is an objective that appears to have been met but will not be known for some time. If maintenance becomes necessary all stakeholders will be consulted and a course of action will be determined.

Photo 7: This photo taken on August 7, 2012 prior to start of construction shows the top 4 walls of the concrete fishway. The top wall serves as the irrigation diversion check wall and the Lostine Ditch Company asked that this wall be left undisturbed. Jump height at each wall exceeds State and Federal criteria.

Photo 8: Photo taken on September 13, 2012 at the same location as photos 3 and 7. The concrete fishway has been modified and overtopped with a roughened channel, natural channel design fishway. Flow had been activated through the project reach for 2-days at this time, it did not go subsurface, and there are no barriers for fish as they pass through the area.

Photo 9: This photo taken in the same location as photo #2 is at mid project looking upstream. Flow is centered in the channel as intended. Rock clusters have been placed between the cross-vanes to provide flow velocity diversity and resting areas for fish.

Photo 10: Standing near the top of project looking downstream on August 7, 2012. The large boulders below the wall in the foreground were used to shore this wall during a past maintenance activity.

Photo 11: Standing in the same location as photo 10 after project completion.

Acknowledgement

The Grande Ronde Model Watershed would like to thank all of those organizations that made the Lostine River/City of Lostine Diversion Replacement project possible. Without the generous funding support of BPA, ODFW and the Lostine Ditch Company this project would not have been completed. Technical assistance from ODFW, specifically the Enterprise office, was invaluable and design review from USFWS, NMFS, & ODFW Salem made this a better project. The Nez Perce Tribe Fisheries Department provided fish tracking data during the construction phase and for this our sincere thanks is given. Finally, to the Hobbs family our sincere gratitude is given for access to your property in order to improve fisheries in the Lostine watershed.

Final Budget

Funding Source	Cash Amount
BPA (cash)	$118,532.58
ODFW (cash)	$72,951.42
GRMW (cash)	$23,790.87
GRMW (in-kind)	$13,078
Lostine Ditch Company (cash)	$3,000
Total	**$231,352.87**

Project Expense	Cash Amount
Lindley Construction Inc.	$175,741
Anderson Perry & Associates	$50,611.87
Richard & Jennifer Hobbs	$5,000
Total	**$231,352.87**

BPA Project Title: Grande Ronde Model Watershed

Contract Title: 199202601 Lostine RVR Diversion Structure Replacement
Contract Number:
56216

Performance Period: March 1, 2012 - February 28, 2013

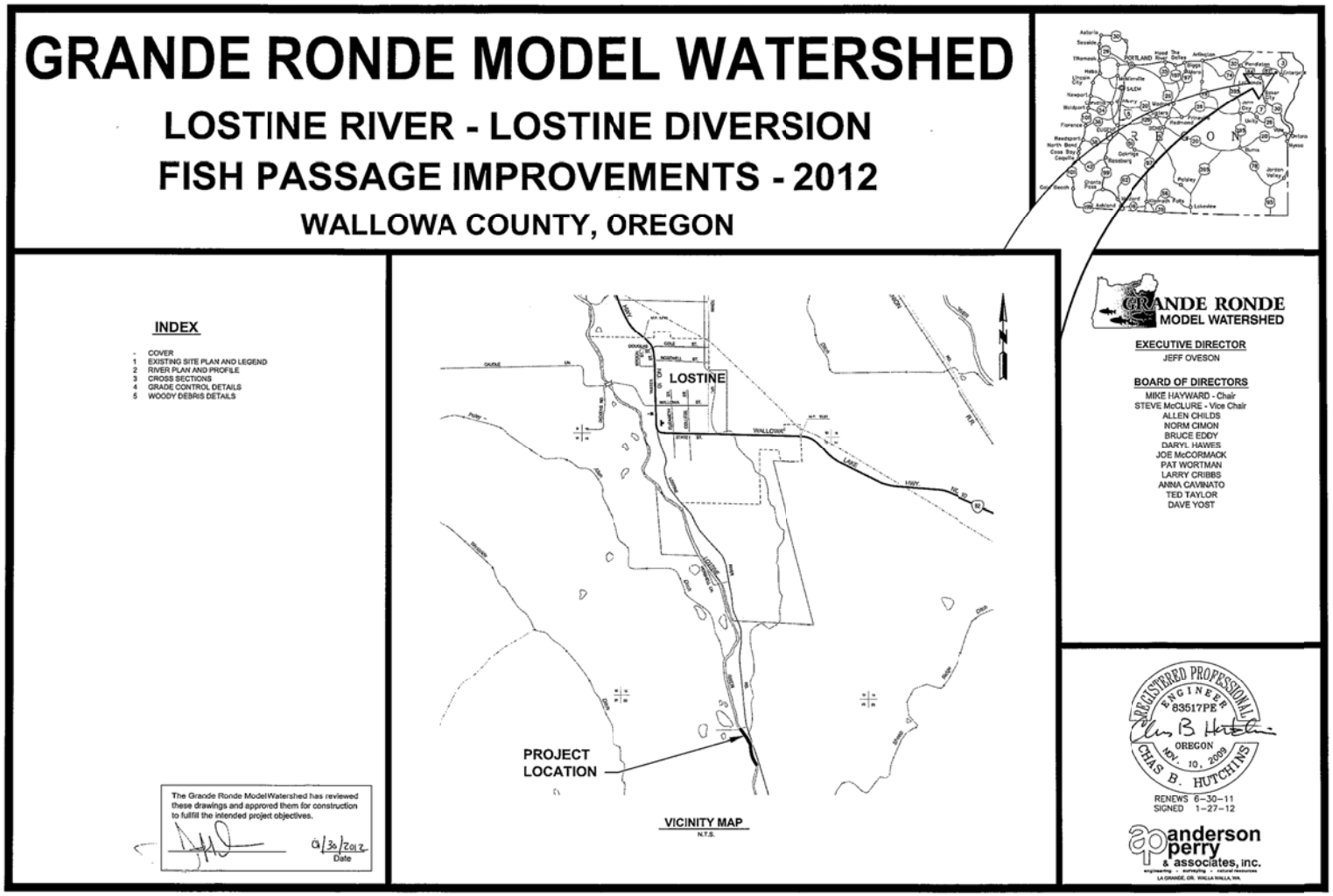
Period Covered for this Invoice: September 26, 2012 - November 26, 2012.

Invoice Number: 5621604 Final - Prepared: January 16, 2013 BY: Mary Estes 541-663-0570

Steve Lindley Contractor	Approved Budget	Total of Previous Invoices	Total for This Invoice	Total Invoices to Date	Total Remaining
Construction Engineer - AP	$11,000.00	$7,541.58	$0.00	$7,541.58	$3,458.42
Mobilization	$7,000.00	$7,000.00	$0.00	$7,000.00	$0.00
Remove Concrete Weirs	$14,000.00	$14,000.00	$0.00	$14,000.00	$0.00
Clearing and Grubbing	$4,000.00	$4,000.00	$0.00	$4,000.00	$0.00
Grade Control Structures	$25,241.00	$25,241.00	$0.00	$25,241.00	$0.00
Rock Rib	$18,000.00	$18,000.00	$0.00	$18,000.00	$0.00
Woody Debris Structures	$3,000.00	$3,000.00	$0.00	$3,000.00	$0.00
Streambed Simulation	$13,500.00	$13,500.00	$0.00	$13,500.00	$0.00
Seeding Planting Materials	$500.00	$0.00	$500.00	$500.00	$0.00
Rock Clusters	$10,750.00	$10,750.00	$0.00	$10,750.00	$0.00
Water Control	$15,000.00	$15,000.00	$0.00	$15,000.00	$0.00
TOTAL	**$121,991.00**	**$118,032.58**	**$500.00**	**$118,532.58**	**$3,458.42**

Grande Ronde Model Watershed						
1114 "J" Avenue, La Grande OR 97850						
ODFW Grant #53300-703818-01						
Project #: P-08-0065						
Project Title: City of Lostine Passage						
Performance Period of Grant: 3/12/12 - 12/31/12						
Performance Period of this Invoice: August 1, 2012 - September 25, 2012						
Date and Prepared by: October 9, 2012, Mary Estes						
				Total of	[redacted]	**Total**	
			Approved	**Previous**		**Invoices**	**Total**
			Budget	**Invoices**		**to Date**	**Remaining**
Contracted Services:							
Engineering and Design			$2,500.00	$0.00	$727.54	$727.54	$1,772.46
Construction Engineering			$4,000.00	$0.00	$4,000.00	$4,000.00	$0.00
Grade Control Structures - Lindley Con.			$64,750.00	$0.00	$64,750.00	$64,750.00	$0.00
GRMW Administration			$3,750.00	$0.00	$3,473.88	$3,473.88	$276.12
		Subtotal	**$75,000.00**	**$0.00**	**$72,951.42**	**$72,951.42**	**$2,048.58**

Map


GRANDE RONDE MODEL WATERSHED
LOSTINE RIVER - LOSTINE DIVERSION
FISH PASSAGE IMPROVEMENTS - 2012
WALLOWA COUNTY, OREGON
INDEX
- COVER
1 EXISTING SITE PLAN AND LEGEND
2 RIVER PLAN AND PROFILE
3 CROSS SECTIONS
4 GRADE CONTROL DETAILS
5 WOODY DEBRIS DETAILS
The Grande Ronde ModelWatershed has reviewed these drawings and approved them for construction to fulfill the intended project objectives.
Date
LOSTINE
PROJECT LOCATION
VICINITY MAP
N.T.S.
GRANDE RONDE MODEL WATERSHED
EXECUTIVE DIRECTOR
JEFF OVESON
BOARD OF DIRECTORS
MIKE HAYWARD - Chair
STEVE McCLURE - Vice Chair
ALLEN CHILDS
NORM CIMON
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DARYL HAWES
JOE McCORMACK
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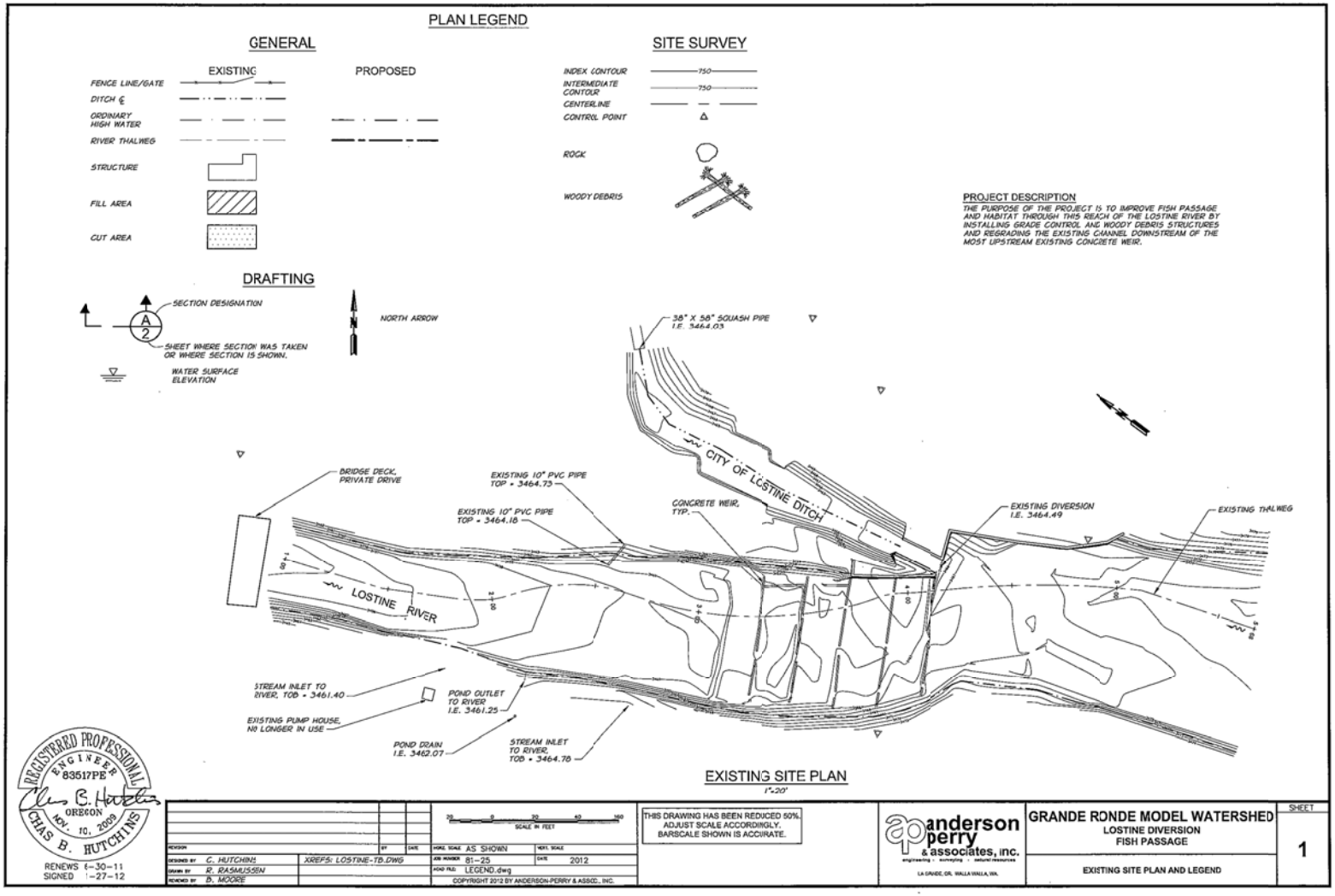
LARRY CRIBBS
ANNA CAVINATO
TED TAYLOR
DAVE YOST
REGISTERED PROFESSIONAL ENGINEER
83517PE
OREGON
NOV. 10, 2009
CHAS B. HUTCHINS
RENEWS 6-30-11
SIGNED 1-27-12
anderson perry & associates, inc.
Q:\Grande_Ronde_MW\81-25_LOSTINE RIV-LOST div09\dwg\COVER.dwg, COV, 1/27/2012 10:12:08 AM, pmichaldson

Design Sheets



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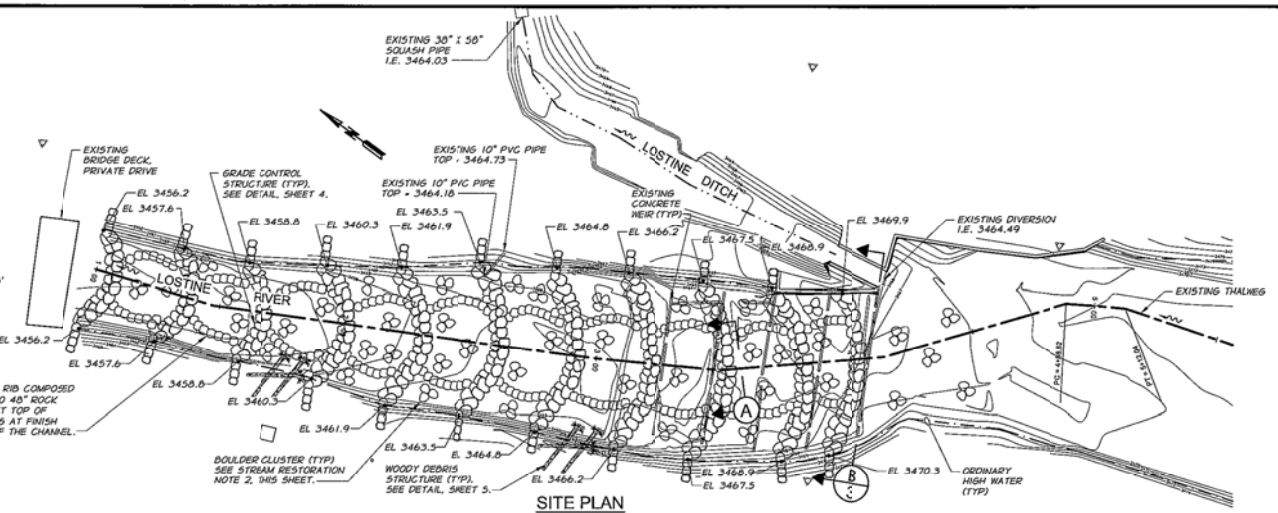
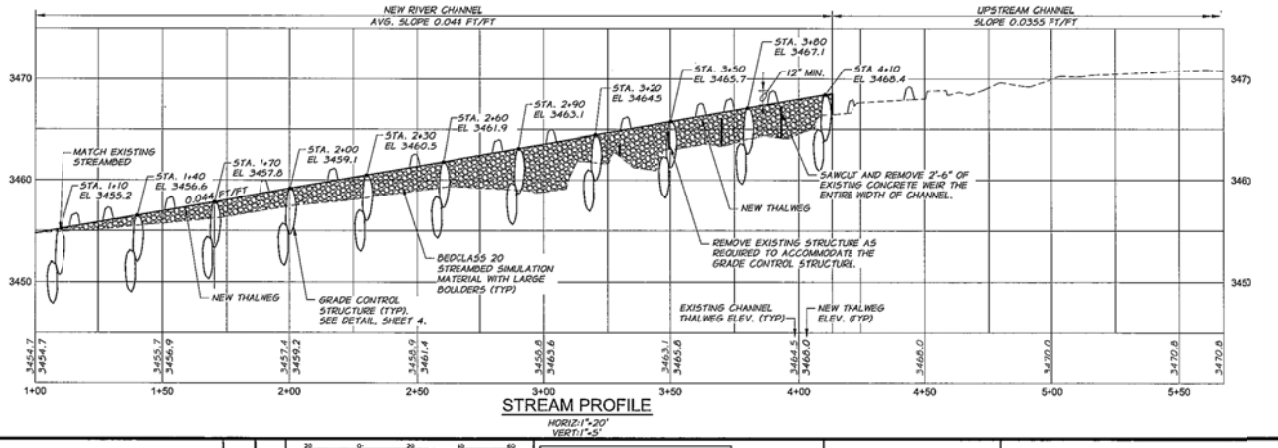
STREAM RESTORATION NOTES:

1. STREAMBED SIMULATION MATERIAL SHALL BE PLACED TO THE GRADE SHOWN ON THE DRAWINGS. MATERIAL SHALL BE PLACED BY FIRST INSTALLING THE LARGEST ROCK THAT WILL PROTRUDE ABOVE THE STREAMBED SURFACE. SMALLER MATERIAL SHALL THEN BE USED TO FILL THE VOIDS BETWEEN THE LARGE ROCK. THIS MATERIAL SHALL BE TAMPED IN PLACE FOLLOWED BY JETTING OR FLOODING THE SURFACE WITH WATER TO WASH THE FINER MATERIAL INTO REMAINING VOIDS.
2. BOULDERS RANGING IN SIZE FROM 36" TO 48" SHALL BE PLACED IN GROUPS OF 3 NEAR THE SURFACE OF THE STREAMBED AND SHALL BE BURIED APPROXIMATELY 60% TO ACHIEVE LARGE SCALE HYDRAULIC ROUGHNESS AND RESTING LOCATIONS FOR FISH. SPACING SHALL BE APPROXIMATELY 15' O.C. THROUGHOUT THE NEWLY CONSTRUCTED REACH.



SITE PLAN
HORIZ: 1"=20'



STREAM PROFILE
HORIZ:1"=20'
VERT:1"=5'

REGISTERED PROFESSIONAL ENGINEER
83517PE
OREGON
NOV. 10, 2009
CHAS B. HUTCHINS
RENEWS 6-30-11
SIGNED 1-27-12

DESIGNED BY	C. HUTCHINS	XREFS: LOSTINE-TB.DWG	
DRAWN BY	P. RICHARDSON		
REVIEWED BY	B. MOORE		

SCALE IN FEET
HORZ. SCALE 1"=20' VERT. SCALE 1"=5'
JOB NUMBER 81-25 DATE 2012
ACAD FILE: SITE-PP2B.dwg

THIS DRAWING HAS BEEN REDUCED 50%. ADJUST SCALE ACCORDINGLY. BARSCALE SHOWN IS ACCURATE.

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GRANDE RONDE MODEL WATERSHED
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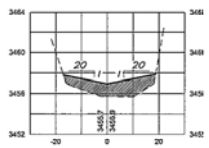
FISH PASSAGE

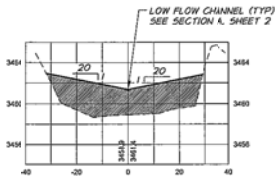
RIVER PLAN AND PROFILE

SHEET 2

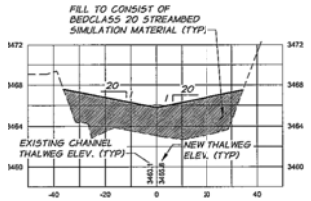
C:\Grande_Ronde_MW\81-25_LOSTINE RIV-LOST div09\dwg\SITE-PP2B.dwg, PP, 1/30/2012 1:37:00 PM, prichardson



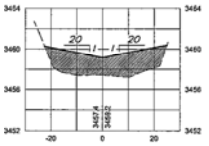
STATION 1+50
NEAT LINE FILL AREA = 43.55 SQ. FT.



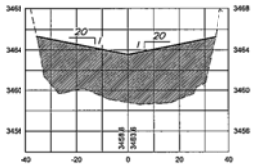
STATION 2+50
NEAT LINE FILL AREA = 160.4 SQ. FT.



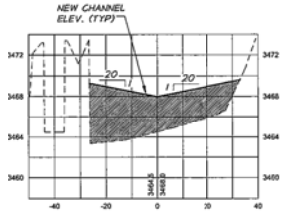
STATION 3+50
NEAT LINE FILL AREA = 210.1 SQ. FT.



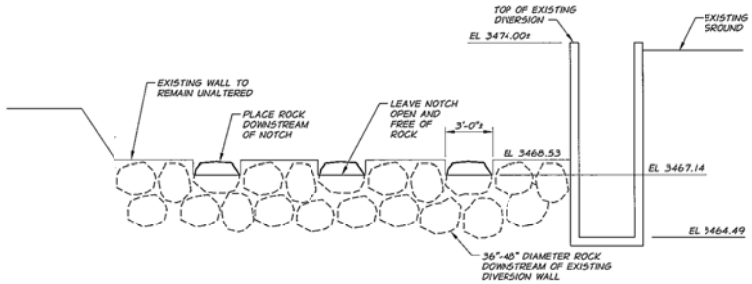
STATION 2+00
NEAT LINE FILL AREA = 93.0 SQ. FT.



STATION 3+00
NEAT LINE FILL AREA = 322.5 SQ. FT.



STATION 4+00
NEAT LINE FILL AREA = 221.1 SQ. FT.



SECTION B/2
N.T.S.

REGISTERED PROFESSIONAL ENGINEER
83517PE
OREGON
NOV. 10, 2009
CHAS B. HUTCHINS
RENEWS 6-30-11
SIGNED 1-27-12

REVISION	BY	DATE	
DESIGNED BY	C. HUTCHINS	XREFS: LOSTINE-TD.DWG	
DRAWN BY	P. RICHARDSON		
REVIEWED BY	B. MOORE		

SCALE IN FEET (20 0 20 40 60)
SCALE IN FEET (5 0 10 15)

HORZ. SCALE	1"=20'
VERT. SCALE	1"=5'
JOB NUMBER	81-25
DATE	2012
ACAD FILE	SITE-PP2B.dwg

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GRANDE RONDE MODEL WATERSHED
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FISH PASSAGE

CROSS SECTIONS

SHEET 3

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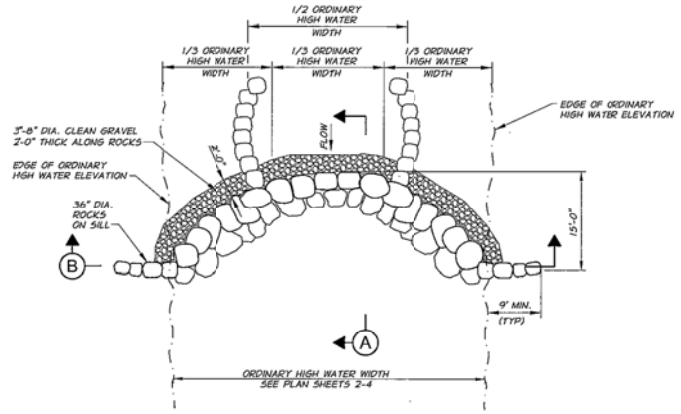
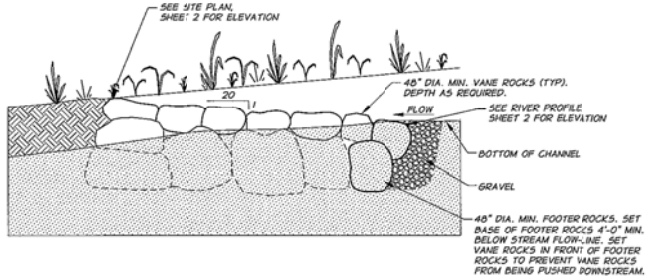
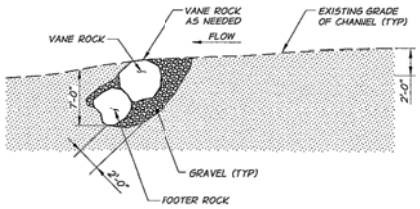


PLAN
N.T.S.

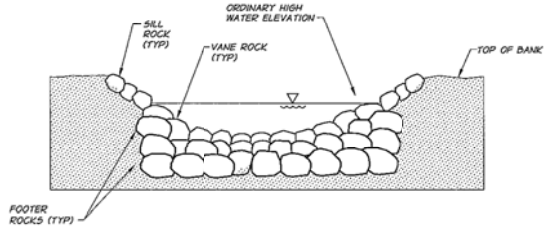


GRADE CONTROL SECTION A
(ROCKS SHOWN OUT OF SECTION FOR CLARITY)
N.T.S.



ROCK PLACEMENT DETAIL
N.T.S.

NOTES:
1. VANE ROCKS SHALL BE PLACED UPSTREAM AND AGAINST FOOTER AND LOWER VANE ROCKS, NOT ON TOP OF THEM.
2. GRAVEL SHALL BE COARSE GRADED AND INSTALLED SO THAT IT DOES NOT WASH THROUGH THE SPACES BETWEEN THE FOOTER AND VANE ROCKS.



GRADE CONTROL SECTION B
(ROCKS SHOWN OUT OF SECTION FOR CLARITY)
N.T.S.

NOTE:
1. SEE RICK PLACEMENT DETAIL THIS SHEET FOR HIW TO INSTALL ROCK.

REGISTERED PROFESSIONAL ENGINEER
83517PE
OREGON
NOV. 10, 2009
CHAS B. HUTCHINS
RENEWS 6-30-11
SIGNED 1-27-12

DESIGNED BY	C. HUTCHINS	XREFS: LOSTINE-TB.DWG	
DRAWN BY	P. RICHARDSON		
REVIEWED BY	B. MOORE		

HORZ. SCALE: NONE
VERT. SCALE:
JOB NUMBER: 81-25
DATE: 2012
ACAD FILE: VaneDetails.dwg

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GRADE CONTROL DETAILS

SHEET 4

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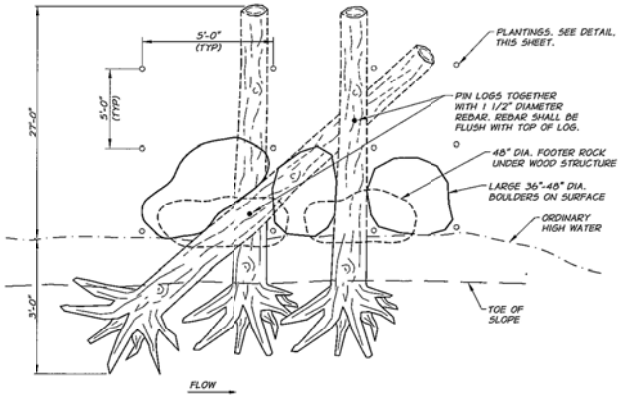
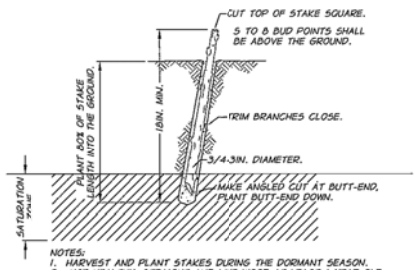


WOODY DEBRIS PLAN

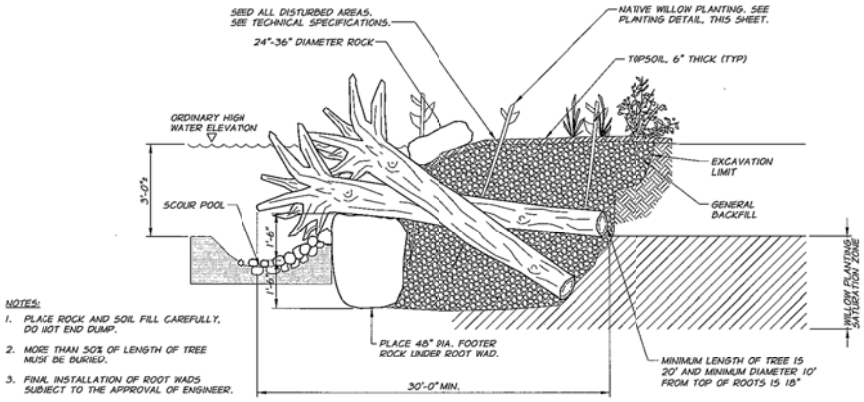
N.T.S.



NOTES:
1. HARVEST AND PLANT STAKES DURING THE DORMANT SEASON.
2. USE HEALTHY, STRAIGHT AND LIVE WOOD AT LEAST 1 YEAR OLD.
3. MAKE CLEAN CUTS AND DO NOT DAMAGE STAKES OR SPLIT ENDS DURING INSTALLATION. USE A PILOT BAR IN FIRM SOILS.
4. SOAK CUTTINGS FOR 24 HOURS (MIN.) PRIOR TO INSTALLATION.
5. TAMP THE SOIL AROUND THE STAKE.
6. EXTEND STAKES IN TO WATER SATURATION ZONE.

TYPICAL PLANTING DETAIL

N.T.S.



NOTES:
1. PLACE ROCK AND SOIL FILL CAREFULLY, DO NOT END DUMP.
2. MORE THAN 50% OF LENGTH OF TREE MUST BE BURIED.
3. FINAL INSTALLATION OF ROOT WADS SUBJECT TO THE APPROVAL OF ENGINEER.

WOODY DEBRIS SECTION

N.T.S.

REGISTERED PROFESSIONAL ENGINEER
83517PE
OREGON
NOV. 10, 2009
CHAS B. HUTCHINS
RENEWS 6-30-11
SIGNED 1-27-12

REVISION	BY	DATE

DESIGNED BY C. HUTCHINS
DRAWN BY P. RICHARDSON
REVIEWED BY B. MOORE
XREFS: LOSTINE-TB.DWG
HORZ. SCALE N.T.S.
VERT. SCALE
JOB NUMBER 81-25
DATE 2212
ACAD FILE VaneDet1.dwg

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GRANDE RONDE MODEL WATERSHED
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FISH PASSAGE

WOODY DEBRIS DETAILS

SHEET 5

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