

Lewis River Hydroelectric Projects

FERC Project Nos. 935, 2071, 2111, 2213



Photo courtesy of Kendel Emmerson

2011 Annual Report

Lewis River Aquatic Fund Projects



April 2010

Introduction

This 2011 Annual Report prepared by PacifiCorp Energy and the Public Utility District No. 1 of Cowlitz County, Washington (“Cowlitz PUD”) (collectively the “Utilities”) is provided to the Lewis River Settlement Agreement Parties to fulfill the reporting requirement in Article 7.5.3.2 (5) of the Settlement Agreement (SA). This report identifies the actions and selection of Aquatic Resource Projects (Resource Projects) to be funded from the Lewis River Aquatic Fund established under terms of the SA (Article 7.5, see **Appendix A**). Although the funding process was managed by the Utilities, the Aquatic Coordination Committee (ACC) provided final approval of funded projects. This report includes only Resource Projects selected from the 2010/2011 funding process, additional projects are expected to be selected and funded annually following the process established by the ACC.

This 2011 report is available to the Public on PacifiCorp Energy’s website at http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/annual_report_cover.pdf

Copies of this report are available from PacifiCorp Energy upon request.

Background

PacifiCorp Energy owns the Merwin, Yale, and Swift No. 1 hydroelectric projects on the Lewis River in southwest Washington. Cowlitz PUD owns the Swift No. 2 hydroelectric project, also located on the Lewis River. These projects are operated as a coordinated system by PacifiCorp Energy. On November 30, 2004, the Lewis River Settlement Agreement established the Lewis River Aquatics Fund (Fund). The purpose of the Fund is to support resource protection measures through funding aquatic related projects in the Lewis River basin.

As identified in the SA:

“Resource Projects may include, without limitation, projects that enhance and improve wetlands, riparian, and riverine habitats; projects that enhance and improve riparian and aquatic species connectivity that may be affected by the continued operation of the hydroelectric projects; and projects that increase the probability for a successful reintroduction program upstream of Merwin Dam. Species that are targeted to benefit from Resource Projects include Chinook, steelhead, coho, bull trout, chum, and sea-run cutthroat.”

Under the direction of the SA, the Utilities in Consultation with the ACC developed the “Aquatics Fund -- Strategic Plan and Administrative Procedures” (September 2005 – Revised January 2009). This strategic plan provides: (a) a guide to Resource Project development, solicitation, and review; and (b) provides administrative procedures to guide implementation of the Aquatics Fund.

The strategic plan is available to the Public on PacifiCorp Energy’s website at: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/Aquatics_Fund_Strategic_Plan_and_Administrative_Procedures_Sept_2005_Revised_January_2009.pdf

On September 3, 2010, PacifiCorp announced the availability of calendar year (CY) 2010/2011 funds for aquatic related projects in the Lewis River Basin (Letter to interested parties from T. Olson, PacifiCorp, see **Appendix B**). The letter requested that individuals or parties interested in obtaining project funding submit a Pre-Proposal to PacifiCorp. Pre-Proposals were due by October 4, 2010.

In response to the announcement letter, three entities provided seven different project Pre-Proposals. They include:

Applicant	Project Title
Cowlitz Indian Tribe	Eagle Island Habitat Enhancement: Sites B and C
USDA Forest Service	Lewis River Side Channel Near Muddy River Instream Habitat Restoration
USDA Forest Service	Muddy River Mainstem Restoration
USDA Forest Service	Muddy River Side Channel Restoration
USDA Forest Service	2011 Pine Creek Nutrient Enhancement by Snowcats and Snowmobiles
Lower Columbia Fish Enhancement Group	NF Lewis River Gravel Augmentation
Lower Columbia Fish Enhancement Group	NF Lewis RM 13.5 Side-Channel Habitat Enhancement

Following the Aquatics Fund – Strategic Plan and Administrative Procedures, PacifiCorp and Cowlitz PUD reviewed and evaluated the Pre-Proposals and, on November 18, 2010, provided the ACC with a list of projects recommended for further consideration (Memo to ACC from Shrier – PacifiCorp and Gritten-MacDonald – Cowlitz PUD, see **Appendix C**). In general the Utilities’ evaluation suggested that, while additional information is needed before a commitment of funds should be given, the following projects be solicited to provide complete Proposals:

- USDA FS – Muddy River Side Channel Restoration
- USDA FS – Muddy River Mainstem Restoration
- USDA FS – Lewis River Side Channel Near Muddy River Instream Habitat Restoration
- USDA FS – 2011 Pine Creek Nutrient Enhancement by Snowcats and Snowmobiles
- CIT - Eagle Island Habitat Enhancement – Sites B and C

- LCFEG – NF Lewis RM 13.5 Side-Channel Habitat Enhancement

The Rush Creek Side Channel Restoration project was not selected for full proposal.

On December 9, 2010, the ACC concurred with the Utilities evaluation to request full proposals for six of the seven submitted pre-proposals. Shortly thereafter, PacifiCorp notified the project sponsors and requested full Proposals by January 28, 2011.

Upon the due date, five of the six full proposals were submitted. The USDA Forest Service proposal for the 2011 Pine Creek Nutrient Enhancement by Snowcats and Snowmobiles was withdrawn on January 25, 2011.

Following receipt of the proposals the Utilities' Subject Matter Experts evaluated and scored the above proposals. Evaluations were conducted as outlined in the *Aquatic Fund – Strategic Plan and Administrative Procedures* document.

Consultation with the ACC began on February 10, 2011 with visual presentations of project proposals to include an opportunity for ACC questions and comments. On February 17, 2011, the ACC was provided a memo (Subject: Review of CY 2010 Aquatic Fund Final Proposals, see **Appendix D**) providing a description of the proposed Resource Projects, the Utilities evaluation of projects, and the Utilities basis for recommending or not recommending a project for funding. The Utilities requested review and ACC comment including its agreement or disagreement with the Utilities evaluation by March 17, 2011.

The ACC met on March 10, 2011 for an Aquatic Fund project discussion meeting followed by an Aquatic Project Proposal Decision Meeting on March 29, 2011. The committee was able to make decisions on three of the four proposals, but determined that more information was needed before a decision could be made on the Cowlitz Indian Tribe's project, Eagle Island Habitat Enhancement: Sites B and C. A follow-up meeting was held April 6, 2011 to make a final determination on the project. The result of the meeting was to fund the project as-is, without modification.

Consensus was reached on a final Resource Project list as follows:

Applicant	Project Title	Approved Funding	Decision
Cowlitz Indian Tribe	Eagle Island Habitat Enhancement: Sites B and C	\$85,000	Yes
USDA Forest Service	Lewis River Side Channel Near Muddy River Instream Habitat Restoration	\$42,000	Yes
USDA Forest Service	Muddy River Mainstem Restoration	\$43,000	No
USDA Forest Service	Muddy River Side Channel Restoration	\$39,000	Yes

On April 14, 2011 the Utilities notified all ACC Participants of the selected 2010/2011 Aquatic Funding projects approved for full funding (email dated April 14, 2011 - ACC Funding Approvals Matrix , SA 7.5.3.2 - 2010/2011 Aquatic Fund Evaluation Matrix, see **Appendix E**)

Projects Selected for Funding

The following is a summary description of the individual Resource Projects selected to be funded by the Aquatics Fund. All of these projects are expected to promote the recovery of anadromous fish post re-introduction upstream of the Lewis River dams, and the federally listed bull trout which spend a portion of their life history in the Lewis River hydroelectric project reservoirs. Included for each project is an overview of the original proposal, any ACC modifications to the project, and identification of Resource Project nexus to the hydroelectric projects. Final Resource Project Plans are provided as appendices to this document.

1) Eagle Island Habitat Enhancement – Sites B and C

This Cowlitz Indian Tribe sponsored project is subsequent to the 2009 Site A Eagle Island Habitat Enhancement proposal that was previously funded by the ACC. Sites B and C have been integrated into one proposal so that they may be implemented simultaneously and thus reduce costs.

This project will place medium to large log jams and individual pieces of large woody debris through a 1,200 foot long side channel and restore riparian plant communities to result in more vital spawning and rearing habitat along Eagle Island.

The main objective of this project is to provide more habitat for the six species of salmonid that use the North Fork Lewis River, thus helping to increase the abundance

and distribution of those species along the entire Lewis River System. To accomplish that task a perennial side channel will be augmented with large woody debris to promote scour, pool formation, and habitat. Native plantings and invasive plant removal will help perpetuate the complexity of the system by providing wood and other organic inputs.

ACC representatives agreed to fund this project as proposed and granted funding of \$85,000.

The final Resource Project Plan is provided in **Appendix F** and would be completed in accordance with the schedule below pending acquiring additional funding through other resources:

Final Design and permitting	Late 2011/early 2012
Construction target date	Summer 2012
Monitoring	Continue until 2022
Herbicide treatments	Last treatment in 2015

2) Lewis River Side Channel Near Muddy River Instream Habitat Restoration

This USDA Forest Service sponsored project is intended to enhance the quality of fish habitat of the Lewis River by using approximately 160 pieces of LWM to build complex habitat and specified structure locations. This would:

- Improve habitat complexity and diversity in the side channel using large wood material (LWM);
- Provide refuge during winter flows for juvenile salmonids; and
- Provide increased spawning opportunities for adult salmonids.

ACC representatives agreed to fund this project as proposed and granted funding of \$42,000.

The final Resource Project Plan is provided in **Appendix G** and would be completed in accordance with the schedule below:

Monitoring	Summer, 2012
Project Implementation	July, 2012
As-built documents	December, 2012
Pre & Post Project Data	December, 2013

3) Muddy River Side Channel Restoration

This USDA Forest Service proposed project will restore and enhance the side channel and tributary habitat complexity for reintroduced salmon and steelhead by creating 30 rearing and overwintering pools and spawning beds by placing LWM complexes in the side channels.

Approximately 80 pieces of large woody material will be placed in side channel one to create approximately 12 log complexes, and 120 pieces will be placed in side channel

two to create approximately 18 log complexes using a small 16,000lb – 28,000 lb excavator.

The final Resource Project Plan is provided in **Appendix H** and would be completed in accordance with the schedule below:

NEPA-Summer	March 2010 (Completed)
Finalize Project Design	Summer 2010
Monitoring	Summer 2012
Implementation	July 2012
As-built documents	December 2012
Pre & Post Project Data	December 2013

Aquatic Fund Accounting

In March, 2011, PacifiCorp conducted an internal review of the *Lewis River Hydroelectric Projects Settlement Agreement*, section 7.5 Aquatics Fund, and the accounting documents for the Fund. The following discrepancies were noted and immediately corrected as follows:

- 2008 Bull Trout Funds: The Panamaker project came in under budget in August of 2008. Originally funded at \$25,000, only \$13,578.84 was actually used. This fact was documented in the Annual report, but not changed in the accounting spreadsheet.
 - This was corrected on March 22, 2011, backdated to August, 2008, and the balance has been recalculated to reflect the adjustment.

- 2009 & 2010: Both years were funded at \$200,000 (resource funds), should be \$325,000.
 - Additional \$100,000 was previously going to bull trout funds, but as per SA 7.5.3, bull trout fund stopped in 2008, and the additional \$100,000 that should have been put towards resource funds was not entered in the spreadsheet.
 - Additional \$25,000 comes from Cowlitz PUD, SA 7.5.2, starting on the April 30th “following the first anniversary of the Issuance of the New License for the Swift No. 2 Project,” which was 2008, making the first anniversary 2009 and continuing each year thereafter until the 20th anniversary (2028).
 - $\$200,000 + \$100,000 + \$25,000 = \$325,000$
 - The additional funds have been accounted for in the accounting spreadsheet and the balance of the fund has been adjusted accordingly.

Conclusion

This report provides the final CY2010/2011 Resource Project descriptions and plans for aquatic projects to be funded from the Lewis River Aquatics Fund. Distribution of funds to these projects will reduce the current Aquatic Fund by \$209,000. None of the projects selected by the ACC can be attributed to bull trout enhancement.

According to SA article 7.5.3.2 (5), any ACC member may initiate the Alternative Dispute Resolution Procedures to resolve disputes relating to Resource Projects 30 days after receiving this final report. If no disputes are identified, PacifiCorp and Cowlitz PUD will provide funds to the identified project owners to implement Resource Projects per SA article 7.8.

APPENDIX A
LEWIS RIVER SETTLEMENT AGREEMENT ARTICLE 7.5

7.5 Aquatics Fund. PacifiCorp and Cowlitz PUD shall establish the Lewis River Aquatics Fund (“Aquatics Fund”) to support resource protection measures (“Resource Projects”). Resource Projects may include, without limitation, projects that enhance and improve wetlands, riparian, and riverine habitats; projects that enhance and improve riparian and aquatic species connectivity that may be affected by the continued operation of the Projects; and projects that increase the probability for a successful reintroduction program. The Aquatics Fund shall be a Tracking Account maintained by the Licensees with all accrued interest being credited to the Aquatics Fund. PacifiCorp shall provide \$5.2 million, in addition to those funds set forth in Section 7.1.1, to enhance, protect, and restore aquatic habitat in the Lewis River Basin as provided below. Cowlitz PUD shall provide or cause to be provided \$520,000 to enhance, protect, and restore aquatic habitat in the Lewis River Basin as provided below; provided that Cowlitz PUD’s funds may only be used for Resource Projects upstream of Swift No. 2, including without limitation the Bypass Reach. The Licensees shall provide such funds according to the schedules set forth below.

7.5.1 PacifiCorp’s Contributions.

- a. PacifiCorp shall make funds available as follows: on each April 30 commencing in 2005, \$300,000 per year until 2009 (a total of \$1.5 million).
- b. For each of the Merwin, Yale, and Swift No. 1 Projects, PacifiCorp shall make one-third of the following funds available as follows after the Issuance of the New License for that Project: on each April 30 commencing in 2010, \$300,000 per year through 2014 (a total of \$1.5 million); on each April 30 commencing in 2015, \$100,000 per year through 2018 (a total of \$400,000); and on each April 30 commencing in 2019, \$200,000 per year through 2027 (a total of \$1.8 million); provided that, for any New License that has not been Issued by April 30, 2009, the funding obligation for that Project shall be contributed annually in the same amounts but commencing on April 30 following the first anniversary of Issuance of the New License for that Project.
- c. PacifiCorp shall contribute \$10,000 annually to the Aquatics Fund as set forth in Section 7.1.1.

7.5.2 Cowlitz PUD’s Contributions. Cowlitz PUD shall make or cause to be made funds available as follows: \$25,000 per year on each April 30 following the first anniversary of the Issuance of the New License for the Swift No. 2 Project through the April 30 following the 20th anniversary of the Issuance of the New License for the Swift No. 2 Project (a total of \$500,000); and a single amount of \$20,000 on the April 30 following the 21st anniversary of the Issuance of the New License for the Swift No. 2 Project.

7.5.3 Use of Funds. Decisions on how to spend the Aquatics Fund, including any accrued interest, shall be made as provided in Section 7.5.3.2 below; provided that (1) at least \$600,000 of such monies shall be designated for projects designed to benefit bull trout according to the following schedule: as of April 30, 2005, \$150,000; as of April 30,

2006, \$100,000; as of April 30, 2007, \$150,000; as of April 30, 2008, \$100,000; and on or before the April 30 following the fifth anniversary of the Issuance of all New Licenses, \$100,000; and such projects shall be consistent with bull trout recovery objectives as determined by USFWS; (2) fund expenditures for the maintenance of the Constructed Channel (Section 4.1.3) shall not exceed \$20,000 per year on average; (3) if studies indicate that inadequate “Reservoir Survival,” defined as the percentage of actively migrating juvenile anadromous fish of each of the species designated in Section 4.1.7 that survive in the reservoir (from reservoir entry points, including tributary mouths to collection points) and are available to be collected, is hindering attainment of the Overall Downstream Survival standard as set forth in Section 3, then at least \$400,000 of such monies shall be used for Resource Projects specifically designed to address reservoir mortality; and (4) \$10,000 annually shall be used for lower river projects as set forth in Section 7.1.1. Projects shall be designed to further the objectives and according to the priorities set forth below in Section 7.5.3.1.

7.5.3.1 Guidance for Resource Project Approval and Aquatics Fund Expenditures.

- a. Resource Projects must be consistent with applicable Federal, State, and local laws and, to the extent feasible, shall be consistent with policies and comprehensive plans in effect at the time the project is proposed. These may include, but are not limited to, Washington’s Wild Salmonid Policy, the Lower Columbia River Bull Trout Recovery Plan, and the Lower Columbia River Anadromous Fish Recovery Plan.
- b. The Aquatics Fund shall not be used to fund Resource Projects that any entity is otherwise required by law to perform (not including obligations under this Agreement or the New Licenses for use of the Aquatics Fund), unless by agreement of the ACC.
- c. The Licensees shall evaluate Resource Projects using the following objectives:
 - (1) benefit fish recovery throughout the North Fork Lewis River, with priority to federal ESA-listed species;
 - (2) support the reintroduction of anadromous fish throughout the Basin; and
 - (3) enhance fish habitat in the Lewis River Basin, with priority given to the North Fork Lewis River.

For the purposes of this Section 7.5, the North Fork Lewis River refers to the portion of the Lewis River from its confluence with the Columbia River upstream to the headwaters, including tributaries except the East Fork of the Lewis River.

The Licensees shall also consider the following factors to reflect the feasibility of projects and give priority to Resource Projects that are more practical to

implement:

- (i) Whether the activity may be planned and initiated within one year,
- (ii) Whether the activity will provide long-term benefits,
- (iii) Whether the activity will be cost-shared with other funding sources,
- (iv) Probability of success, and
- (v) Anticipated benefits relative to cost.

7.5.3.2 Resource Project Proposal, Review, and Selection.

(1) By the first anniversary of the Effective Date, the Licensees shall develop, in Consultation with the ACC, (a) a strategic plan consistent with the guidance in Section 7.5.3.1 above to guide Resource Project development, solicitation, and review; and (b) administrative procedures to guide implementation of the Aquatics Fund. Both may be modified periodically with the approval of the ACC.

(2) Any person or entity, including the Licensees, may propose a Resource Project. In addition, the Licensees may solicit Resource Projects proposals from any person or entity.

(3) The Licensees shall review all Resource Project proposals, applying the guidance set forth in Section 7.5.3.1. The Licensees shall provide an annual report describing proposed Resource Project recommendations to the ACC. The date for submitting such report shall be determined in the strategic plan defined in subsection 7.5.3.2(1) above. The report will include a description of all proposed Resource Projects, an evaluation of each Resource Project, and the basis for recommending or not recommending a project for funding.

(4) The Licensees shall convene a meeting of the ACC on an annual basis, no sooner than 30 days and no later than 60 days after distribution of the report set forth in Section 7.5.3.2(2), for Consultation regarding Resource Projects described in the report.

(5) Licensees shall modify the report on proposed Resource Projects, based on the above Consultation, and submit the final report to the ACC within 45 days after the above Consultation. Any ACC member may, within 30 days after receiving the final report, initiate the ADR Procedures to resolve disputes relating to Resource Projects. If the ADR Procedures are commenced, the Licensees shall defer submission of the

final report on Resource Projects to the Commission, if necessary, until after the ADR Procedures are completed. If the ADR Procedures fail to resolve all disputes, the Licensees shall provide the comments of the ACC to the Commission. If no ACC member initiates the ADR Procedures, the Licensees shall submit the final report to the Commission, if necessary, within 45 days after submission of the final report to the ACC.

APPENDIX B

MEMORANDUM DATED SEPTEMBER 3, 2010
LETTER TO INTERESTED PARTIES FROM T. OLSON, PACIFICORP
AVAILABILITY OF FUNDS FOR AQUATIC RELATED PROJECTS

September 3, 2010

Subject: Availability of Funds for Aquatic Related Projects in the Lewis River Basin

Dear Interested Party,

PacifiCorp owns the Merwin, Yale, and Swift No. 1 hydroelectric projects on the Lewis River in southwest Washington. Public Utility District No. 1 of Cowlitz County, Washington (Cowlitz PUD) owns the Swift No. 2 hydroelectric project, also located on the Lewis River. These projects are operated as a coordinated system. On November 30, 2004, the Lewis River Settlement Agreement established the Lewis River Aquatics Fund (Fund). On June 26, 2008, the Federal Energy Regulatory Commission acknowledged this fund as a stipulation of project operating licenses. The purpose of the Fund is to support resource protection measures via aquatic related projects (Resource Projects) in the Lewis River basin. The projects are evaluated for funding according to their:

- (1) Benefit to fish recovery throughout the North Fork Lewis River, with priority to federal ESA-listed species;
- (2) Support of the reintroduction of anadromous fish throughout the Basin; and
- (3) Enhancement to fish habitat in the Lewis River Basin, with priority given to the North Fork Lewis River.

Species that are targeted to benefit from Resource Projects include Chinook, steelhead, coho, bull trout, chum, and sea-run cutthroat.

This letter is to provide you the opportunity to submit proposals for Resource Project funding. The total Fund amount available this year is limited to \$487,401.13 for Resource Projects and \$270,533.74 for Bull Trout Projects. The selection of Resource Projects will be conducted in two phases. To be considered, applicants must submit a completed Pre-Proposal Form (see attachment A for Form) **by close of business October 4, 2010**. Pre-Proposals will be evaluated with some projects appropriately selected for further consideration (see attachment B for evaluation criteria). If selected, applicants will be notified in early December, and be requested to submit a formal proposal by mid-January. The Utilities and representatives of the Lewis River Aquatic Coordination Committee will finalize the list of successful projects in early April 2011. Shortly thereafter the Utilities will submit the final list to the Federal Energy Regulatory Commission to meet the submittal deadline of April 15, 2011.

Please give attention to this excellent opportunity. If you should have any questions feel free to contact Mr. Frank Shrier, PacifiCorp, (503) 813-6622. We look forward to your response in early October.

Sincerely,



Todd Olson
Director, Compliance Hydro Resources

cc: Diana Gritten-MacDonald, Cowlitz PUD
Mailing List
Attachments

Aquatic Fund Announcement Mailing List – Sept. 3, 2010

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Don Stuart
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Pat Spurgin
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Aquatic Fund Announcement Mailing List – Sept. 3, 2010

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APPENDIX C
MEMORANDUM DATED NOVEMBER 11, 2010
MEMO TO ACC FROM SHRIER – PACIFICORP AND GRITTEN-MACDONALD –
COWLITZ PUD
REVIEW OF CY 2011 AQUATIC FUND PRE-PROPOSALS

November 11, 2010

To: Memo to Lewis River Aquatics Coordination Committee representatives

From: Frank Shrier – PacifiCorp Energy and Diana Gritten-MacDonald – Cowlitz PUD

Subject: Review of CY 2011 Aquatic Fund Pre-Proposals

On September 3, 2010 PacifiCorp Energy announced the availability of funds for aquatic related projects in the Lewis River Basin (letter to interested parties from T. Olson). The letter requested that individuals or parties interested in obtaining project funding submit a Pre-Proposal to PacifiCorp Energy. Pre-Proposals were due by October 4, 2010. At that time and in following the Aquatics Fund – Strategic Plan and Administrative Procedures, PacifiCorp Energy and Cowlitz PUD (Utilities) reviewed the Pre-Proposals and, with this memo are providing the ACC with a recommended project list for further consideration. Following ACC review and agreement with this project list, PacifiCorp Energy will request complete proposals from selected project proponents. The schedule for proposal request is early December with complete proposals due in late-January 2011.

In response to the announcement letter, three entities provided seven different project Pre-Proposals. They include:

USDA Forest Service	Lewis River Side Channel Near Muddy River Instream Habitat Restoration
USDA Forest Service	Muddy River Side Channel Restoration
USDA Forest Service	Rush Creek Side Channel Restoration
USDA Forest Service	Muddy River Mainstem Channel Restoration
USDA Forest Service	2011 Pine Creek Nutrient Enhancement by Snowcats and Snowmobiles
Lower Columbia Fish Enhancement Group	NF Lewis RM 13.5 Side-Channel Habitat Enhancement
Cowlitz Indian Tribe	Eagle Island Habitat Enhancement - Sites B and C

PacifiCorp Energy and Cowlitz PUD subject matter experts have evaluated and scored the above proposals. Evaluations were conducted as outlined in the Aquatic Fund – Strategic Plan and Administrative Procedures document. For ACC review, the Utilities have attached to this memo an Evaluation matrix (Attachment 1). Costs for each project are also included. Individual Pre-Proposals have been attached for reference (Attachments 2-8).

The Utilities evaluation suggests that while additional information is needed before a commitment of funds should be given, we propose that the following six projects be solicited to provide complete Proposals:

- USDA FS - Lewis River Side Channel Near Muddy River Instream Habitat Restoration
- USDA FS - Muddy River Side Channel Restoration
- USDA FS - Muddy River Mainstem Channel Restoration
- USDA FS - 2011 Pine Creek Nutrient Enhancement by Snowcats and Snowmobiles
- LCFEG - NF Lewis RM 13.5 Side-Channel Habitat Enhancement
- CIT - Eagle Island Habitat Enhancement - Sites B and C

The Utilities propose to not further consider the USDA FS project titled: 'Rush Creek Side Channel Restoration' because of concerns the USFWS has expressed previously for a similar project proposal.

For your information, PacifiCorp has included a financial reporting on the Aquatics Resource and Bull Trout (7.5) tracking accounts (Attachment 12) as of 10/31/10.

The Utilities are submitting this document and attachments for review in hopes of reaching concurrence on projects for further consideration. If, in your review of the Pre-proposals, you have comments or questions to ask the Project proponent, please provide comments to me and we will include them in the formal Proposal request.

To meet the Funding Process Timeline as included in the Aquatics Fund – Strategic Plan and Administrative Procedures (see Table 4.1). **ACC representatives should provide comments and their project selection by December 2, 2010.** On December 9, 2010, project selection will be finalized during the ACC meeting. Soon after, the Utilities will request formal Proposals from identified project proponents.

Attachment 12

Lewis River License Implementation Lewis River Aquatics Fund - Resource Projects Sections 7.5, 7.5.1, 7.5.3, 7.5.3.1 & 7.7	Funding Start Date: 4/30/05
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Release Date	Funds Received	Expense	Interest	Balance	Notes
12/31/05				\$ 161,327.11	Contributions in 2004 dollars, adjusted for inflation.
4/30/06	\$ 212,172.03				
9/30/06		\$ 46,000.00			Muddy River Tributary Road Decommission - USDA FS *
12/31/06			\$ 24,305.00		
4/30/07	\$ 163,897.54	\$ 80,000.00			Fish Passage Culvert Replacement - USDA FS
8/23/07		\$ 79,000.00			2007 Dispersed Camping & Day Use Road Restoration - USDA FS
9/6/07		\$ 75,000.00			2007 Aquatic Funding Enhancement Projects - Cowlitz Indian Tribe*
12/31/07			\$ 30,833.16		
4/30/08	\$ 225,347.95				
7/3/08		\$ 34,000.00			2008 Clear Creek Road Decommission - USDA FS
7/3/08		\$ 117,000.00			2008 Muddy River Habitat Improvement - USDA FS
10/2/08		\$ 43,500.00			2008 Mud Creek Enhancement - Cowlitz Indian Tribe *
4/30/09	\$ 230,341.27				
8/20/09		\$ 190,000.00			2009 NF RM 13.5 Habitat Enhancement - LCFEG
9/16/09		\$ 106,000.00			2009 Clear Creek Instream - USDA FS
9/24/09		\$ 33,000.00			2009 Spencer Peak Road Decommission - USDA FS
9/25/09		\$ 41,000.00			2009 Nutrient Enhancement Pine Creek - USDA FS
		\$ 50,000.00			2009 Plas Newydd RM 2.0 - Cowlitz Indian Tribe
4/30/10	\$ 200,000.00				
Total Spent to Date:			\$ 894,500.00		
Balance Remaining:			\$ 253,724.06		

* Project close out complete

Attachment 12 (cont'd)

Lewis River License Implementation					Funding Start Date: 4/30/05
Lewis River Aquatics Fund - Bull Trout					
Sections 7.5, 7.5.1, 7.5.3, 7.5.3.1 & 7.7					
Release Date	Funds Received	Expense	Balance	Notes	
12/31/05			\$ 161,327.11	Contributions in 2004 dollars, adjusted for inflation.	
4/30/06	\$ 106,086.01				
11/30/06		\$ 37,889.08		Pine Creek Nutrient Enhancement - USDA FS*	
12/31/06			\$ 248,700.65		
4/30/07	\$ 164,776.65	\$ 25,000.00		Pine Creek Instream & Floodplain Structures for Bull Trout and Steelhead - USDA FS	
7/31/07		\$ 20,000.00		Rush Creek Gravel Restoration - USDA FS	
8/21/07		\$ 43,150.00		2007 Pine Creek Nutrient Enhancement - USDA FS*	
12/31/07			\$ 351,848.59		
4/30/08	\$ 112,861.86				
7/3/08		\$ 25,000.00		2008 Panamaker Crk. Rd Close & Culvert Removal - PacifiCorp*	
12/31/08			\$ 460,849.14		
3/25/09	\$ 19,269.66			Return of funds: Rush Creek Gravel Restoration - USDA FS	
3/31/09	\$ 23,493.72			Return of funds: Pine Creek Instream & Floodplain Structures for Bull Trout and Steelhead - USDA FS	
12/31/09			\$ 519,901.13		
Total Spent to Date:			\$ 151,039.08		
Balance Remaining:			\$ 519,901.13		

Note: In August 2009, the Bureau of Economic Analysis (BEA) restated the index numbers in Table 1.1.9 (Implicit Price Deflators for Gross Domestic Product). The index numbers are now based on 2005 = 100. This changes the beginning adjustment number for year 2000, quarter

Summary Table of non-Bull Trout Aquatic Fund Expenditures

Enhancement type	2005	2006	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010
Above Merwin												
Nutrient Enhancement		\$37,889	\$43,150									
Instream structures			\$25,000									
Gravel Restoration												
Road Decommission												
Culvert Replacement/Removal				\$25,000								
Below Merwin												
Nutrient Enhancement												
Instream structures												
Gravel Restoration												
Road Decommission		\$ 46,000.00										
Culvert Replacement												

Table 4.1. Funding Process Timeline

Activity	Target Milestone Date
Submit Request For Pre-Proposal Forms	Early September
Pre-Proposal Forms due	Early October
Pre-Proposal Listing and Evaluation Report Submitted to ACC	Early November
Pre-Proposal Report Comments due from ACC	Late November
Finalize List of Selected Projects for Additional Consideration	Early December
Submit Request For Proposals to Selected Applicants	Early December
Proposals due	Mid January
Proposal Evaluation Report Submitted to ACC (30 day review)	Mid February
Proposal Report Comments due	Mid March
Finalize List of Selected Projects and Notify Project Funding Recipients	Early April
Contract Procurement	April
Submit Report To FERC	May
Funding Available for Invoicing	April

APPENDIX D
MEMORANDUM DATED FEBRUARY 17, 2011
MEMO TO ACC FROM SHRIER – PACIFICORP AND GRITTEN-MACDONALD –
COWLITZ PUD
REVIEW OF CY 2011 AQUATIC FUND PROPOSALS

From: Hickerson, Sabrina
To: "michael_hudson@fws.gov"; "[Adam Haspiel \(ahaspiel@fs.fed.us\)](mailto:ahaspiel@fs.fed.us)"; "[Athena Sanchez \(pebbles@yakama.com\)](mailto:Athena_Sanchez@yakama.com)"; "[Bernadette Graham Hudson \(bghudson@lcfwb.gen.wa.us\)](mailto:Bernadette_Graham_Hudson@lcfwb.gen.wa.us)"; "[Bighouse, Donna \(DFW\)](#)"; "[Bill Bakke](#)"; "[Bob Rose \(brose@yakama.com\)](mailto:brose@yakama.com)"; "[Brett Swift](#)"; "[Bryan Nordlund](#)"; "[Darlene Johnson](#)"; "[David Hu](#)"; "[Diana MacDonald](#)"; [Doyle, Jeremiah](#); "[Eli Asher \(easher@lcfwb.gen.wa.us\)](mailto:easher@lcfwb.gen.wa.us)"; "[Eric Kinne](#)"; "[Eychaner, Jim \(RCO\)](#)"; "[James Dixon \(dixonjfd@dfw.wa.gov\)](mailto:dixonjfd@dfw.wa.gov)"; "[Jeff Breckel](#)"; "[Jim Byrne \(byrnejbb@dfw.wa.gov\)](mailto:byrnejbb@dfw.wa.gov)"; "[Jim Malinowski](#)"; "[Joel Rupley](#)"; "[John Clapp](#)"; "[John Weinheimer](#)"; "[Kathryn Miller \(kmiller@tu.org\)](mailto:kmiller@tu.org)"; [Lesko, Erik](#); "[LouEllyn Jones](#)"; "[Mariah Stoll-Smith Reese \(M.Reese@tds.net\)](mailto:M.Reese@tds.net)"; "[Maynard, Chris \(ECY\)](#)"; "[Melody Tereski](#)"; "[Michelle Day](#)"; "[Neil Turner \(turnenet@dfw.wa.gov\)](mailto:turnenet@dfw.wa.gov)"; [Olson, Todd](#); "[Pat Frazier \(frazipaf@dfw.wa.gov\)](mailto:frazipaf@dfw.wa.gov)"; "[Paul Pearce \(pearce@co.skamania.wa.us\)](mailto:pearce@co.skamania.wa.us)"; "peggy.miller@dfw.wa.gov"; "[Rhidian Morgan \(rmmorgan@plasnewydd.org\)](mailto:rmmorgan@plasnewydd.org)"; "Rich.Turner@noaa.gov (Rich.Turner@noaa.gov); "[Ryan Lopossa](#)"; "[Shannon Wills](#)"; [Shrier, Frank](#); "[Steve Branz \[branzs@ci.woodland.wa.us\]](mailto:branzs@ci.woodland.wa.us)"; "[Steve Manlow \(smanlow@lcfwb.gen.wa.us\)](mailto:smanlow@lcfwb.gen.wa.us)"; "[Susan Rosebrough](#)"; "[Taylor Aalvik \(taalvik@cowlitz.org\)](mailto:taalvik@cowlitz.org)";

Subject: SA 7.5.3.2 - Review of CY 2010 Aquatic Fund Proposals
Date: Thursday, February 17, 2011 12:51:00 PM
Attachments: [02172011 LR - ACC Lewis River AQ Fund evaluation - 2010_2011_ACC comments.xls](#)
[02172011 LR - Lewis AQ Fund Memo - Review of Final Proposals Memo to ACC.pdf](#)

Hello,

The Utilities have completed its evaluation of the 2010/2011 Aquatic Fund Proposals. I have attached the cover letter and evaluation matrix for your review.

You may also view the aquatic fund projects on the Lewis River website at the following link:

<http://www.pacificorp.com/es/hydro/hl/lr.html#>

Click on "Aquatics Coordination Committee 2011" to display the proposals.

The Utilities welcome your review and comments - including your agreement or disagreement with the Utilities' evaluations - and ask that you provide them to PacifiCorp by **March 17, 2011**. This timing is so that we may compile results and distribute the collective ACC's evaluation prior to the April 14, 2010, ACC meeting. At that meeting, the ACC should work to finalize its selection of to-be-funded projects. To continue to meet the Funding Process Timeline as included in the Plan, the ACC must reach agreement on projects no later than mid-April.

Best regards,

Sabrina Hickerson
Project Coordinator
(503) 813-6078



Lewis River Aquatic Fund ACC Evaluation Matrix 2009/2010
 April 8, 2010

Lewis River Aquatic Fund - ACC Evaluation of 2009/2010 Project Proposals														
ACC Decision	Applicant	Project Title	Funding Request	WDFW	Fish First	LCFRB	Yakama Nation	USFS	Cowlitz Indian Tribe	USFWS	NMFS	Trout Unlimited	Utilities	
1	Cowlitz Indian Tribe	Eagle Island Habitat Enhancement: Sites B and C	\$ 85,000.00											PacificCorp supports work on sites A & B and supports the concept for site C with concerns regarding the proposed implementation. Ideally this will improve fry rearing habitat & assist work on the North channel in the future. However, Site C instream habitat is adequate and the placement of structures is more of a concern for boat traffic in this area.
2	USDA Forest Service	Lewis River Side Channel Near Muddy River Instream Habitat Restoration	\$ 42,000.00											PacificCorp supports, although the side channel already provides adequate habitat. How are impacts due to skidder addressed?
3	USDA Forest Service	Muddy River Mainstem Restoration	\$ 43,000.00											PacificCorp supports, but has the following concern: It is agreed that we need to do something to harden & establish the Muddy's channel, this proposal may not be the best means of doing so. This being a volatile stream in a large flood plain leaves concern that this proposal is high risk without much benefit. The channel may move.
4	USDA Forest Service	Muddy River Side Channel Restoration	\$ 39,000.00											PacificCorp supports and believes this project should be done before the Muddy mainstem project. Concern is that the benefit is limited to spawning and early rearing. Additionally, are the banks stable enough to hold the material?
Total			\$ 209,000.00											

Lewis River Aquatic Fund - Utilities' Evaluation of 2010/2011 Project Proposals																
No.	Applicant	Project Title	Project Schedule	Benefit	Bull Trout	Project Partners	Funding	Cost Share?	Consistency with Fund Objectives	Benefit to Priority Fish	Scientific Validity	Success Potential	Cost Effectiveness	Total Score	Selected by Utilities for Full-Proposal	Comments
1	Cowlitz Indian Tribe	Eagle Island Habitat Enhancement: Sites B and C	late 2011-early 2012; late summer 2012; multi-year monitoring until 2022; last treatments applied 2015	Restore and enhance the riparian zone, in-stream habitat and channel form to provide more spawning and juvenile rearing habitat for salmonids that use the North Fork Lewis River.			\$ 85,000.00	Yes SRFB \$450,000	Benefit recovery-Y Support Reintro - Y Enhance LR Fish habitat - Y	14.66	14.66	3	2.66	35		PacifiCorp supports work on sites A & B and supports the concept for site C with concerns regarding the proposed implementation. Ideally this will improve fry rearing habitat & assist work on the North channel in the future. However, Site C instream habitat is adequate and the placement of structures is more of a concern for boat traffic in this area.
2	USDA Forest Service	Lewis River Side Channel Near Muddy River Instream Habitat Restoration	summer 2012; as built docs by Dec. 2012; monitoring report Dec. 2013	Enhance fish habitat quality by improving habitat complexity and diversity using LWM, providing refugia during winter flows for juvenile salmonids, and providing increased spawning opportunities for adult salmonids.		Forest Service, Mt. St. Helens Institute, Swift Community Action Team, Fish First, and Equipment Rental Services	\$ 42,000.00	Yes USFS-\$14,000 IK, USFS-\$16,000 M, MSHI-\$2,000 IK, SCAT-\$1,000 Machine, Fish First-\$1,000 Machine, Equip. Rental-\$1,000 Machine	Benefit recovery-Y Support Reintro - Y Enhance LR Fish habitat - Y	14.66	14.66	2.66	3.33	35.33		PacifiCorp supports, although the side channel already provides adequate habitat. How are impacts due to skidder addressed?
3	USDA Forest Service	Muddy River Mainstem Restoration	summer 2012; as built docs by Dec. 2012; monitoring report Dec. 2013	Restore and enhance stream habitat complexity for reintroduced salmon and steelhead by creating 20 rearing/overwintering pools and spawning beds by placing LWM complexes along stream margins.		Forest Service, Mt. St. Helens Institute,	\$ 43,000.00	Yes USFS-\$22,000 IK, USFS-\$15,000 trees, MSHI-\$2,000 IK	Benefit recovery-Y Support Reintro - Y Enhance LR Fish habitat - Y	14.66	13.33	2	3	33		PacifiCorp supports, but has the following concern: It is agreed that we need to do something to harden & establish the Muddy's channel, this proposal may not be the best means of doing so. This being a volatile stream in a large flood-plain leaves concern that this proposal is high risk without much benefit. The channel may move.
4	USDA Forest Service	Muddy River Side Channel Restoration	summer 2012; as built docs by Dec. 2012; monitoring report Dec. 2013	Restore and enhance side channel and tributary habitat complexity for reintroduced salmon and steelhead by creating 30 rearing/overwintering pools and spawning beds by placing LWM complexes in side channels.		Forest Service, Mt. St. Helens Institute,	\$ 39,000.00	Yes USFS-\$14,000 IK, USFS-\$10,000 Trees, MSHI-\$2,000 IK	Benefit recovery-Y Support Reintro - Y Enhance LR Fish habitat - Y	16	14.66	3	3.66	37.33		PacifiCorp supports and believes this project should be done before the Muddy mainstem project. Concern is that the benefit is limited to spawning and early rearing. Additionally, are the banks stable enough to hold the material?
Fund Objectives: 1. Benefit fish recovery throughout the North Fork Lewis River, priority to federal ESA-listed species 2. Support the re-introduction of anadromous fish throughout the basin 3. Enhance fish habitat in the Lewis River Basin, with priority given to North Fork Lewis River							Resource Funds (requested) \$ 209,000.00 Resource Funds (recommended projects) Bull Trout Funds (recommended projects) Total Aquatic Funds \$ -									

February 17, 2011

Memo to Lewis River Aquatics Coordination Committee representatives

From: Frank Shrier – PacifiCorp Energy and Diana Gritten-MacDonald – Cowlitz PUD

Subject: SA 7.5.3.2 - Review of CY 2011 Aquatic Fund Proposals

In September 2005 the Lewis River Aquatics Coordination Committee (ACC) established the Aquatics Fund – Strategic Plan and Administrative Procedures to meet obligations of the Lewis River Settlement Agreement. Since that time PacifiCorp Energy and the Public Utility District No. 1 of Cowlitz County (Cowlitz PUD) (collectively the Utilities) have been working under the Plan and with the ACC to identify and select aquatic resource projects for funding.

On December 9, 2010, the ACC selected six aquatic project proposals for additional consideration. Shortly thereafter, PacifiCorp Energy notified the project sponsors and requested full proposals by January 28, 2011. On February 10, 2011, PacifiCorp Energy provided copies of each final project proposal to the ACC. In addition, each applicant presented a PowerPoint at the ACC meeting on February 10, 2011, to present further project detail and address ACC questions and comments, if any. The proposed projects include:

Applicant	Project Title
Cowlitz Indian Tribe	Eagle Island Habitat Enhancement: Sites B & C
USDA Forest Service	Lewis River Side Channel Near Muddy River Instream Habitat Restoration
USDA Forest Service	Muddy River Mainstem Restoration
USDA Forest Service	Muddy River Side Channel Restoration

The Utilities subject matter experts have evaluated and scored the above proposals. Evaluations were conducted as outlined in the Aquatic Fund – Strategic Plan and Administrative Procedures (PacifiCorp and Cowlitz PUD, September 2005 – Revised January 2009). For ACC review, the Utilities have attached an Evaluation Matrix to this memo, which identifies the average total score of the Utility reviewers for each Proposal and comments/questions (Attachment 1). Costs for each project are also included. Individual Proposals have been previously provided to the ACC and are available upon request. They are also available for viewing on the Lewis River website at the following link: <http://www.pacificorp.com/es/hydro/hl/lr.html#>. Click on “Aquatics Coordination Committee 2011” to display the proposals.

By this memo the Utilities provide the ACC with a list of the projects and our recommendation for funding in order of evaluation ranking.

1. **Muddy River Side Channel Restoration** – Funding request is for \$39,00. Utilities recommend: Funding
2. **Lewis River Side Channel Near Muddy River Instream Habitat Restoration** – Funding request is for \$42,000. Utilities recommend: Funding
3. **Eagle Island Habitat Enhancement: Sites B and C** – Funding request is for \$85,000. Utilities recommend: Funding
4. **Muddy River Mainstem** – Funding request is for \$43,000. Utilities recommend: Funding

The next step in the process is for the ACC to review and provide input on selection of projects to be funded. An opportunity will be available to discuss the projects at the upcoming March 10, 2011, ACC meeting. The Utilities welcome review and your comments including your agreement or disagreement with the Utilities evaluation, and ask that you provide them to PacifiCorp by **March 17, 2011**. This timing is so that we may compile results and distribute the collective ACC's evaluation prior to the April 14, 2010, ACC meeting. At that meeting, the ACC should work to finalize its selection of to-be-funded projects. To continue to meet the Funding Process Timeline as included in the Plan, the ACC must reach agreement on projects no later than mid-April.

Thank you for your attention to this matter, we look forward to receiving your input.

Attachment 1

Lewis River Aquatics Fund – Individual Project Evaluation Sheet

For each Evaluation Criteria listed below, a determination of “meets” or “does not meet” or a score of 1 to 5 is assigned by project evaluator. If during the Pre-Proposal review the project receives a “does not meet” response to any “Consistency with Fund Objectives and Priorities” component, the proposal will be dropped from further evaluation and funding. A 1 is the lowest score (does not or very unlikely to meet objectives), a 5 the highest score (greater likelihood of meeting objectives). Scores are multiplied by the assigned weighting then totaled for a single project score.

<p>A. Consistency with Fund Objectives and Priorities (Meets or Does not meet):</p> <ol style="list-style-type: none"> 1. Benefit fish recovery throughout the North Fork Lewis River, priority to federal ESA-listed species (Bull Trout, Chinook, Steelhead, and Chum) 2. Support the re-introduction of anadromous fish throughout the Basin (Spring Chinook, Winter Steelhead, Coho, and Sea-run Cutthroat) 3. Enhance fish habitat in the Lewis River Basin, with priority given to the North Fork Lewis River. 	
<p>B. How does the project benefit priority fish species and stocks? (Spring Chinook, Winter Steelhead, Coho, Bull Trout, and Sea-run Cutthroat) (40 % weight):</p> <ul style="list-style-type: none"> ▪ Does the proposal clearly describe the expected fish benefits of the project? ▪ Does the proposal clearly identify the salmonid species and stocks that would benefit from the project? ▪ Does the project address a limiting factor(s) to the target species, a limiting life history stage, or an important habitat process or condition? ▪ Will the project provide long-term benefits? Does the project provide tangible, on-the-ground benefits? ▪ Is the project generally consistent with the intent (strategies, measures, actions, and priorities) of applicable recovery and planning documents (e.g. Lower Columbia Salmon Recovery Plan)? 	<p>Score = _____ multiplied by 4.0 = _____</p>

<p>C. Scientific validity and technical quality of proposed project (40% weight):</p> <ul style="list-style-type: none"> • Is the problem to salmonids and the associated objectives of the proposed project clearly described? • Does the proposal employ appropriate techniques, adequate design and proper siting? • Is it clear how the proposed project will meet its intent and purpose? • Is it likely that the project will achieve stated objectives? • Does the project provide for implementation monitoring? If so what monitoring protocols will be used? Are the benefits or outcomes from the project measurable (e.g. number of trees planted or amount of structure placed)? • Have watershed processes and a larger global aspect been considered in developing the proposal? • How does the project fit within the fish needs as identified through watershed planning documents, recovery plans, etc? • Has the project proposal received professional review? • Does the proposal identify any negative or positive impacts to other resource areas (e.g. wildlife, recreation, etc.)? 	<p>Score = _____ multiplied by 4.0 = _____</p>
<p>D. Ability for the project proponent to successfully implement proposed project (10% weight)</p> <ul style="list-style-type: none"> • Does proposal include both appropriate numbers of personnel and experienced team members? • Has the applying party submitted proposals in previous years? If their proposal received funding, has it been successfully implemented? • Will the project be able to obtain the necessary permits in a timely manner? 	<p>Score = _____ multiplied by 1.0 = _____</p>
<p>E. Cost effectiveness and timeliness (10% weight)</p> <ul style="list-style-type: none"> • Does the project have matching funding or in-kind participation? Is there collaboration between numerous parties? • Is the project budget identified by work effort (administration, materials, labor, etc.) and is it appropriate? • Does the project have a reasonable cost relative to the anticipated benefits? • Is the project self-maintaining once completed? If not, how will maintenance be achieved? • Can the project activities be planned and initiated in one year? 	<p>Score = _____ multiplied by 1.0 = _____</p>
<p>Total Weighted Score</p>	<p>XX</p>

APPENDIX E
EMAIL DATED APRIL 11, 2011
TO THE ACC FROM HICKERSON – PACIFICORP
FOR 30-DAY COMMENT: LEWIS RIVER AQUATIC FUND 2011 ANNUAL REPORT

To be included with FERC submittal...

Lewis River Aquatic Fund ACC Evaluation Matrix 2009/2010
April 8, 2010

Lewis River Aquatic Fund - ACC Evaluation of 2010/2011 Project Proposals														
ACC Decision	Applicant	Project Title	Funding Request	WDFW	Fish First	LCFRB	Yakama Nation	USFS	Cowlitz Indian Tribe	USFWS	NMFS	Trout Unlimited	Utilities	
Yes	1	Cowlitz Indian Tribe	Eagle Island Habitat Enhancement: Sites B and C	\$ 85,000.00		No Comment	<i>The LCFRB supports funding for this project.</i> This project is located in Lewis 4B, the highest priority reach in the entire basin according to the LCFRB Habitat Strategy. This reach has high potential for all four listed salmon and steelhead populations, and wood placement and side channel habitat enhancement are both high benefit project types for multiple species. Private landownership immediately across the river from site C may increase uncertainty and constraints on construction techniques, but significant benefits to rearing habitat should still be attained. Increased complexity in channel margin habitat will directly benefit rearing Chinook, coho, and steelhead juveniles. The budget demonstrates impressive leverage, and the sponsor has decreased the request amount by reexamining cost assumptions with contractors and consultants. The application thoroughly explains the objectives, habitat needs, and proposed treatments.		<i>Support funding at requested amount.</i> Great responsiveness to pre-proposal comments; good background descriptions to set up project context; significant multi-species benefit; high benefit to partner restoration planning efforts; excellent cost leveraging approach.	Supports	No Comments	No comment		PacifiCorp supports work on sites A & B and <i>supports the concept for site C with concerns regarding the proposed implementation.</i> Ideally this will improve fry rearing habitat & assist work on the North channel in the future. However, Site C instream habitat is adequate and the placement of structures is more of a concern for boat traffic in this area.
Yes	2	USDA Forest Service	Lewis River Side Channel Near Muddy River Instream Habitat Restoration	\$ 42,000.00		No Comment	<i>The LCFRB supports funding for this project.</i> Project site is located in Lewis 20, identified in the LCFRB Habitat Strategy as a tier 1, (highest priority) reach. EDT modeling indicates that off-channel and side channel habitat enhancement is a high multi-species priority in the reach. From the aerial photos provided, the side channel is very close to the mainstem Muddy River. The sponsor described the site sufficiently during the in-person presentation and with follow-up notes to alleviate concerns regarding imminent avulsion. The detailed budget provided with the final application is thorough. The rationale provided for the need for the project is somewhat slim, but adding wood structures to the sidechannel will likely result in improved rearing conditions for coho.		<i>Support funding at amount requested.</i> Good youth education involvement, and cost leveraging, wish there was a map showing the site-specific locations proposed for placing structures to evaluate project outcome and benefits.	Supports	No Comments	No comment		PacifiCorp supports, although the side channel already provides adequate habitat. How are impacts due to skidder addressed?
No	3	USDA Forest Service	Muddy River Mainstem Restoration	\$ 43,000.00		No Comment	<i>The LCFRB does not support funding for this project.</i> The project site is located in Muddy 1A, identified in the LCFRB Habitat Strategy as a tier 2 (medium) priority reach. EDT modeling indicates that the reach has high potential for coho production, medium potential for winter steelhead, low potential for spring Chinook, and that stream channel habitat structure enhancement is a high multi-species priority for the reach. Despite pre-proposal comments from the Utilities and ACC members regarding the extremely wide and dynamic nature of the project area, neither the full proposal nor follow-up responses addressed long term function of instream structures to address channel stability issues. Structures built with relatively small diameter trees intertwined with shoreline vegetation or buried in the bank seem inadequate to address the scope of the channel instability issues in this reach, and may not provide significant long term benefit to fish. A more aggressive approach may be necessary to jump-start channel processes more similar to historical conditions.		<i>Support funding at amount requested.</i> Good youth education involvement, and cost leveraging, wish there was a map showing the site-specific locations proposed for placing structures to evaluate project outcome and benefits.	For the Muddy Main we do not support funding at any level	No Comments	No comment		PacifiCorp supports, but has the following concern: It is agreed that we need to do something to harden & establish the Muddy's channel, this proposal may not be the best means of doing so. This being a volatile stream in a large flood-plain leaves concern that this proposal is high risk without much benefit. The channel may move.
Yes	4	USDA Forest Service	Muddy River Side Channel Restoration	\$ 39,000.00		No Comment	<i>The LCFRB supports funding for this project.</i> The project site is located in Muddy 1A, identified in the LCFRB Habitat Strategy as a tier 2 (medium) priority reach. EDT modeling indicates that the reach has high potential for coho production, and that off-channel and side channel habitat enhancement is a high multi-species priority for the reach. Follow-up comments provided by the sponsor adequately described habitat conditions and features in the side channels proposed for enhancement. The budget is well developed, and the approach is familiar. Based on the descriptions of the sidechannels (perennial, cool, secondarily fed by tributaries), additional wood installed as part of this project should provide excellent rearing habitat for coho.		<i>Support funding at amount requested.</i> Good youth education involvement, partner involvement and contribution and cost leveraging, wish there was a map showing the site-specific locations proposed for placing structures to evaluate project outcome and benefits.	Supports	No Comments	No comment		PacifiCorp supports and believes this project should be done before the Muddy mainstem project. Concern is that the benefit is limited to spawning and early rearing. Additionally, are the banks stable enough to hold the material?
			Total	\$ 209,000.00										

Lewis River Aquatic Fund - Utilities' Evaluation of 2010/2011 Project Proposals																
No.	Applicant	Project Title	Project Schedule	Benefit	Bull Trout	Project Partners	Funding	Cost Share?	Consistency with Fund Objectives	Benefit to Priority Fish	Scientific Validity	Success Potential	Cost Effectiveness	Total Score	Selected by Utilities for Full-Proposal	Comments
1	Cowlitz Indian Tribe	Eagle Island Habitat Enhancement: Sites B and C	late 2011-early 2012; late summer 2012; multi-year monitoring until 2022; last treatments applied 2015	Restore and enhance the riparian zone, in-stream habitat and channel form to provide more spawning and juvenile rearing habitat for salmonids that use the North Fork Lewis River.			\$ 85,000.00	Yes SRFB \$450,000	Benefit recovery-Y Support Reintro - Y Enhance LR Fish habitat - Y	14.66	14.66	3	2.66	35		PacifiCorp supports work on sites A & B and supports the concept for site C with concerns regarding the proposed implementation. Ideally this will improve fry rearing habitat & assist work on the North channel in the future. However, Site C instream habitat is adequate and the placement of structures is more of a concern for boat traffic in this area.
2	USDA Forest Service	Lewis River Side Channel Near Muddy River Instream Habitat Restoration	summer 2012; as built docs by Dec. 2012; monitoring report Dec. 2013	Enhance fish habitat quality by improving habitat complexity and diversity using LWM, providing refugia during winter flows for juvenile salmonids, and providing increased spawning opportunities for adult salmonids.		Forest Service, Mt. St. Helens Institute, Swift Community Action Team, Fish First, and Equipment Rental Services	\$ 42,000.00	Yes USFS-\$14,000 IK, USFS-\$16,000 M, MSHI-\$2,000 IK, SCAT-\$1,000 Machine, Fish First-\$1,000 Machine, Equip. Rental-\$1,000 Machine	Benefit recovery-Y Support Reintro - Y Enhance LR Fish habitat - Y	14.66	14.66	2.66	3.33	35.33		PacifiCorp supports, although the side channel already provides adequate habitat. How are impacts due to skidder addressed?
3	USDA Forest Service	Muddy River Mainstem Restoration	summer 2012; as built docs by Dec. 2012; monitoring report Dec. 2013	Restore and enhance stream habitat complexity for reintroduced salmon and steelhead by creating 20 rearing/overwintering pools and spawning beds by placing LWM complexes along stream margins.		Forest Service, Mt. St. Helens Institute,	\$ 43,000.00	Yes USFS-\$22,000 IK, USFS-\$15,000 trees, MSHI-\$2,000 IK	Benefit recovery-Y Support Reintro - Y Enhance LR Fish habitat - Y	14.66	13.33	2	3	33		PacifiCorp supports, but has the following concern: It is agreed that we need to do something to harden & establish the Muddy's channel, this proposal may not be the best means of doing so. This being a volatile stream in a large flood-plain leaves concern that this proposal is high risk without much benefit. The channel may move.
4	USDA Forest Service	Muddy River Side Channel Restoration	summer 2012; as built docs by Dec. 2012; monitoring report Dec. 2013	Restore and enhance side channel and tributary habitat complexity for reintroduced salmon and steelhead by creating 30 rearing/overwintering pools and spawning beds by placing LWM complexes in side channels.		Forest Service, Mt. St. Helens Institute,	\$ 39,000.00	Yes USFS-\$14,000 IK, USFS-\$10,000 Trees, MSHI-\$2,000 IK	Benefit recovery-Y Support Reintro - Y Enhance LR Fish habitat - Y	16	14.66	3	3.66	37.33		PacifiCorp supports and believes this project should be done before the Muddy mainstem project. Concern is that the benefit is limited to spawning and early rearing. Additionally, are the banks stable enough to hold the material?
Fund Objectives: 1. Benefit fish recovery throughout the North Fork Lewis River, priority to federal ESA-listed species 2. Support the re-introduction of anadromous fish throughout the basin 3. Enhance fish habitat in the Lewis River Basin, with priority given to North Fork Lewis River							Resource Funds (requested) \$ 209,000.00 Resource Funds (recommended projects) Bull Trout Funds (recommended projects) Total Aquatic Funds \$ -									

APPENDIX F
EAGLE ISLAND HABITAT ENHANCEMENT – SITES B AND C

PROPOSAL FORM

Lewis River Aquatic Fund

1. Project Title

Eagle Island Habitat Enhancement: Sites B and C

2. Project manager

Rudy Salakory, Biologist
Cowlitz Indian Tribe
PO Box 2547
Longview, WA 98632
Phone: 360.575.6227
Email: rsalakory@cowlitz.org

3. Identification of problem or opportunity to be addressed

Problem:

In the watershed of the North Fork and lower mainstem of the Lewis River, there is scarce high-quality riparian zone and in-stream spawning/rearing habitat. This habitat is essential for species listed under the Endangered Species Act (ESA) that use the Lewis River basin, including:

1. Lower Columbia River Chinook salmon, listed as a threatened species,
 - Lewis River is designated critical habitat
2. Columbia River Chum salmon, listed as a threatened species,
 - Lewis River is designated critical habitat
3. Lower Columbia River Steelhead, listed as a threatened species,
 - Lewis River is designated critical habitat
4. Lower Columbia River Coho salmon, listed as a threatened species,
 - Lewis River is proposed as critical habitat
5. Bull Trout, listed as a threatened species,
 - Lewis River is designated critical habitat
6. Eulachon, listed as a threatened species,
 - Lewis River is proposed as critical habitat

These species have endured many impacts that threaten their persistence in the watershed. The impacts arise from various sources and include: alteration of natural flow regimes, degradation of riparian habitat function, loss of floodplain and off-channel habitat areas, inputs of point source and non-point source pollution and impacts of urbanization.

Opportunity:

This project proposal develops the opportunity to benefit fish recovery throughout the North Fork Lewis River, with priority for federal ESA-listed species, by restoring critical riparian zone and in-stream habitat at Eagle Island Sites B and C (Fig. 1). Enhancement of existing riparian forest and in-stream habitat will support larger populations of anadromous fish. This project will also increase the overall abundance of functional habitat, which is in short supply throughout the lower Lewis River.

Our proposal to the ACC is an opportunity to leverage PacifiCorp mitigation funding in the Lewis River watershed at a better-than 6:1 ratio. We will use this ACC award as an anchoring match to leverage additional funding from the Salmon Recovery Fund Board. We estimate the entire project cost for Eagle Island Sites B and C as \$535,000, but request only \$85,000 from the ACC. If for any reason the balance of necessary funding for this whole project is not secured, our ACC award will be returned in full to PacifiCorp.

The Cowlitz Tribe successfully used this leveraging approach in the ACC 2010 round to leverage an additional \$355,000. We anticipate continuing to use this paired funding mechanism to finance restoration projects in the Eagle Island reach of the Lewis River for many years.

The Tribe has integrated Sites B and C into one proposal in order to reduce the significant amount of staging necessary to access the sites. Combining these projects and implementing them simultaneously reduces costs that would be incurred if they were funded separately and implemented sequentially.

Finally, sites B and C are the second and third projects in a large suite of salmonid habitat restoration opportunities developed within Eagle Island reaches for the Eagle Island Technical Oversight Group (TOG). The Cowlitz Tribe successfully obtained funding for Site A and will begin implementing that project in 2011. Other subsequent projects are in scoping and development.

4. Background, Combined Sites B and C

Geomorphic Setting

The project sites are located in the broad alluvial lower Lewis River valley. The river channel is unconfined at this location. Channel type is pool-riffle dominated by gravel and cobble substrate. Gradient is very flat at approximately 0.1%. Summer low-flow wetted-width of the Lewis River south channel at this location is approximately 180 feet. There are few well-defined pools; past habitat surveys indicated most of the habitat in this reach is composed of glide habitat (PacifiCorp 2004).

The historical record (aerial photos dating back to 1938 and survey maps dating back to 1854) indicates a history of active channel dynamics in the project area. Changes in channel shape and structure are due to natural flood processes, as well as human activities including gravel mining. Aerial photos since 1938 show flow in both the north and south Eagle Island channels, with summer flow slowly shifting to the south channel over time.

At the reach scale, channel complexity, available habitat cover, and the health of native riparian forest communities have been reduced since historical conditions. Reach-scale fluvial evolution is progressing toward a simplified channel planform as former multithread channels are abandoned. Past gravel mining, and possibly the effects of the hydropower system on sediment transport, have contributed to incision that has resulted in abandonment of off-channel habitat and has appeared to reduce the frequency of channel adjustment.

Large Woody Debris Conditions

LWD in the mainstem Lewis River has been quantified as part of a number of studies, including the Stream Channel Morphology and Aquatic Habitat Study (BioAnalysts, et al. 2003, WTS-3 Report) and a habitat assessment conducted by the Lower Columbia Fish Recovery Board (LCFRB 2004a). The WTS-3 Study counted 72+ pieces (>15 cm diameter and >7.6 meters long) in the Eagle Island channels in 2000 and the LCFRB study (2004a) counted approximately 113 pieces (>10 cm diameter and >7.6 meters long).

Large woody debris (LWD) conditions in the lower river below Merwin Dam were evaluated as part of the Lewis River LWD Study (Interfluve et al. 2008). The study estimated the historical abundance of LWD pieces by reach using a regression model developed from old-growth streams throughout Washington State (Fox and Bolton 2007). These data suggest an historical LWD frequency of approximately 70 pieces per 100 meters, for a total of 2,709 pieces (>10 cm diameter and > 2 meters long) within the Eagle Island reaches. Thus, historical LWD numbers may have been on the order of 20 times larger than current numbers in the Eagle Island reaches.

As part of the LWD Study, a survey was conducted on August 10, 2007 to identify the quantity of “key pieces” of LWD in the mainstem. A key piece was defined as a piece that was judged to be self-stabilized within the bankfull channel. In the Eagle Island reaches (Lewis 4A and 4B) a total of 5 key pieces were identified; 4 were cottonwoods and one was of unknown species. One piece in reach 4B was serving as a key piece of a large jam that extended up onto the river right flood terrace (South channel, river mile 11.3). The presence of large key pieces is critical in a system the size of the Lewis, where most wood will only be retained in the channel as part of large jams that are initiated by very large (i.e. old-growth) key pieces.

In general, the LWD study concluded that LWD dynamics have been severely altered in the mainstem. The ability of the Lewis River to support significant quantities of LWD is impacted by: 1) the series of hydroelectric dams that interrupt wood transport, 2) past harvest of large trees that could provide a source for key pieces, 3) alteration of the natural flood regime that could serve to recruit wood from the stream corridor, and 4) channel alterations that reduce channel migration processes that could recruit LWD.

Fish Species and Use

The lower North Fork Lewis Basin is used by 6 populations of salmon and steelhead, including fall and spring Chinook, winter and summer steelhead, coho, and chum. The fall Chinook run consists of an early-spawning “tule” run as well as a late-spawning “bright” run. Fall Chinook make extensive use of the lower mainstem for spawning. The highest concentrations of Chinook spawning occur within the 5 mile reach downstream of Merwin Dam; however, Chinook spawning also occurs within the Eagle Island reaches.

Since the early 1980s, WDFW has conducted juvenile seining targeting fall Chinook in the spring and early summer (typically late May to early July). The seining effort is conducted in order to capture juvenile fall Chinook for tagging and is not specifically designed to map spatial distribution or habitat preferences for juvenile rearing. Nevertheless, the data does provide some indication of occurrence of juvenile rearing in the project area. Data from 2004 to 2008 indicate 700 to 3,600 have been captured near Site B; and 0 to over 10,000 have been captured near Site C. Based on species composition for the entire lower river, the vast majority of these juvenile fish are Chinook, with smaller amounts of coho, trout, and chum (very few chum would be expected in these catches).

In addition, unpublished 2008 and 2009 WDFW survey data for winter steelhead show multiple redds in close proximity to the entrance of the Site C side channel (Fig. 2).

Although eulachon are known to ascend as high in the Lewis River as the base of Merwin Dam, it is not expected that these enhancements to alcove and side-channel structure and habitat will benefit the species, either returning spawners, eggs or larvae.

Though Bull Trout are known from the basin, none are expected in this reach.

Site Description: Site B

Site B is located on the right bank (west) side of the south channel 750 meters below the upstream end of Eagle Island, and consists of an alcove and backchannel complex that is approximately 220 meters long (45.935751N -122.689128E, Fig.1).

This site is located on river right across from the Site A side-channel outlet. This site contains numerous meander-scar traces from historical mainstem channel locations. The upstream portion of the site consists of a large alcove and the downstream portion consists of an exposed bar and low-flow backwater channel. The low-flow backwater channel is part of an abandoned channel that begins just downstream of the alcove. The upstream portion of the channel is filled with silty sand and is overgrown with vegetation. The inlet is just upstream of a riffle in the main channel and the outlet enters the main channel downstream of the riffle. There is some ponding of water in this overflow channel. This area appeared to contain an active side-channel in the 1974 aerial photos and a connected backwater channel as recently as 1996.

This site contains moderate channel complexity but few pieces of LWD with the exception of a large log jam on the terrace at the southern end of the alcove. This jam is likely a relic of the 1996 flood.

This area is characterized by shallow water habitats, emergent wetlands, and shrub/scrub habitats. Vegetation is a combination of common wetland shrub species such as red-osier dogwood (*Cornus sericea*), pacific ninebark (*Physocarpus capitatus*), willows, spirea, and areas of dense reed canarygrass. Emergent wetland species include soft rush (*Juncus effuses*), toad rush (*Juncus buffoensis*), dagger tipped rush (*Juncus ensifolius*), bur-reed (*Sparganium erectum*), and slough sedge (*Carex obtusa*).

Evidence of past Chinook spawning (redd features) in this area were observed during a field visit.

Site Description: Site C

Site C is located on the right bank (west) side of the south channel 1120 meters below the upstream end of Eagle Island, and consists of a perennially-active side-channel that is approximately 350 meters long (45.931993N -122.688658E, Fig.1). Site C is located approximately 1,500 feet downstream of Site B and the outlet of Site A. The site consists of a low-water side-channel complex. Most of the bar/island is overtopped above bankfull flows. There is very little LWD in this side-channel. The island is dominated by willows and there are mature riparian trees at the upstream end of the island. The river right streambank is composed of willows, spirea, reed canary grass, and some mature cottonwood.

5. Project Objective(s)

The main objective of this project is to provide more spawning and juvenile rearing habitat for the 6 populations of salmonids that use the North Fork Lewis River, thus helping to increase the abundance

and distribution of those species along the entire Lewis River System. To accomplish this, we will restore and enhance the riparian zone, in-stream habitat and channel form at two sites in the Eagle Island reach of the south channel of the Lewis River. Native plantings and invasive plant removal will help perpetuate the complexity of the system by providing wood and other organic inputs.

6. Tasks

- Task 1: Landowner coordination and whole-project scheduling
- Task 2: Apply for necessary permits, (Right of entry, HPA, JARPA, ESA limit 8 SPIF)
- Task 3: RFQ and hiring of contractors for construction, invasive species removal and planting
- Task 4: Coordinate purchase and delivery of plant materials LWD materials
- Task 5: Project implementation: Site Access
- Task 6: Project implementation: Excavation and LWD placement
- Task 7: Project implementation: Invasive removal and plantings
- Task 8: Assess planting installation success/ prepare short report
- Task 9: Prepare as-built plans
- Task 10: Conduct monitoring to assess survivorship of plantings, construction efficacy
- Task 11: Prepare monitoring report

7. Methods

Site B Treatment Approach:

Site B provides an excellent opportunity to enhance existing complexity by adding a series of apex jams designed to split flow into historical channel scar depressions. The preliminary design includes three bar apex jams to enhance channel dynamics and split flow conditions. Bar apex jams are expected to capture additional wood during floods. The development of large jams is likely to re-establish a dynamic, shifting channel condition in this reach, adding to habitat complexity. Construction of a lateral scour pool jam in the alcove will enhance pool scour and cover. Habitat cover wood in the existing backwater channel will increase habitat cover and complexity. Placement of floodplain wood will provide roughness elements that are lacking due to the absence of a robust native riparian vegetation community.

The vegetation enhancement strategy in this area will focus on establishing a medium-density tree canopy and creating isolated patches of shrub cover. Plantings will occur along the banks and low lying portions of the treatment area. Tree species will include those suited to thrive in moist to seasonally flooded conditions, such as Oregon ash and black cottonwood. The goal of these tree plantings is to establish a tree canopy to provide shade over surface waters, increase organic inputs to the stream and provide for future woody debris recruitment. Plantings in this area will be spaced to prevent complete canopy closure, which could result in the loss of the shade intolerant emergent species currently located in the treatment area. In addition to the proposed tree plantings, a small amount of native shrub species will also be planted in isolated clusters throughout the treatment area. Shrub species will be limited to willows (*Salix spp*) and spirea. The goal of the shrub plantings is to increase wildlife habitat values, provide opportunities for amphibian egg laying, and stabilization of soils.

Lastly, in order to increase the success of the proposed plantings and limit the spread of invasives, Himalayan blackberry eradication will be necessary within and adjacent to the enhancement areas. Himalayan blackberry can be effectively eliminated with herbicide applications in the fall followed up

with spot treatments the following spring. This is the most effective way to eliminate existing spot patches of Himalayan blackberry.

The general types and function of Site B large woody debris installations, as well as riparian planting zones, are detailed in the 30% design plans (attached as Appendix "C")

Site B Anticipated Benefits:

This project will benefit off-channel and near-shore rearing for salmon and steelhead, and will provide spawning habitat in the connected side channel. Construction of apex jams and activation of side-channels will enhance channel complexity. Other wood placements will increase the availability of pools and wood cover that will provide refuge habitats for salmonid rearing and holding. The vegetation enhancements will result in increased habitat complexity and native plant species diversity. In addition, water quality benefits such as reduced stream water temperatures and attenuation of sediments should be achieved once riparian plantings have matured.

Site C Treatment Approach:

Site C contains moderate complexity in the form of a multi-thread channel, but LWD quantities are very low or non-existent, and complex rearing cover is virtually absent. The preliminary design includes the construction of two apex jams to encourage the continuation of split flow conditions. Two to three lateral scour pool jams are included to promote pool scour and provide cover. Multiple placements of habitat cover wood provide additional rearing cover and complexity.

The island itself currently contains high numbers of willow and red-osier dogwood saplings and therefore the revegetation plan does not include any planting on the island. Revegetation on the island will only be necessary in areas disturbed during construction. Although the river-right streambank on Eagle Island does contain some mature black cottonwoods, the current number of trees and shrubs is generally low. Plantings in this area will increase wildlife habitat values, provide bank stability, and eventually outcompete reed canarygrass stands through shading. Suitable species for planting in this area include Oregon ash, black cottonwood, red alder, willow, dogwood, and spirea.

Lastly, in order to increase the success of the proposed plantings and limit the spread of invasives, Himalayan blackberry eradication will be necessary within and adjacent to the enhancement areas. As in the previous treatment site, chemical control methods will be the most effective way to eliminate existing spot patches of Himalayan blackberry.

The general types and function of Site C large woody debris installations, as well as riparian planting zones, are detailed in the 30% design plans (attached as Appendix "C")

Site C Anticipated Benefits:

This project will benefit off-channel and near-shore rearing for salmon and steelhead and will provide spawning habitat in the connected side channel. Construction of apex jams and activation of side-channels will enhance channel complexity. Other wood placements will increase the availability of pools and wood cover that will provide refuge habitats for salmonid rearing and holding.

8. Specific Work Products

There will be 5 specific work products:

1. Stakeholder meetings to bring the existing 30% designs to 100% completion, including stamped engineering plans
2. Construction and placement of around 170 sticks of LWD in the following structures (Sites B and C combined):
 - 5 apex jams
 - 3 lateral pool scour jams
 - 7 placements of floodplain wood
 - 2 placements of habitat cover wood
3. Native riparian zone plantings
4. Construction completion report detailing final construction, lessons learned and photographs of the finished project
5. A final report describing the entire process and the state of the project two years out (two years after implementation)

9. Project Duration

Once this project is successfully funded by both the ACC and the SRFB, stakeholder meetings, final design and permitting will begin in late 2011-early 2012 with a construction start date target of late summer 2012. Initial narrative reports will be completed and distributed in late 2012. Multi-year monitoring and effectiveness monitoring will continue until 2022. Multi-year herbicide treatments may be necessary as well; the last treatments will be applied in 2015. A final report will be submitted in 2015.

10. Permits

This project will need five permits. As a partner in development of this project, WDFW (the landowner) has indicated that right of entry and permission to implement the project in this proposal will be granted. SEPA review is bypassed via the fish habitat exemption. ESA consultation requirements will be met under the limit 8 process through SRFB funded grants. This project meets the criteria for the Washington State Streamlined Joint Aquatics Resource Permit Application (JARPA) process as well as the Nationwide Permit 27 (USACE), Section 404 and Section 10, if required. Washington Dept. of Ecology will be notified regarding section 401 water quality certification. A WDFW Hydraulic Project Approval (HPA) will be needed. An Aquatics Land Use Authorization will be needed from Washington State Department of Natural Resources for entry and work on this site.

11. Matching Funds

No in-kind is expected for the ACC award component. As previously noted, however, we intend to use this ACC award of \$85,000 to leverage an additional \$450,000 in funding from the SRFB, for a whole-project total of \$535,000; representing a better-than 6:1 leveraging of funds.

12. Peer Review of Proposed Project

This project has been completed in coordination with a Technical Oversight Group (TOG) made up of local technical stakeholders involved in aquatic habitat management in the Eagle Island area. Each step of this study has been conducted in coordination with the TOG and the TOG has provided reviews of each technical memo produced as part of this effort. TOG members include: Frank Shrier (PacifiCorp Energy), Eli Asher (Lower Columbia Fish Recovery Board), Donna Bighouse, Brian Calkins, and Ron Roler (WA Dept of Fish and Wildlife), Bill Dygert, Pat Lee (Clark County), and Rudy Salakory (Cowlitz Indian Tribe) as project proponent and project manager. In addition to stakeholder review, the 30% plans were also reviewed by Michelle Cramer, Chief Environmental Engineer for WA Department of Fish and Wildlife.

13. Budget

See Appendix "A" for detailed budget

14. Photo Documentation

Photographic documentation of this project from before, during, and after construction will be an integral part of this project. Photographs will be part of the final report, as well as monitoring reports.

REFERENCES:

Bio-Analysts, EDAW, Historical Research Associates, Hardin-Davis, Mason Bruce & Girard, Meridian Environmental, Mobrand Biometrics, Montgomery Watson Harza, Northwest Hydraulic Consultants, Washington Department of Fish and Wildlife, and Watershed GeoDynamics. 2003. Final Licensee's 2001 technical study status reports for the Lewis River Hydroelectric Projects. FERC No. 935, 2071, 2111, 2213. Prepared for PacifiCorp, Portland, Oregon and Public Utility District No. 1 of Cowlitz County, Longview, Washington.

Interfluve, Cramer Fish Sciences, and Fox Environmental Services. 2008. Lewis River LWD Study. Prepared for PacifiCorp, Portland, OR.

LCFRB (Lower Columbia Fish Recovery Board). 2004a. Kalama, Washougal and Lewis River Habitat Assessments Chapter 3: The North Fork Lewis River Basin. Prepared by R2 Resource Consultants for the LCFRB.

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Stillwater Sciences. 2009 Lewis River Spawning Gravel Evaluation, Final Report. Prepared for PacifiCorp, Portland, Oregon and Public Utility District No. 1 of Cowlitz County, Longview, Washington.

Wade, G. 2000. Salmon and steelhead habitat limiting factors: water resource inventory area 27. Washington Conservation Commission, Olympia

FIGURES:



Fig. 1: Locations of Eagle Island Sites B and C within the North Fork Lewis River basin, at approximately RM 11.



Fig. 2: WDFW data (unpublished) of steelhead redd locations near Eagle Island Sites B and C.

Eagle Island Habitat Enhancement: Sites B and C

**Appendix A:
Working budget for the full project**

Project Name	Eagle Island Sites B and C								
Granting Agency	PacifiCorp ACC/ State of Washington SFRB								
Name of preparer	Rudy Salakory, Nathan Reynolds								
Date Prepared	1/21/2011								
Section A: Personnel	Status	Hrs/Wk	Weeks	FTE	Annual Hours	Hourly Rate	Personnel Cost	Total Amount	
CIT Executive Coordination	Contin	3	36	0.05	108	\$ 60.00	\$ 6,480		
Accountant	Contin	4	36	0.07	144	\$ 60.00	\$ 8,640		
NRD Project Manager (A&E)	Contin	12	52	0.3	624	\$ 30.00	\$ 18,720		
NRD Project Manager (Construction)	Contin	28	6	0.08	168	\$ 30.00	\$ 5,040		
sum of continuous staff FTE				0.5			Personnel	\$ 38,880.00	
Section B: Payroll Taxes & Benefits						%	Amount		
Payroll Taxes and Benefits for all staff						33.15%	\$ 12,888		
							Payroll Taxes & Benefits	\$ 12,888.00	
Section C: Travel		Rate/ Mile	Miles/ Round trip		Trips/ Week	weeks	Travel Cost		
Car Miles		0.500	80		1	40	\$ 1,600		
							Travel	\$ 1,600	
Section E: Supplies				Unit	Qty	Unit cost	Cost		
Large Woody Debris				EACH	170	\$ 600.00	\$ 102,000		
Straw Mulch				ACRE	2.75	\$ 1,500.00	\$ 4,125		
Boulders				EACH	303	\$ 100.00	\$ 30,300		
							Supplies	\$ 136,425	
Section F: Contractual Costs				Unit	Qty	Unit cost	Cost		
Additional Design				EACH	1	\$ 45,000.00	\$ 45,000		
Permitting				EACH	1	\$ 12,000.00	\$ 12,000		
							Contractual Costs	\$ 57,000	
Section G: Construction Costs				Unit	Qty	Unit cost	Cost		
Plantings (Cuttings)				EACH	1800	\$ 3.25	\$ 5,850		
Plantings (Bare Root)				EACH	2325	\$ 5.25	\$ 12,206		
Seed Installation				ACRE	2.25	\$ 400.00	\$ 900		
Cultural Resources Survey				EACH	2	\$ 3,000.00	\$ 6,000		
Large Woody Debris Placement				Stick	170	\$ 400.00	\$ 68,000		
Bulk Excavation				CY	1000	\$ 12.00	\$ 12,000		
Construction Oversight				EACH	1	\$ 20,000.00	\$ 20,000		
Invasive Species Control				ACRE	2.75	\$ 500.00	\$ 1,375		
Mobilization Insurance and Bonding				EACH	1	\$ 30,000.00	\$ 30,000		
Erosion Control				EACH	2	\$ 10,000.00	\$ 20,000		
Site Access/Temporary Bridge				LS	1	\$ 80,000.00	\$ 80,000		
Stone Construction Entrance				LS	1	\$ 5,000.00	\$ 5,000		
Coffer Dams				LF	740	\$ 35.00	\$ 25,900		
							Construction Costs	\$ 287,231	
							Total Budget	\$ 534,024.00	

Appendix B:

Types and function of woody debris structures described in the 30% designs.

Bar Apex Jams:

Bar apex jams are positioned with the intent of creating or maintaining a split flow condition around the jam. These jams consist of key members oriented parallel to the flow with raked members positioned perpendicular to the flow along the upstream portion of the jam. Bar apex jams create scour just upstream of the jam and deposition just downstream. They are designed to capture additional fluvial wood from upstream. These jams provide habitat cover and velocity refuge but are mainly designed to enhance channel complexity.

Lateral Scour Pool Jams:

Lateral scour pool log jams are positioned to induce pool scour. They are typically placed along the outside of meander bends, though they may be placed at other locations along the channel boundary as appropriate. These jams provide the functions of habitat cover wood, but also maintain pools, sort gravels, and capture additional wood.

Habitat Cover Wood:

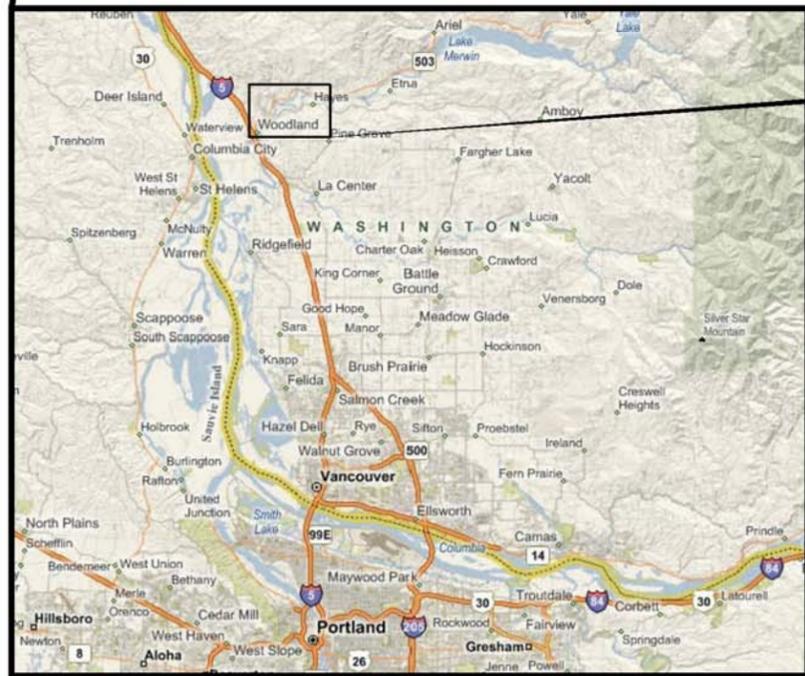
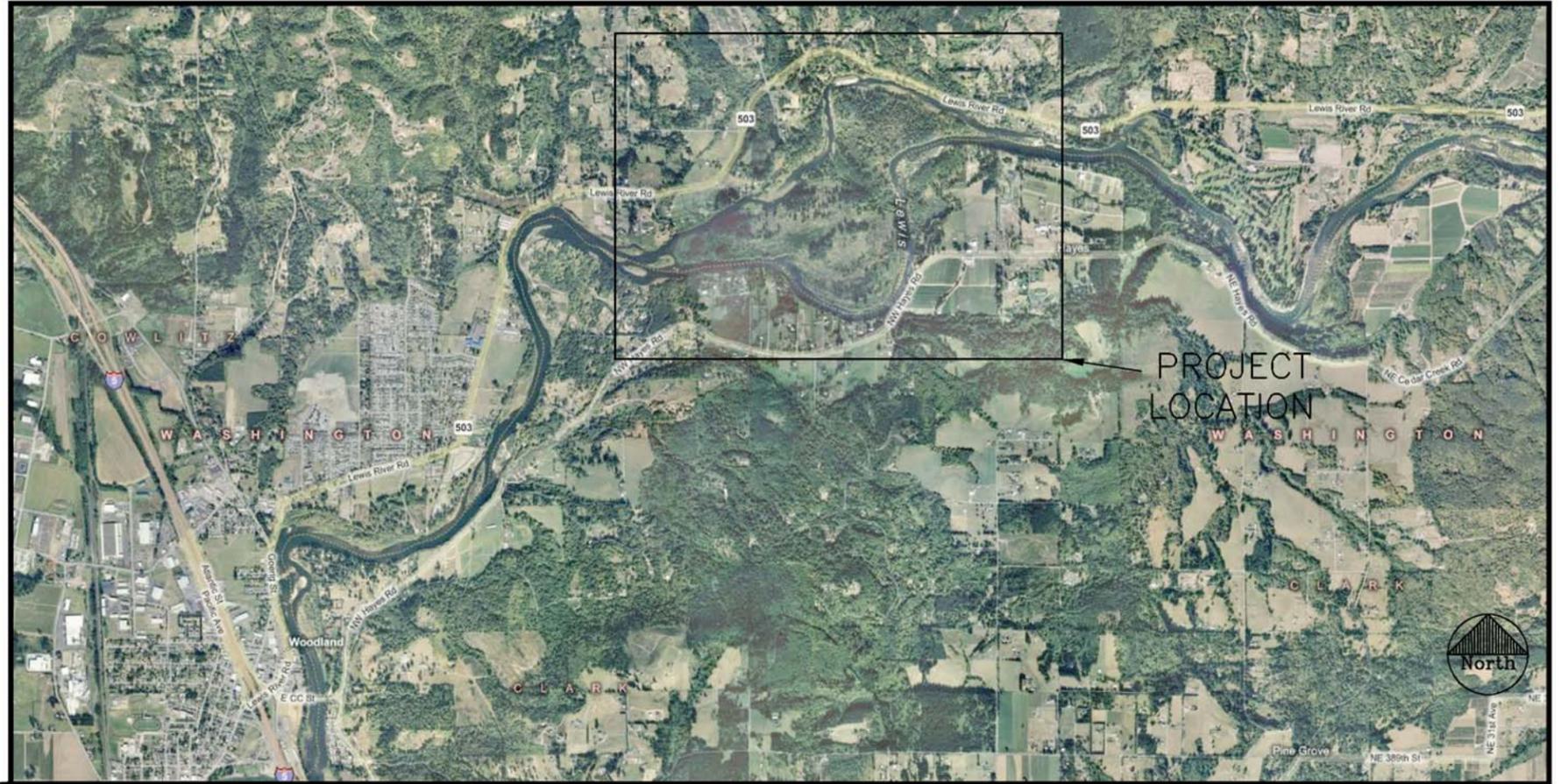
Habitat cover wood consists of individual placements or small accumulations (1-10 pieces) within the active channel that are designed to provide holding and rearing cover. These structures provide velocity refuge during high flow, provide cover from predators, and provide a substrate for macro-invertebrate colonization.

Floodplain Wood:

Floodplain wood consists of individual pieces or small accumulations of wood placed on the floodplain surface to increase floodplain roughness where natural floodplain roughness elements (e.g. vegetation or logs) are insufficient. These placements reduce avulsion risk and erosion associated with unstable channels until a point at which natural vegetation and natural wood recruitment are able to provide natural stability.

Appendix C:

30% Designs for Site B and Site C are attached.



SITE MAP

VICINITY MAP

ABBREVIATIONS

LWD	LARGE WOODY DEBRIS
ESC	EROSION SEDIMENT AND CONTROL
FES	FABRIC ENCAPSULATED SOIL
FT	FEET
STA	STATION
ELEV	ELEVATION
IN	INCH
APPROX	APPROXIMATE
YR	YEAR
'	FEET
"	INCH
°	DEGREES
%	PERCENT
INV	INVERT
DIA	DIAMETER
HDPE	HIGH DENSITY POLYETHYLENE
OHW	ORDINARY HIGH WATER

SHEET INDEX

1	COVER, SHEET INDEX AND VICINITY MAP
2	GENERAL NOTES
3	SITE PLAN AND ACCESS
4	EROSION AND SEDIMENT CONTROL PLAN
5	PLAN VIEW HABITAT RESTORATION
6	CROSS-SECTIONS
7	TYPICAL DETAILS
8	TYPICAL DETAILS
9	TYPICAL DETAILS
10	TYPICAL DETAILS
11	EROSION CONTROL NOTES AND DETAILS
12	REVEGETATION PLAN

Preliminary Not
For Construction

30% DESIGN

NO.	BY	DATE	REVISION DESCRIPTION

RP	BN	BN,GJ
DRAWN	DESIGNED	CHECKED
BN	11/09/09	
APPROVED	DATE	PROJECT

Lewis River – Eagle Island
Habitat Restoration – Site B
Woodland, Washington



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Cover, Sheet Index and
Vicinity Map

SHEET
1 of 12

EXISTING DATA

GENERAL TOPOGRAPHIC INFORMATION IS PROVIDED FROM LIDAR FROM CLARK COUNTY AND SPECIFIC PROJECT AREA SURVEY PERFORMED BY INTER-FLUVE, INC.

SOILS

LEWIS RIVER GRAVEL BAR.

UTILITIES

THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR HAVING UTILITIES LOCATED PRIOR TO CONSTRUCTION ACTIVITIES.

THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE AFFECTED UTILITY SERVICE TO REPORT ANY DAMAGED OR DESTROYED UTILITIES. THE CONTRACTOR SHALL PROVIDE EQUIPMENT OR LABOR TO AID THE AFFECTED UTILITY SERVICE IN REPAIRING DAMAGED OR DESTROYED UTILITIES AT NO COST TO THE OWNER.

CONSTRUCTION ACCESS

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR OBTAINING ANY REQUIRED TRAFFIC CONTROL OR ACCESS PERMITS.

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROVIDING ANY REQUIRED TRAFFIC CONTROL INCLUDING, BUT NOT LIMITED TO, SIGNAGE AND FLAGGERS.

ALL SAPLING AND TREES TO BE TRANSPLANTED OR REMOVED SHALL BE APPROVED BY THE OWNER'S REPRESENTATIVE AND CLEARLY MARKED.

ALL EQUIPMENT, MATERIALS AND PERSONNEL SHALL REMAIN WITHIN THE LIMITS OF DISTURBANCE.

THE CONTRACTOR SHALL KEEP THE WORK AREAS IN A NEAT AND SIGHTLY CONDITION FREE OF DEBRIS AND LITTER FOR THE DURATION OF THE PROJECT.

COFFERDAM

WORK AREA(S) SHALL BE ISOLATED BY COFFERDAMS INSTALLED UPSTREAM AND DOWNSTREAM OF ENHANCEMENT AREA. COFFERDAM MAY BE CONSTRUCTED WITH SAND FILLED BULK BAGS AND LINED WITH VISQUEEN ADJACENT TO ACTIVE FLOW IN THE CHANNEL.

DEWATERING OF WORK AREA(S) SHALL OCCUR CONCURRENT WITH FISH RESCUE. THE OWNER WILL BE RESPONSIBLE FOR CONDUCTING AND COORDINATING THE FISH RESCUE. THE CONTRACTOR SHALL COORDINATE DEWATERING WITH FISH RESCUE ACTIVITIES.

PUMPING SHALL BE PERFORMED TO KEEP WORK AREA DEWATERED. PUMPED DISCHARGE SHALL RELEASE SEDIMENT-LADEN WATER IN A MANNER THAT DOES NOT CAUSE CONTAMINATION OR INCREASE TURBIDITY OF SURFACE WATERS. (SEE CONTROL DEWATERING).

FISH RESCUE

COFFER DAM SHALL BE INSTALLED TO ISOLATE WORK.

INITIAL DEWATERING SHALL OCCUR SLOWLY BY INCREMENTALLY REDUCING COFFER DAMMED AREAS OVER A PERIOD OF 30 MINUTES TO ALLOW TIME FOR FISH TO FIND RESIDUAL POOLS WITHOUT RISK OF SUDDEN STRANDING.

RESIDUAL POOLS WITHIN THE DEWATERED CONSTRUCTION SITE SHALL BE PUMPED DRY USING SCREENED PUMP INTAKES. TRAPPED FISH SHALL BE RESCUED.

FISH BARRIERS AND PUMP INTAKES SHALL ADHERE TO NMFS SCREENING CRITERIA. NATIONAL MARINE FISHERIES SERVICE JUVENILE FISH SCREEN CRITERIA (REVISED FEBRUARY 16, 1995) AND ADDENDUM: JUVENILE FISH SCREEN CRITERIA FOR PUMP INTAKES (MAY 9, 1996)

ALL FISH RESCUE EFFORTS SHALL BE SUPERVISED BY A QUALIFIED FISHERIES/AQUATIC BIOLOGIST EXPERIENCED WITH THE COLLECTION AND HANDLING OF SALMONID FISHES FROM CONSTRUCTION SITES.

ALL FISH TRAPPED IN RESIDUAL POOLS WITHIN THE PROJECT AREA WILL BE CAREFULLY COLLECTED BY SEINE AND/OR DIP NETS AND PLACED IN CLEAN TRANSFER CONTAINERS WITH PORTABLE AERATION.

CAPTURED FISHES SHALL BE IMMEDIATELY RELEASED TO DOWNSTREAM OR UPSTREAM OF THE CONSTRUCTION SITE, DEPENDING ON SPECIES AND LIFESTAGE.

TREE SALVAGE

ANY REMOVED VEGETATION GREATER THAN 6 INCHES DIAMETER AND 15 FEET LONG SHOULD BE INCORPORATED INTO LOG JAM STRUCTURES. CONTRACTOR IS RESPONSIBLE FOR REMOVING SMALLER CLEARING AND GRUBBING DEBRIS FROM THE SITE AT THE END OF THE PROJECT UNLESS DIRECTED BY THE OWNER'S REPRESENTATIVE. TREES THAT ARE REMOVED DURING CONSTRUCTION WILL BE USED AS PART OF THE PROJECT. TREES SHALL BE REMOVED WITH ROOT WADS ATTACHED UNLESS THEIR SIZE PROHIBITS THEIR SAFE REMOVAL WITH ROOT WAD ATTACHED. IN THESE CASES THE TREES SHALL BE FELLED AND THE ROOT WADS SALVAGED. TREE TOPS WILL BE UTILIZED AND BE CUT TO FIELD DIRECTED LENGTHS DEPENDENT ON TREE SIZE AND SPECIES.

LIVE TREES

ALL TREES NOT MARKED FOR REMOVAL SHALL BE LEFT STANDING UNDISTURBED. LOGGING ACTIVITY SHALL NOT DEBARK OR DAMAGE LIVE TREES.

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General Notes



SITE PLAN

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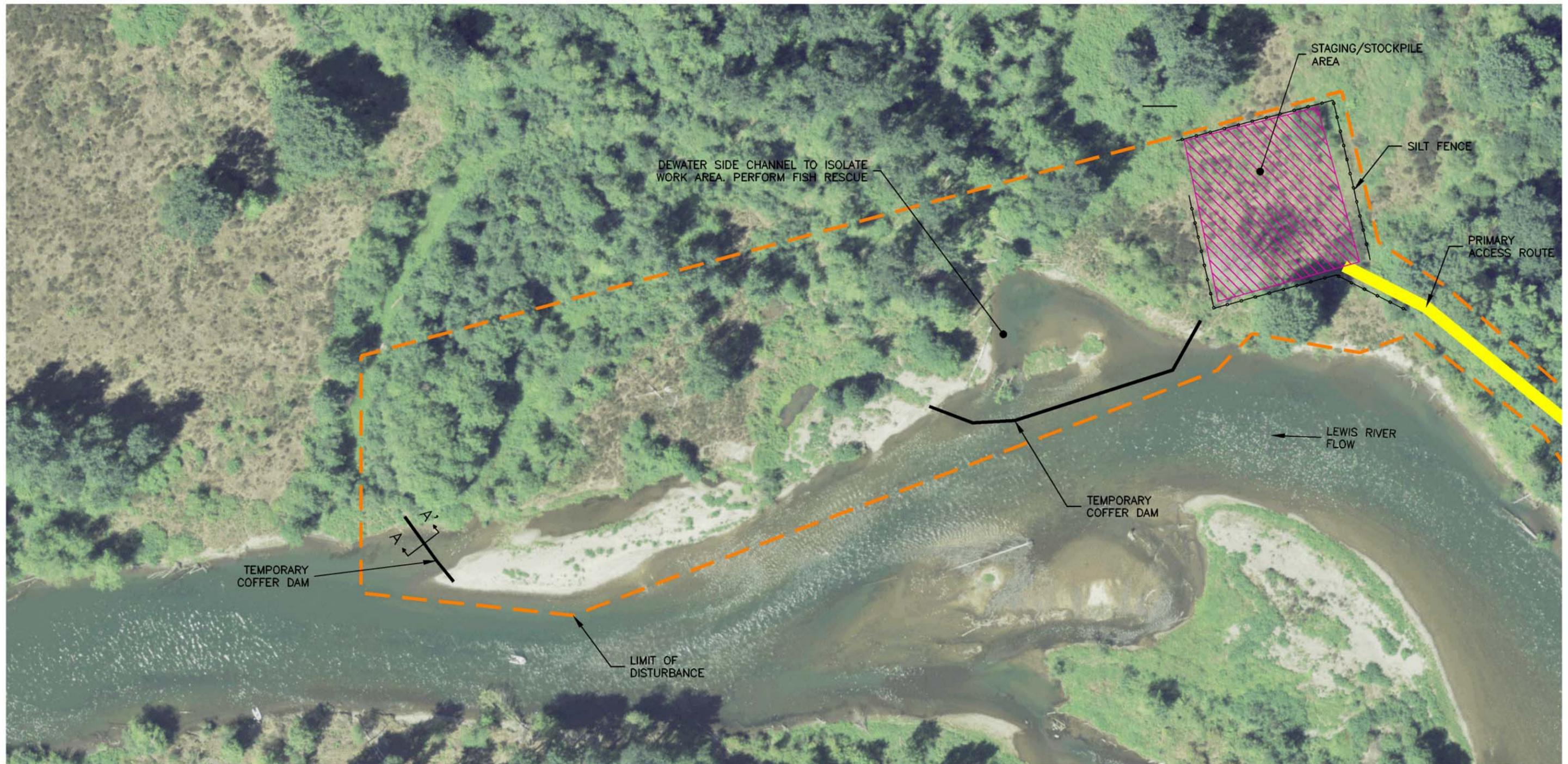
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Site Plan and Access

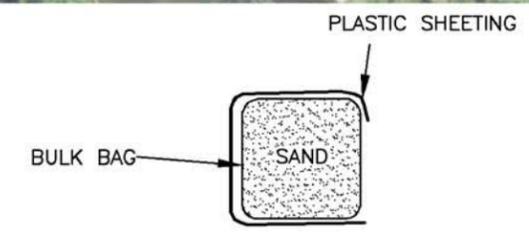


LEGEND

- TEMPORARY COFFER DAM
- ACCESS ROUTE
- STAGING/STOCKPILE
- LIMITS OF DISTURBANCE
- SEDIMENT FENCE

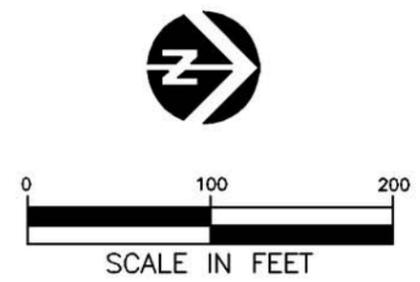
PLAN VIEW

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SECTION A-A'
NO SCALE

- NOTES:**
1. PLACE COFFER DAMS PRIOR TO PERFORMING IN-WATER WORK.
 3. REMOVE COFFER DAMS AFTER IN-WATER WORK IS COMPLETE.



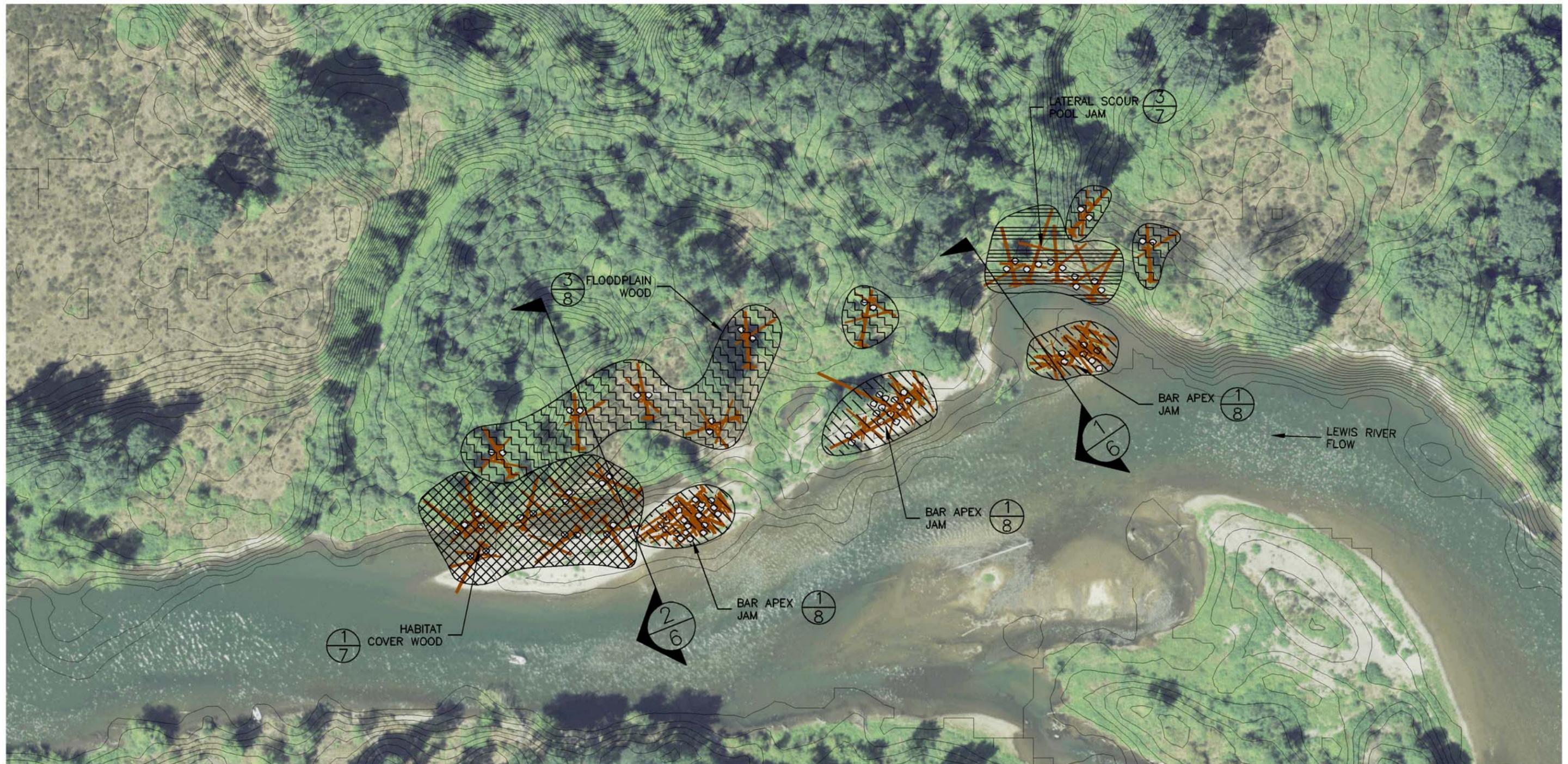
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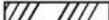
Erosion and Sediment
Control Plan



PLAN VIEW



LEGEND

-  WOOD
-  BOULDER BALLAST
-  LIDAR CONTOURS (1 FOOT INTERVALS)
-  HABITAT WOOD COVER (1/7) (2/7)
-  LATERAL SCOUR POOL JAM (3/7) (4/7)
-  FLOODPLAIN WOOD (3/8) (4/8)
-  BAR APEX JAM (1/8) (2/8)

NOTE:
SPECIFIC ORIENTATION OF LOGS AND BALLAST MATERIALS MAY VARY FROM PLAN VIEW DRAWING DEPENDING ON SIZE AND SHAPE OF MATERIAL ACQUIRED AND SITE CONDITIONS AT TIME OF CONSTRUCTION.

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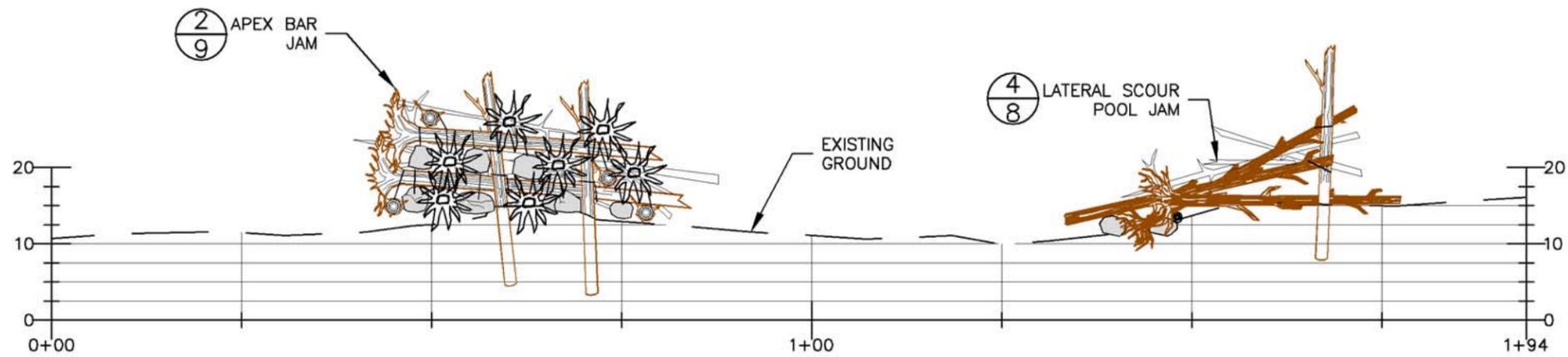
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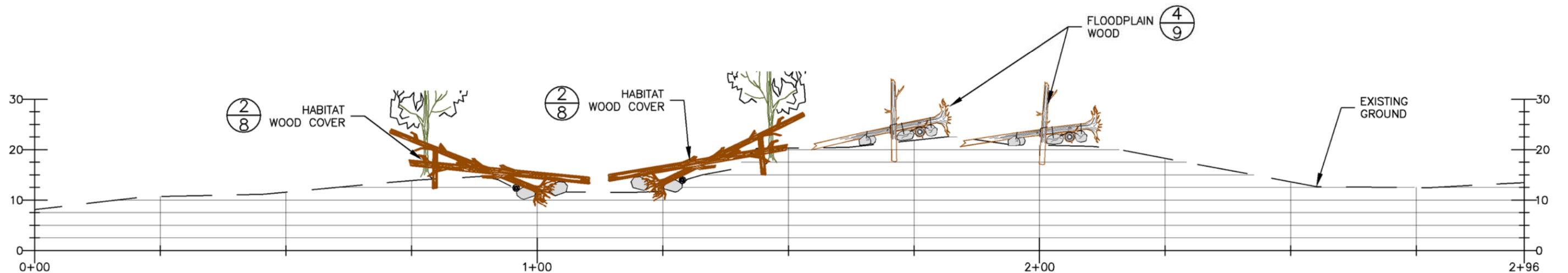


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Plan View
Habitat Restoration



1 CROSS-SECTION
6 NOT TO SCALE



2 CROSS-SECTION
6 NOT TO SCALE

NOTE:
CROSS-SECTION INFORMATION WAS
COMPILED USING SURVEY DATA
CONDUCTED OCT, 2009 BY
INTER-FLUVE, INC.

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Cross-Sections

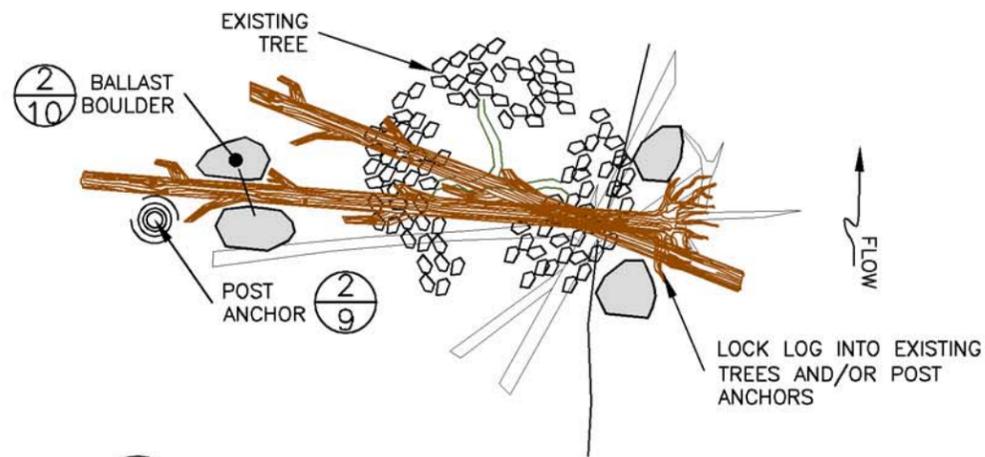
SHEET

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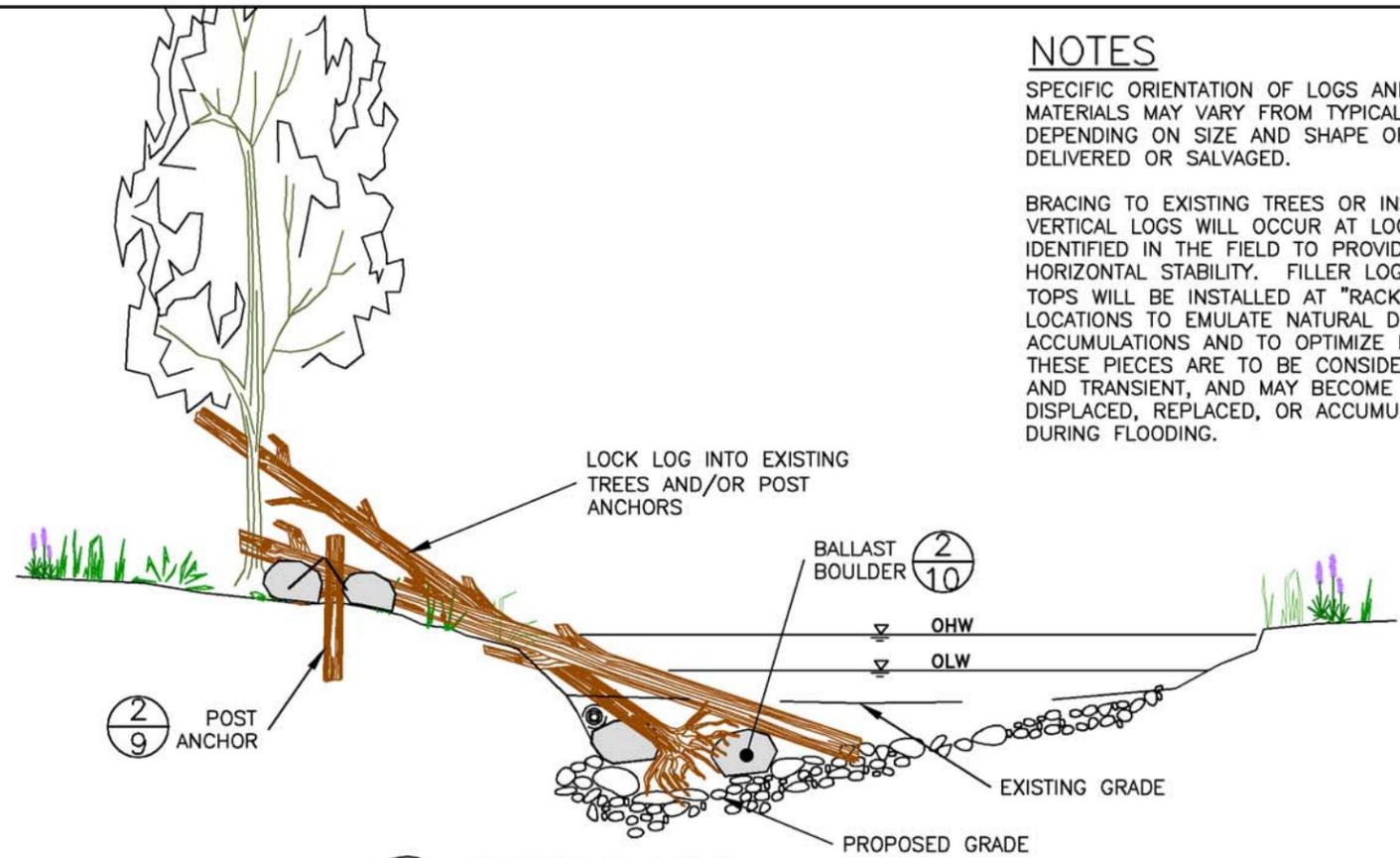
NOTES

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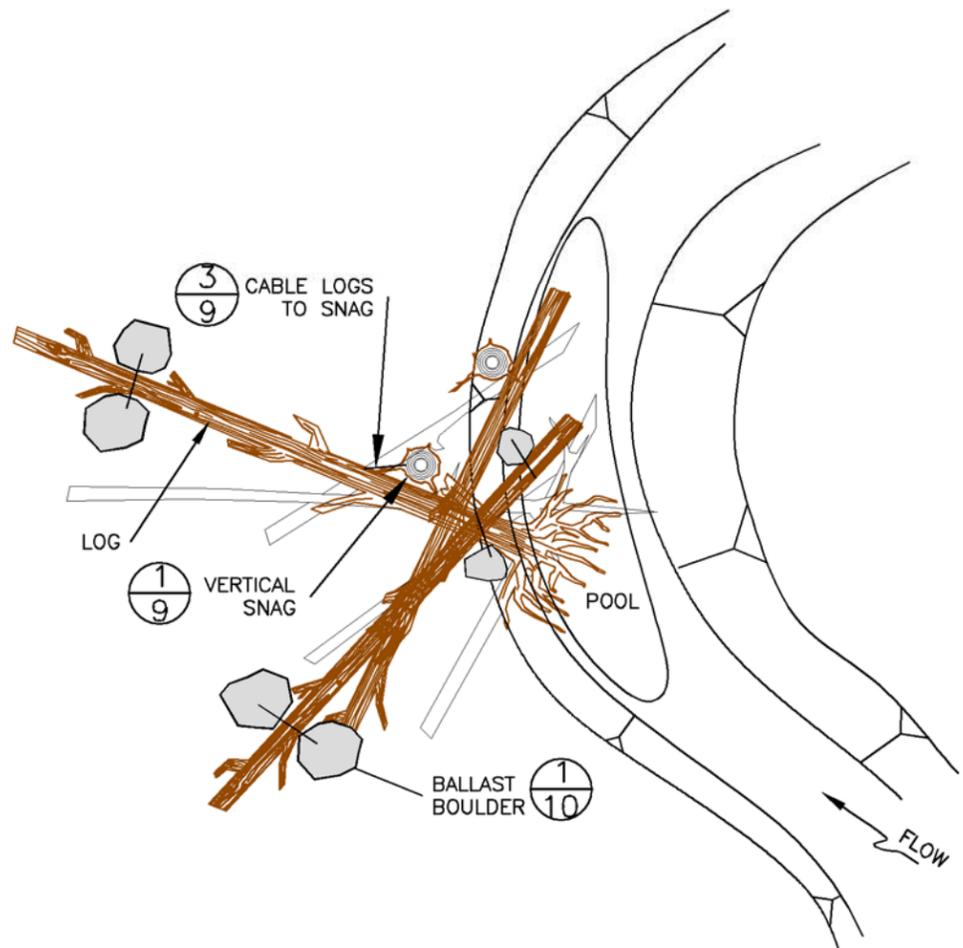
BRACING TO EXISTING TREES OR INSTALLED VERTICAL LOGS WILL OCCUR AT LOCATIONS IDENTIFIED IN THE FIELD TO PROVIDE HORIZONTAL STABILITY. FILLER LOGS AND TREE TOPS WILL BE INSTALLED AT "RACKING" LOCATIONS TO EMULATE NATURAL DEBRIS ACCUMULATIONS AND TO OPTIMIZE FISH HABITAT. THESE PIECES ARE TO BE CONSIDERED MOBILE AND TRANSIENT, AND MAY BECOME LOOSE, DISPLACED, REPLACED, OR ACCUMULATED ONTO DURING FLOODING.



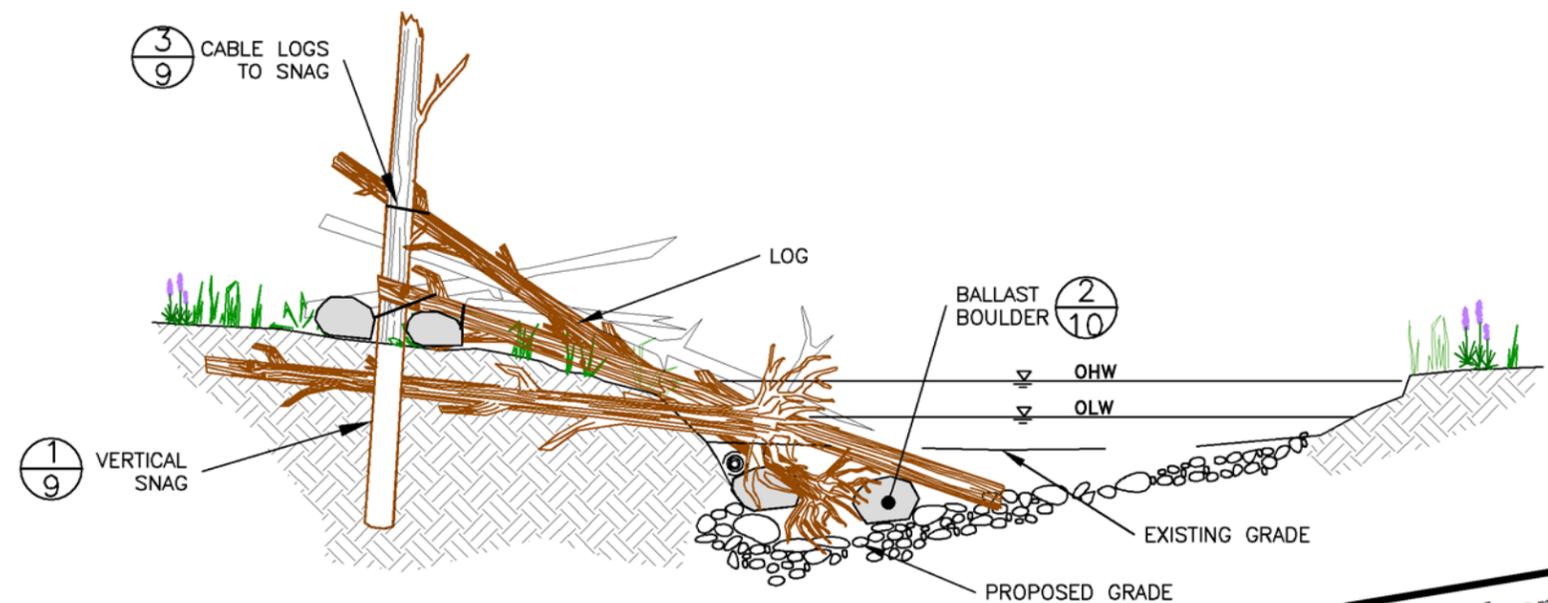
1 PLAN VIEW
7 TYPICAL HABITAT WOOD COVER
NOT TO SCALE



2 SECTION VIEW
7 TYPICAL HABITAT COVER WOOD
NOT TO SCALE



3 PLAN VIEW
7 TYPICAL LATERAL SCOUR POOL JAM
NOT TO SCALE



4 SECTION VIEW
7 TYPICAL LATERAL SCOUR POOL JAM
NOT TO SCALE

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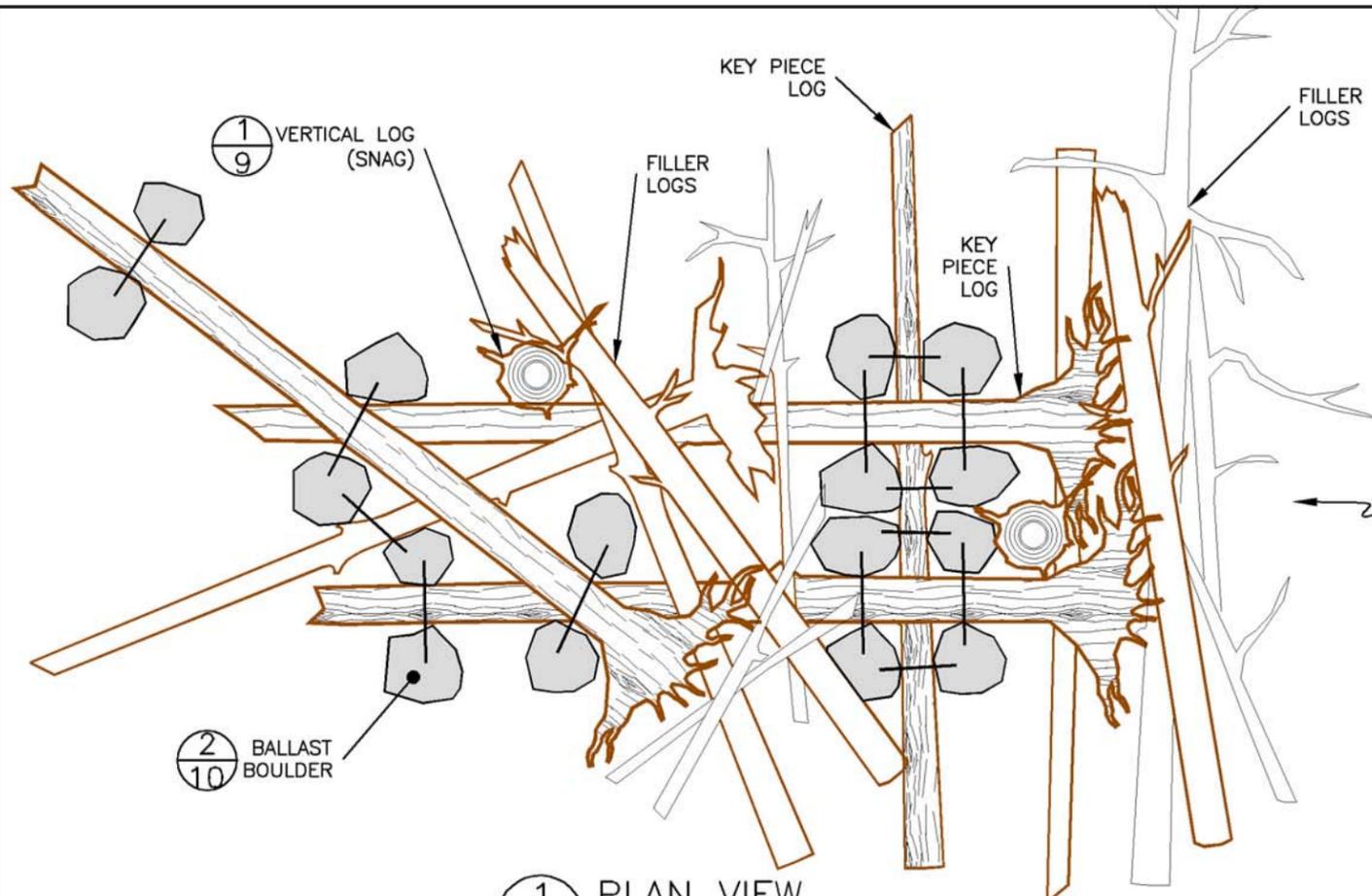
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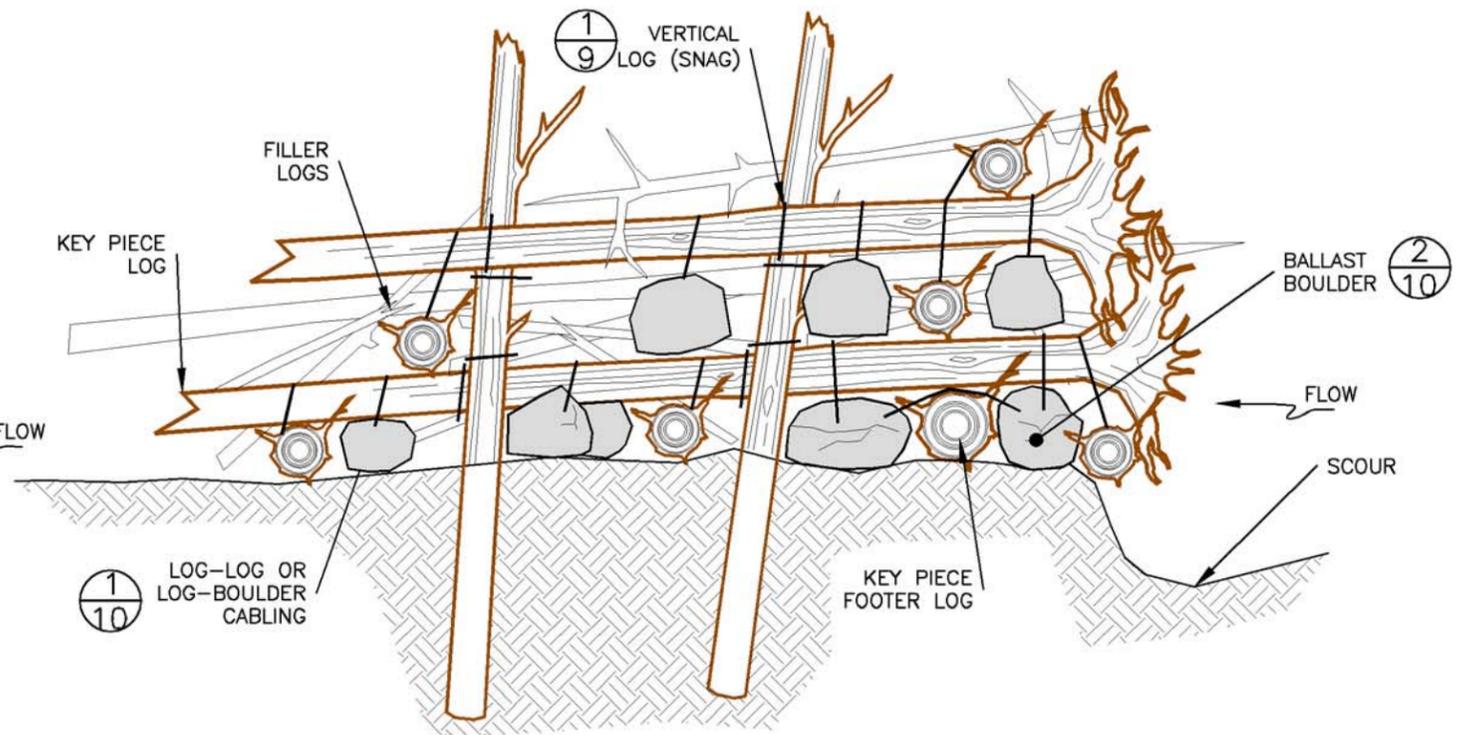


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Typical Details



1 PLAN VIEW
8 TYPICAL BAR APEX LOG JAM
NOT TO SCALE

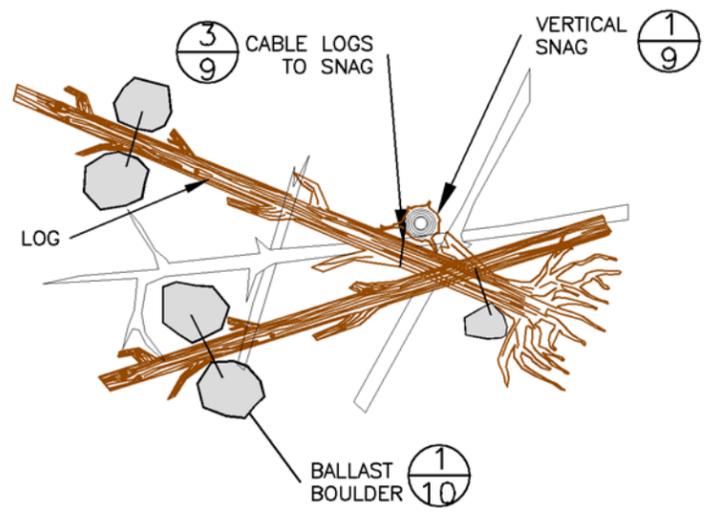


2 SECTION VIEW
8 TYPICAL BAR APEX LOG JAM
NOT TO SCALE

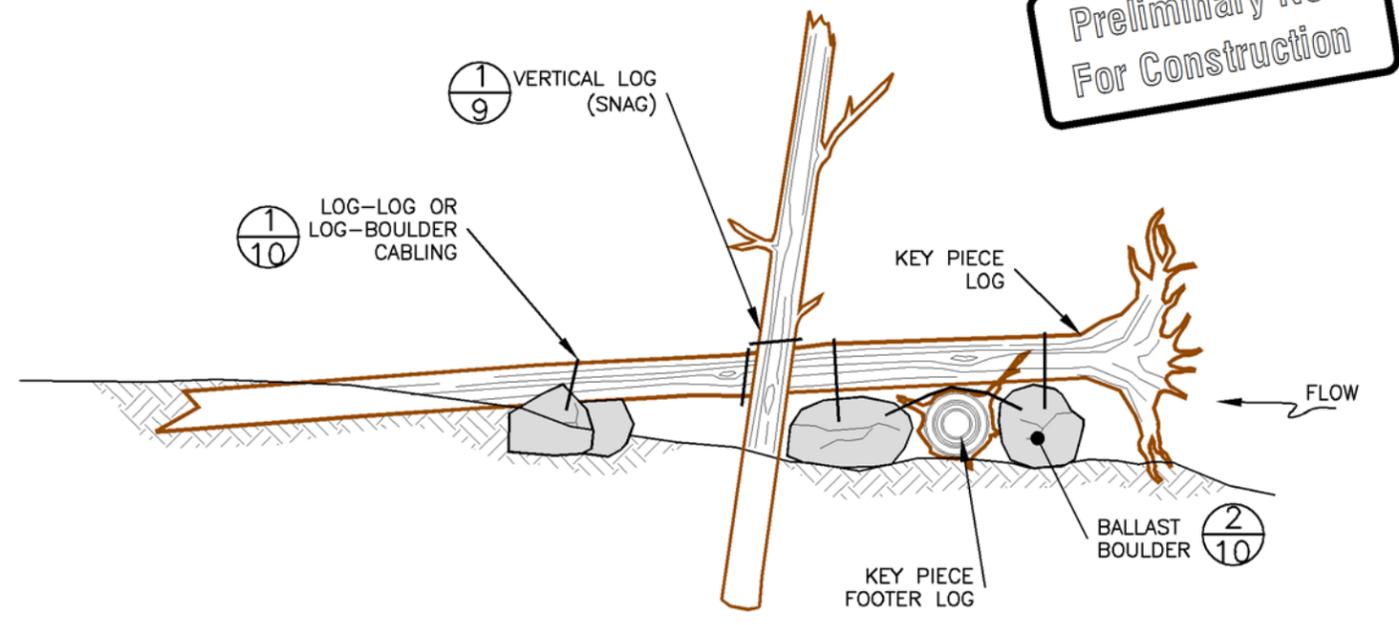
NOTES

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3 PLAN VIEW
8 TYPICAL FLOODPLAIN WOOD
NOT TO SCALE



4 SECTION VIEW
8 TYPICAL FLOODPLAIN WOOD
NOT TO SCALE

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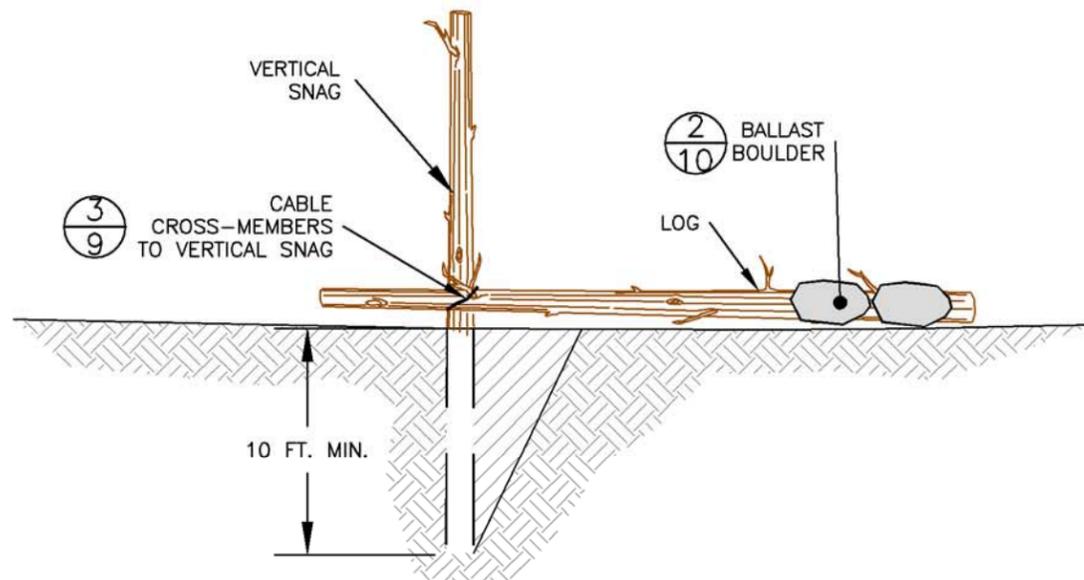
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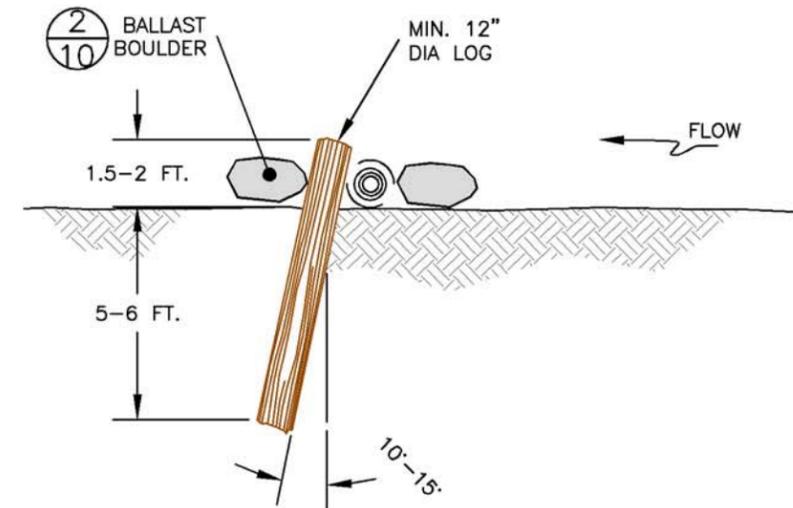
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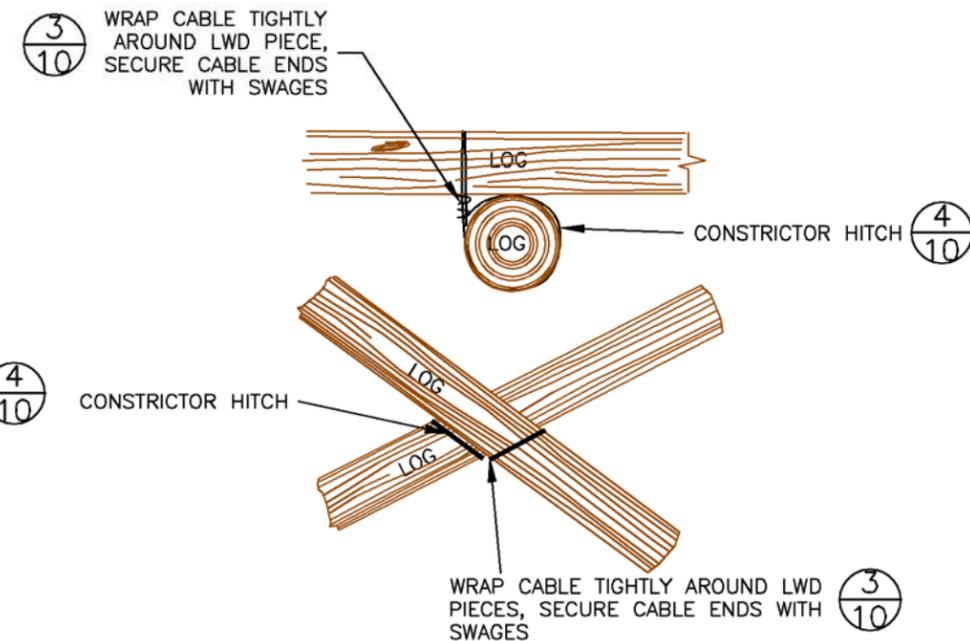
1 SECTION VIEW
9 TYPICAL LOGS SECURED AT VERTICAL SNAG
NOT TO SCALE

CABLING

USE 1/2 INCH GALVANIZED CABLE. CABLE SHALL BE CONSTRICTOR HITCHED AROUND VERTICAL SNAG WRAPPED ONCE AROUND OTHER LOG BEFORE ENDS ARE FASTENED TOGETHER. THERE SHALL BE NO SLACK IN THE CABLE AFTER IT IS FASTENED.



2 SECTION VIEW
9 TYPICAL LWD POST ANCHOR
NOT TO SCALE



3 DETAIL VIEWS
9 TYPICAL LOG CABLING
NOT TO SCALE

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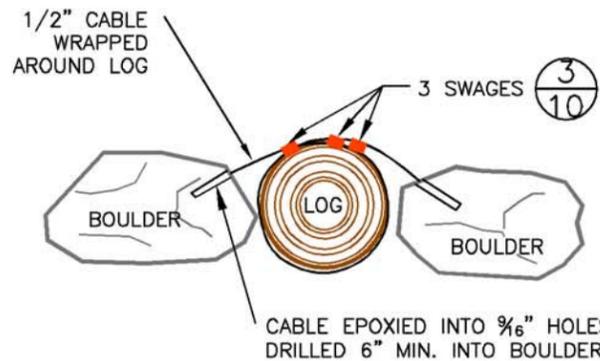


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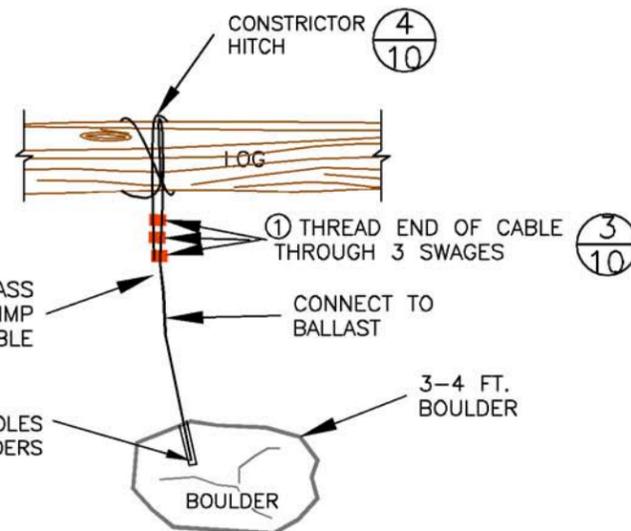
Typical Details

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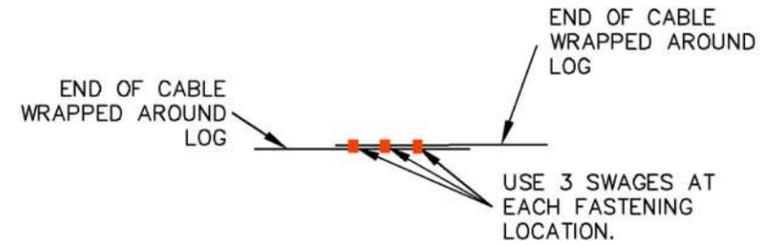
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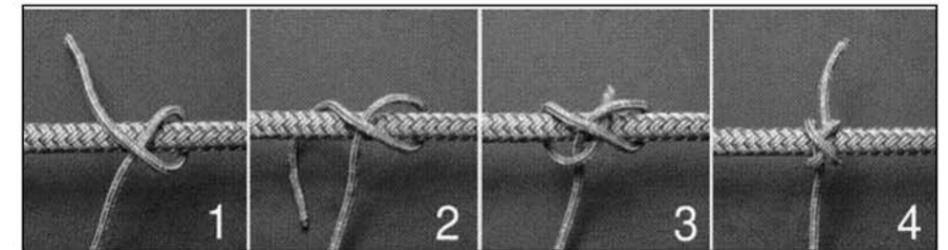
1 LWD INSTALLATION
10 DETAILS



2 CONSTRICTOR HITCH
10 CABLE WRAP



3 SWAGES CABLE
10 SPLICE DETAIL



4 CONSTRICTOR HITCH
10 CABLE KNOT DETAIL

Log Wood Buoyancy Force in Pounds Assumes Wood Specific Gravity = 0.5	
DBH X Log Length (feet)	Safety Factor 1.5
1 x 30	1104
2 x 30	4416
3 x 30	9935
1 x 40	1472
2 x 40	5887
Additional Root Wad Buoyancy Force in Pounds. Estimate Based on 35% Void Space Adjust as needed based on void space in each root wad.	
2 X 2 Foot Diameter RW	64
3 X 3 Foot Diameter RW	215
4 X 4 Foot Diameter RW	510
5 X 5 Foot Diameter RW	997
6 X 6 Foot Diameter RW	1722

NOTE:
THE NUMBER OF ANCHOR ROCKS PER ANCHORED LOG STRUCTURE SHALL BE AS SHOWN ON THE TABLES PROVIDED ON THIS SHEET USING APPROPRIATE NUMBER OF BOULDERS AND THE SIZE OF LOGS.

Submerged Boulder Ballast in Pounds. Assumes Rock Density of 2.65 and lift @ 6fps	
Boulder Diameter	Ballast
3 Foot	1289
2 - Boulder Configuration	2579
4 - Boulder Configuration	3868
3.5 Foot	2085
2 - Boulder Configuration	4171
4 - Boulder Configuration	6256
4 Foot	3156
2 - Boulder Configuration	6311
4 - Boulder Configuration	9467

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BOULDER BALLAST AND WOOD CABLING:

BOULDER BALLAST NOTES

DESCRIPTION
THIS WORK CONSISTS OF INSTALLING LOGS WITH ROOT WADS INTO ANCHORED LOG STRUCTURES AS SHOWN ON THE PLANS AND AS DIRECTED BY THE OWNERS REPRESENTATIVE.

MATERIALS
ANCHORS FOR THIS WORK WILL CONSIST OF CABLED BOULDERS. BOULDERS SHALL BE NON-FRACTURED BASALT WITH A MINIMUM SPECIFIC GRAVITY OF 2.65.

CABLE SHALL BE GALVANIZED, STEEL CORE, AND SHALL HAVE A MINIMUM DIAMETER OF 1/2 INCH.

SWAGES SHALL BE ZINC PLATED COPPER AND SHALL MEET THE PERFORMANCE REQUIREMENTS OF MILITARY STANDARD MS-51844, REV. C, SLEEVES, SWAGING-WIRE ROPE. MINIMUM OF 3 SWAGES PER CONNECTION.

EPOXY FOR ANCHORING SHALL BE HILTI HIT RE 500 ADHESIVE OR APPROVED EQUAL.

CONSTRUCTION
FINAL POSITIONING OF THE ANCHORED LOG STRUCTURES SHALL BE IN THE APPROXIMATE LOCATION AS SHOWN ON THE PLANS AND AS APPROVED IN THE FIELD BY THE OWNERS REPRESENTATIVE.

GENERAL NOTES , CONT'D

FINAL POSITIONING OF THE ANCHORED LOG STRUCTURES SHALL BE IN THE APPROXIMATE LOCATION AS SHOWN ON THE PLANS AND AS APPROVED IN THE FIELD BY THE OWNERS REPRESENTATIVE.

BALLAST BOULDERS SHALL BE SECURED AS SHOWN ON THE PLANS.

DRILL HOLES IN SOLID ROCK AND AVOID ANY CRACKS OR FRACTURES. HOLES SHALL BE 9/16 INCH IN DIAMETER. HOLES MUST BE DRILLED 6 INCHES, MINIMUM, INTO ROCK. HOLES MUST BE CLEANED OF LOOSE ROCK FRAGMENTS AND POWDER WITH A BRUSH AND WATER. HOLES MUST BE CLEAN OF ALL DUST, DEBRIS, OIL, AND SOAP RESIDUES. THE HOLES MUST FLUSH CLEAR TO INSURE NO MATERIAL EXISTS BETWEEN THE CABLE, EPOXY, AND ROCK SURFACE. INSTALL EPOXY PER MANUFACTURER'S RECOMMENDATIONS.

CABLE SHALL BE WRAPPED ONCE AROUND LOG BEFORE ENDS ARE INSERTED INTO THE DRILLED HOLES FILLED WITH EPOXY. WIPE CABLE WITH CLEAN ACETONE SOAKED RAG TO REMOVE OILS AND GREASES PRIOR TO INSERTION INTO EPOXY FILLED HOLE. FILL DRILL HOLES ENOUGH TO ENSURE COMPLETE COVERAGE WITH EPOXY. INSERT CABLE INTO HOLE SO THAT END OF CABLE HITS THE BOTTOM OF THE HOLE. EXCESS EPOXY SHOULD COME OUT OF THE TOP OF THE HOLE AS CABLE IS SEATED IN DRILL HOLE.

MINIMUM 3 SWAGES PER CONNECTION. SWAGES SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION, SPACING AND SWAGE TOOL DIAMETER FOR THE SIZE AND LOAD RATING OF THE CABLE BEING USED. SWAGING TOOL SHALL BE CHECKED FOR PROPER COMPRESSION, ACCORDING TO MANUFACTURER'S RECOMMENDATIONS, USING A GAUGE PROVIDED BY THE MANUFACTURER OF THE SWAGE FITTINGS BEING INSTALLED.

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Typical Details

SHEET

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THE CONTRACTOR IS ADVISED THAT THE PROJECT AREA DRAINS TO A SALMON BEARING STREAM AND/OR STATE WATERS AND THAT THE CONTRACTOR IS RESPONSIBLE TO PROTECT THE RECEIVING WATERS FROM DELETERIOUS EFFECTS OF CONSTRUCTION.

THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE EROSION CONTROL MEASURES SHOWN OR DESCRIBED IN THE CONTRACT DOCUMENTS AND ANY ADDITIONAL MEASURES THAT MAY BE REQUIRED BY THE CONTRACTORS MEANS AND METHODS OF CONSTRUCTION AS NEEDED TO CONTROL EROSION AND SEDIMENT AT THE CONSTRUCTION SITE AND TO PREVENT VIOLATION OF SURFACE WATER QUALITY, GROUND WATER QUALITY, OR SEDIMENT MANAGEMENT STANDARDS. EROSION CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE COURSE OF CONSTRUCTION AND UNTIL ALL DISTURBED EARTH IS STABILIZED IN FINISH GRADES.

EROSION CONTROL

CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND MAINTAINING ALL NECESSARY EROSION CONTROL FACILITIES TO COMPLY WITH APPLICABLE EROSION CONTROL REGULATIONS.

AN APPROVED EROSION AND SEDIMENT CONTROL (ESC) PLAN IS PROVIDED IN THESE DRAWINGS. THE BID AND CONSTRUCTION CONTRACT ARE BASED UPON IT. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR PROVIDING EROSION CONTROL MEASURES TO COMPLY WITH APPLICABLE REGULATIONS AND PERMITS.

THE FOLLOWING RECOMMENDATIONS FOR AN ESC PLAN WILL PROVIDE A GUIDELINE FOR THE CONTRACTOR TO DEVELOP AND IMPLEMENT AN ESC PLAN.

A. THE IMPLEMENTATION OF THESE RECOMMENDATIONS FOR AN ESC PLAN AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED, AND VEGETATION IS ESTABLISHED.

B. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE FLAGGED CLEARING LIMITS SHALL BE PERMITTED. THE FLAGGING SHALL BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF CONSTRUCTION.

C. ESC FACILITIES AS APPROXIMATELY SHOWN ON THIS PLAN ARE TO BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT ENTER THE DRAINAGE SYSTEM, OR VIOLATE APPLICABLE WATER STANDARDS.

D. THE ESC FACILITIES SHOWN ON THE ESC PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.

E. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.

F. FROM OCTOBER 1 – APRIL 30, NO SUBSTANTIALLY UNWORKED SOILS SHALL REMAIN EXPOSED FOR MORE THAN TWO DAYS AT A TIME. FROM MAY 1 – SEPT 30 NO SUBSTANTIALLY UNWORKED SOILS SHALL REMAIN EXPOSED FOR MORE THAN SEVEN DAYS AT A TIME.

SEDIMENT FENCES

1. THE SILT FENCE SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, SILT FENCE SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 12 INCH OVERLAP, AND BOTH ENDS SECURELY FASTENED TO THE POST, OR OVERLAP 2'X2" POSTS AND ATTACH AS APPROVED BY THE OWNER'S REPRESENTATIVE.

2. THE SILT FENCE IS TO BE INSTALLED AT LOCATIONS SHOWN ON THE PLAN ALONG THE DOWNHILL PERIMETER OF DISTURBED AREAS. THE FENCE POSTS SHALL BE SPACED A MAXIMUM OF 4 FEET APART AND DRIVEN SECURELY INTO THE GROUND A MINIMUM OF 12 INCHES.

3. THE SILT FENCE SHALL HAVE A MINIMUM VERTICAL BURIAL OF 6 INCHES. ALL EXCAVATED MATERIAL FROM FILTER FABRIC FENCE INSTALLATION SHALL BE BACKFILLED AND COMPACTED, ALONG THE ENTIRE DISTURBED AREA.

4. STANDARD OR HEAVY DUTY SILT FENCE SHALL HAVE MANUFACTURED STITCHED LOOPS FOR 2' x 2' POST INSTALLATION.

5. SILT FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY PROTECTED AND STABILIZED.

6. SILT FENCES SHALL BE INSPECTED BY THE CONTRACTOR IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.

7. ON PROJECT COMPLETION THE CONTRACTOR SHALL REMOVE ALL SILT FENCES AND TEMPORARY EROSION CONTROL MEASURES FROM THE PROJECT SITE.

INSPECTION AND MAINTENANCE

ALL BEST MANAGEMENT PRACTICES (BMPs) SHALL BE INSPECTED, MAINTAINED, AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. ALL ON-SITE EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.5 INCHES OF RAIN PER 24 HOUR PERIOD.

SEDIMENT MUST BE REMOVED FROM SILT FENCES BEFORE IT REACHES APPROXIMATELY ONE THIRD THE HEIGHT OF THE FENCE, ESPECIALLY IF HEAVY RAINS ARE EXPECTED.

STABILIZE SOILS AND PROTECT SLOPES

FROM MAY 1 THROUGH SEPTEMBER 30, ALL EXPOSED SOILS SHALL BE PROTECTED FROM EROSION BY MULCHING, PLASTIC SHEETING, HYDROSEED COVERING, OR OTHER APPROVED MEASURES WITHIN ONE WEEK OF GRADING. FROM OCTOBER 1 THROUGH APRIL 30, ALL EXPOSED SOILS MUST BE PROTECTED WITHIN 2 DAYS OF GRADING. SOILS SHALL BE STABILIZED BEFORE A WORK SHUTDOWN, HOLIDAY OR WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST. SOIL STOCKPILES MUST BE STABILIZED AND PROTECTED WITH SEDIMENT TRAPPING MEASURES. HYDROSEED AS SOON AS PRACTICAL ALL DISTURBED AREAS NOT INDICATED IN THE CONTRACT DOCUMENTS FOR OTHER PERMANENT STABILIZATION MEASURES. DESIGN, CONSTRUCT, AND PHASE CUT AND FILL SLOPES IN A MANNER THAT WILL MINIMIZE EROSION. REDUCE SLOPE VELOCITIES ON DISTURBED SLOPES BY PROVIDING TEMPORARY BARRIERS. STORMWATER FROM OFF SITE SHOULD BE HANDLED SEPARATELY FROM STORMWATER GENERATED ON SITE.

AFTER FINAL SITE STABILIZATION

ALL TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED OR AFTER THE TEMPORARY BMPs ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED FROM THE SITE OR INCORPORATED INTO FINISHED GRADING. DISTURBED SOIL AREAS RESULTING FROM REMOVAL SHALL BE PERMANENTLY STABILIZED.

CONSTRUCTION ACCESS

PUBLIC RIGHTS-OF-WAY SHALL BE KEPT IN A CLEAN AND SERVICEABLE CONDITION AT ALL TIMES. IN THE EVENT MATERIALS ARE INADVERTENTLY DEPOSITED ON ROADWAYS THE MATERIAL SHALL BE PROMPTLY REMOVED. MATERIALS ARE TO BE SWEEPED AND REMOVED PRIOR TO ANY STREET FLUSHING.

SILT FENCE SHALL BE PLACED ALONG ACCESS ROUTES, STOCKPILE AREA, AND DOWNSTREAM OF OUTLET COFFER DAM.

CONTROL POLLUTANTS

CONTRACTOR MUST PREPARE A SPILL PREVENTION CONTROL AND COUNTER MEASURE (SPCC) PLAN AND IMPLEMENT REQUIRED MEASURES TO CONTROL POLLUTANTS. SEE THE SPECIAL PROVISIONS.

ALL POLLUTANT DISCHARGES OTHER THAN SEDIMENT THAT OCCUR ON SITE DURING CONSTRUCTION SHALL BE HANDLED AND DISPOSED OF IN A MANNER THAT DOES NOT CAUSE CONTAMINATION OF STORMWATER, GROUNDWATER, OR SOILS TO REMAIN ON SITE.

THE USE OF LIME, FLY ASH, OR OTHER SOIL AMENDMENTS THAT COULD ALTER THE PH OF DISCHARGE WATERS IS PROHIBITED.

SEDIMENT CONTROLS

THE DUFF LAYER, NATIVE TOP SOIL, AND NATURAL VEGETATION SHALL BE RETAINED IN AN UNDISTURBED STATE TO THE MAXIMUM EXTENT PRACTICABLE. THE CONTRACTOR SHALL MARK ALL AREAS WHICH ARE NOT TO BE DISTURBED, INCLUDING SETBACKS, SENSITIVE/CRITICAL AREAS AND THEIR BUFFERS. TREES AND DRAINAGE COURSES NOT TO BE DISTURBED SHALL BE MARKED AND FLAGGED BEFORE CONSTRUCTION ACTIVITIES ARE INITIATED. THESE AREAS SHALL BE PROTECTED BY THE CONTRACTOR WITH BARRIER FENCING AS SHOWN ON THE DRAWING AND AS DIRECTED BY THE ENGINEER WHEN CONSTRUCTION ACTIVITIES ARE INITIATED.

THE CONTRACTOR MAY ELECT TO CONSTRUCT TEMPORARY SEDIMENTATION PONDS, TANKS, OR OTHER FACILITIES AS NECESSARY TO CONTROL RUNOFF AND/OR TO FILTER DEWATERING DISCHARGE.

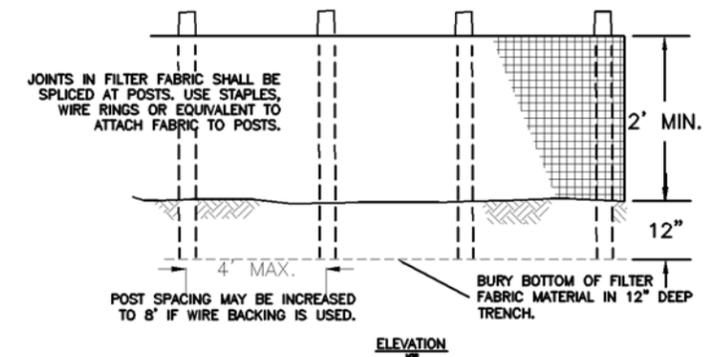
CONTROL DEWATERING

HIGHLY TURBID OR CONTAMINATED DEWATERING WATER FROM CONSTRUCTION EQUIPMENT OPERATION SHALL BE PREVENTED FROM DELIVERING SEDIMENT TO THE RIVER. DISPOSAL OPTIONS FOR DEWATERING DISCHARGE INCLUDE:

1. SEDIMENT-LADEN WATER MAY BE PUMPED TO AN UPLAND AREA AND ALLOWED TO SHEET FLOW OVER UNDISTURBED GROUND THROUGH EXISTING VEGETATION TO INFILTRATE INTO THE GROUND.
2. USE OF AN APPROPRIATELY SIZED AND MAINTAINED SEDIMENTATION BAG (DIRTBAG) OR OTHER SEDIMENTATION FACILITY WITH OUTFALL TO A DITCH OR SWALE FOR SMALL VOLUMES OF LOCALIZED DEWATERING.

NOTES:

1. FENCE SHALL NOT BE INSTALLED ON SLOPES STEEPER THAN 2:1.
2. JOINTS IN FILTER FABRIC SHALL BE OVERLAPPED 12 INCHES AT POST.
3. USE STAPLES, WIRE RINGS, OR EQUIVALENT TO ATTACH FABRIC.
4. REMOVE SEDIMENT WHEN IT REACHES 1/3 FENCE HEIGHT.



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1
11 SILT FENCE
DETAIL

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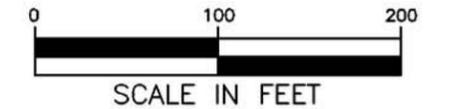
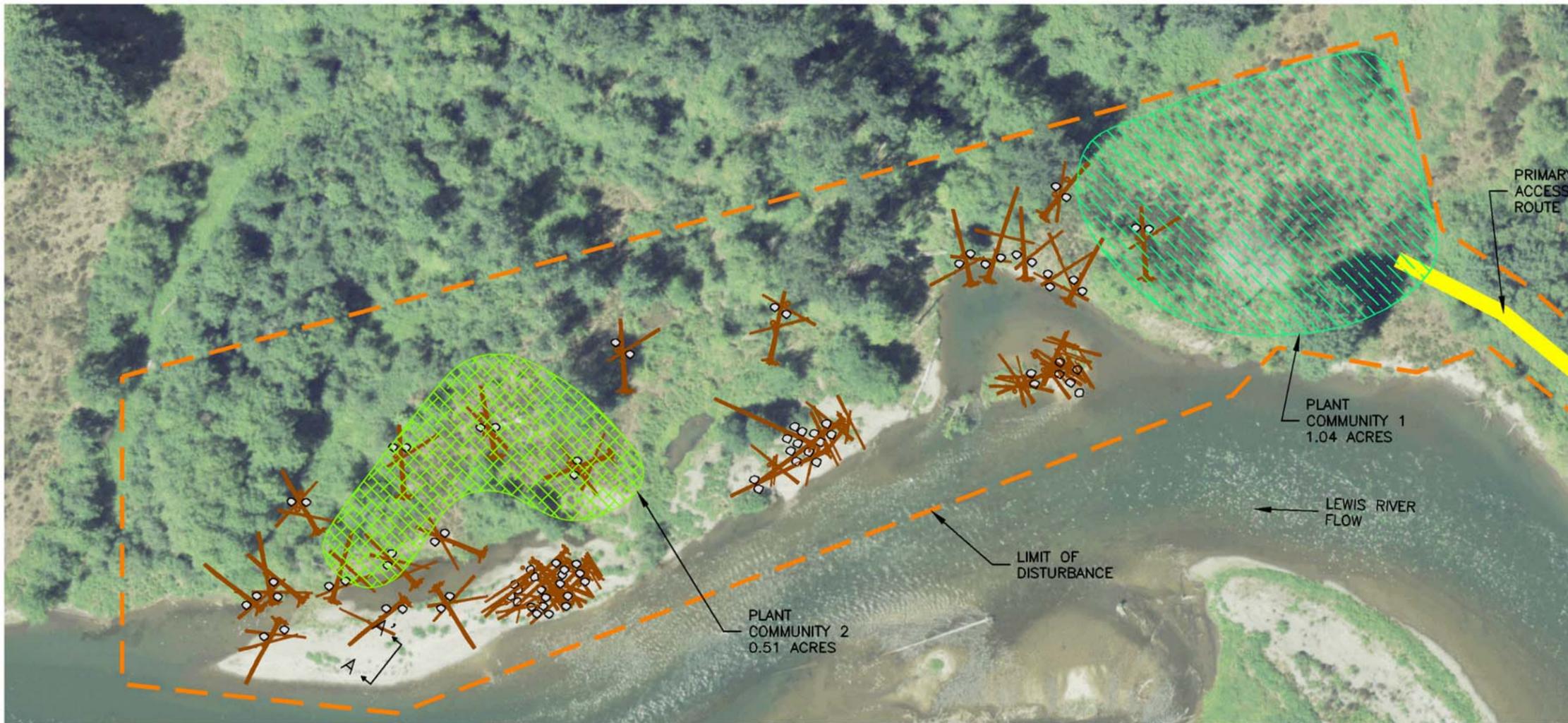
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Erosion Control Notes and
Details



LEGEND

- WOOD
- BOULDER BALLAST
- ACCESS ROUTE
- LIMITS OF DISTURBANCE
- PLANT COMMUNITY 1 (1.04 ACRES)
- PLANT COMMUNITY 2 (0.51 ACRES)

PLAN VIEW

Plant Community 1
Upland Restoration Community (1.04 acres)



Common Name	Scientific Name	Plant Form	Minimum Size	Required Number
Trees – approximately 15 foot spacing on center				
Red alder	<i>Alnus rubra</i>	Bare root	24"	125
Big leaf maple	<i>Acer macrophyllum</i>	Bare root	5 gal./24"	50
Douglas-fir	<i>Pseudotsuga menziesii</i>	Bare root	5 gal./24"	50
Total Trees				225
Shrubs – approximately 5 foot spacing on center				
Evergreen huckleberry	<i>Vaccinium ovatum</i>	Bare root	2 gal./24"	375
Beaked hazelnut	<i>Corylus cornuta</i>	Bare root	2 gal./24"	275
Snowberry	<i>Symphoricarpos alba</i>	Bare root	2 gal./24"	225
Total Shrubs				875
Seed – Upland mix for staging area restoration – Seed at approximately 20 lbs/ acre				
Blue Wildrye	<i>Elymus glaucus</i>	40% of composition by weight		
California brome	<i>Bromus carinatus</i>	40% of composition by weight		
Red fescue	<i>Festuca rubra</i>	20% of composition by weight		

Plant Community 2
Riparian Tree/Shrub Community (0.51 acres)



Common Name	Scientific Name	Plant Form	Minimum Size	Required Number
Trees – approximately 15 foot spacing on center				
Black cottonwood	<i>Populus balsamifera</i>	Bare root	24"	50
Oregon Ash	<i>Fraxinus latifolia</i>	Bare root	24"	25
Total Trees				75
Shrubs – approximately 5 foot spacing on center				
Pacific willow	<i>Salix lasiandra</i>	Bare root	36"	175
Sitka willow	<i>Salix sitchensis</i>	Bare root	36"	175
Douglas spiraea	<i>Spiraea douglasii</i>	Bare root	24"	150
Total Shrubs				500

NOTE:
SITE ACCESS ROADS AND OTHER
DISTURBED AREAS TO BE
SEEDED WITH NATIVE EROSION
CONTROL SEED MIX.

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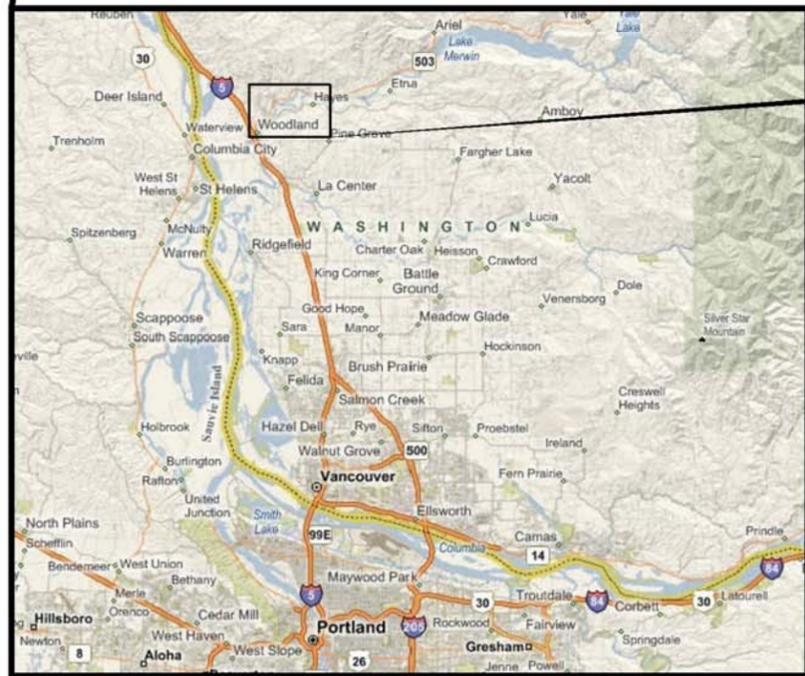


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Revegetation Plan

SHEET

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ABBREVIATIONS

LWD	LARGE WOODY DEBRIS
ESC	EROSION SEDIMENT AND CONTROL
FES	FABRIC ENCAPSULATED SOIL
FT	FEET
STA	STATION
ELEV	ELEVATION
IN	INCH
APPROX	APPROXIMATE
YR	YEAR
'	FEET
"	INCH
°	DEGREES
%	PERCENT
INV	INVERT
DIA	DIAMETER
HDPE	HIGH DENSITY POLYETHYLENE
OHW	ORDINARY HIGH WATER

SHEET INDEX

1	COVER, SHEET INDEX AND VICINITY MAP
2	GENERAL NOTES
3	SITE PLAN AND ACCESS
4	EROSION AND SEDIMENT CONTROL PLAN
5	PLAN VIEW HABITAT RESTORATION
6	CROSS-SECTIONS
7	TYPICAL DETAILS
8	TYPICAL DETAILS
9	TYPICAL DETAILS
10	TYPICAL DETAILS
11	EROSION CONTROL NOTES AND DETAILS
12	REVEGETATION PLAN

30% DESIGN

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Cover, Sheet Index and
Vicinity Map

SHEET
1 of 12

EXISTING DATA

GENERAL TOPOGRAPHIC INFORMATION IS PROVIDED FROM LIDAR FROM CLARK COUNTY AND SPECIFIC PROJECT AREA SURVEY PERFORMED BY INTER-FLUVE, INC.

SOILS

LEWIS RIVER GRAVEL BAR.

UTILITIES

THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR HAVING UTILITIES LOCATED PRIOR TO CONSTRUCTION ACTIVITIES.

THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE AFFECTED UTILITY SERVICE TO REPORT ANY DAMAGED OR DESTROYED UTILITIES. THE CONTRACTOR SHALL PROVIDE EQUIPMENT OR LABOR TO AID THE AFFECTED UTILITY SERVICE IN REPAIRING DAMAGED OR DESTROYED UTILITIES AT NO COST TO THE OWNER.

CONSTRUCTION ACCESS

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR OBTAINING ANY REQUIRED TRAFFIC CONTROL OR ACCESS PERMITS.

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROVIDING ANY REQUIRED TRAFFIC CONTROL INCLUDING, BUT NOT LIMITED TO, SIGNAGE AND FLAGGERS.

ALL SAPLING AND TREES TO BE TRANSPLANTED OR REMOVED SHALL BE APPROVED BY THE OWNER'S REPRESENTATIVE AND CLEARLY MARKED.

ALL EQUIPMENT, MATERIALS AND PERSONNEL SHALL REMAIN WITHIN THE LIMITS OF DISTURBANCE.

THE CONTRACTOR SHALL KEEP THE WORK AREAS IN A NEAT AND SIGHTLY CONDITION FREE OF DEBRIS AND LITTER FOR THE DURATION OF THE PROJECT.

COFFERDAM

WORK AREA(S) SHALL BE ISOLATED BY COFFERDAMS INSTALLED UPSTREAM AND DOWNSTREAM OF ENHANCEMENT AREA. COFFERDAM MAY BE CONSTRUCTED WITH SAND FILLED BULK BAGS AND LINED WITH VISQUEEN ADJACENT TO ACTIVE FLOW IN THE CHANNEL.

DEWATERING OF WORK AREA(S) SHALL OCCUR CONCURRENT WITH FISH RESCUE. THE OWNER WILL BE RESPONSIBLE FOR CONDUCTING AND COORDINATING THE FISH RESCUE. THE CONTRACTOR SHALL COORDINATE DEWATERING WITH FISH RESCUE ACTIVITIES.

PUMPING SHALL BE PERFORMED TO KEEP WORK AREA DEWATERED. PUMPED DISCHARGE SHALL RELEASE SEDIMENT-LADEN WATER IN A MANNER THAT DOES NOT CAUSE CONTAMINATION OR INCREASE TURBIDITY OF SURFACE WATERS. (SEE CONTROL DEWATERING).

FISH RESCUE

COFFER DAM SHALL BE INSTALLED TO ISOLATE WORK.

INITIAL DEWATERING SHALL OCCUR SLOWLY BY INCREMENTALLY REDUCING COFFER DAMMED AREAS OVER A PERIOD OF 30 MINUTES TO ALLOW TIME FOR FISH TO FIND RESIDUAL POOLS WITHOUT RISK OF SUDDEN STRANDING.

RESIDUAL POOLS WITHIN THE DEWATERED CONSTRUCTION SITE SHALL BE PUMPED DRY USING SCREENED PUMP INTAKES. TRAPPED FISH SHALL BE RESCUED.

FISH BARRIERS AND PUMP INTAKES SHALL ADHERE TO NMFS SCREENING CRITERIA. NATIONAL MARINE FISHERIES SERVICE JUVENILE FISH SCREEN CRITERIA (REVISED FEBRUARY 16, 1995) AND ADDENDUM: JUVENILE FISH SCREEN CRITERIA FOR PUMP INTAKES (MAY 9, 1996)

ALL FISH RESCUE EFFORTS SHALL BE SUPERVISED BY A QUALIFIED FISHERIES/AQUATIC BIOLOGIST EXPERIENCED WITH THE COLLECTION AND HANDLING OF SALMONID FISHES FROM CONSTRUCTION SITES.

ALL FISH TRAPPED IN RESIDUAL POOLS WITHIN THE PROJECT AREA WILL BE CAREFULLY COLLECTED BY SEINE AND/OR DIP NETS AND PLACED IN CLEAN TRANSFER CONTAINERS WITH PORTABLE AERATION.

CAPTURED FISHES SHALL BE IMMEDIATELY RELEASED TO DOWNSTREAM OR UPSTREAM OF THE CONSTRUCTION SITE, DEPENDING ON SPECIES AND LIFESTAGE.

TREE SALVAGE

ANY REMOVED VEGETATION GREATER THAN 6 INCHES DIAMETER AND 15 FEET LONG SHOULD BE INCORPORATED INTO LOG JAM STRUCTURES. CONTRACTOR IS RESPONSIBLE FOR REMOVING SMALLER CLEARING AND GRUBBING DEBRIS FROM THE SITE AT THE END OF THE PROJECT UNLESS DIRECTED BY THE OWNER'S REPRESENTATIVE. TREES THAT ARE REMOVED DURING CONSTRUCTION WILL BE USED AS PART OF THE PROJECT. TREES SHALL BE REMOVED WITH ROOT WADS ATTACHED UNLESS THEIR SIZE PROHIBITS THEIR SAFE REMOVAL WITH ROOT WAD ATTACHED. IN THESE CASES THE TREES SHALL BE FELLED AND THE ROOT WADS SALVAGED. TREE TOPS WILL BE UTILIZED AND BE CUT TO FIELD DIRECTED LENGTHS DEPENDENT ON TREE SIZE AND SPECIES.

LIVE TREES

ALL TREES NOT MARKED FOR REMOVAL SHALL BE LEFT STANDING UNDISTURBED. LOGGING ACTIVITY SHALL NOT DEBARK OR DAMAGE LIVE TREES.

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General Notes



SITE PLAN

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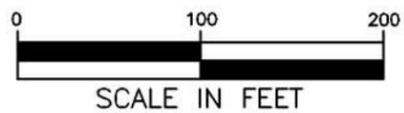
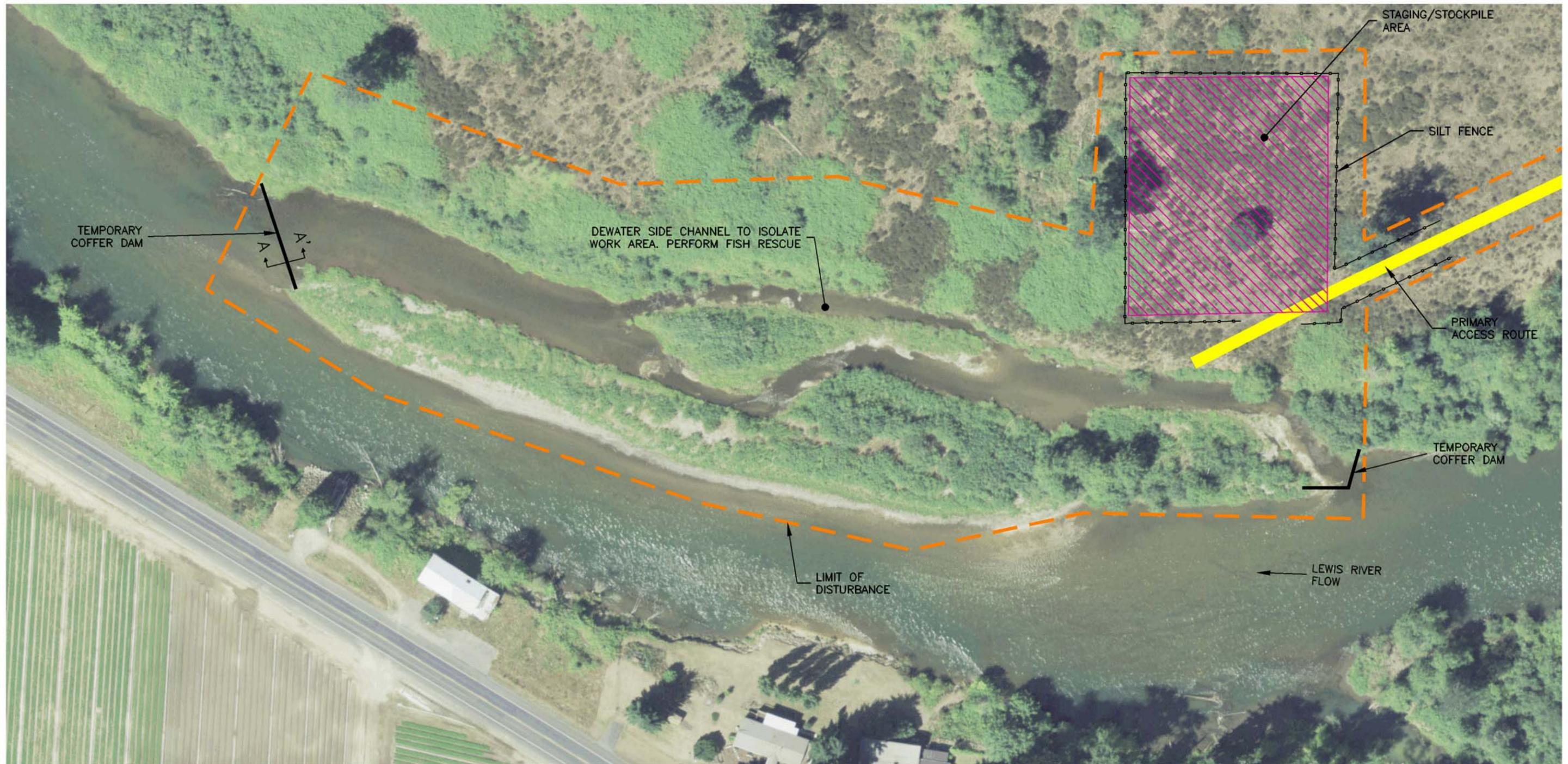
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Site Plan and Access



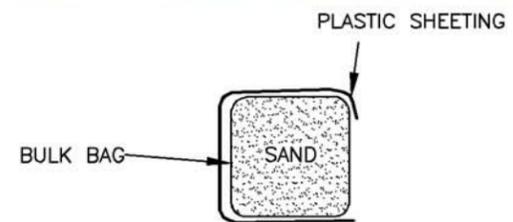
SCALE IN FEET

LEGEND

- TEMPORARY COFFER DAM
- ACCESS ROUTE
- STAGING/STOCKPILE
- LIMITS OF DISTURBANCE
- SEDIMENT FENCE

PLAN VIEW

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SECTION A-A'
NO SCALE

- NOTES:
1. PLACE COFFER DAMS PRIOR TO PERFORMING IN-WATER WORK.
 3. REMOVE COFFER DAMS AFTER IN-WATER WORK IS COMPLETE.

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Erosion and Sediment
Control Plan



PLAN VIEW



LEGEND

- WOOD
- BOULDER BALLAST
- LIDAR CONTOURS (1 FOOT INTERVALS)
- HABITAT WOOD COVER (1/7) (2/7)
- LATERAL SCOUR POOL JAM (3/7) (4/7)
- FLOODPLAIN WOOD (3/8) (4/8)
- BAR APEX JAM (1/8) (2/8)

NOTE:
SPECIFIC ORIENTATION OF LOGS AND BALLAST MATERIALS MAY VARY FROM PLAN VIEW DRAWING DEPENDING ON SIZE AND SHAPE OF MATERIAL ACQUIRED AND SITE CONDITIONS AT TIME OF CONSTRUCTION.

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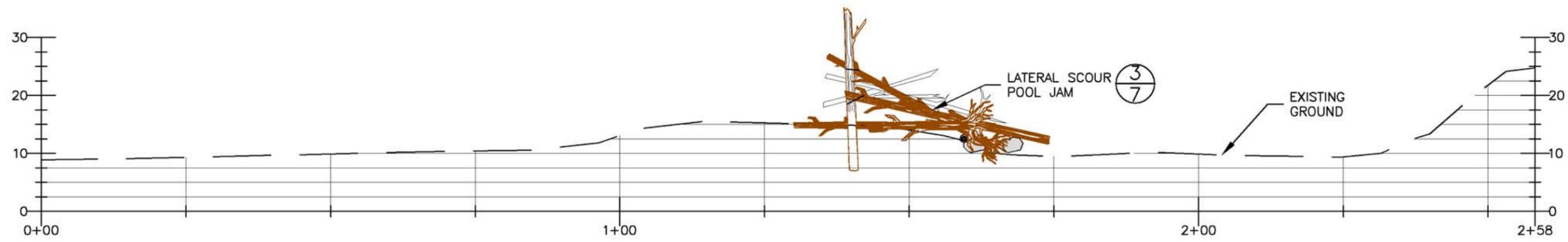
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Erosion and Sediment
Control Plan



1 CROSS-SECTION
6 NOT TO SCALE

NOTE:
CROSS-SECTION INFORMATION WAS
COMPILED USING SURVEY DATA
CONDUCTED OCT, 2009 BY
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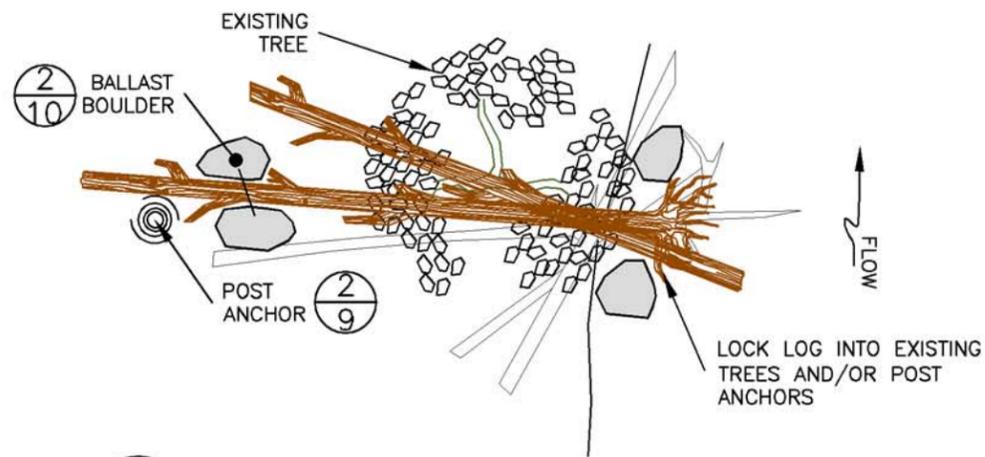
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Cross-Sections

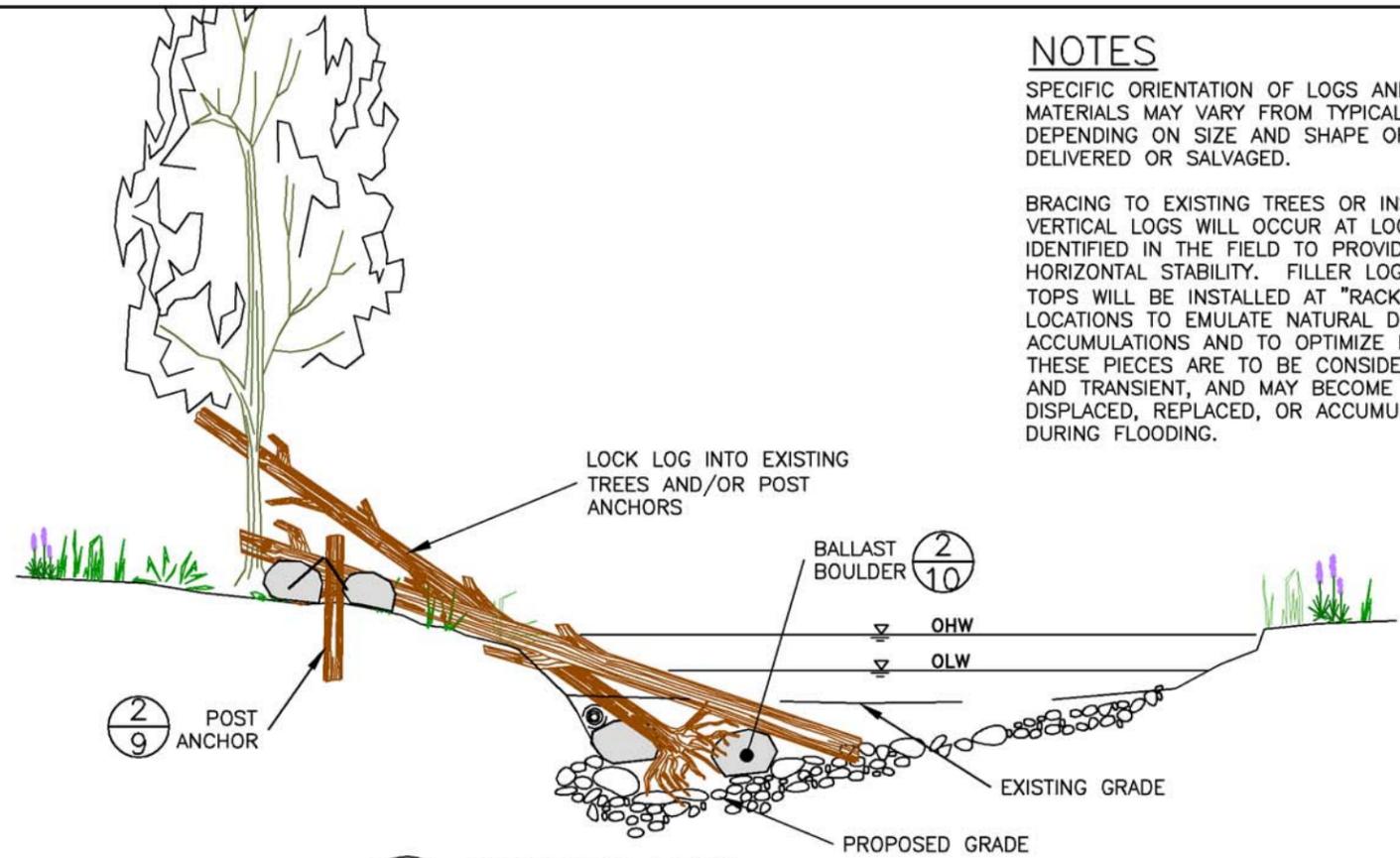
NOTES

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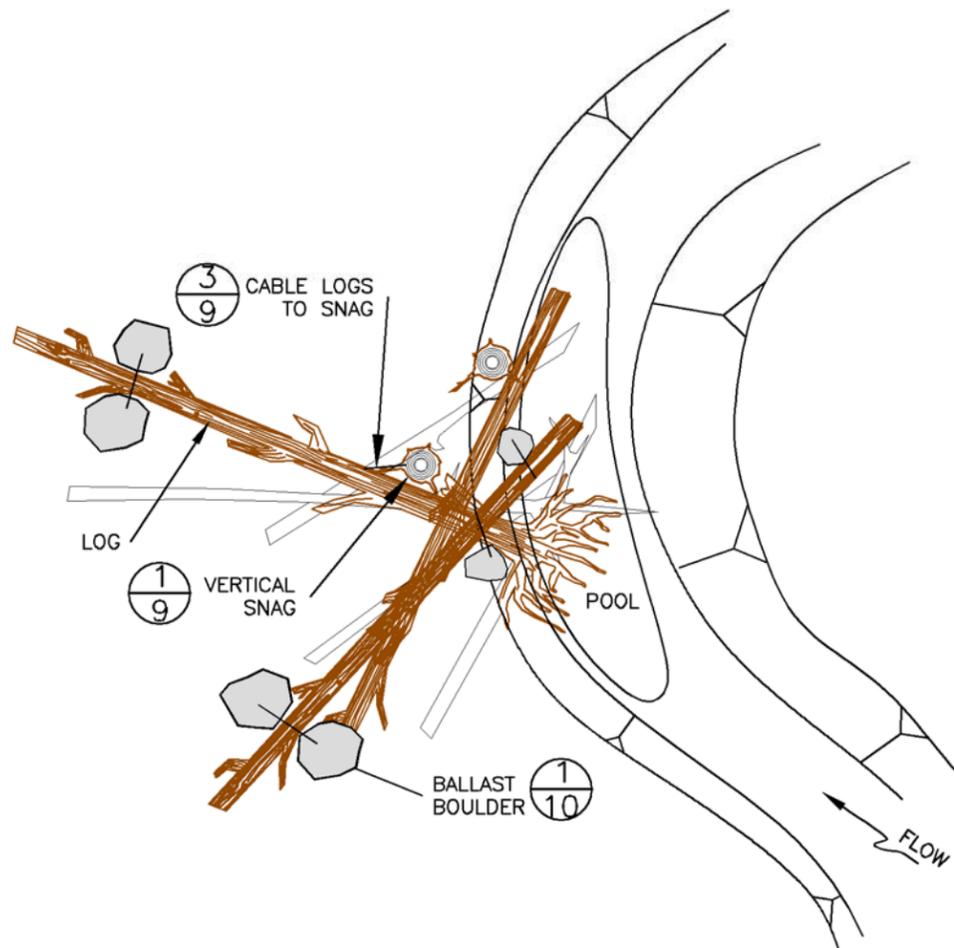
BRACING TO EXISTING TREES OR INSTALLED VERTICAL LOGS WILL OCCUR AT LOCATIONS IDENTIFIED IN THE FIELD TO PROVIDE HORIZONTAL STABILITY. FILLER LOGS AND TREE TOPS WILL BE INSTALLED AT "RACKING" LOCATIONS TO EMULATE NATURAL DEBRIS ACCUMULATIONS AND TO OPTIMIZE FISH HABITAT. THESE PIECES ARE TO BE CONSIDERED MOBILE AND TRANSIENT, AND MAY BECOME LOOSE, DISPLACED, REPLACED, OR ACCUMULATED ONTO DURING FLOODING.



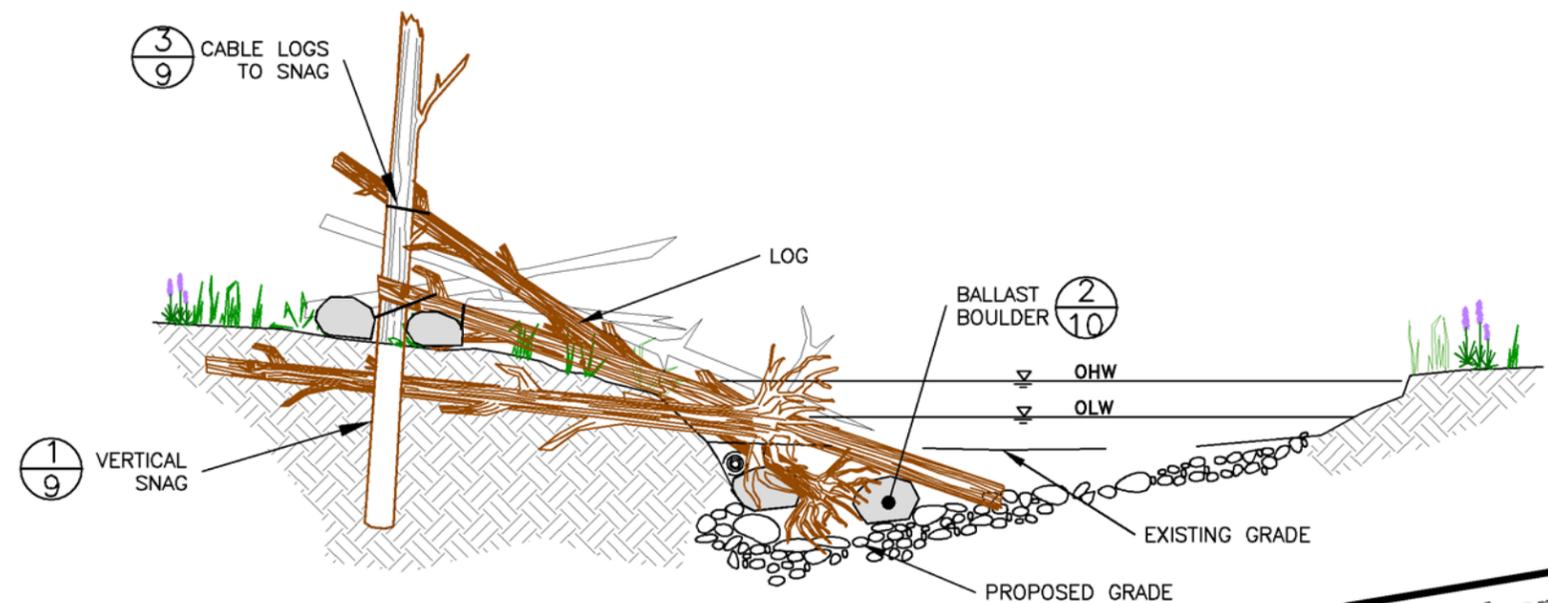
1 PLAN VIEW
7 TYPICAL HABITAT WOOD COVER
NOT TO SCALE



2 SECTION VIEW
7 TYPICAL HABITAT COVER WOOD
NOT TO SCALE



3 PLAN VIEW
7 TYPICAL LATERAL SCOUR POOL JAM
NOT TO SCALE



4 SECTION VIEW
7 TYPICAL LATERAL SCOUR POOL JAM
NOT TO SCALE

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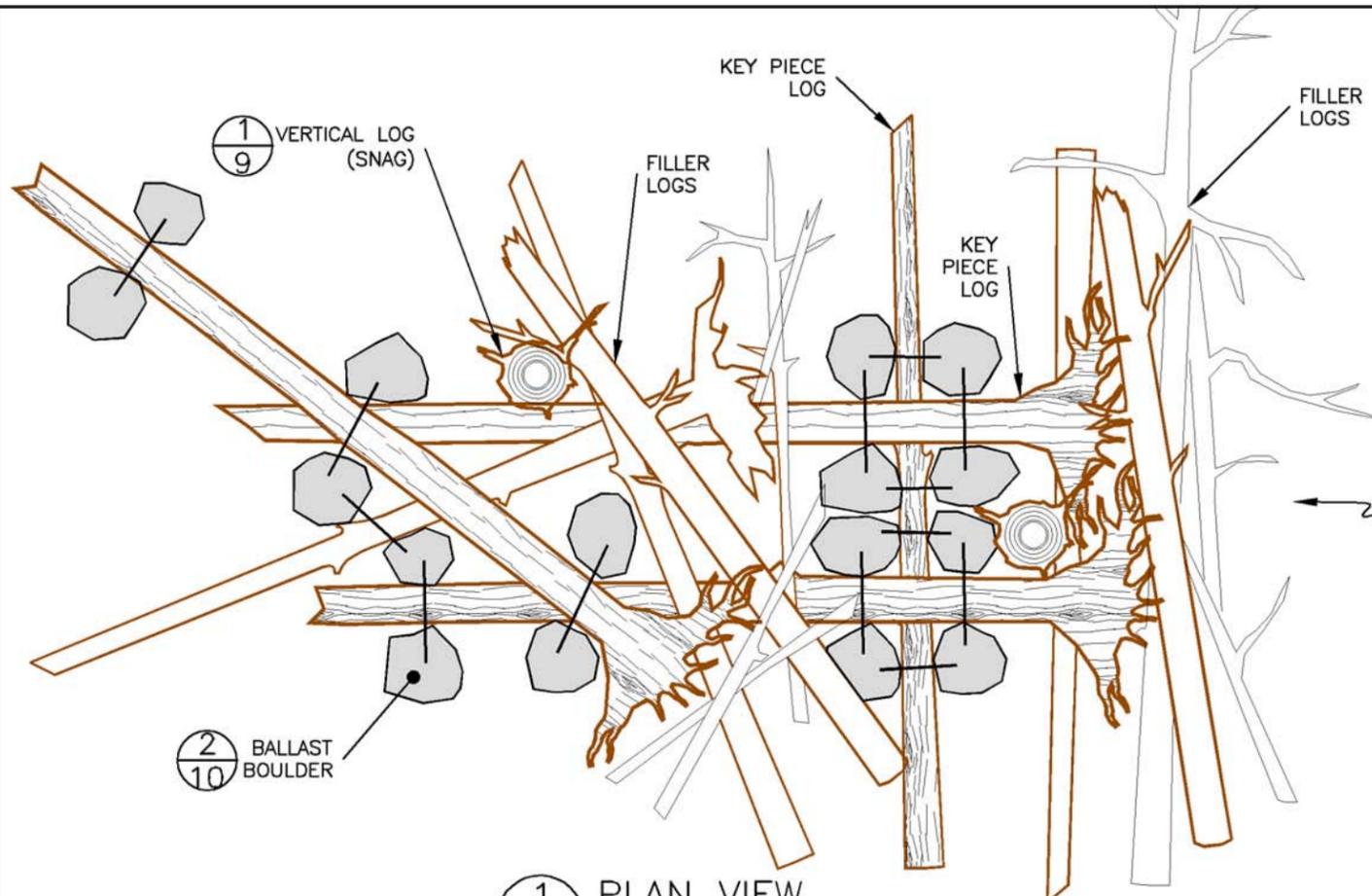
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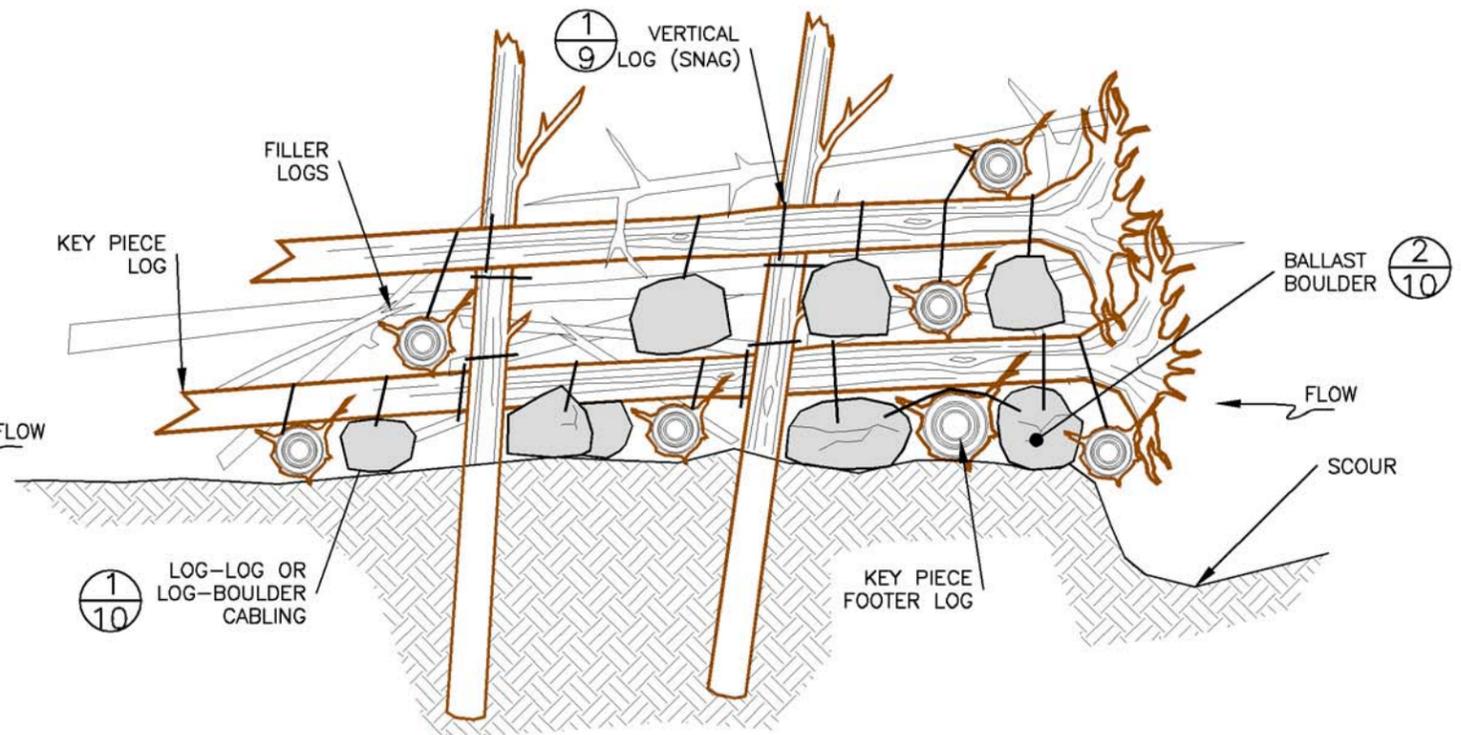
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Typical Details

SHEET
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1 PLAN VIEW
8 TYPICAL BAR APEX LOG JAM
NOT TO SCALE

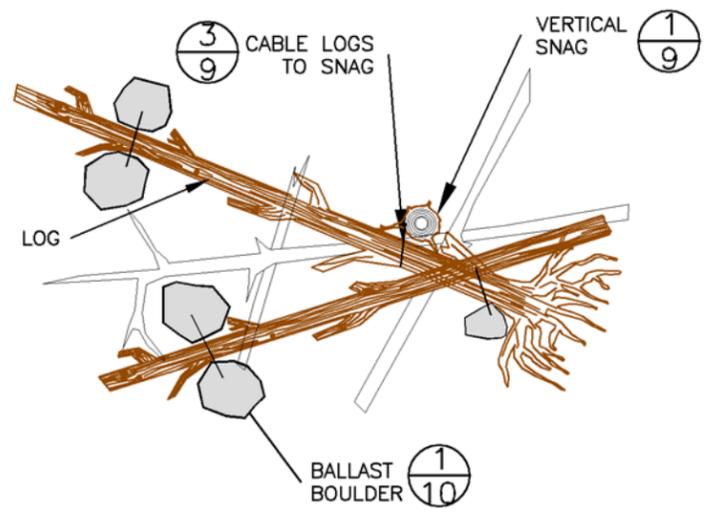


2 SECTION VIEW
8 TYPICAL BAR APEX LOG JAM
NOT TO SCALE

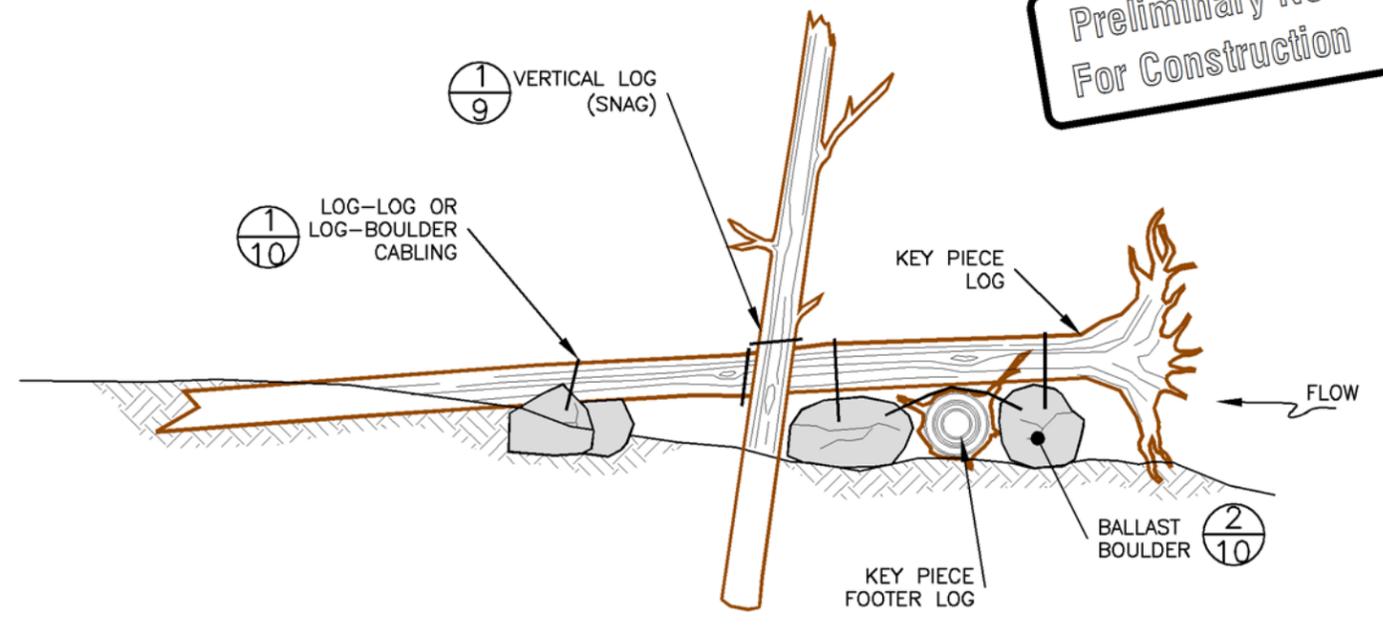
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3 PLAN VIEW
8 TYPICAL FLOODPLAIN WOOD
NOT TO SCALE



4 SECTION VIEW
8 TYPICAL FLOODPLAIN WOOD
NOT TO SCALE

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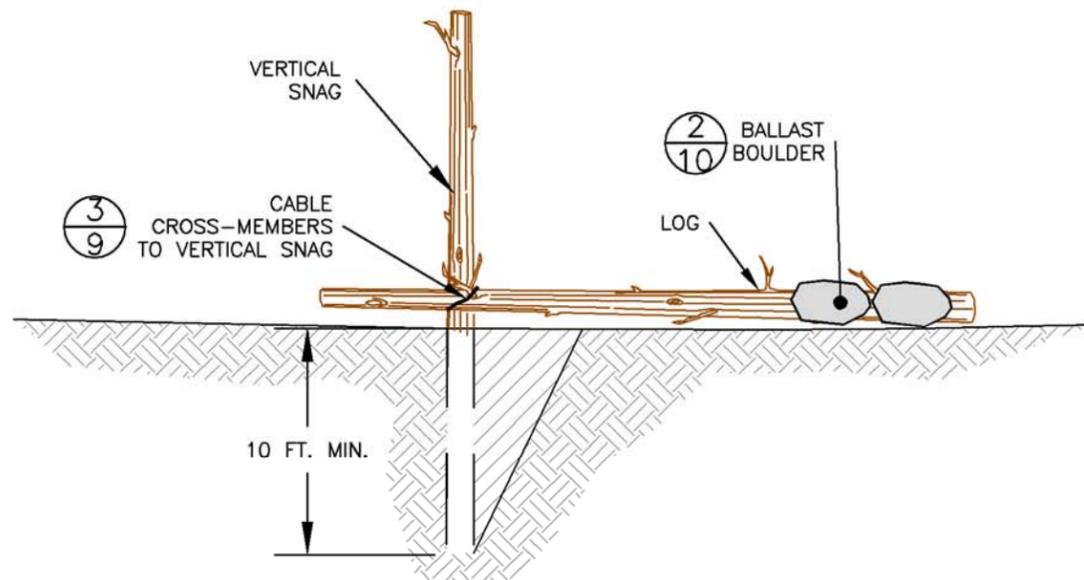
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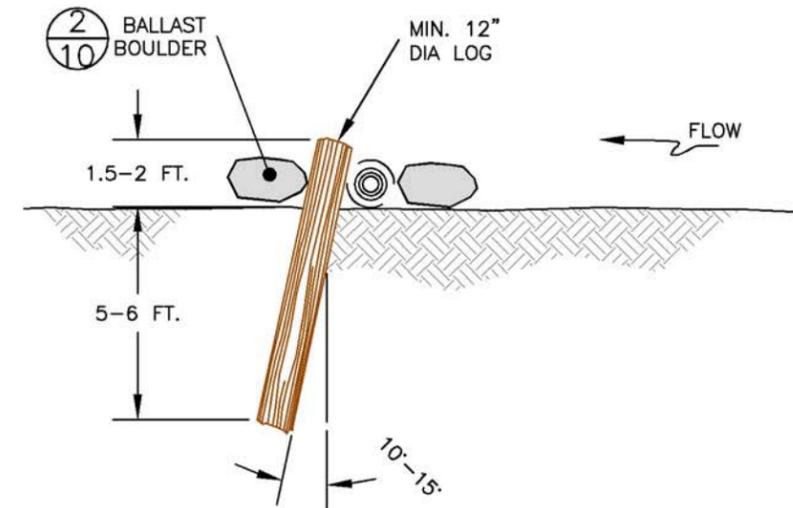
Typical Details



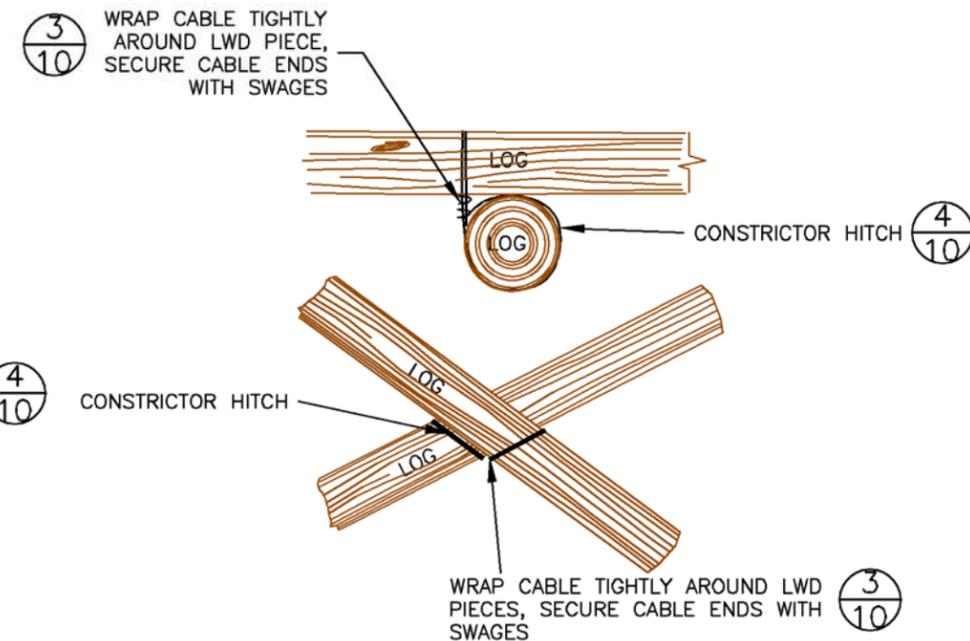
1 SECTION VIEW
9 TYPICAL LOGS SECURED AT VERTICAL SNAG
NOT TO SCALE

CABLING

USE 1/2 INCH GALVANIZED CABLE. CABLE SHALL BE CONSTRICTOR HITCHED AROUND VERTICAL SNAG WRAPPED ONCE AROUND OTHER LOG BEFORE ENDS ARE FASTENED TOGETHER. THERE SHALL BE NO SLACK IN THE CABLE AFTER IT IS FASTENED.



2 SECTION VIEW
9 TYPICAL LWD POST ANCHOR
NOT TO SCALE



3 DETAIL VIEWS
9 TYPICAL LOG CABLING
NOT TO SCALE

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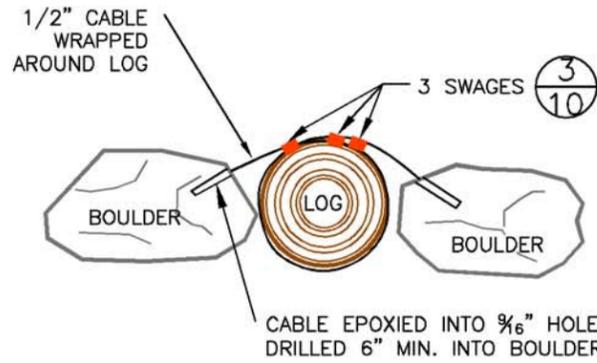


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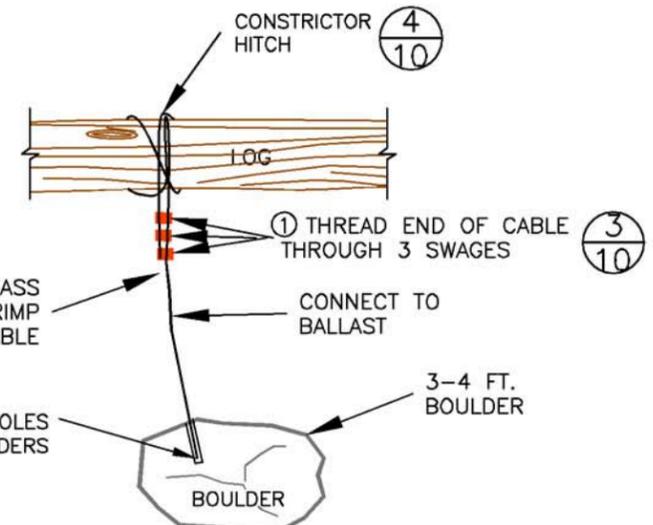
Typical Details

SHEET

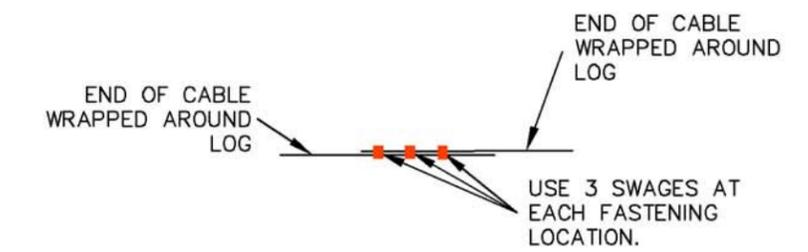
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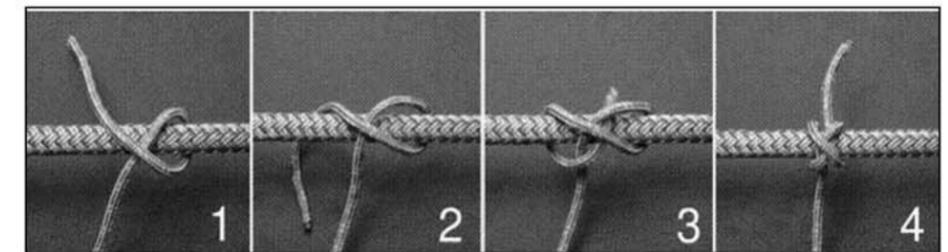
1 LWD INSTALLATION
10 DETAILS



2 CONSTRICTOR HITCH
10 CABLE WRAP



3 SWAGES CABLE
10 SPLICE DETAIL



4 CONSTRICTOR HITCH
10 CABLE KNOT DETAIL

Log Wood Buoyancy Force in Pounds Assumes Wood Specific Gravity = 0.5	
DBH X Log Length (feet)	Safety Factor 1.5
1 x 30	1104
2 x 30	4416
3 x 30	9935
1 x 40	1472
2 x 40	5887
Additional Root Wad Buoyancy Force in Pounds. Estimate Based on 35% Void Space Adjust as needed based on void space in each root wad.	
2 X 2 Foot Diameter RW	64
3 X 3 Foot Diameter RW	215
4 X 4 Foot Diameter RW	510
5 X 5 Foot Diameter RW	997
6 X 6 Foot Diameter RW	1722

NOTE:
THE NUMBER OF ANCHOR ROCKS PER ANCHORED LOG STRUCTURE SHALL BE AS SHOWN ON THE TABLES PROVIDED ON THIS SHEET USING APPROPRIATE NUMBER OF BOULDERS AND THE SIZE OF LOGS.

Submerged Boulder Ballast in Pounds. Assumes Rock Density of 2.65 and lift @ 6fps	
Boulder Diameter	Ballast
3 Foot	1289
2 - Boulder Configuration	2579
4 - Boulder Configuration	3868
3.5 Foot	2085
2 - Boulder Configuration	4171
4 - Boulder Configuration	6256
4 Foot	3156
2 - Boulder Configuration	6311
4 - Boulder Configuration	9467

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BOULDER BALLAST AND WOOD CABLING:

BOULDER BALLAST NOTES

DESCRIPTION
THIS WORK CONSISTS OF INSTALLING LOGS WITH ROOT WADS INTO ANCHORED LOG STRUCTURES AS SHOWN ON THE PLANS AND AS DIRECTED BY THE OWNERS REPRESENTATIVE.

MATERIALS
ANCHORS FOR THIS WORK WILL CONSIST OF CABLED BOULDERS. BOULDERS SHALL BE NON-FRACTURED BASALT WITH A MINIMUM SPECIFIC GRAVITY OF 2.65.

CABLE SHALL BE GALVANIZED, STEEL CORE, AND SHALL HAVE A MINIMUM DIAMETER OF 1/2 INCH.

SWAGES SHALL BE ZINC PLATED COPPER AND SHALL MEET THE PERFORMANCE REQUIREMENTS OF MILITARY STANDARD MS-51844, REV. C, SLEEVES, SWAGING-WIRE ROPE. MINIMUM OF 3 SWAGES PER CONNECTION.

EPOXY FOR ANCHORING SHALL BE HILTI HIT RE 500 ADHESIVE OR APPROVED EQUAL.

CONSTRUCTION
FINAL POSITIONING OF THE ANCHORED LOG STRUCTURES SHALL BE IN THE APPROXIMATE LOCATION AS SHOWN ON THE PLANS AND AS APPROVED IN THE FIELD BY THE OWNERS REPRESENTATIVE.

GENERAL NOTES , CONT'D

FINAL POSITIONING OF THE ANCHORED LOG STRUCTURES SHALL BE IN THE APPROXIMATE LOCATION AS SHOWN ON THE PLANS AND AS APPROVED IN THE FIELD BY THE OWNERS REPRESENTATIVE.

BALLAST BOULDERS SHALL BE SECURED AS SHOWN ON THE PLANS.

DRILL HOLES IN SOLID ROCK AND AVOID ANY CRACKS OR FRACTURES. HOLES SHALL BE 9/16 INCH IN DIAMETER. HOLES MUST BE DRILLED 6 INCHES, MINIMUM, INTO ROCK. HOLES MUST BE CLEANED OF LOOSE ROCK FRAGMENTS AND POWDER WITH A BRUSH AND WATER. HOLES MUST BE CLEAN OF ALL DUST, DEBRIS, OIL, AND SOAP RESIDUES. THE HOLES MUST FLUSH CLEAR TO INSURE NO MATERIAL EXISTS BETWEEN THE CABLE, EPOXY, AND ROCK SURFACE. INSTALL EPOXY PER MANUFACTURER'S RECOMMENDATIONS.

CABLE SHALL BE WRAPPED ONCE AROUND LOG BEFORE ENDS ARE INSERTED INTO THE DRILLED HOLES FILLED WITH EPOXY. WIPE CABLE WITH CLEAN ACETONE SOAKED RAG TO REMOVE OILS AND GREASES PRIOR TO INSERTION INTO EPOXY FILLED HOLE. FILL DRILL HOLES ENOUGH TO ENSURE COMPLETE COVERAGE WITH EPOXY. INSERT CABLE INTO HOLE SO THAT END OF CABLE HITS THE BOTTOM OF THE HOLE. EXCESS EPOXY SHOULD COME OUT OF THE TOP OF THE HOLE AS CABLE IS SEATED IN DRILL HOLE.

MINIMUM 3 SWAGES PER CONNECTION. SWAGES SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION, SPACING AND SWAGE TOOL DIAMETER FOR THE SIZE AND LOAD RATING OF THE CABLE BEING USED. SWAGING TOOL SHALL BE CHECKED FOR PROPER COMPRESSION, ACCORDING TO MANUFACTURER'S RECOMMENDATIONS, USING A GAUGE PROVIDED BY THE MANUFACTURER OF THE SWAGE FITTINGS BEING INSTALLED.

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Typical Details

THE CONTRACTOR IS ADVISED THAT THE PROJECT AREA DRAINS TO A SALMON BEARING STREAM AND/OR STATE WATERS AND THAT THE CONTRACTOR IS RESPONSIBLE TO PROTECT THE RECEIVING WATERS FROM DELETERIOUS EFFECTS OF CONSTRUCTION.

THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE EROSION CONTROL MEASURES SHOWN OR DESCRIBED IN THE CONTRACT DOCUMENTS AND ANY ADDITIONAL MEASURES THAT MAY BE REQUIRED BY THE CONTRACTORS MEANS AND METHODS OF CONSTRUCTION AS NEEDED TO CONTROL EROSION AND SEDIMENT AT THE CONSTRUCTION SITE AND TO PREVENT VIOLATION OF SURFACE WATER QUALITY, GROUND WATER QUALITY, OR SEDIMENT MANAGEMENT STANDARDS. EROSION CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE COURSE OF CONSTRUCTION AND UNTIL ALL DISTURBED EARTH IS STABILIZED IN FINISH GRADES.

EROSION CONTROL

CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND MAINTAINING ALL NECESSARY EROSION CONTROL FACILITIES TO COMPLY WITH APPLICABLE EROSION CONTROL REGULATIONS.

AN APPROVED EROSION AND SEDIMENT CONTROL (ESC) PLAN IS PROVIDED IN THESE DRAWINGS. THE BID AND CONSTRUCTION CONTRACT ARE BASED UPON IT. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR PROVIDING EROSION CONTROL MEASURES TO COMPLY WITH APPLICABLE REGULATIONS AND PERMITS.

THE FOLLOWING RECOMMENDATIONS FOR AN ESC PLAN WILL PROVIDE A GUIDELINE FOR THE CONTRACTOR TO DEVELOP AND IMPLEMENT AN ESC PLAN.

A. THE IMPLEMENTATION OF THESE RECOMMENDATIONS FOR AN ESC PLAN AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED, AND VEGETATION IS ESTABLISHED.

B. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE FLAGGED CLEARING LIMITS SHALL BE PERMITTED. THE FLAGGING SHALL BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF CONSTRUCTION.

C. ESC FACILITIES AS APPROXIMATELY SHOWN ON THIS PLAN ARE TO BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT ENTER THE DRAINAGE SYSTEM, OR VIOLATE APPLICABLE WATER STANDARDS.

D. THE ESC FACILITIES SHOWN ON THE ESC PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.

E. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.

F. FROM OCTOBER 1 – APRIL 30, NO SUBSTANTIALLY UNWORKED SOILS SHALL REMAIN EXPOSED FOR MORE THAN TWO DAYS AT A TIME. FROM MAY 1 – SEPT 30 NO SUBSTANTIALLY UNWORKED SOILS SHALL REMAIN EXPOSED FOR MORE THAN SEVEN DAYS AT A TIME.

SEDIMENT FENCES

1. THE SILT FENCE SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, SILT FENCE SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 12 INCH OVERLAP, AND BOTH ENDS SECURELY FASTENED TO THE POST, OR OVERLAP 2'X2" POSTS AND ATTACH AS APPROVED BY THE OWNER'S REPRESENTATIVE.

2. THE SILT FENCE IS TO BE INSTALLED AT LOCATIONS SHOWN ON THE PLAN ALONG THE DOWNHILL PERIMETER OF DISTURBED AREAS. THE FENCE POSTS SHALL BE SPACED A MAXIMUM OF 4 FEET APART AND DRIVEN SECURELY INTO THE GROUND A MINIMUM OF 12 INCHES.

3. THE SILT FENCE SHALL HAVE A MINIMUM VERTICAL BURIAL OF 6 INCHES. ALL EXCAVATED MATERIAL FROM FILTER FABRIC FENCE INSTALLATION SHALL BE BACKFILLED AND COMPACTED, ALONG THE ENTIRE DISTURBED AREA.

4. STANDARD OR HEAVY DUTY SILT FENCE SHALL HAVE MANUFACTURED STITCHED LOOPS FOR 2' x 2' POST INSTALLATION.

5. SILT FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY PROTECTED AND STABILIZED.

6. SILT FENCES SHALL BE INSPECTED BY THE CONTRACTOR IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.

7. ON PROJECT COMPLETION THE CONTRACTOR SHALL REMOVE ALL SILT FENCES AND TEMPORARY EROSION CONTROL MEASURES FROM THE PROJECT SITE.

INSPECTION AND MAINTENANCE

ALL BEST MANAGEMENT PRACTICES (BMPs) SHALL BE INSPECTED, MAINTAINED, AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. ALL ON-SITE EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.5 INCHES OF RAIN PER 24 HOUR PERIOD.

SEDIMENT MUST BE REMOVED FROM SILT FENCES BEFORE IT REACHES APPROXIMATELY ONE THIRD THE HEIGHT OF THE FENCE, ESPECIALLY IF HEAVY RAINS ARE EXPECTED.

STABILIZE SOILS AND PROTECT SLOPES

FROM MAY 1 THROUGH SEPTEMBER 30, ALL EXPOSED SOILS SHALL BE PROTECTED FROM EROSION BY MULCHING, PLASTIC SHEETING, HYDROSEED COVERING, OR OTHER APPROVED MEASURES WITHIN ONE WEEK OF GRADING. FROM OCTOBER 1 THROUGH APRIL 30, ALL EXPOSED SOILS MUST BE PROTECTED WITHIN 2 DAYS OF GRADING. SOILS SHALL BE STABILIZED BEFORE A WORK SHUTDOWN, HOLIDAY OR WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST. SOIL STOCKPILES MUST BE STABILIZED AND PROTECTED WITH SEDIMENT TRAPPING MEASURES. HYDROSEED AS SOON AS PRACTICAL ALL DISTURBED AREAS NOT INDICATED IN THE CONTRACT DOCUMENTS FOR OTHER PERMANENT STABILIZATION MEASURES. DESIGN, CONSTRUCT, AND PHASE CUT AND FILL SLOPES IN A MANNER THAT WILL MINIMIZE EROSION. REDUCE SLOPE VELOCITIES ON DISTURBED SLOPES BY PROVIDING TEMPORARY BARRIERS. STORMWATER FROM OFF SITE SHOULD BE HANDLED SEPARATELY FROM STORMWATER GENERATED ON SITE.

AFTER FINAL SITE STABILIZATION

ALL TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED OR AFTER THE TEMPORARY BMPs ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED FROM THE SITE OR INCORPORATED INTO FINISHED GRADING. DISTURBED SOIL AREAS RESULTING FROM REMOVAL SHALL BE PERMANENTLY STABILIZED.

CONSTRUCTION ACCESS

PUBLIC RIGHTS-OF-WAY SHALL BE KEPT IN A CLEAN AND SERVICEABLE CONDITION AT ALL TIMES. IN THE EVENT MATERIALS ARE INADVERTENTLY DEPOSITED ON ROADWAYS THE MATERIAL SHALL BE PROMPTLY REMOVED. MATERIALS ARE TO BE SWEEPED AND REMOVED PRIOR TO ANY STREET FLUSHING.

SILT FENCE SHALL BE PLACED ALONG ACCESS ROUTES, STOCKPILE AREA, AND DOWNSTREAM OF OUTLET COFFER DAM.

CONTROL POLLUTANTS

CONTRACTOR MUST PREPARE A SPILL PREVENTION CONTROL AND COUNTER MEASURE (SPCC) PLAN AND IMPLEMENT REQUIRED MEASURES TO CONTROL POLLUTANTS. SEE THE SPECIAL PROVISIONS.

ALL POLLUTANT DISCHARGES OTHER THAN SEDIMENT THAT OCCUR ON SITE DURING CONSTRUCTION SHALL BE HANDLED AND DISPOSED OF IN A MANNER THAT DOES NOT CAUSE CONTAMINATION OF STORMWATER, GROUNDWATER, OR SOILS TO REMAIN ON SITE.

THE USE OF LIME, FLY ASH, OR OTHER SOIL AMENDMENTS THAT COULD ALTER THE PH OF DISCHARGE WATERS IS PROHIBITED.

SEDIMENT CONTROLS

THE DUFF LAYER, NATIVE TOP SOIL, AND NATURAL VEGETATION SHALL BE RETAINED IN AN UNDISTURBED STATE TO THE MAXIMUM EXTENT PRACTICABLE. THE CONTRACTOR SHALL MARK ALL AREAS WHICH ARE NOT TO BE DISTURBED, INCLUDING SETBACKS, SENSITIVE/CRITICAL AREAS AND THEIR BUFFERS. TREES AND DRAINAGE COURSES NOT TO BE DISTURBED SHALL BE MARKED AND FLAGGED BEFORE CONSTRUCTION ACTIVITIES ARE INITIATED. THESE AREAS SHALL BE PROTECTED BY THE CONTRACTOR WITH BARRIER FENCING AS SHOWN ON THE DRAWING AND AS DIRECTED BY THE ENGINEER WHEN CONSTRUCTION ACTIVITIES ARE INITIATED.

THE CONTRACTOR MAY ELECT TO CONSTRUCT TEMPORARY SEDIMENTATION PONDS, TANKS, OR OTHER FACILITIES AS NECESSARY TO CONTROL RUNOFF AND/OR TO FILTER DEWATERING DISCHARGE.

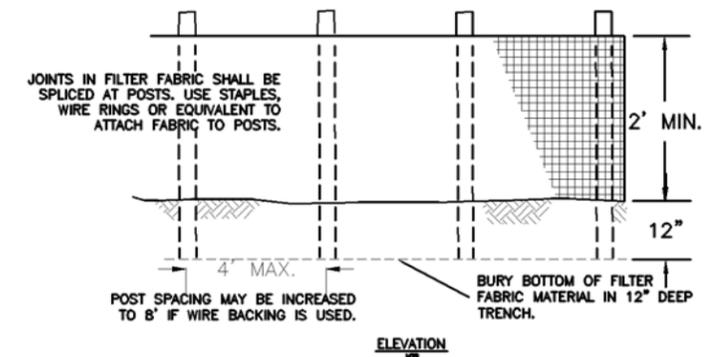
CONTROL DEWATERING

HIGHLY TURBID OR CONTAMINATED DEWATERING WATER FROM CONSTRUCTION EQUIPMENT OPERATION SHALL BE PREVENTED FROM DELIVERING SEDIMENT TO THE RIVER. DISPOSAL OPTIONS FOR DEWATERING DISCHARGE INCLUDE:

1. SEDIMENT-LADEN WATER MAY BE PUMPED TO AN UPLAND AREA AND ALLOWED TO SHEET FLOW OVER UNDISTURBED GROUND THROUGH EXISTING VEGETATION TO INFILTRATE INTO THE GROUND.
2. USE OF AN APPROPRIATELY SIZED AND MAINTAINED SEDIMENTATION BAG (DIRTBAG) OR OTHER SEDIMENTATION FACILITY WITH OUTFALL TO A DITCH OR SWALE FOR SMALL VOLUMES OF LOCALIZED DEWATERING.

NOTES:

1. FENCE SHALL NOT BE INSTALLED ON SLOPES STEEPER THAN 2:1.
2. JOINTS IN FILTER FABRIC SHALL BE OVERLAPPED 12 INCHES AT POST.
3. USE STAPLES, WIRE RINGS, OR EQUIVALENT TO ATTACH FABRIC.
4. REMOVE SEDIMENT WHEN IT REACHES 1/3 FENCE HEIGHT.



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1 SILT FENCE
9 DETAIL

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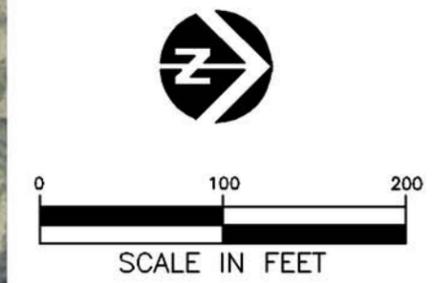
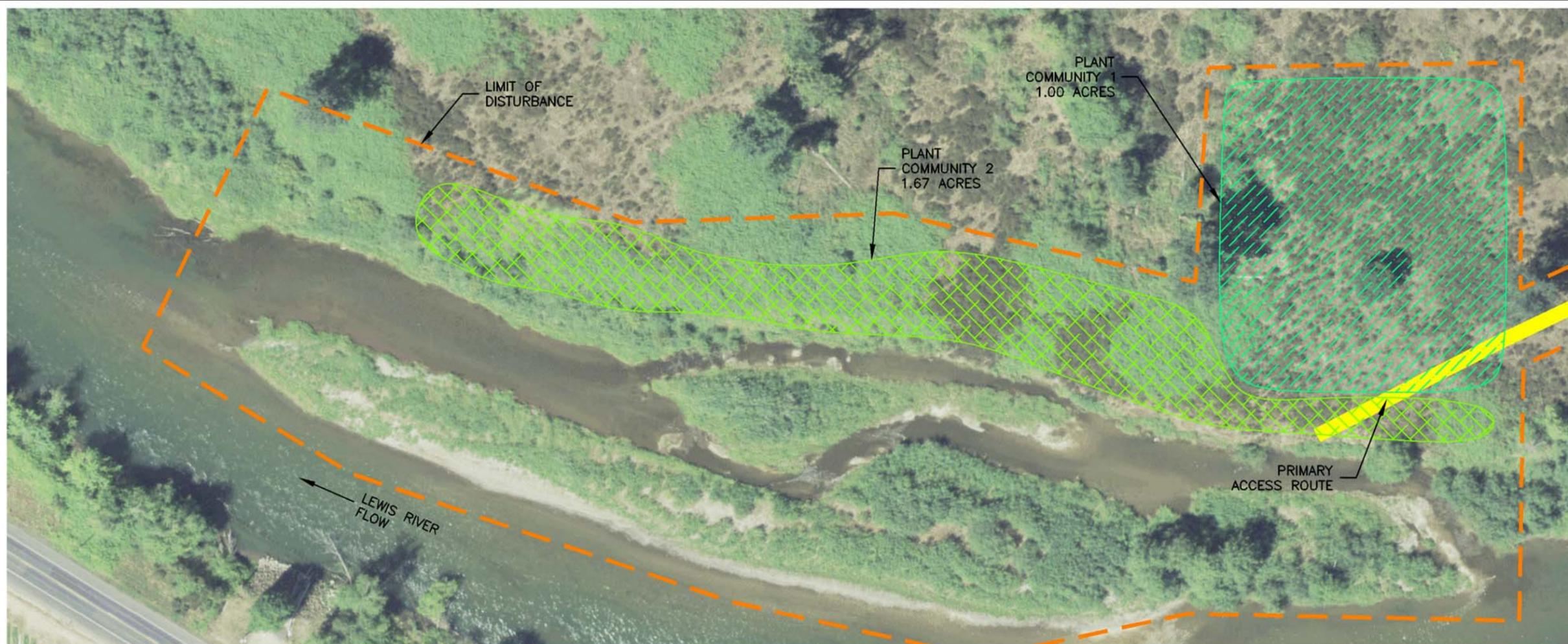
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Erosion Control Notes and
Details



LEGEND

- WOOD
- BOULDER BALLAST
- ACCESS ROUTE
- LIMITS OF DISTURBANCE
- PLANT COMMUNITY 1 (1.00 ACRES)
- PLANT COMMUNITY 2 (1.67 ACRES)

PLAN VIEW

Plant Community 1
Upland Staging Area Restoration (1.00 acres)

Common Name	Scientific Name	Plant Form	Minimum Size	Required Number
Trees – approximately 15 foot spacing on center				
Red alder	<i>Alnus rubra</i>	Bare root	24"	125
Big leaf maple	<i>Acer macrophyllum</i>	Bare root	5 gal./24"	50
Douglas-fir	<i>Pseudotsuga menziesii</i>	Bare root	5 gal./24"	50
Total Trees				225
Shrubs – approximately 5 foot spacing on center				
Evergreen huckleberry	<i>Vaccinium ovatum</i>	Bare root	2 gal./24"	375
Beaked hazelnut	<i>Corylus cornuta</i>	Bare root	2 gal./24"	275
Snowberry	<i>Symphoricarpos alba</i>	Bare root	2 gal./24"	225
Total Shrubs				875
Seed – Upland mix for staging area restoration – Seed at approximately 20 lbs/ acre				
Blue Wildrye	<i>Elymus glaucus</i>	40% of composition by weight		
California brome	<i>Bromus carinatus</i>	40% of composition by weight		
Red fescue	<i>Festuca rubra</i>	20% of composition by weight		

Plant Community 2
Floodplain Tree/Shrub Community (1.67 acres)

Common Name	Scientific Name	Plant Form	Minimum Size	Required Number
Trees – approximately 15 foot spacing on center				
Oregon Ash	<i>Fraxinus latifolia</i>	Bare root	24"	150
Total Trees				150
Shrubs – approximately 5 foot spacing on center				
Pacific willow	<i>Salix lasioandra</i>	Bare root	36"	200
Red-osier dogwood	<i>Cornus sericea</i>	Bare root	36"	150
Douglas spiraea	<i>Spiraea douglasii</i>	Bare root	36"	150
Total Shrubs				500

NOTE:
SITE ACCESS ROADS AND OTHER DISTURBED AREAS TO BE SEEDED WITH NATIVE EROSION CONTROL SEED MIX.

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Revegetation Plan

APPENDIX G
**LEWIS RIVER SIDE CHANNEL NEAR MUDDY RIVER INSTREAM HABITAT
RESTORATION**

1. Project Title

Lewis River Side Channel Near Muddy River Instream Habitat Restoration

2. Project Manager

Adam Haspiel

Mt. St. Helens National Volcanic Monument
42218 NE Yale Bridge Road
Amboy, WA 98604
360-449-7833
360-449-7801 (fax)
ahaspiel@fs.fed.us

3. Identification of problem or opportunity to be addressed

An opportunity to enhance approximately 1000 feet of quality side channel habitat in the Upper Lewis River with large woody material (LWM) exists.

Approximately 160 piece of LWM are being proposed under this project to be used to create 16 structures at strategic locations in the side channel to maximize natural channel characteristics while providing structure stability. Woody Material would come from a nearby timber sale unit which would provide long pieces of wood with attached rootwads.

This side channel is located on private property and is approximately ¼ mile downstream of the Pepper Lewis Side channel.

Rearing habitat for coho has been identified to be limited in the Upper Lewis System.

4. Background

Reconnaissance surveys conducted for this project occurred during July, August September, October and November of 2010. Water flows into the side channel from the river year round, the amount is controlled by a large log jam at the head of the channel, and an outlet to the river is always present, providing easy access into and out of the side channel. The side channel varies between 30 and 20 feet in width, and is well protected by a stable island. In November 1956 Chambers (WDFW) found coho redds in this side channel. This island and side channel have been a stable feature of the Lewis River for over 50 years.

The Lower Columbia Salmon Recovery Plan 2009 Six Year Habitat Work Schedule identifies this as a Tier 1 reach. For coho salmon it has an Overall Preservation rank of 2 of 100, and Overall Restoration rank of 31 of 103, this means it is highly valued and should respond very well to restoration efforts. EDT analyses concludes habitat diversity and side channel habitat is one of the highest concerns in this reach and should respond well to restoration activities. Concerns include high habitat diversity, moderate hatchery fish competition, food availability, and sediment concerns. The ACC Synthesis Matrix rated this section of the river as having medium restoration potential and as a Primary coho population area.

5. Project Objective(s)

GOAL:

Enhance the quality of fish habitat in the Lewis River by:

- ◆ Improving habitat complexity and diversity in the side channel using LWM
- ◆ Providing refugia during winter flows for juvenile salmonids.
- ◆ Providing increased spawning opportunities for adult salmonids.

This project addresses the following Aquatic Fund priorities.

Priority 1: *Benefit fish recovery throughout the North Fork Lewis River, with priority to federal ESA-listed species.*

Coho and steelhead trout are listed as a threatened species under the ESA. This project will contribute to the recovery of these species by increasing the amount and quality of rearing pools in side channels. In addition, spawning areas will be associated with the log complexes.

Lower Columbia ESU coho salmon are listed as a threatened species under the ESA

Lower Columbia ESU steelhead trout are listed as a threatened species under the ESA

Lower Columbia ESU Chinook Salmon are listed as a threatened species under the ESA

Priority 2: *Support the reintroduction of anadromous fish throughout the basin.*

Juvenile anadromous salmonids will have a quality rearing and refugia area when this project is complete, thus ensuring survival and promotion of the various species during reintroduction efforts.

Priority 3: *Enhance fish habitat in the Lewis River Basin-, with priority given to the North Fork Lewis River.*

This project is located in the North Fork Lewis River basin. This project consists of large woody material placed instream in side channels, designed specifically to enhance and restore fish habitat. This project will increase instream habitat diversity, and in turn it is expected that this project will contribute to increasing fish production in this area.

6. Tasks:

Task 1: NEPA and required permits.

- 1) Complete NEPA documentation. Field work for this NEPA document would be completed during the summer and fall of 2011. The final document should be crafted and signed by March 2012, and the project would be implemented July 2012.
- 2) Instream restoration activities are covered within the WDFW-MOU.

Task 2: Project Design.

- 1) Finalize project design and project preparation details. Preliminary designs have been planned during reconnaissance visits in 2010. We will use a laser level to run a longitudinal profile and collect cross-sectional information as we finalize designs.

- 2) Secure materials. We will layout a timber sale unit for thinning operations and prepare for harvest operations. Additional material may be acquired from PacifiCorp Swift Reservoir Cleaning operations.

Task 3: Project Implementation

- 1) Develop contract. A standard RFQ contract will be developed specifying the scope of the project and project requirements. We will use an equipment rental contract to perform the actual work which will allow us the flexibility to make changes to the project as implementation is occurring.
- 2) Administer contract. A Fish Biologist or Fisheries Technician will administer the contract to ensure contract compliance and project specifications are met.

Task 4: Monitoring

- 1) Perform baseline monitoring. This monitoring will occur prior to project implementation and include a longitudinal profile, cross-sections, pebble counts, photo-documentation and snorkel surveys. MSHI will provide two interns, ten volunteer youth from the youth stream team, and a supervisor to perform monitoring work. They will perform all aspects of the monitoring with supervision and training from the Forest Service.
- 2) Perform after project monitoring. This monitoring will occur following project implementation and will continue on an annual basis for several years following project completion. MSHI will provide two interns and ten volunteers for this portion of the work supervised by the Forest Service.
- 3) Monitoring Report. A monitoring report will be written each year following project implementation. MSHI will provide raw data in excel format, the Forest Service will provide analysis of data and report.

7. Methods:

The Mount. St. Helens Fisheries department will oversee all phases of this project including project design, implementation and monitoring.

Approximately 160 pieces of large wood material would be harvested during thinning operations from a nearby timber sale unit which would allow us to use long stems (60+ feet) with attached rootwads. Woody material will be trucked down a spur road through private land to a staging area at the confluence of the Muddy River and Lewis River. From there, the wood will be moved to the project site via a skidder and excavator. This project would create and improve rearing opportunities for coho salmon. Wood for this project would primarily come from USFS lands, however if an opportunity exists to acquire large wood from Swift Reservoir cleaning operations, we may pursue that avenue as well.

Approximately 10 to 15 pieces of LWM will be used at each structure location to form complex habitat. Structures will protrude 1/2 to 1/3 of the way into the channel to minimize water shear stress and create a meandering thalweg. Key pieces of wood at each location will be anchored into the streambanks using an excavator to dig trenches up to 30 feet long, and bury the wood. Other pieces of LWM will be interwoven into these key pieces and riparian vegetation.

8. Specific Work Products

Deliverable 1: Completed project.

Deliverable 2: A report describing the project. Report to include project narrative, financial information, staff time to implement the project, and photographs of completed projects.

Deliverable 3: Monitoring Report.

9. Project Duration

Monitoring for this project would begin during the summer of 2012, Project implementation would occur July 15th 2012 and is expected to take two weeks to complete. As built documents will be completed by December 31st, 2012. An initial report documenting fish response to the structures will be completed by December 31st, 2013. The first monitoring report with pre and post project data will be available December 31, 2013. If funding or LWM supply becomes an issue, project dates would be delayed by one year from above.

A project closeout meeting would occur at an ACC meeting following project completion.

10. Permits

NEPA- Field work will be completed during the summer of 2011, NEPA document will be completed January 2012.

The Gifford Pinchot National Forest has a Memorandum of Agreement with the Washington State Department of Ecology (DOE). The agreement recognizes the Forest Service will ensure that 1) all waters on National Forest lands meet or exceed water quality laws and regulations (Sections 301, 302, 303, 306 and 307) of the Clean Water Act and 2) activities on those lands are consistent with the level of protection of the Washington Administrative Code relevant to state and federal water quality requirements. This agreement is neither a fiscal nor a funds obligation document.

The Gifford Pinchot National Forest has a Memorandum of Understanding (MOU) with the Washington State Department of Fish and Wildlife Regarding Hydraulic Projects conducted by USDA Forest Service Northwest Region (2005). Compliance with the instream restoration provisions within this MOU replaces the need for an individual hydraulic project approval (HPA). This fish habitat enhancement project will be conducted within the provisions set forth in this MOU.

The Clean Water Act (as amended by the Water Quality Act of 1987, Public Law 100-4) authorizes the states to regulate the “fill and removal” activities of Federal agencies. In Washington, the Forest Service has authorization for its fill and removal projects through the MOU with WDFW when the projects comply with the provisions of the MOU.

Land ownership in this section of the Lewis River is comprised of private lands. The project is wholly on private lands, however the access route is through both Forest and private lands. We have received permission from the landowners to use the private spur road to access this project area.

11. Matching Funds and In-kind Contributions

Partner	Contribution	Funds
Forest Service	Project development, Contracting, Permitting, Monitoring	\$14,000 In-kind
Materials from USFS	Trees	\$16,000 In-kind
Mt. St. Helens Institute	Monitoring	\$2,000 In-kind
Swift Community Action Team (SCAT)	Machine Time	\$1000
Fish First	Machine Transport	\$1000
Equipment Rental Services	Machine Time	\$1000

12. Professional Review of Proposed Project

This project proposal was reviewed by Gifford Pinchot National Forest (GPNF) Hydrology program manager, Ruth Tracy and GPNF Fisheries program manager Dave Hu.

13. Budget

	NEPA	Final designs	Project Mgmt	Construction	Monitoring/Labor /Reporting/Coord.
Personnel Costs					
FS - Zone Team or Contract	\$8,000 (ACC)				
FS -Fish Bio and Hydrologist		\$4,000 (IK) \$1,000 (ACC)			
FS - Fish Bio and Hydrologist			\$5,000 (IK) \$3,000 (ACC)		\$1,000 (ACC)
FS - Contract administrator -				\$3,000 (IK) \$4,000 (ACC)	
FS - Contract Specialist				\$2,000 (IK)	
Mt St. Helens Institute					\$2,000 (IK)
Mt. St. Helens Institute Community Education					\$2,000 (ACC)
Materials					
Forest Service 160 Pieces of LWM with rootwads				\$16,000 (IK)	
Contract Payables					
Excavator and Skidder Contract				\$12,000 (ACC) \$3,000 Fish First, SCAT, ERS)	
Logging and hauling of trees				\$10,000 (ACC)	
Materials and Supplies			\$ 1,000(ACC)		
Total ACC Funds	\$42,000	\$8,000	\$1,000	\$4,000	\$26,000
<i>Total FS Funds</i>	<i>\$30,000</i>	<i>\$4,000</i>	<i>\$5,000</i>	<i>\$21,000</i>	<i>\$3,000</i>
<i>Total Partner Funds</i>	<i>\$5,000</i>			<i>\$3,000</i>	<i>\$2,000</i>
Project Total	\$77,000				
FS personnel estimated as \$300/day.					

Lewis Side Channel expanded budget 2010

Item	Personnel	Estimated Days/units*	Cost Per Unit	Total*
NEPA Environmental Assessment required by Federal Law	Fish Biologist Wildlife Biologist Hydrologist Botanist Archeologist Soil Scientist Recreation Forester NEPA Coordinator	5 2 5 5 5 1 0.5 0.5 3	\$300 per day per person	\$8,000 (ACC)
Final Designs	Fish Biologist Hydrologist Fish Technician	5 3 9	\$300 per day per person	\$4,000 (IK) \$1,000 (ACC)
Project Management	Fish Biologist Fish Technician Mileage	12 11 2000 miles	\$300 per day per person \$0.50	\$4,000 (IK) \$3,000 (ACC) \$1,000 (IK)
Construction	Contract Administration/Prep Transportation Logging Equipment	28 1,000 miles	\$300 per day per person \$0.50	\$4,500 (IK) \$4,000 (ACC) \$500 (IK) \$10,000 (ACC) \$16,000 (ACC)
Materials & Supplies	Field Equipment, Notebooks, Misc Supplies			\$1,000 (ACC)
Trees with rootwads		160		\$16,000 (IK)
Monitoring <i>MSHI</i> <i>USFS</i>	Supervisor Assistant Fish Biologist Volunteers Transportation	10 25 1,000	\$300 per day per person \$20 \$0.50	\$1,500 (IK) \$2,500 (ACC) \$500 (IK) \$500 (ACC)
Total				\$77,000

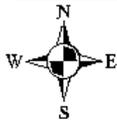
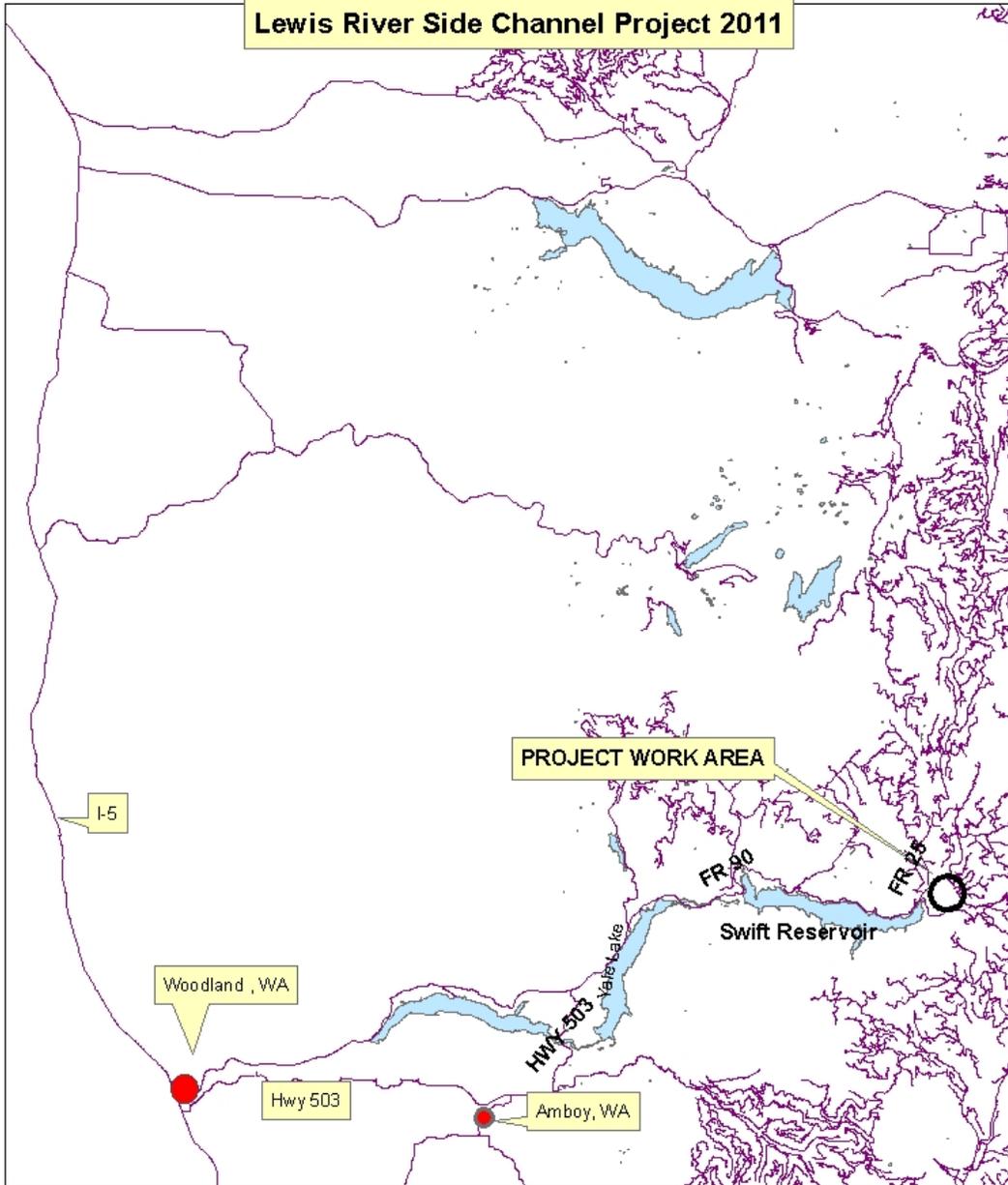
*Values are rounded up or down as need to display whole number and days

Lewis Side Channel Equipment Budget 2010

Item	Cost per unit	Number of units	ACC cost	Total Cost
Excavator Operator/Fuel/Supplies, misc	\$100 hour	50	\$5,000	\$5,000
Excavator Machine	\$ Donated (\$2,000)	50		\$2,000
Excavator Move in/out	\$ Donated (\$1,000)	1		\$1,000
Skidder	\$150/Hour	40	\$6,000	\$6,000
Skidder Move in/out	\$1,000	1	\$1,000	\$1,000
Logging and Hauling cost: Estimate from Logging Contractor*	\$10,000	1	\$10,000	\$10,000
Total	Donated \$3,000		\$22,000	\$25,000

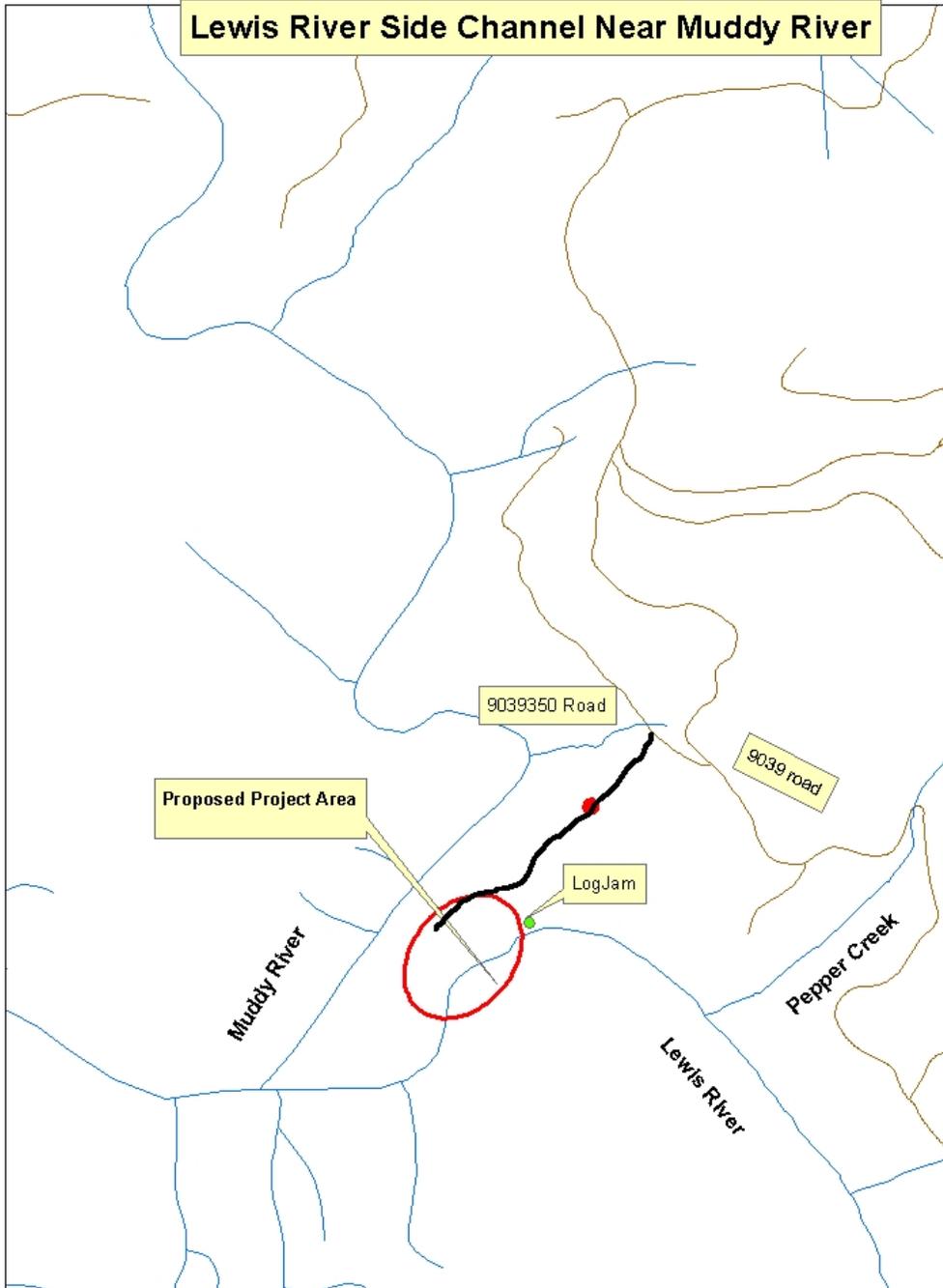
*From Logging Contractor
Ball Park Estimate Received on January 6, 2010

Lewis River Side Channel Project 2011



**Lewis River Side Channel
Project Location Map**

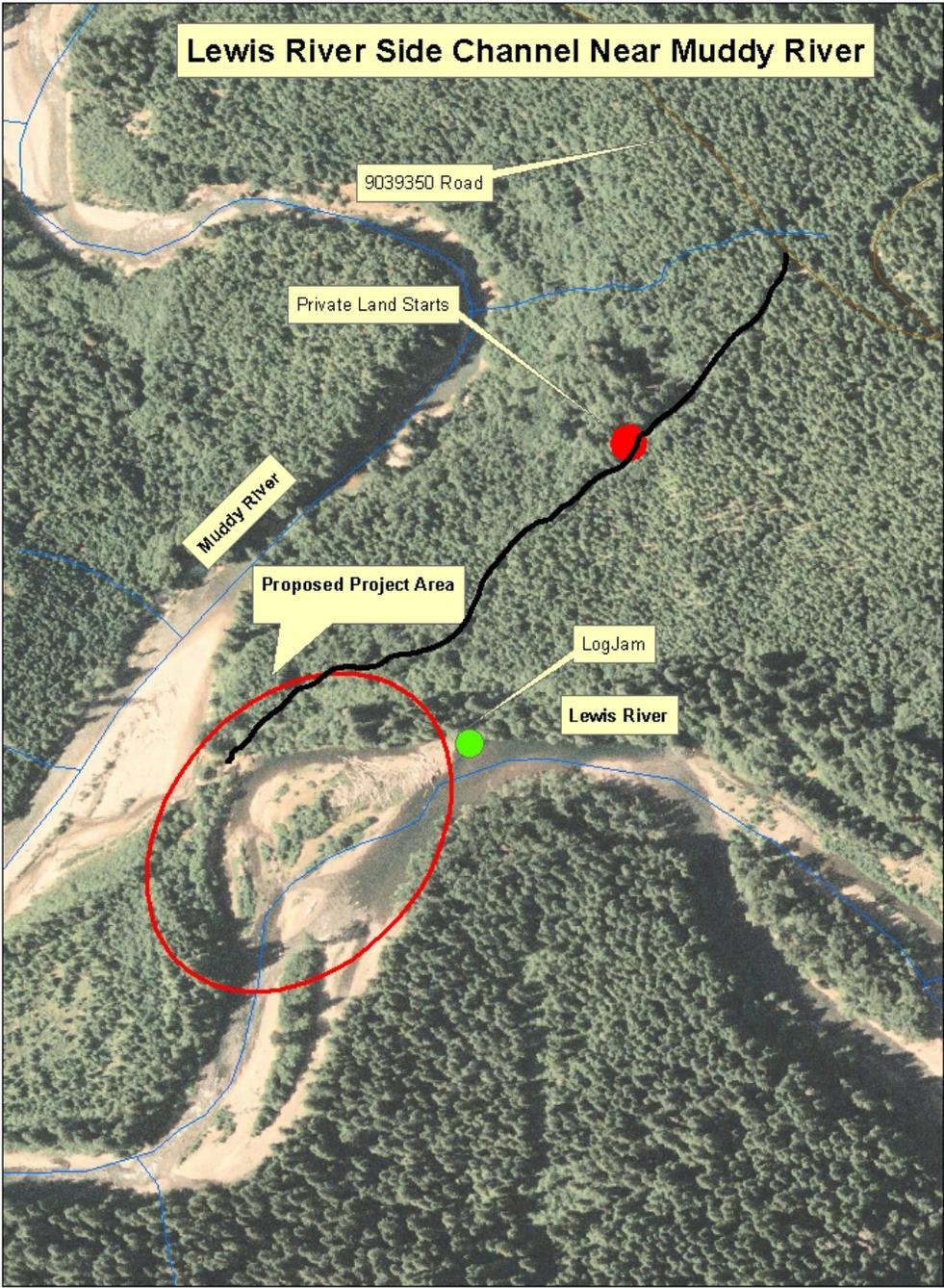
Lewis River Side Channel Near Muddy River



0 650 1,300 2,600 3,900 5,200 Feet



Lewis River Side Channel Near Muddy River



Lewis River Side Channel Near Muddy River
Close-Up view



Side Channel

LogJam

Lewis River



Typical Margin Structure

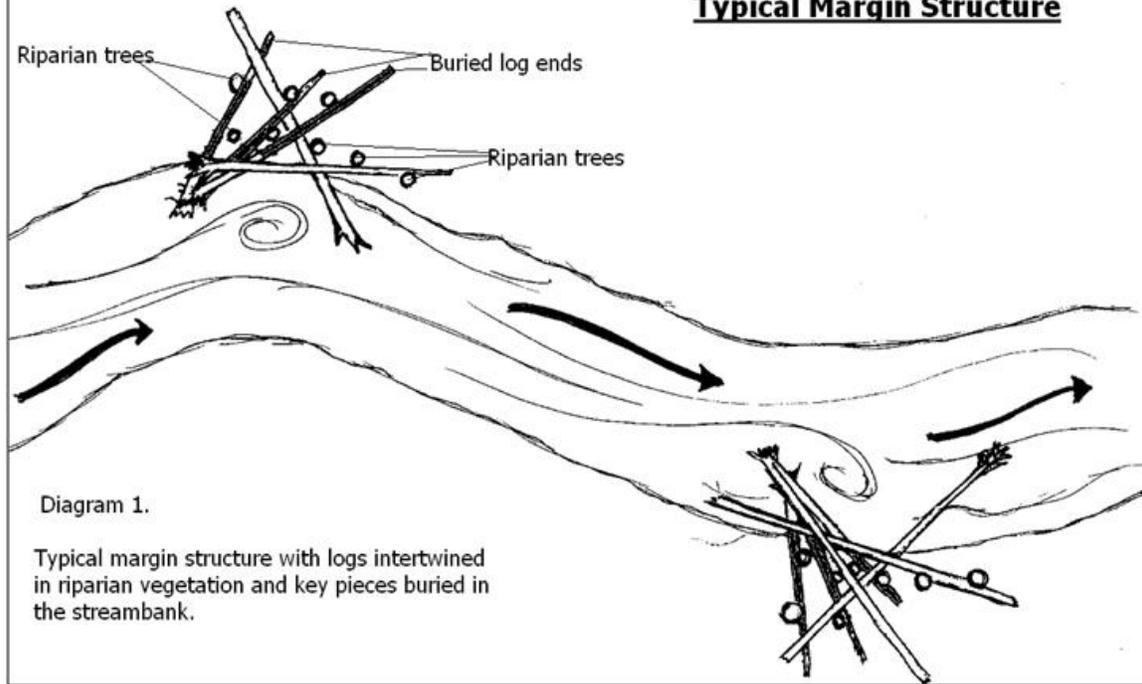


Diagram 1.

Typical margin structure with logs intertwined in riparian vegetation and key pieces buried in the streambank.

APPENDIX H
MUDDY RIVER SIDE CHANNEL RESTORATION

1. Project Title

Muddy River Side Channel Restoration

2. Project Manager

Adam Haspiel

Mt. St. Helens National Volcanic Monument
42218 NE Yale Bridge Road
Amboy, WA 98604
360-449-7833
360-449-7801 (fax)
ahaspiel@fs.fed.us

3. Identification of problem or opportunity to be addressed

Two side channels on the Muddy River will have large woody material placed in them to enhance and restore juvenile salmonid rearing habitat. Coho salmon will be the main species to benefit from these actions, however steelhead may also use these side channels to escape high winter flows in the mainstem of Muddy River. Approximately 80 pieces of large woody material will be placed in side channel 1 to create approximately 12 log complexes, and 120 pieces will be placed in side channel 2 to create approximately 18 log complexes using a small 16,000lb- 28,000 lb excavator.

The Muddy River was one of the top coho producing stream in the Upper North Fork Lewis River sub-basin prior to dam construction.

4. Background

The Muddy River was probably the top coho producing stream in the Upper North Fork Lewis River sub-basin prior to construction of Merwin, Yale and Swift Dams. In 1957 during the period when the dams were being constructed, Chambers documented the Muddy River as the best coho spawning tributary in the Upper Lewis. Ongoing restoration efforts support the reintroduction of anadromous fish to the basin.

During preliminary design surveys of Side Channel 2 in fall 2010, small landlocked adult coho (12-14 inches) and HPP full size adult coho were found spawning in this side channel.

The Gifford Pinchot National Forest Stream Restoration Plan identifies these as priority projects in the Muddy River Watershed (specific section for the Muddy River is attached as an appendix). The Muddy River Action Plan places high priority on these projects to help salmonid reintroduction efforts. The Lower Columbia Fish Recovery Boards Salmon Recovery Plan specifically cites side channel habitat and stream channel habitat structure as high priority restoration needs. It is rated in the top five stream reaches for restoration work. The top three critical life stages identified in the plan are egg incubation and 0-age active rearing, and, 0-age inactive rearing (overwintering). The ACC Synthesis Matrix rated this section of the river as having medium/high restoration potential and as a Primary coho population area.

5. Project Objective(s)

Goal: Restore and enhance side channel and tributary habitat complexity for reintroduced salmon and steelhead.

Objective . Create 30 rearing/overwintering pools and spawning beds by placing Large Woody Material complexes in side channels.

This project addresses the following ACC priorities:

Priority 1: Benefit fish recovery throughout the North Fork Lewis River, with priority to federal ESA-listed species.

Coho and steelhead trout are listed as a threatened species under the ESA. This project will contribute to the recovery of these species by increasing the amount and quality of rearing pools in side channels. In addition, spawning areas will be associated with the log complexes.

Priority 2: Support the reintroduction of anadromous fish throughout the basin.

By creating rearing and overwintering pools, and spawning gravel in these side channels, this project will provide coho salmon and steelhead trout with keys areas to flourish during reintroduction.

Priority 3: Enhance fish habitat in the Lewis River Basin-, with priority given to the North Fork Lewis River.

This project is located in the Muddy River watershed, which is located within the North Fork Lewis River basin. This project is consists of large woody material placed instream in side channels, designed specifically to enhance and restore fish habitat. This project will increase instream habitat diversity, and in turn it is expected that this project will contribute to increasing fish production in this area.

6. Tasks:

Task 1: NEPA and required permits.

- 1) NEPA for this project was completed in March of 2010.
- 2) These instream and floodplain restoration activities are covered within the provisions of the WDFW and USFS Memorandum of Understanding .

Task 2: Project Design.

- 1) Finalize project design and project preparation details. Preliminary designs have been planned during reconnaissance visits in 2010. We will use a laser level to run a longitudinal profile and collect cross-sectional information as we finalize designs.
- 2) Secure materials. We will layout a timber sale unit for thinning operations and prepare for harvest operations. In addition, material from PacifiCorp Swift Reservoir Cleaning operations has been secured and is stored at the USFS Pine Creek work center.

Task 3: Project Implementation

- 1) Develop contract. A standard RFQ contract will be developed specifying the scope of the project and project requirements. We will use an equipment rental contract to perform the actual work which will allows us the flexibility to make changes to the project as implementation is occurring.

- 2) Administer contract. A Fish Biologist and Fisheries Technician will administer the contract to ensure contract compliance and project specifications are met.

Task 4: Monitoring

- 1) Perform baseline monitoring. This monitoring will occur prior to project implementation and include a longitudinal profile, cross-sections, pebble counts, photo-documentation and snorkel surveys. MSHI will provide two interns, five volunteer youth from the youth stream team and a supervisor to perform monitoring work. They will perform all aspects of the monitoring with supervision and training from the Forest Service.
- 2) Perform after project monitoring. This monitoring will occur following project implementation and will continue on an annual basis for several years following project completion. MSHI will provide two interns for this portion of the work supervised by the Forest Service.
- 3) Monitoring Report. A monitoring report will be written each year following project implementation. MSHI will provide raw data in excel format, the Forest Service will provide analysis of data and report.

7. Methods:

The Mt. St. Helens Fisheries department will oversee all phases of this project including project design, implementation and monitoring.

8. Specific Work Products

Deliverable 1: Completed project.

Deliverable 2: A report describing the project. Report to include project narrative, financial information, -staff time to implement the project, and photographs of completed projects.

Deliverable 3: Monitoring Report.

9. Project Duration

Monitoring for this project would begin during the summer of 2012, project implementation would occur July 15th 2012 and is expected to take two weeks to complete. As built documents will be completed by December 31st, 2012. An initial report documenting fish response to the structures will be completed by December 31st, 2013. The first monitoring report with pre and post project data will be available December 31st 2013. If funding or LWM supply becomes an issue, project dates would be delayed by one year from above.

A project closeout meeting would occur at an ACC meeting following project completion.

10. Permits

NEPA for this project was completed March 2010.

The Gifford Pinchot National Forest has a Memorandum of Agreement with the Washington State Department of Ecology (DOE). The agreement recognizes the Forest Service will ensure that 1) all waters on National Forest lands meet or exceed water quality laws and regulations (Sections 301, 302, 303, 306 and 307) of the Clean Water Act and 2) activities on those lands are consistent with the level of protection of the

Washington Administrative Code relevant to state and federal water quality requirements. This agreement is neither a fiscal nor a funds obligation document.

The Gifford Pinchot National Forest has a Memorandum of Understanding (MOU) with the Washington State Department of Fish and Wildlife Regarding Hydraulic Projects conducted by USDA Forest Service Northwest Region (2005). Compliance with the MOU provisions for instream restoration replaces the need for an individual hydraulic project approval (HPA). This fish habitat enhancement project will be conducted within the provisions set forth in this MOU.

The Clean Water Act (as amended by the Water Quality Act of 1987, Public Law 100-4) authorizes the states to regulate the “fill and removal” activities of Federal agencies. In Washington, the Forest Service has authorization for its fill and removal projects through the MOU with WDFW when the projects comply with the provisions of the MOU.

The project is in compliance with all pertinent sections.

11. Matching Funds and In-kind Contributions.

Partner	Contribution	Funds
Forest Service	Project development, Contracting, Permitting, Monitoring	\$22,000 In-kind
Materials from USFS	Trees	\$10,000 In-kind
Mt. St. Helens Institute	Monitoring	\$2,000 In-kind

12. Professional Review of Proposed Project

This project proposal was reviewed by Gifford Pinchot National Forest (GPNF) Hydrology program manager, Ruth Tracy, and the GPNF Fisheries program manager, Dave Hu.

13. Budget

	NEPA	Final designs	Project Mgmt	Construction	Monitoring/Labor /Reporting/Coord.
Personnel Costs					
FS - Zone Team or Contract	\$8,000 (IK)				
FS –Fish Bio and Hydrologist		\$4,000 (IK) \$1,000 (ACC)			
FS - Fish Bio and Hydrologist			\$5,000 (IK) \$3,000 (ACC)		\$1,000 (ACC)
FS - Contract administrator -				\$3,000 (IK) \$4,000 (ACC)	
FS - Contract Specialist				\$2,000 (IK)	
DNR Specialist					
Mt St. Helens Institute					\$2,000 (IK)
Mt. St. Helens Institute Community Education					\$3,000 (ACC)
Materials					
Forest Service 200 Pieces of LWM				\$10,000 (IK)	
Contract Payables					
Excavator and Skidder Contract				\$15,000 (ACC)	
Logging and hauling of trees				\$11,000 (ACC)	
Materials and Supplies			\$ 1,000(ACC)		
Administrative Overhead					
Total ACC Funds	\$39,000		\$1,000	\$4,000	\$30,000
<i>Total FS Funds</i>	<i>\$32,000</i>	<i>\$8,000</i>	<i>\$4,000</i>	<i>\$5,000</i>	<i>\$15,000</i>
<i>Total Partner Funds</i>	<i>\$2,000</i>				<i>\$2,000</i>
Project Total	\$73,000				

Muddy River Side Channel Expanded Budget 2011

Item	Personnel	Estimated Days/units*	Cost Per Unit	Total*
NEPA		27 days	\$300 per day per person	\$8,000 (IK)
Final Designs	Fish Biologist Hydrologist Fish Technician	5 days 3 days 9 days	\$300 per day per person	\$4,000 (IK) \$1,000 (ACC)
Project Management	Fish Biologist Fish Technician Mileage	12 days 11 days 2000 miles	\$300 per day per person \$0.50	\$4,000 (IK) \$3,000 (ACC) \$1,000 (IK)
Construction	Contract Administration/Prep Logging Excavator	30 days	\$300 per day per person	\$5,000(IK) \$4,000 (ACC) \$11,000 (ACC) \$15,000 (ACC)
Materials & Supplies	Field Equipment, Notebooks, Misc Supplies			\$1,000 (ACC)
Trees		200 each	\$50/tree	\$10,000 (IK)
Monitoring	Supervisor Assistant Volunteers	20 10	\$300 per day per person	\$2,000 (IK) \$4,000 (ACC)
Total				\$73,000

*Values are rounded up or down as need to display whole number and days

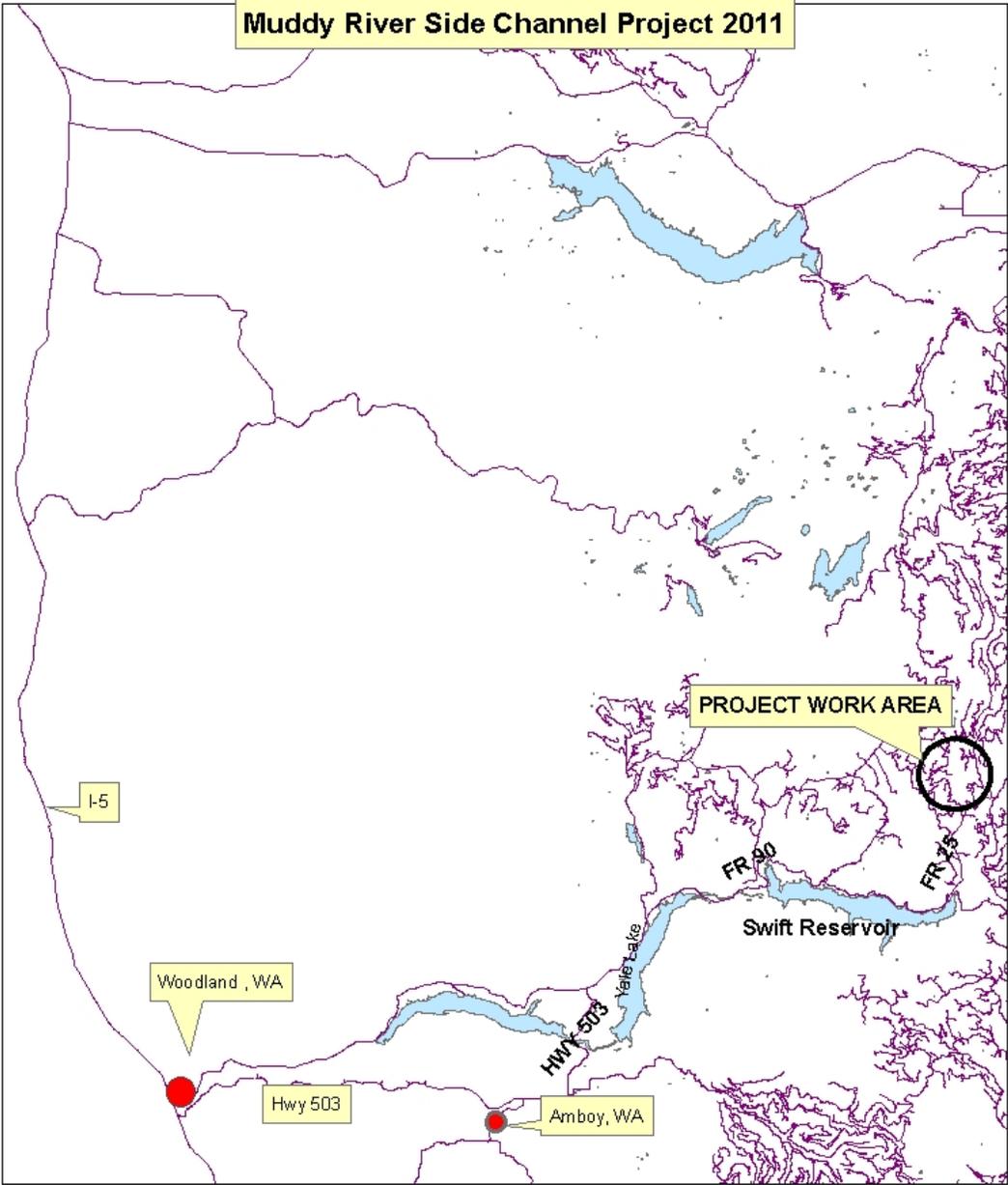
Muddy River Side Channel Equipment Budget 2011

Item	Cost per unit	Number of units	Total Cost
Excavator and Skidder Contract	\$150/hour	90	\$13,500
Excavator / Skidder Move in/out	\$1,500 Lump Sum	1	\$1,500
Logging and Hauling cost: Estimate from Logging Contractor*	\$11,000	1	\$11,000
Total			\$26,000

*From Logging Contractor

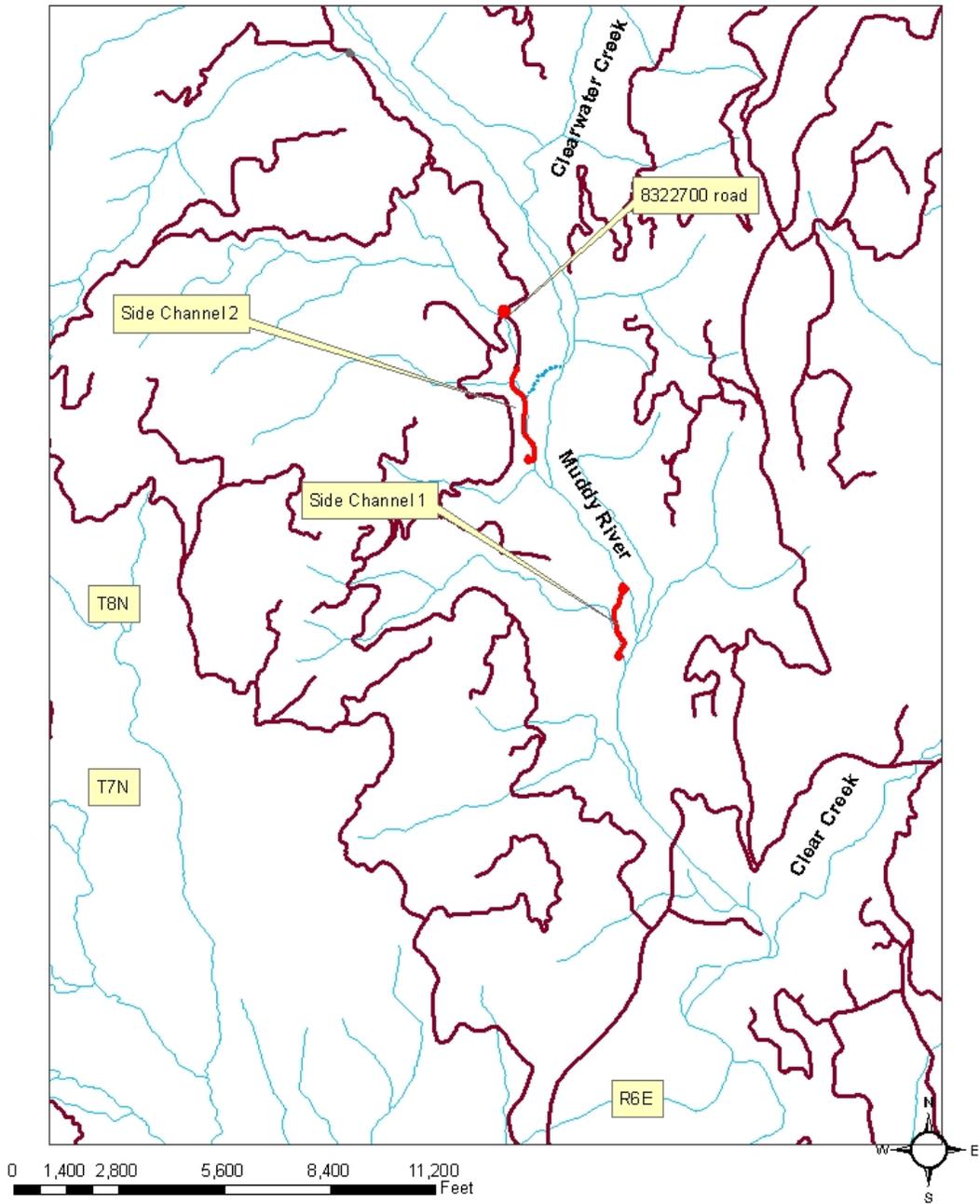
Ball Park Estimate Received on January 12, 2011

Muddy River Side Channel Project 2011

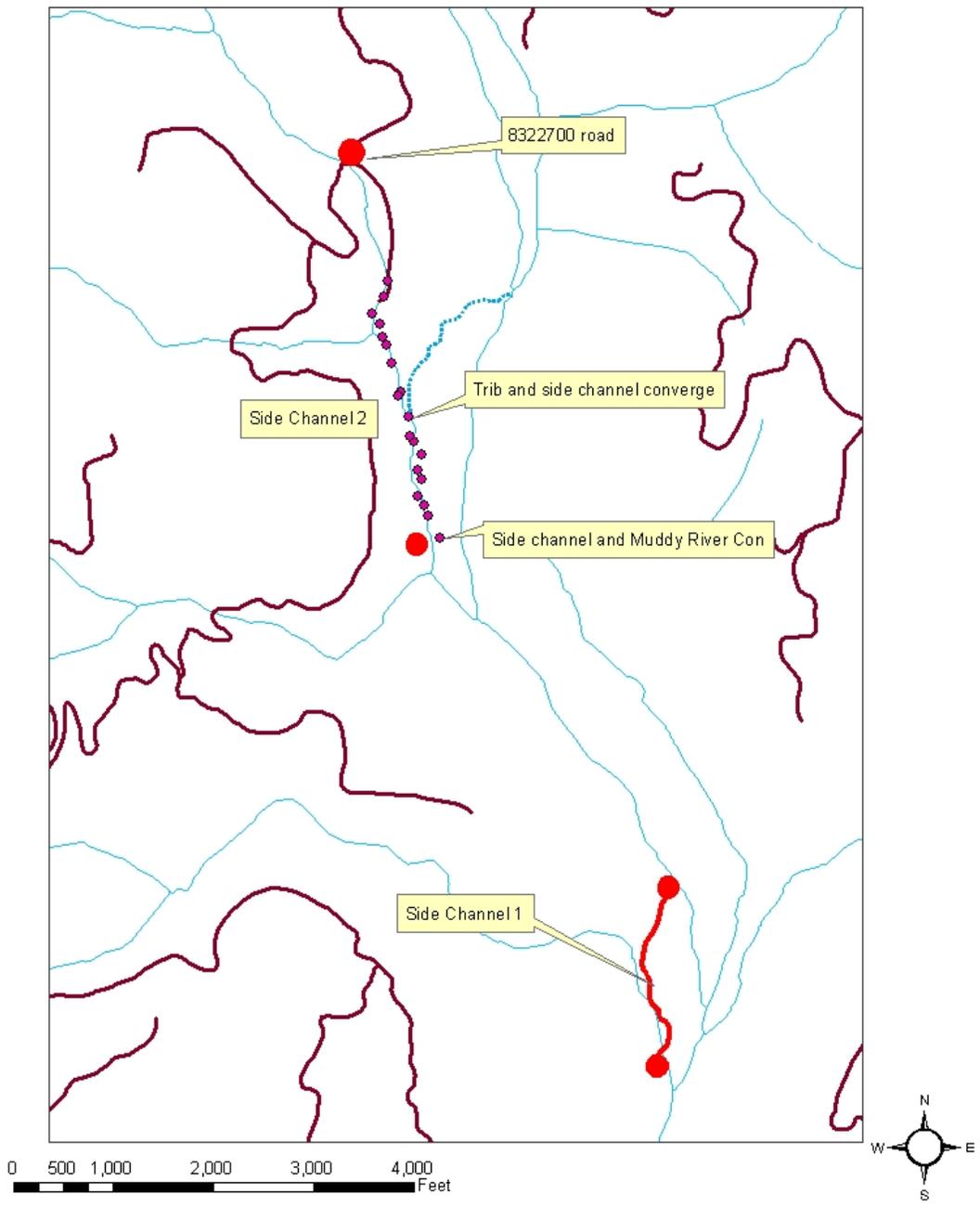


**Muddy River Side Channel
Project Location Map**

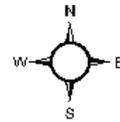
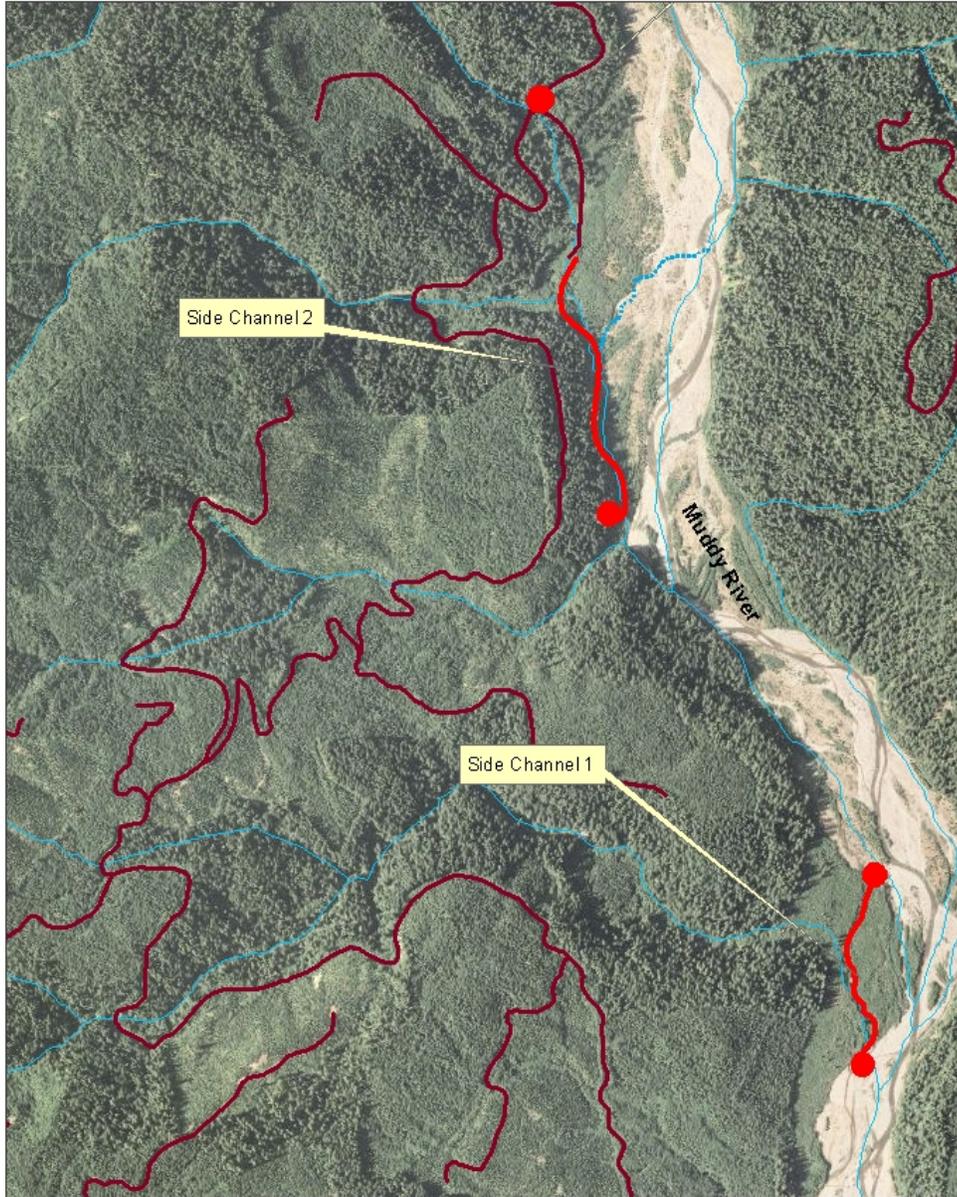
2011 Muddy River Side Channel Project Proposal



2011 Muddy River Side Channel Project Proposal



2011 Muddy River Side Channel Project Proposal





Typical Side Channel 2 picture

Typical Margin Structure

