

Erosion Control Plan

North Umpqua Hydroelectric Project (FERC Project No. 1927)

Volume 1 - Erosion Control Plan

Prepared by:

Washington Group International
Bellevue, Washington
and
PacifiCorp
Portland, Oregon

In Consultation With:

USDA Forest Service, Pacific Northwest Region, Umpqua National Forest
NOAA National Marine Fisheries Service (NOAA Fisheries)
USDI Bureau of Land Management, Roseburg District
USDI Fish and Wildlife Service
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
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April 26, 2004

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EXECUTIVE SUMMARY

PacifiCorp, a U. S. Division of Scottish Power (PacifiCorp), is the operator of the North Umpqua Hydroelectric Project FERC No. 1927 (Project) licensed by the Federal Energy Regulatory Commission (FERC) in 1947. Under the terms of the North Umpqua Hydroelectric Project Settlement Agreement (SA) dated June 13, 2001, between PacifiCorp and several Federal and state agencies (Governmental Parties), a new FERC license period will be issued for a term of 35 years. The new FERC license order was issued to PacifiCorp in 2003. Recognizing that Project facilities have induced erosion in the vicinity of the Project, PacifiCorp acknowledged responsibility in the SA for providing appropriate resources to address existing and future erosion conditions. As the Project is located within lands managed by the USDA Forest Service (USDA-FS) and USDI Bureau of Land Management (USDI-BLM), these agencies have a shared responsibility in the management of geologic and soil resources.

PacifiCorp, in consultation with the Governmental Parties (including USDA-FS, Umpqua National Forest; NOAA National Marine Fisheries Service (NOAA Fisheries); USDI-BLM, Roseburg District; USDI Fish and Wildlife Service (USFWS); Oregon Department of Environmental Quality (ODEQ); Oregon Department of Fish and Wildlife (ODFW); and Oregon Water Resources Department (OWRD)) to the North Umpqua Hydroelectric Project Settlement Agreement dated June 13, 2001, , has prepared this Erosion Control Plan (ECP or Plan) under the authority of Title 18 Code of Federal Regulations (CFR) 4.41 Major Modified Project. The SA specifies the completion of the Plan in 2002. This due date has been extended to 2004 by the Executive Policy Group of the Resource Coordinating Committee (RCC) and by FERC.

PacifiCorp and the Governmental Parties will use this Plan to manage geologic and soils resources associated with the Project over the term of the new license. The Plan cites goals for managing erosion in the Project vicinity, identifies proposed measures for existing erosion features, and describes programs designed to implement those measures. More specifically, the Plan is an implementation guide to plan, design, construct, monitor, and maintain erosion mitigation measures in the Project vicinity. The activities identified are to be utilized throughout the term of the new license (35 years).

PacifiCorp and the Governmental Parties, principally USDA-FS and ODFW, have agreed to a number of erosion mitigation and enhancement measures (included as Exhibits to this Plan) associated with the Project. To accomplish this purpose and to incorporate actions from the SA, three activity areas are included in this Plan:

1. Remediation measures for past erosion inducing events;
2. Preventative measures to reduce the impacts of future potential erosion events; and
3. Ongoing monitoring to identify new or potential erosion sites.

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EXHIBITS

- A Settlement Agreement (Section 14)
- B Erosion Control Plan Annual Summary Report Template
- C Umpqua National Forest Land and Resource Management Plan Soil Productivity Standards
- D USDI-BLM Record of Decision and Resource Management Plan, Best Management Practices
- E Rolling 5-Year Erosion Management Action Plan Template

1.1 APPENDICES

- A HIGH and MEDIUM Priority Sites Remediation Data
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ACRONYMS AND ABBREVIATIONS

ADR	Alternative Dispute Resolution
AMP	Aesthetics Management Plan
CE	Categorical Exclusion
CFR	Code of Federal Regulations
EA	Environmental Assessment
ECP	Erosion Control Plan
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FLRMP	Umpqua National Forest Land and Resource Management Plan, as amended
Governmental Parties	Agencies including USDA Forest Service, Umpqua National Forest; NOAA National Marine Fisheries Service (NOAA Fisheries); USDI Bureau of Land Management (USDI-BLM), Roseburg District; USDI Fish and Wildlife Service (USFWS); Oregon Department of Environmental Quality (ODEQ); Oregon Department of Fish and Wildlife (ODFW); and Oregon Water Resources Department (OWRD)
HMP	Hazardous Management Plan
HPMP	Historic Properties Management Plan
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
O&M	Operations and Maintenance
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OWRD	Oregon Water Resources Department
Plan	Erosion Control Plan
PM&E	Protection, Mitigation and Enhancement (measure)
Project	North Umpqua Hydroelectric Project, FERC Project No. 1927
RCC	Resource Coordination Committee
RCP	Resource Coordination Plan
RRMP	Recreation Resource Management Plan
SA	Settlement Agreement
TMP	Transportation Management Plan
UNF	Umpqua National Forest
USDA-FS	U.S. Department of Agriculture, Forest Service
USDI-BLM	U.S. Department of the Interior, Bureau of Land Management
VMP	Vegetation Management Plan

1.0 INTRODUCTION

PacifiCorp, a U. S. Division of Scottish Power (PacifiCorp), is the operator of the North Umpqua Hydroelectric Project FERC No. 1927 (Project) licensed by the Federal Energy Regulatory Commission (FERC) in 1947. Under the terms of the North Umpqua Hydroelectric Project Settlement Agreement (SA) dated June 13, 2001 between PacifiCorp and the Governmental Parties (including USDA Forest Service, Umpqua National Forest; NOAA National Marine Fisheries Service (NOAA Fisheries); USDI Bureau of Land Management (USDI-BLM), Roseburg District; USDI Fish and Wildlife Service (USFWS); Oregon Department of Environmental Quality (ODEQ); Oregon Department of Fish and Wildlife (ODFW); and Oregon Water Resources Department (OWRD), the new FERC license period will be for a period of 35 years. The new FERC license order was issued to PacifiCorp in 2003. Recognizing that some Project facilities have induced erosion in the vicinity of the Project, PacifiCorp acknowledged responsibility in the SA for providing appropriate resources to meet existing and future Project-related erosion control needs. As the Project is located within lands managed by the Umpqua National Forest (UNF), the USDA-FS also has a shared responsibility in the management of geologic and soil resources. PacifiCorp has prepared this Erosion Control Plan (ECP or Plan) as part of the relicensing process and SA.

The Plan has been prepared under the authority of Title 18 Code of Federal Regulations (CFR) 4.41 Major Modified Project. In addition, the SA specifies for the completion of the Plan in 2002. This due date was extended to 2004 by the Executive Policy Group of the Resource Coordinating Committee and by FERC. The Governmental Parties were consulted in the preparation of the Plan, principally USDA-FS, ODFW, and ODEQ.

Section 1.0 discusses the purpose and intent, goals and objectives, and implementation programs of the Plan.

1.1 USER'S GUIDE

This section is a user's guide to help clarify potential conflicts or ambiguity in implementing the Plan during the term of the new license. If the authority or action is unclear or contradictory, the following prioritized list of documents will guide decision-makers. The document hierarchy is as follows (first to last):

- FERC license.
- Settlement Agreement (SA) (June 13, 2001) – main text Sections 1 through 24, excluding Appendices and Schedules.
- Management Plans including this Plan and associated main text sections and exhibits.
- Management Plans including this Plan and associated broader goals, objectives and vision statements.

- Settlement Agreement (June 13, 2001) Appendices and Schedule, that were superseded with exhibits in this Plan and Plan refinements.

Potential conflicts or ambiguity in implementing this Plan may be discussed and addressed during annual Plan coordination meetings and update of the Plan that will occur every 7 years.

1.2 PURPOSE AND INTENT

The purpose of the Plan is to guide actions related to erosion control and remediation, consistent with measures identified in Section 14 of the SA. The Plan is one of several management plans implemented through the SA and new FERC License that addresses resource management needs and related implementation actions for the Project. Related plans that may also discuss recreation resources or have related topics include the Transportation Management Plan (TMP), Vegetation Management Plan (VMP), Aesthetics Management Plan (AMP), Recreation Resources Management Plan (RRMP), Resource Coordination Plan (RCP), and Historic Properties Management Plan (HPMP). See Section 2.5 for coordination with these other plans.

The Plan provides a systematic method for addressing past erosion events and eliminating or reducing future events at the Project. The Plan includes:

- Remediation measures for erosion inducing activities;
- Preventative measures to reduce the impacts of future potential erosion events; and
- Ongoing monitoring program to identify new or potential erosion sites.

The Plan is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contributions of funds between PacifiCorp and the Governmental Parties, principally the USDA-FS, to this instrument will be handled in accordance with applicable laws, regulations, and procedures, including those for government procurement and printing. This Plan does not provide such authority.

1.3 GOALS

This section of the Plan describes the goals and objectives for management of Project-related erosion within the FERC Project boundary. These goals describe the identified priority erosion sites within the Project area, the types of erosion control and remediation measures that will be employed, and the monitoring requirements that have been developed to allow ongoing evaluation of erosion within the Project area. These goals are:

Goal 1: Remediate identified HIGH and MEDIUM priority erosion sites within the Project area according to a prescribed schedule set forth in the SA.

Objective 1a: Develop remediation options which can be utilized at identified HIGH and MEDIUM priority erosion sites associated with Project structures.

Objective 1b: Develop site-specific plans for prevention and remediation at each of the 31 HIGH priority sites and 27 MEDIUM priority sites using a least-cost, fit-to-site approach.

Goal 2: Implement preventative measures, such as the waterway shut-off and drainage system, to minimize the effects of unforeseen future erosion events.

Objective 2a: Develop an automated system for monitoring water levels in high hazard areas of the Lemolo No. 2, Clearwater No. 2 and Fish Creek waterways.

Objective 2b: Install remotely operated systems to drain the waterways once a waterway failure has been detected.

Goal 3: Establish a monitoring program that annually identifies new erosion sites and the methodology for treatment and inclusion of these sites within the Plan.

Objective 3a: Provide assurance that new and existing erosion sites will be evaluated through a prescribed monitoring program in the Plan.

The Plan is the result of a long-term consultation and study effort between PacifiCorp and the Governmental Parties, principally the USDA-FS.

1.4 PLAN IMPLEMENTATION ACTIVITIES SUMMARY

To address the erosion control components of the SA, Plan implementation includes the following activities:

1. **Section 4.0 – Remediation Program Implementation Activities** - defines remediation measures to be implemented along the Lemolo No. 2, Clearwater No. 2 and Fish Creek waterways, and at other sites (SA 14.1, 14.3, 14.3.1, 14.3.3, 14.4, 14.6, 14.4.1, 14.4.2, and 14.4.3).
2. **Section 5.0 – Erosion Prevention Program** - addresses the waterway shutoff and drainage system, erosion measures to be implemented during new construction, and monitoring requirements (SA 14.2).
3. **Section 6.0 – Coordination Requirements** - defines coordination during the implementation of other PM&E measures (SA 14.1, 14.3, 14.3.1, 14.3.2, 14.3.3 and 14.8).
4. **Section 7.0 – Monitoring & Reporting Requirements** - defines annual erosion-related reports to the RCC and the Plan update to be completed every 7 years during the term of the new license (SA 14.5 and 14.7).

Plan provisions address Project-related erosion through site-specific remediation and through a program of erosion prevention practices. Site-specific remediation will enhance and stabilize the habitat surrounding Project features consistent with the Umpqua National Forest Land and Resource Management Plan and the Northwest Forest Plan. The Plan's erosion prevention program includes an aggressive monitoring element, a waterway drainage system program, erosion control measures for construction practices, and vegetation restoration measures.

The Plan addresses specific erosion remediation at 58 sites that were identified by a resources team consisting of USDA-FS, PacifiCorp, and consulting geotechnical personnel. The sites were evaluated and assigned a relative priority considering both risks from geologic hazards and impacts to environmental resources. Based on evaluation of the 58 sites, 31 are considered HIGH priority and 27 are considered MEDIUM priority. According to terms in the SA (Schedule 14.4), completion of remedial work at these 58 sites will occur between the second anniversary of the New License or 2006, whichever ever comes first; and the eleventh anniversary of the New License. Prior to License issuance, remedial measures will occur on one or more of these 58 sites as determined by the RCC (SA Section 19.5) through work conducted under the Early Implementation Fund. Work at all of the erosion sites will be coordinated with other protection, mitigation, and enhancement measures (PM&E's) required in the SA.

Sites identified as LOW priority will be evaluated each year as part of the annual monitoring program of all Project facilities. No remedial actions are presently planned at any of these erosion sites. Future monitoring may identify an increased hazard at these sites, in which case appropriate mitigation measures will be developed and scheduled for implementation, as discussed below.

A waterway shut-off and drainage system will be developed for Fish Creek, Lemolo No. 2 and Clearwater No. 2 waterways. The drainage system will be controlled by an automated system that will monitor canal water levels and divert water through a drainage system if water levels indicate that spill is occurring. If possible, the drainage system will discharge all water from the canal within 30 minutes of the time that a flume failure is detected. Per the SA, construction of the waterway shut-off and drainage system will be completed on Fish Creek within one year after the New License becomes final and on the Lemolo No. 2 and Clearwater No. 2 waterways, within three years after the New License becomes final. All new construction will implement appropriate erosion control measures during construction.

A component of the Plan will monitor areas along Project waterways, unstable slopes, and all identified erosion sites. This effort will: 1) identify any new sources of erosion and/or maintenance needs; 2) assess the relative priority of erosion sites; and 3) develop site remediation plans for any newly identified erosion sites. The waterways are monitored daily for canal blockage or damage that could lead to spillage and an erosion event. Annual erosion monitoring will be conducted each year in late spring or early summer. If new erosion sites are identified, PacifiCorp will develop site-specific

remediation plans in consultation with the USDA-FS, with implementation scheduled by the RCC. The RCC, represented by the Parties to the SA, is chartered with administering the implementation of the PM&E's outlined in the SA. This information will be presented in an Erosion Control Annual Summary Report.

All erosion control work will be coordinated with terrestrial, riparian, cultural and aquatic measures. A coordination process to ensure that all resources are taken into consideration prior to and during construction of PM&E's as well as for ongoing operations and maintenance of hydro facilities has been developed in the RCP (PacifiCorp, 1995c). This plan will be finalized in 2005 by PacifiCorp. Other management plans that affect the Plan include the VMP, AMP, HPMP, RRMP, and TMP. All necessary permits and approvals will be obtained prior to performing any erosion control construction. The Plan outlines coordination, notification procedures and emergency response measures that are to be taken in case of a waterway spill.

The Plan will be updated every 7-years in consultation with the Governmental Parties to amend or modify site data that changes over time. The 7-year interval was selected so that the first Plan update would not occur until the large number of remedial actions scheduled for the first 6 years of the new license are complete. An Erosion Control Annual Summary Report will not be prepared during those years that a full update of the Plan is prepared by PacifiCorp. Information that would otherwise be presented in the Annual Summary Report will be integrated into the updated Plan.

1.5 EXPLANATION OF TERMS AND DEFINITIONS

Key terms and definitions used throughout the Plan and relevant to erosion control planning for the Project area are defined below.

Approval - Confirmation of concurrence with plans, designs, projects, and schedules prior to implementation by the party or parties assigned the responsibility in the SA for the Project.

Authority - The legal right to approve or modify an action or proposed action; this is based on statute, regulations, or legal agreements.

Buffer, Buffering - To screen with vegetation or visual barriers or otherwise reduce the visibility of man-made objects as viewed from a specific sensitive public viewpoint; to treat objects with color or texture to blend with the natural environment so that they do not attract attention.

Capital Improvement - The construction, installation, or assembly of a new fixed asset, or the significant alteration, expansion, or extension of an existing fixed asset, to accommodate a change of purpose.

Construction - The erection, construction, installation, or assembly of a new fixed asset.

Consultation - Formal or informal discussions for the purposes of developing and/or reviewing proposed projects and implementation plans. Consultation involves providing another party an opportunity for review and input regarding a proposed plan or project. The objective of consultation is to obtain input and reach a joint understanding of requirements for the project or plans. The results of consultation are generally documented in reports or letters. Informal consultation general pertains to the results of meetings, exchange of e-mail or other informal communication between the Parties. Formal consultation involves procedures that are covered by agency regulations, such as consultation with the USDI Fish and Wildlife Service (USFWS) under the Endangered Species Act, and tribal consultation.

Decommissioning – Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1). Existing roads that are no longer needed for access to and management of NFS lands are candidates for decommissioning. The objectives for decommissioning of a road are to reestablish vegetation and, as necessary, to restore ecological processes interrupted or adversely impacted by the road and its operation. Decommissioning includes various levels of treatments to stabilize and rehabilitate the road. Treatments may include one or more of the following activities:

- Blocking the entrance to the road;
- Removing culverts and reestablishing former drainage patterns;
- Installing waterbars on the road surface;
- Pulling back road shoulders and removing unstable road fills;
- Ripping of the roadbed to promote water infiltration;
- Stabilizing slopes;
- Scattering slash over the roadbed;
- Restoring vegetation in the road prism; and
- Other methods designed to meet specific conditions associated with the road.

In some instances, road decommissioning may involve complete elimination of the roadbed by restoring natural contours and slopes.

The specific treatments for an individual road are best identified by an interdisciplinary team of resource specialists based on the site specific conditions along that road.

FERC Project Boundary or FERC Boundary - The boundary of the Project as approved by the FERC under the license.

Funding – Money that is available and has been committed by an organization to accomplish an activity, project, or program. Funding represents monies currently available for expenditure for the designated work, compared to a budget which may only represent a plan or projection for use of future anticipated funding. A commitment of money may take several forms, including a contract, approved collection agreement, payment of a bill of collection, appropriation of funds by Congress and allocated by higher levels of an agency, or a formal grant agreement.

Governmental Parties – Agencies who signed the Settlement Agreement (dated June 13, 2001) including USDA Forest Service (USDA-FS), Umpqua National Forest; NOAA National Marine Fisheries Service (NOAA Fisheries); USDI Bureau of Land Management (USDI-BLM), Roseburg District; USDI Fish and Wildlife Service (USFWS); Oregon Department of Environmental Quality (ODEQ); Oregon Department of Fish and Wildlife (ODFW); and Oregon Water Resources Department (OWRD)

Guideline - A statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if professional judgment or scientific/engineering study indicates the deviation to be appropriate.

Implementation – Accomplishment of on-the-ground or on-site construction, restoration, reconstruction, maintenance, or operational activities. Implementation may involve actual ground or habitat disturbance. Implementation normally will not take place until the appropriate agencies or officials approve required permits, NEPA decisions, designs and/or implementation plans.

Insignificant / Casual Use – The occasional commercial use by pickups and line and bucket service vehicles on an intermittent basis that does not generate a significant maintenance requirement. Also, non-commercial activities that are not prohibited by closure of lands to such activities, and involve practices that do not ordinarily cause any appreciable disturbance or damage to the public lands, resources or improvements thereon, and, therefore, do not require a written authorization (i.e., ingress and egress on existing roads and trails where no commercial activity is being conducted such as hauling logs, ore, or use of heavy equipment). The determination of whether the use is casual or insignificant will rest with the USDA-FS and/or the USDI-BLM, depending upon the jurisdictional location. If a need to control the use through stipulations exists, then the use would be formally authorized using the appropriate agreement.

Jurisdiction – The legal right to control and regulate the use and traffic on a transportation facility. Roads on NFS lands are under the control of the USDA-FS, except for private roads, roads for which the USDA-FS has granted rights-of-way to private landowners or public road agencies.

License - The new license issued by the FERC to operate and maintain the North Umpqua Hydroelectric Project, FERC Project No. 1927.

Maintenance - The act of keeping fixed assets in acceptable condition. It includes preventive maintenance, normal repairs, replacement of parts and structural components, and other activities needed to preserve a fixed asset so that it continues to provide acceptable service and achieves its expected life. Maintenance excludes activities aimed at expanding the capacity of an asset or otherwise upgrading it to serve needs different from, or significantly greater than, those originally intended.

Maintenance includes work needed to adhere to laws, regulations, codes, and other legal direction as long as the original intent or purpose of the fixed asset is not changed.

Four types of maintenance are identified in the Plan including annual (recurrent), deferred, critical deferred, and emergency:

- Annual Maintenance - Maintenance that is recurrent. Such road maintenance is performed to comply with standards and policies and does not arise out of an emergency condition, and is not reconstructive in nature. This includes both traffic-generated and non-traffic-generated road maintenance. Recurrent maintenance is conducted as a matter of course on a periodic basis.
- Deferred Maintenance – Deferred maintenance is maintenance that was not performed when it normally would have been or when it was scheduled; and therefore, was put off or delayed for a future period of one or more years until it can be economically or efficiently performed. When allowed to accumulate without limits or consideration of useful life, deferred maintenance typically leads to deterioration of performance, increased costs to repair, and decrease in asset value. Deferred maintenance needs may be categorized as critical or non-critical at any point in time. Continued deferral of non-critical maintenance will normally result in an increase in critical deferred maintenance.

Code compliance (e.g. life safety, OSHA, environmental, etc.), Forest Plan Direction, Best Management Practices, Biological Evaluations other regulatory or Executive Order compliance requirements, or applicable standards not met on schedule are considered deferred maintenance.

- Critical Deferred Maintenance - Maintenance that was not performed when it should have been or when it was scheduled and which, therefore, was put off or delayed for a future period; and is to the point that it is a serious threat to public health or safety, a natural resource or the ability to carry out the mission of the organization.
- Emergency Maintenance - An urgent maintenance need that may result in injury, illness, or loss of life, natural resource, or property; and must be satisfied immediately. Emergency needs generally require a declaration of emergency or disaster, or a finding by a USDA-FS or USDI-BLM line officer that an emergency exists.

May – This word is not normally synonymous with “should” and does not normally express certainty as “will” or shall do. It is used to indicate a certain measure of likelihood or possibility, and is used to express a desire, contingency, purpose or result. To be allowed or permitted to do something.

Must - This word, like the word “shall,” is of mandatory effect.

New Construction - Activity that results in the addition of forest classified or temporary road miles (36 CFR 212.1).

Parties – PacifiCorp and the Governmental Parties

Project - The North Umpqua Hydroelectric Project, FERC Project No. 1927, including all lands associated therewith as described in the new FERC license.

Project Vicinity - The area of potential effect of the Project, principally located within the FERC Project boundary upstream of the Soda Springs powerhouse to Lemolo Lake, and concentrated within the Lemolo Lake and Toketee Lake recreation areas.

Project Water Bodies - The bodies of water that have been created by the Project including reservoirs, lakes, and forebays.

Reconstruction (Rehabilitation) - Replacement of an existing facility involving the reconstruction, reinstallation, or reassembly of a fixed asset. Activity that results in improvement or realignment of an existing road, including: 1) road improvement - where an activity results in an increase in an existing road's traffic service level, an expansion of its capacity, or a change in its original design function, and 2) road realignment – where an activity results in a new location of an existing road or portions of an existing road and treatment of the old roadway (36 CFR 212.1).

Resource Coordination Committee (RCC) - The RCC is created by Section 21 of the North Umpqua Hydroelectric Project, FERC No. 1927-008 Settlement Agreement (SA), and derives authority from the SA. The RCC makes collective decisions while implementing the SA. The structure and process of the RCC is intended to be value-added to its member organizations by providing a forum to address time sensitive matters, early warning of problems, and coordination of member organization actions, schedules, and decisions to save time and expense. The RCC shall not infringe on the authority of the agencies.

Restoration - Work necessary, as a result of major damage, to restore a road, bridge or other transportation facility to the designated standard and serviceability.

Shall - As used in the SA and the Plan, this word is imperative and mandatory. “Shall” is a word of command, and one which has always or which must be given a compulsory meaning; as denoting obligation. It has a peremptory meaning, and it is generally imperative or mandatory. It has the invariable significance of excluding the idea of discretion, and has the significance of operating to impose a duty which may be enforced, particularly if public policy is in favor of this meaning, or when addressed to public officials, or where a public interest is involved, or where the public or persons have rights which ought to be exercised or enforced, unless a contrary intent appears.

Should - The past tense of shall; ordinarily implying duty or obligation; although usually no more than an obligation of propriety or expediency, or a moral obligation, thereby distinguishing it from “ought.” It is not normally synonymous with “may,” and although

often interchangeable with the word “would;” it does not ordinarily express certainty as “will” and shall do.

Standard - A statement of required, mandatory, or specifically prohibitive practice regarding land management, safety, or other procedures.

Watershed Analysis - Watershed analysis is a process used to characterize the human, biological and physical conditions, processes, and interactions within a watershed. It is an intermediate analysis between land management planning and project planning. The analysis focuses on specific issues, values and uses identified within the landscape that are essential for making sound management decisions.

Will - This word expresses certainty and is used in a mandatory sense, unlike “should” or “may” that expresses a degree of permission, but not certainty. This word is used most often in the Plan, as compared to shall, should, must, and may.

2.0 PLANNING AND COORDINATION

An important part of the Plan over the term of the new license will be ongoing planning and coordination by PacifiCorp and others as conditions change over time. Section 2.0 describes the roles and responsibilities of agencies and PacifiCorp, annual reviews and coordination with the RCC, and development of annual summary reports that are integrated into the overall Plan. These elements are discussed below.

2.1 AGENCY AND PACIFICORP ROLES AND RESPONSIBILITIES

Implementation of the Plan is the primary responsibility of PacifiCorp as licensee. However, since much of the Project is located within the UNF, the USDA-FS also plays an important role in its implementation. Other agencies will also play a continuing role over the term of the new license including ODFW and ODEQ. Portions of the project transmission lines are located on land owned by the BLM. The BLM is involved in the implementation of the ECP if future inspections identify new erosion sites along the transmission line corridors. Transmission lines are also addressed under the provisions of the TMP. Below are the basic roles and responsibilities of the entities involved in implementation of the Plan.

PacifiCorp Roles – PacifiCorp roles and responsibilities are identified in the FERC License Terms and Conditions (not included herein) and in the SA, Section 14. These include the following:

- Provide the USDA-FS with site-specific plans and construction schedules for erosion control improvements (SA 14.1 and 14.4.1).
- Responsibility for implementation of the Plan as a party to the SA, including the funding or implementation of specific erosion control actions.
- Participates as a member of the RCC (SA 21.1).
- Coordinates and prepares Erosion Control Plan Annual Summary Reports to the RCC.
- Responsibility for coordination with other Project-related resource management plans including the VMP, TMP, AMP, RRMP, RCP, and HPMP.
- Responsible for periodic (7-year) reviews and updates of the Plan and tracking changes.
- Responsible for funding and/or conducting environmental compliance and permitting on erosion control projects. This activity may include (depending on the project): U.S. Army Corps of Engineers administered Clean Water Act – Section 404 Wetland Permitting, Section 106 compliance for cultural resources, ESA compliance, and others as needed (SA 21.7).

Umpqua National Forest (USDA-FS) Roles – Within NFS lands, the USDA-FS has the following roles and responsibilities:

- A party to the SA.
- Lead agency for environmental compliance and permitting on NFS lands involving erosion control construction projects, including compliance with NHPA, FLRMP (as amended), ESA, U.S. Army Corps of Engineers administered Clean Water Act – Section 404 wetland permitting, and others (SA 21.7).
- Participates as a member of the RCC (SA 21.1).

Oregon Department of Environmental Quality (ODEQ)–ODEQ has the following roles and responsibilities related to the Plan, including:

- A party to the SA.
- Participate as a member of the RCC (SA 21.1).
- Review conceptual plans for erosion site remediation
- Consulted with regarding Project reservoirs, stream channels and adjacent lands for wildlife habitat and passage.
- Lead state agency for overall compliance with Clean Water Act Section 401 water quality certification.

Oregon Department of Fish and Wildlife (ODFW) –ODFW has the following roles and responsibilities related to the Plan, including:

- A party to the SA.
- Lead agency for managing the state’s fish and wildlife resources.
- Participate as a member of the RCC (SA 21.1).
- Approval authority for the ECP.

NOAA National Marine Fisheries Service (NOAA Fisheries) – NOAA Fisheries has the following roles and responsibilities related to the Plan, including:

- A party to the SA.
- Participate as a member of the RCC (SA 21.1).
- Approval authority for the ECP.

Oregon Water Resources Department (OWRD) – OWRD has the following roles and responsibilities related to the Plan, including:

- A party to the SA.
- Participate as a member of the RCC (SA 21.1).
- Approval authority for the ECP.

US Department of Interior, Fish and Wildlife Service (USFWS) – USFWS has the following roles and responsibilities related to the Plan, including:

- A party to the SA.
- Participate as a member of the RCC (SA 21.1).
- Approval authority for the ECP.

US Department of Interior, Bureau of Land Management (USDI-BLM) – USDI-BLM has the following roles and responsibilities related to the Plan, including:

- A party to the SA.
- Participates as a member of the RCC (SA 21.1).
- Lead agency for overall environmental compliance and permitting on USDI-BLM managed lands involving erosion control construction projects.

Resource Coordination Committee (RCC) Roles – RCC has the following roles and responsibilities related to the Plan, including:

- Prioritize early implementation projects (SA 19.5.1);
- Coordinate and monitor implementation of PM&E measures (SA 21.1), and coordinate ongoing monitoring requirements by PacifiCorp (SA 21.1);
- Facilitate coordination and consultation on plans developed by PacifiCorp (SA 21.1);

2.2 PLAN ANNUAL SUMMARY REPORT

PacifiCorp will prepare an Erosion Control Plan Annual Summary Report by November 1st of each year. A framework for this annual plan is presented in Exhibit B. This framework plan will be tested in the initial years of implementation and will be modified as necessary. The ECP Annual Summary Report will include:

- A summary of work completed the previous construction season, including photographs where appropriate.
- Site Inspection Forms that would document the annual monitoring of each identified erosion site including photos.
- Identification of any new sites.
- Updated Plan schedule with remediated sites removed and new sites added.
- List of work to be done in the upcoming construction season

Construction documents and design reports will be prepared under separate cover and will include the level of detail needed for issuance of environmental documents and release of construction, while providing adequate opportunities for design studies and USDA-FS review.

PacifiCorp and the USDA-FS will each designate a Contact Person who will coordinate Plan-related activities. PacifiCorp and the USDA-FS will seek agreement on the next

year's erosion control program, completed or uncompleted activities, and unforeseen needs and actions.

This report will be distributed to the Governmental Parties listed in the SA. The updated list of sites presented in the annual report will be the most current source of erosion control sites.

2.3 ANNUAL PLAN MEETING

To facilitate efficient coordination and action between the Parties, an annual Plan meeting will be held prior to March 1, and when feasible, prior to the end of November each year. The purpose of the annual Plan meeting includes:

- Reviewing the results of the Annual Erosion Monitoring Report.
- Ranking and prioritizing newly discovered erosion sites and incorporating them into the Rolling 5-Year Action Plan if appropriate.
- Updating the Rolling 5-Year Action Plan (see Section 2.4).
- Final approval of pending construction activities – Final approval by the USDA-FS of construction activities planned for the upcoming construction season.
- Environmental/permitting planning for projects 2 years out – Interested Governmental Parties will provide comments on final planning / coordination of environmental documentation requirements.
- Reviews of designs for projects 2 years out – Interested Governmental Parties will review and provide written comments on engineering designs and supporting studies for each construction project.
- Review concepts for projects 3-years out – Interested Governmental Parties will provide comments on preliminary design concepts for year 3.

2.4 ROLLING 5-YEAR EROSION MANAGEMENT ACTION PLAN DEVELOPMENT

Prior to each annual RCC meeting, PacifiCorp, the USDA-FS, ODEQ and ODFW and other interested Governmental Parties will meet during the Annual Erosion Control Plan Meeting (see Section 2.3) to review and update the Rolling 5-Year Action Plan for future erosion control and remediation activities. A framework for the Rolling 5-Year Action Plan is presented in Exhibit E. The framework for the plan will be tested in the initial years of implementation and may be adapted as necessary.

PacifiCorp, the USDA-FS, ODEQ and ODFW will each designate a contract person who will coordinate Plan-related activities for their agency. PacifiCorp, the USDA-FS, ODEQ and ODFW will seek agreement on the content of the 5-year plan.

Projections for the next 4 year's activities will be reviewed or developed, with an emphasis on any expected erosion projects that may require long lead time to acquire native plant materials. The prior year's activities are also verified and documented as completed and shown in the Rolling 5-Year Action Plan.

2.5 ANNUAL RESOURCE COORDINATION COMMITTEE (RCC) REVIEW

Once the ECP Annual Summary Report has been completed, PacifiCorp will provide a summary of this report to the RCC. PacifiCorp will provide the RCC with the status of implementation of the Plan as required in the SA (21.4.2).

2.6 ENVIRONMENTAL COMPLIANCE, APPROVALS, AND PERMITTING

PacifiCorp will be responsible for funding and/or conducting environmental analysis, compliance, and permitting for erosion management activities, as necessary, subject to the requirements contained in the SA, and laws, regulations, and policies in force at the time individual actions are undertaken.

Section 21.7 of the SA requires that PacifiCorp conduct or fund an environmental analysis of any ground- or habitat-disturbing actions associated with the SA measures on the UNF. Such environmental analyses must comply with criteria set forth in USDA-FS NEPA regulations and policies in existence at the time the particular measure is initiated by PacifiCorp. Consequently, as applicable USDA-FS NEPA implementation regulations and policies change concerning the application of NEPA to SA actions, so may PacifiCorp's obligations to undertake or fund appropriate NEPA analyses.

PacifiCorp will refer or rely upon applicable previous NEPA compliance documentation prepared by FERC, USDA-FS, USDI-BLM, or other Party to the maximum extent possible to avoid any unnecessary costs, duplication, and delay. Nothing in the Plan expands or alters PacifiCorp's obligations to conduct environmental analyses pursuant to the SA.

Section 21.1 of the SA requires that PacifiCorp prepare a RCP (PacifiCorp 2005) that unifies the processes for implementation of the new license conditions, ongoing operations, and maintenance activities consistent with the terms of the SA. The RCP is to be finalized within one year after the new license becomes final or 2005. One aspect of the RCP will be to provide more detail concerning required environmental analyses, compliance, and permitting activities needed for implementation projects.

During the annual Plan meeting, PacifiCorp, USDA-FS, and USDI-BLM will consider environmental analyses, compliance, and permitting for all upcoming erosion

management projects. Because of the lead-time needed for some compliance activities (such as public input, cultural resource inventories, or ESA Section 7 consultation), advance scheduling is essential for timely implementation of erosion management projects. Such activities should be scheduled two years in advance, to the extent possible. To the extent possible, planned erosion management projects will be grouped together to minimize environmental analyses and permitting needs.

Planned activities will be reviewed for policy consistency with 1) Project-related plans, such as the Transportation Management Plan (TMP) (PacifiCorp 2004d), and 2) non-Project-related plans, such as resource management plans, other guidance, or watershed analyses as listed below.

Project-Related Plans Prepared by PacifiCorp (PacifiCorp 2004a-e, 2005)

- Aesthetics Management Plan (AMP; PacifiCorp 2004a)
- Erosion Control Plan (ECP [this plan]; PacifiCorp 2004b)
- Recreation Resource Management Plan (RRMP; PacifiCorp 2004c)
- Transportation Management Plan (TMP; PacifiCorp 2004d)
- Vegetation Management Plan (VMP; PacifiCorp 2004e)
- Resource Coordination Plan (RCP; PacifiCorp 2005)

Non-Project-Related Plans

- Umpqua National Forest Land and Resource Management Plan, as amended (USDA-FS 1990)
- FSM 2700 – Special Uses Management, Chapter 2770 – Federal Power Act Projects, Amendment 2700-2003-2, as amended (USDA-FS 2003)
- Roseburg District Resource Management Plan, as amended (USDI-BLM 1990)
- Middle North Umpqua Watershed Analysis (USDA-FS 2001)
- Diamond Lake and Lemolo Lake Areas Watershed Analysis (USDA-FS 1998)
- Fish Creek Watershed Analysis (USDA-FS 1999)
- Calf-Copeland Watershed Analysis (USDA-FS 2001)

2.7 COORDINATION WITH OTHER PROJECT PLANS

The Plan is one of several management plans that provide implementation direction and guidance for the Project (see Table 1 below). Reference will be made to these plans for specific management direction as indicated below. The primary plan is the principal source of specific implementation direction for the activity listed. Where conflict in directions between two or more plans exists, the document listed as “primary” will take precedence. For example, the TMP will address campground road maintenance and improvements at developed recreation sites as the “Primary and Secondary Plans;” however, the VMP is a document that is also referenced.

Table 1. Plan Coordination and Funding Guidance for Typical Erosion Control Activities.

Plan - related Activities	Primary Plan	Funding Plan Responsibility	Other Plan or Authority References
Erosion remediation projects	ECP	ECP	VMP, TMP
Vegetation maintenance and management	VMP	VMP	AMP
Canal shutoff and drainage	ECP	ECP	--
Spoil material removal and disposal	ECP	ECP	--
Construction site erosion control	ECP	ECP	VMP, TMP
Reservoir bank erosion control	ECP	ECP	RRMP
Erosion associated with project roads	TMP	TMP	ECP, VMP
Cultural clearance for erosion control activities	HPMP	HPMP	VMP, AMP
Noxious weed control at erosion sites	VMP	VMP	--
Recreation site erosion control	RRMP (Forest Plan Compliance)	RRMP	ECP
Road failure due to natural or Project-related event	ECP	ECP	TMP
Bridge or major culvert failure due to emergency road maintenance and storm damage	TMP	TMP	ECP, Forest Emergency Road Maintenance Plan (FERM)
Annual and deferred road maintenance	TMP	TMP	VMP, ECP, Forest Service Handbook (FSH)

2.8 CONSISTENCY WITH RELEVANT PLANS

The USDA-FS directs land management practices according to the Umpqua National Forest Land and Resource Management Plan (FLRMP) and the Northwest Forest Plan (NFP) **(add citations)**. Erosion issues were considered to have a potential affect on the forest resource areas of fisheries, water quality, riparian areas, soil productivity, and transportation system facilities. The LRMP and the NFP were reviewed to determine if the ECP was consistent with their respective management directives to protect such resources. The outcome of this review is presented below.

2.8.1 Umpqua National Forest Land and Resource Management Plan

The Umpqua National Forest Land and Resource Management Plan, as amended, (USDA-FS 1990) was developed to provide direction and guidelines for the management of the Umpqua National Forest. Forest resource areas addressed in the plan which are directly affected by erosion issues include fisheries, water quality, riparian areas, soil productivity, and transportation system facilities. Under each forest resource area specific goals, objectives, and standards and guidelines were developed to guide the management activities for the Umpqua National Forest. These are:

- **Fisheries:** Protect, maintain, and enhance the productivity of fish habitat, meet turbidity and sediment standards, and to minimize slope failures into streams.
- **Water Quality:** Maintain or enhance the water quality for the beneficial uses of human and aquatic life. These goals coincide with the objectives of compliance with requirements set forth by the State of Oregon for protection of water quality, the Federal Clean Water Act, the USDA-FS Best Management Practices (BMPs), and the Federal Safe Drinking Water Act.
- **Soil Productivity:** Protect soil stability, productivity, water quality and riparian habitats through:
 - i. Controlling soil compaction, displacement, puddling, severe burning, loss of organic matter, surface erosion and mass wasting;
 - ii. Monitoring of soil disturbances to determine effects upon soil productivity, water quality, and riparian habitat; and
 - iii. Provide for rehabilitation of unacceptable soil conditions.

Exhibit C presents the Soil Productivity section of the LMRP. Where erosion potential exists, the USDA-FS has developed standards and guidelines to direct the improvements and enhancements needed to reduce the potential for erosion and to bring these areas into conformance with the land and resource management goals and objectives. Listed below are the standards and guidelines specific to the minimizing of erosion.

- Maintain and improve soil stability adjacent to all streams.
- Design new stream crossings to provide for unimpeded fish passage and correct existing passage problems on a prioritized schedule.
- Locate new roads outside riparian areas, preferably on ridge tops, except where a stream crossing is necessary. Road reconstruction should not further degrade riparian areas.
- The application of BMPs for the protection of water quality and beneficial uses (fish habitat or potable water, for example) will be monitored on ground-disturbing activities.
- Energy transmission corridors and hydroelectric facilities will be managed in a manner that will meet riparian objectives, maintain fish and wildlife habitat, and maintain water quality and quantity.

- Beneficial uses of water and aquatic habitats will not be degraded by turbidity or sedimentation caused by timber harvest, road construction, and related activities. To reduce or avoid cumulative effects that can result from surface erosion, landslides and/or debris torrents, timber harvest, and associated activities will be evaluated during project planning. This evaluation will be done on watershed analysis areas, which are generally 1,000- to 5,000-acre watersheds affecting fishery streams.

The Plan is consistent with the LRMP and NFP in providing measures and practices to either eliminate erosion sources or reduce the risk and impact of potential erosion events.

2.8.2 Northwest Forest Plan

In 1994, at the direction of President Clinton, the USDA-FS and BLM developed and issued a comprehensive policy for managing over 24 million acres of public lands in the Pacific Northwest and Northern California. The policy, known as the NFP (USDA-FS and BLM 1994), was developed using an ecosystem management approach, and specifically encompassed federally administered lands within the range of the northern spotted owl. The plan incorporates several land allocation categories which define ecological areas and specific land uses, including a Riparian Reserves category of which a majority of the Project area is a part.

Riparian Reserves are defined as those areas of a watershed directly coupled to streams and rivers (that is, the portions of a watershed required for maintaining hydrologic, geomorphic, and ecological processes that directly affect standing and flowing waterbodies such as lakes and ponds, wetlands, streams, and that affect stream processes, and fish habitats). These areas generally parallel the stream network.

The goals and objectives of the NFP, with respect to erosion, are included in the Aquatic Conservation Strategy Objectives of the NFP. The basic objectives are to maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems, and maintain and restore the sediment regime under which aquatic ecosystems evolved. While a continuous supply of coarse woody debris to streams is desired to support riparian and aquatic life, the stream must be protected from excessive bank erosion. Road-related runoff and areas of insufficient riparian vegetation contribute the greatest sediment load to streams.

To reduce erosion within Riparian Reserves, the NFP has included Standards and Guidelines for its implementation which are intended to ensure any proposed management activities are consistent with the Aquatic Conservation Strategy Objectives. These guidelines state, where possible, slopes should be stabilized to reduce the chance of landslides and surface erosion. This is accomplished removing portions of the potentially erodible slope and restricting side-casting as necessary. Modifications of road drainage systems should be implemented where necessary to route flows away from potentially unstable channels, fills, and slopes. Disruption of natural hydrologic flow

paths should be minimized. Culverts, bridges, and other stream crossings should be able to accommodate the 100-year flood runoff.

Vegetation within the Riparian Reserves plays an important role in the well being of the ecosystem and more specifically in erosion control, where it improves the stability of soils and decreases the amount of sediment delivered to adjacent bodies of water. To improve riparian habitat by reducing erosion, appropriate practices may be implemented, including planting of unstable areas such as landslides and un-vegetated slopes along streams and flood terraces.

The Plan was developed to achieve consistency with the goals of the NFP and the Aquatic Conservation Strategy (ACS). The erosion site plans (Appendix A) as well as the Erosion Prevention Program, were developed utilizing standards and guidelines from the FLRMP and NFP to move the Project towards meeting and/or not preventing the attainment of ACS objectives.

2.8.3 USDI Bureau of Land Management Roseburg District Resource Management Plan

The USDI-BLM Roseburg District Resource Management Plan is a consolidated document with the Record of Decision for management of USDI-BLM-managed lands within Douglas County. The goal of the resource management plan is to maintain or restore healthy, functioning ecosystems while providing a sustainable production of natural resources. Specific objectives with respect to soils are to improve and/or maintain soil productivity through the application of BMP's during all ground and vegetation disturbing activities. Exhibit D includes a copy of the BMP's included in the USDI-BLM's Record of Decision and Resource Management Plan.

2.9 PLAN BACKGROUND

This Plan is the result of a study effort that began in 1991, with the majority of study completed in 1992 and 1993. In the First Stage Consultation Document (FSCD) (PacifiCorp 1992), PacifiCorp identified erosion control as part of aquatic resource studies based on Title 18, Part 4, Section 51 of the Code of Federal Regulations (18 CFR 4.51): Application for License for Major Project - Existing Dam. Throughout 1992 and 1993, PacifiCorp held technical meetings with agency representatives to discuss procedures and preliminary results of these studies for second stage relicensing activities.

The results of the initial studies were summarized by Harza Engineering, Inc. in 1994 as the Final Technical Report (FTR) for Erosion Survey Study (PacifiCorp 1995a, Appendix 10-1). The FTR served as the basis for the development of the Geology and Soils portion of the draft license application (PacifiCorp, 1994).

The USDA-FS reviewed the draft license application and provided extensive comments related to erosion control issues. Additional fieldwork was required to respond to a number of USDA-FS comments. As a consequence, and in consultation with USDA-FS personnel, it was decided to conduct additional field surveys following the formal submission of the license application (PacifiCorp, 1995a) to the FERC.

Project staff from the Washington Group (formerly Ebasco Services Inc.), USDA-FS and PacifiCorp completed the additional field efforts in 1995, which included a risk assessment and prioritization of the sites, which had been identified through the earlier work.

The initial Draft Plan (PacifiCorp, 1995b) was the result of these efforts. Since 1995, PacifiCorp has implemented erosion control measures at 20 sites identified in the 1995 Draft Plan and Annual Erosion Control Summary Reports (PacifiCorp, 1997 and 1998a). Treatments included: stabilization of steep, side-cast fill slopes; road grading and surfacing to control runoff; repair of leaks in canals and flumes; culvert reconstruction; retaining walls, gabion walls and check dams; placement of rip-rap in eroded areas; and hydro-seeding at several sites. Annual Erosion Control Plan Summary Reports were completed in 1996 and 1997 documenting these activities. In 1998 and 1999, no site remediation was conducted.

In 1988, FERC issued PacifiCorp an Additional Information Request (AIR) related to erosion. As a result of this AIR, evaluations of the sites identified in the 1995 Draft Plan report were conducted. The field investigations were performed collaboratively by PacifiCorp and the USDA-FS in April and May of 1998 to update the inventory of identified erosion sites and mass movement areas. All of the previous high priority sites were re-evaluated. Some sites were removed from the list because the sites were remediated as part of interim erosion control measures reported in the 1996 and 1997 Annual Erosion Control Summary Reports or will be mitigated under the Transportation Management Plan (TMP). Sites were also removed from the list where remediation work would cause more resource damage than currently exists at the site. New sites were added based on additional information from the USDA-FS and the results of the current field investigation conducted for the Annual Erosion Control Plan Summary Reports. The information contained in the PacifiCorp response to the FERC AIR (PacifiCorp, 1998b) has been incorporated into this ECP.

3.0 IDENTIFIED EROSION SITES

This Erosion Control Plan is intended to satisfy PacifiCorp's obligation under section 14 of the Settlement Agreement. Nothing in this plan is intended to materially alter the requirements and measures contained in the Settlement Agreement.

3.1 METHOD FOR PRIORITIZING EROSION SITES

The objective of erosion site prioritization is to identify and rank all unstable and potentially unstable sites. A resource team comprised of USDA-FS, PacifiCorp and consulting engineers, identified erosion sites, developed an evaluation matrix for prioritizing sites as HIGH, MEDIUM or LOW for both risk and impact, and completed the site prioritization. Table 2 below shows how sites were prioritized.

Risk factors take into account a subjective evaluation of the geologic hazard, such as the type and magnitude of an erosion event and the likelihood that the event will occur. The impact rating is resource based, (i.e. how valuable is the resource, and to what extent will it be impacted by the event). Riparian, aquatic and terrestrial resources are considered in the impact rating. Included in these evaluations are the amount and type of sediment (coarse versus fine) that could be transported into the stream, potential channel and hydrologic process changes (both long-term and short-term) that would occur as a result of the sediment influx, riparian function, and habitat fragmentation.

Numbers are assigned for each of the designations (low, medium, or high). Assignment of impact and risk ratings create five numeric categories of sites, ranging from a high risk and impact rating of five, to a low risk and impact rating of one, as illustrated in the following table.

Table 2. Erosion Site Priority Evaluation Matrix

		IMPACT		
		Low	Medium	High
Risk	Low	1	2	3
	Medium	2	3	4
	High	3	4	5

Ranking outcomes:

<u>Priority</u>	<u>Score</u>
HIGH PRIORITY	4-5
MEDIUM PRIORITY	3
LOW PRIORITY	1-2

3.2 LISTING OF IDENTIFIED EROSION SITES

Table 3 shows the number of HIGH, MEDIUM, and LOW sites located in each waterway area. Tables 4 through 8 identify the site number, the IMPACT and RISK rating, and the resulting PRIORITY ranking as either HIGH (H), MEDIUM (M), or LOW (L), for each site as defined in the table above. Tables 4 through 8 also list the site location and approximate length of waterway included in each site, a description of the erosion hazard, the estimated volume of material that might fail, and the type of structure on the waterway system that would be impacted. Higher priority rankings are assigned to single and double-walled flumes where the potential for flume wall breakage and large spills is considered higher than in canal sections. HIGH risk ratings are assigned to areas that show signs of ongoing or recent movement. Areas are also noted that require additional geotechnical information to further define the engineering characteristics and geology of the site. At some locations, more than one remediation treatment is recommended per site. This results in the same location being named as two sites. The total number of sites falling into each category is as follows.

Table 3. Erosion Sites by Area and Priority Ranking

	Priority Ranking				
	High		Medium	Low	
	5	4	3	2	1
Location					
Lemolo No. 2	6	15	10	5	3
Clearwater No. 2	2	3	7	0	2
Fish Creek	3	2	7	0	1
Other Sites	0	0	3	0	2

Maps included with this plan show the locations of the HIGH and MEDIUM erosion sites and the Priority 1 and 2 Connectivity Sites in relationship to each other. These maps are presented in Appendix B.

Specific information on each of the HIGH and MEDIUM priority sites and the proposed remediation measures are presented on the site plans in Appendix A.

A CD containing photos for each erosion site taken during the period between 1998 and 2003 is included in Section 10.

Table 4. Lemolo No. 2. erosion sites.

Site No.	Location* MP To MP		Lgth (ft.)	Erosion Hazard Description	Structure Type	Est. Vol. (cu. yds.)	Impact	Risk	Site Priority	Priority Ranking
LM2-1	2.14	2.16	100	Glacial deposits above canal, 1:1 slope, seepage evident	C	10	2	1	2	L
LM2-2	3.18	3.22	200	Spoil pile w/ gullyng & piping below canal	DW	100+	1	1	1	L
LM2-2	3.18	3.22	200	Rockfall hazard above canal	DW	100+	1	3	2	L
LM2-3	3.54	3.55	50	Spoil pile w/ some vegetation above Deer Cr	DW	100+	1	1	1	L
LM2-3	3.54	3.55	50	Cutslope above rd 0.75:1 w/ evidence of past failures	DW	100+	1	1	1	L
LM2-4	NA	NA	100	Failure of Deer Cr access road, failed in 1997 along approx. 70 ft of road, slid directly into Deer Cr, failure height about 30 ft		100+	3	3	5	H
LM2-5	3.77	3.85	420	50' high cutslope w/boulders in matrix, rock rolls into canal	C	10-100	2	1	2	L
LM2-6	4.98	4.99	140	Shallow slump, bulge in canal w/ geomembrane & gunite repair, spoil on downslope of canal	C	100+	3	2	4	H
LM2-7	5.28	5.29	50	Fill failure on Potter Mtn Rd, 40' oversteepened fill	T	100+	3	1	3	M
LM2-8	6.25	6.26	50	Alvin Cr, potential fill failure or debris flow plugging culvert and overtopping fill, scour at culvert outlet, shotgun culvert outlet	T & Fill	100+	3	2	4	H
LM2-9	6.4	6.42	100	Potential fill failure or debris flow plugging culvert and overtopping fill	T & Fill	100+	3	1	3	M
LM2-10	6.43	6.76	1,740	Sidecast fill below road	C	100+	2	2	3	M
LM2-10	6.43	6.76	1,740	Cutslope above canal w/ boulders	C	10-100	3	1	2	L
LM2-11	6.93	6.94	50	Patricia Creek crossing, potential fill failure or debris flow plugging culvert, shotgun culvert outlet	T & Fill	100+	3	3	5	H
LM2-12	6.93	7.1	898	Oversteepened slope below road, seepage, w/ failure channels extending to bottom of slope	C	100+	3	3	5	H
LM2-13	7.14	7.19	300	Rock slope above flume w/ large boulders, 0.5:1 slopes, site is at west end of Sag Pipe	DW	100+	2	2	3	M
LM2-13	7.14	7.19	300	Sidecast fill below road	DW	100+	2	2	3	M
LM2-14	7.19	7.37	950	Sidecast fill below road	Sag Pipe	100+	2	3	4	H
LM2-15	7.35	7.36	50	Spill structure upstream of Sag Pipe, erosion occurring in channel at base of culvert outlet	Sag Pipe Spillway	10-100	2	3	4	H
LM2-16	7.5	7.62	630	Boulders may roll into canal, causing overflow	C	10	2	1	2	L
LM2-17	8.08	8.09	50	Nurse Creek crossing, potential fill failure or debris flow plugging culvert, shotgun culvert outlet	T & Fill	100+	3	2	4	H
LM2-17	8.08	8.11	150	Sidecast fill below road	C	10-100	3	2	4	H

* Mileage measurements for Lemolo 2 canal start at bridge crossing at upper end of Lemolo 2 forebay.

Legend: Structure type SW - Single walled flume DW - Double walled flume C - Gunite-lined canal T - Trestle Structure
Overall Risk Rating L - Low M - Moderate H - High

Table 4. (continued) Lemolo No. 2. erosion sites.

Site No.	Location* MP To MP		Approx. Lgth (ft.)	Erosion Hazard Description	Structure Type	Est. Vol. (cu. yds.)	Impact	Risk	Site Priority	Priority Ranking
LM2-18	8.62	8.63	50	Laura Creek crossing, potential fill failure or debris flow plugging culvert	T & Fill	100+	3	2	4	H
LM2-18	8.62	8.64	300	Sidecast fill below road	C	10-100	3	2	4	H
LM2-19	8.85	8.91	300	Cutslope failure above canal and sidecast failures below, west of Potter Cr	C	100+	2	3	4	H
LM2-20	8.98	9.42	2,320	Potter Cr, debris flow potential, unstable slopes above and below canal, spillway erosion at end of gunite section	DW	100+	3	3	5	H
LM2-21	9.81	9.83	100	Sally Creek crossing, potential fill failure or debris flow plugging culvert, two culverts, upper one shotgun	T & Fill	100+	3	2	4	H
LM2-22	9.93	9.94	50	Dorothy Creek crossing, potential fill failure or debris flow plugging culvert, two culverts, upper one shotgun with trashrack at intake	T & Fill	10-100	3	2	4	H
LM2-22	9.93	10.21	1,480	Sidecast below road w/active sliding into N Umpqua	C	100+	3	2	4	H
LM2-23	10.21	10.71	2,640	Steep, near vertical slope in alluvial/boulders above canal, slope 20'-30' high, sidecast removal over 70% of this section	SW/DW	10-100	3	3	5	H
LM2-24	10.71	10.72	50	Norma Creek crossing, potential fill failure or debris flow plugging culvert	T & Fill	100+	3	1	3	M
LM2-25	11.0	11.34	1,795	Slope 20'-30' high above canal, mudflow w/boulders, possible deposits in canal, includes Helen Cr crossing	SW	10	3	1	3	M
LM2-26	11.33	11.35	100	Beverly Creek crossing, potential fill failure or debris flow plugging culvert, also sidecast fill failure potential	T & Fill	100+	3	2	4	H
LM2-27	11.35	11.50	800	Mudflow breccia, boulders into canal, includes Flume 2 failure area	SW	10	3	3	5	H
LM2-27	11.35	11.50	800	Spoil piles over 80% of this reach	SW	10	3	3	5	H
LM2-28	11.53	11.58	260	Sidecast with 80% slopes	SW	10-100	3	2	4	H
LM2-29	11.60	11.65	260	Nancy Creek crossing, potential fill failure or debris flow plugging culvert, also sidecast fill failure potential, shotgun culvert outlet	T & Fill	10-100	2	2	3	M
LM2-30	11.74	12.2	2,430	Mudflow breccia, boulders into canal	SW	10-100	2	2	3	M
LM2-30	11.74	12.2	2,430	Sidecast below road	SW	10-100	2	2	3	M
* Mileage measurements for Lemolo 2 canal start at bridge crossing at upper end of Lemolo 2 forebay. <u>Legend:</u> Structure type SW - Single walled flume DW - Double walled flume C - Gunite-lined canal T - Trestle Structure Overall Risk Rating L - Low M - Moderate H - High										

Table 5. Clearwater No. 2 erosion sites.

Site No.	Location*		Approx. Lgth (ft.)	Erosion Hazard Description	Structure Type	Est. Vol. (cu. yds.)	Impact	Risk	Site Priority	Priority Ranking
	MP	To MP								
CW2-1	0.68	0.95	1,430	Basalt outcrop w/ unfavorable joint orientation above canal	SW	10	2	2	3	M
CW2-2	1.32	1.40	420	Mudflow breccia w/ small slumps & wedges	DW	10	2	2	3	M
CW2-3	1.60	1.70	530	1997 Flume failure location	C & T	100+	3	1	3	M
CW2-4	1.90	2.05	500	Mudflow breccia above canal, slopes 30' high, erosion below road from overflow	DW	10	3	3	5	H
CW2-5	2.50	2.80	1,580	Breccia outcrops above canal, 20 - 40' high	SW & DW	10-100	3	2	4	H
CW2-6	2.92	2.94	100	Slide area defined by 2 gullies w/ debris flows	C	10	3	3	5**	H
CW2-7	2.94	3.30	1,900	Mudflow exposures 20 - 40' high upslope of canal, potential slumps or wedge failures	C	10	2	2	3	M
CW2-8	3.30	3.30	50	Road fill failure at No Tunnel Creek crossing due to drainage from western side crossing road surface	Fill/T	10	3	2	4	H
CW2-9	3.40	3.90	2,640	Potential rockfall from basalt cliffs above canal	DW	100+	3	2	4	H
CW2-9	3.40	3.90	2,640	Sidecast along road through about 60% of this segment	DW	100+	2	2	3	M
CW2-10	4.00	4.25	1,320	Discontinuous mudflow breccia upslope of canal, 20 - 40' high	C	10-100	2	2	3	M
CW2-11	4.35	4.36	50	Slump in mudflow/ash deposit on slope above canal, 50 x 30 x 5' thick	C	10-100	2	2	3**	M
CW2-12	5.0	5.2	1,060	Pumice slope above canal about 20' high	C	10	1	1	1	L
CW2-13	5.4	5.7	1,580	Pumice slope above canal, 30 - 50' high	C	10	1	1	1	L

* Milepost measurements for CW 2 canal begin at bridge crossing canal at upstream end of CW 2 forebay.

**Requires more geologic/geotechnical data to characterize site.

Legend:

Structure type	SW - Single walled flume	DW - Double walled flume	C - Gunite-lined canal	T - Trestle
Risk Rating	L – Low	M - Moderate	H - High	

Table 6. Fish Creek erosion sites.

Site No.	Location* MP To MP		Approx. Lgth (ft.)	Erosion Hazard Description	Structure Type	Est. Vol. (cu. yds.)	Impact	Risk	Site Priority	Priority Ranking
FC1	0.12	0.38	1,370	Ash on upslope area overlain by basalt w/ adverse joint orientations, boulders could impact flume	DW	10	2	2	3	M
FC2	0.52	0.54	110	Spoil piles/sidecast going into river	C	10-100+	3	3	5	H
FC3	0.58	0.64	320	Potential rockfall which could plug waterway	C	10-100	2	2	3	M
FC4	0.64	0.72	420	Surface erosion/raveling of pumice slopes above canal	C	10-100	1	1	1	L
FC5	0.74	0.76	110	Spoil piles/sidecast below road	C	100+	2	2	3	M
FC6	0.8	0.82	100	Active earthflow in 1980's failed canal, spoil pile/sidecast washed out by spill, eroded area has 30' vertical pumice banks that will continue to slump and deliver sediment to creek	C	100+	3	3	5**	H
FC7	0.85	0.98	690	Rockfalls potentially impact canal wall	DW	10	2	2	3	M
FC7	0.85	0.98	690	Spoil piles/sidecast below road	DW	10	2	2	3	M
FC8	1.11	1.12	50	Active earthflow beneath waterway, which is in wood flume, slump rotational feature below road, activated/enhanced by seepage beneath canal when upslope side of concrete flume upstream was punctured by boulder impact, evidence of multiple past failures, each 100-200+ cu yds	DW & T	100+	3	3	5**	H
FC9	1.12	1.23	580	Rockfalls potentially impact canal wall	C	10	2	2	3	M
FC9	1.12	1.23	580	Spoil piles/sidecast below road, heavily vegetated	C	10-100	2	2	3	M
FC10	1.38	1.59	1,110	Rockfalls potentially impact canal wall	DW	10	3	2	4	H
FC10	1.38	1.59	1,110	Spoil piles/sidecast below road	DW	10-100+	3	2	4	H
* Mileage measurements for Fish Creek canal start at canal headgate (not dam) and continue downstream.										
**Requires more geologic/geotechnical data to characterize site.										
<u>Legend:</u> Structure type SW - Single walled flume DW - Double walled flume C - Gunite-lined canal T - Trestle Structure Risk Rating L - Low M - Moderate H - High										

Table 7 Other identified erosion sites where remediation is planned.

Project Feature	Erosion Hazard Description	Structure Type	Est. Vol. (cu. yds.)	Impact	Risk	Site Priority	Priority Ranking
Slide Creek Diversion Dam	Erosion and failure of timber crib retaining wall	NA		2	2	3	M
Lemolo No. 1 canal - White Mule Creek	Rockfall from breccia and mudflow slope 15 - 20' high above canal	DW	10	2	2	3	M
Lemolo No. 1 canal - White Mule Creek	Sidecast below road	DW	10	2	2	3	M
Legend: Risk Rating L - Low M - Moderate H - High DW - Double walled flume NA - Not Applicable							

4.0 EROSION REMEDIATION PROGRAM

Erosion control activities at individual sites will be completed as per the schedule set forth in the SA Schedule 14.4 and as shown in Table 8. Site plans for the 31 HIGH priority erosion sites and 27 MEDIUM priority erosion sites identified in the Settlement Agreement Schedule 14.4 are presented in Appendix A. Maps show the HIGH and MEDIUM Priority sites along with the Priority 1 and 2 Aquatic Connectivity site locations presented in Appendix B. Additionally, PacifiCorp will develop detailed plans for the waterway shut-off and drainage system as part of the ECP. See Section 5.0.

4.1 HIGH AND MEDIUM PRIORITY SITE REMEDIATION

There are 31 HIGH priority sites and 27 MEDIUM priority sites listed in Tables 4 through 8 in Section 3.0. A summary of the site locations is presented in the following sections.

4.1.1 Lemolo No. 2 Canal System Sites

There are 21 HIGH priority sites and 10 MEDIUM priority sites on the Lemolo No. 2 Canal System. These sites are listed on Table 4 in Section 3.0. Site Plans for these locations are presented in Appendix A. Map sheets 51-56 shows the locations of the Lemolo No. 2 canal system sites presented in Appendix B.

4.1.2 Clearwater No. 2 Canal System Sites

There are 5 HIGH priority and 7 MEDIUM priority sites on the Clearwater No. 2 Canal System. These sites are listed on Table 5 Section 3.0. Site Plans for these locations are presented in Appendix A. Map sheets 46-47 shows the locations of the Clearwater No. 2 canal system sites presented in Appendix B.

4.1.3 Fish Creek Canal System Sites

There are 5 HIGH priority and 7 MEDIUM priority sites on the Fish Creek Canal System. These sites are listed on Table 6 in Section 3.0 with accompanying site plans presented in Appendix A. Map sheets 41-42 shows the locations of the Fish Creek canal system sites presented in Appendix B.

4.1.4 Other Sites

There are 3 MEDIUM priority sites at other locations throughout the project. These sites are listed on Table 7 in Section 3.0.

4.2 SITE REMEDIATION SCHEDULE

The implementation schedule for remediation is shown on Table 8. Per the SA, of the 31 HIGH priority sites, the Fish Creek HIGH priority sites will be completed by the second anniversary of the New License or 2006 whichever comes first. All the other HIGH priority sites will be completed between the second and the sixth anniversary of the New License or between 2006 and 2010, whichever is earlier.

PacifiCorp will remediate 27 MEDIUM priority sites. Work at CW2-3 has already been completed. At 9 additional MEDIUM priority sites, the PM&E measures will be completed between 2006 and 2010. The remaining 27 MEDIUM priority sites will be remediated between License 7 and License 11. At the sites where PM&E measures will be implemented between 2006 and 2010, it has been determined that additional work should be performed for aquatic connectivity, drainage systems or erosion features and it will be economically advantageous to complete erosion remediation work in conjunction with the other tasks. These sites are: FC1, FC7, FC9, CW2-1, CW2-10, LM2-13, LM2-25 LM2-30 and White Mule Creek on Lemolo No.1. The remainder of the MEDIUM priority sites will be completed between the seventh and eleventh year after the New License becomes final.

Table 8. Remediation Implementation Schedule

<u>Erosion Control Measure</u>	<u>Due Date¹</u>
<u>Shutoff and Drainage Systems</u>	
Fish Creek	Lic. +1
Lemolo	Lic. +3
Clearwater	Lic. +3
<u>High Priority Sites</u>	
Fish Creek	Lic. +2 or 2006
Lemolo 2	Lic. +6 or 2010
Clearwater 2	Lic. +6 or 2010
<u>Medium Priority Sites</u>	
All locations	Lic. +7 to 11
<u>Monitoring Program</u>	2001 – End of License Term
<u>Revision of Erosion Control Plan</u>	Every 7 years
Seismic and Geologic Hazard Evaluation	2003, and every 5 years after.
¹ The RCC has the authority to accelerate the schedule for HIGH Priority Erosion Sites up until the License is final. PacifiCorp will develop a Master Schedule of Erosion Control Sites by the end of 2002, in which actions by the RCC will be incorporated.	

4.3 NEW SITE DISCOVERY

New erosion sites may be discovered either through annual monitoring, through operator inspections or by employees during the course of regular activities.

New sites identified may be associated with emergency conditions where partial or complete waterway blockage is causing overflow or spillage and erosion. Erosive events may also be mass earth movement not associated with the failure of a water conveyance system.

Notification and remediation steps are different for sites associated with a waterway conveyance system emergency and for those new sites found during the course of the annual erosion monitoring required for preparation of the Annual Erosion Report.

For emergency related erosive events the following steps for notification, coordination and remediation shall be followed:

Initial Agency Notification:

- The USDA-FS will be notified through a phone call. If an event is discovered outside business hours, PacifiCorp will contact the USDA-FS Umpqua National Forest Fire Dispatch.
- PacifiCorp will notify the Oregon Emergency Response System within 24 hours with a verbal report on location, duration, and effect on water quality and aquatic life.
- No later than the next business day PacifiCorp will notify and consult with the hydropower coordinator and watershed biologist at ODFW's Roseburg office. If PacifiCorp suspects that fish or wildlife or their habitat will be harmed it shall immediately notify and consult with the hydropower coordinator and watershed biologist at ODFW's Roseburg office.

Coordination of Remediation Measures:

- PacifiCorp will initiate remediation planning and implementation within 24 hours of the event.
- Site specific remediation plans for any failure will be developed in consultation with, and approved by USDA-FS, ODFW, and ODEQ.
- Plans will include immediate steps to remedy the failure and bring the waterway back into operation along with timing and performance criteria to be met for completion of the needed remediation.
- Where appropriate, these plans will be designed to improve connectivity for associated terrestrial or aquatic sites.

Implementation of remediation measures:

- Implementation of the remediation plan will be completed within 30 days after the waterway is brought back into operations.

Follow up evaluation:

- Remediated erosion sites will be included in future Annual Erosion Monitoring Reports

For new erosion sites found during the annual erosion monitoring program for preparation of the Annual Erosion Summary Report the following steps for notification, coordination and remediation shall be followed:

Coordination of Remediation Measures for New Sites:

- PacifiCorp shall develop site specific remediation plans in consultation with and subject to the approval of the USDA-FS, ODEQ and ODFW. These approved remediation plans will be included in the Annual Erosion Monitoring Report.

Implementation of Remediation Measures for New Sites

- If new site is designated as a high priority site (see section 4.4 for ranking of new sites) its remediation will be scheduled as soon as practicable by the RCC during Early Implementation. After Early Implementation scheduling will be done during the annual review and update of the Erosion Control Rolling Five Year Action Plan.

Follow up evaluation:

- Remediated erosion sites will be included in future Annual Erosion Monitoring Reports.
- New sites designated as Medium priority will be included in future Annual Erosion Monitoring Reports.

4.4 RANKING OF NEW SITES

A resource team comprised of USDA-FS, PacifiCorp and consulting engineers will evaluate new sites. Using the methodology described in Section 3.1 they will assign a priority ranking to each new erosion site. As noted in Section 4.3 above, PacifiCorp will develop site-specific remediation plans in consultation with USDA-FS, ODEQ and ODFW.

5.0 EROSION PREVENTION PROGRAM

5.1 FLUME FAILURES; SHUTOFF AND DRAINAGE SYSTEMS

PacifiCorp will develop a waterway drainage system that promptly redirects water with the goal of draining the affected waterway segment in the event of a flume failure on any section of Fish Creek, Lemolo 2 and Clearwater 2 Project Waterways. If possible, the drainage system will discharge all water from the canal within 30 minutes of the time that a flume failure is detected.

Final design of the shut-off and drainage system will be completed by PacifiCorp in consultation with the USDA-FS, ODEQ and ODFW. The process for design of each of the drainage systems will include:

- Definition of the segment of each waterway that requires drainage.
- Identification of the most suitable discharge flow characteristics (volume and duration).
- Identification of the optimal configuration for water release and/or detention including number of discharge points and volume to be discharged at each location.
- Determination of waterway elevation and alarm system configuration, monitoring frequency, and alarm criteria.
- Determination of automated response (headgate closure and/or drainage initiation) requirements.

Ongoing Operation and Testing of the System will include:

- Determination of operator and staff notification, training and response procedures.
- Testing protocols
- Post operation assessment
- Operation and maintenance plan

If a drainage system that would meet the 30-minute goal is not possible to construct in a particular segment of any Project Waterway, PacifiCorp, in consultation with ODFW, ODEQ, and USDA-FS, shall identify alternatives through an engineering-feasibility study to isolate the system failure and to identify the most effective drainage system feasible for that waterway segment.

Waterway drainage may employ multiple drainage pipes discharging into the existing channels that are crossed by a given waterway. Drainage pipes will be sized to allow release of the allowable flow within each channel.

USDA-FS and PacifiCorp staff conducted studies in the 1980's to determine the capacity of various stream channels that might be used for drainage discharge. More recent

analysis was conducted by Stillwater Sciences. Table 9 presents the results of these analyses.

Table 9. Drainage channel waterway discharge capacities.

Drainage Channel	Capacity estimated by past USDA-FS/PacifiCorp studies	100-year flood estimated by Stillwater Sciences (2003).
Lemolo No. 2 Waterway		
Nancy Creek	200 cfs (estimated)	99.1
Beverly Creek	200 cfs (estimated)	69.4
Helen Creek	300 cfs	90.8
Norma Creek	200 cfs	88.7
Dorothy Creek	650 cfs	133.3
Unnamed channel	200 cfs (located between Dorothy & Potter Creeks)	48.3
Potter Creek	650 cfs	370.4
Laura Creek	300 cfs	163.9
Nurse Creek	300 cfs	181.5
Unnamed channel	200 cfs (between Nurse Creek & Flume 12 spillway)	23.0
Flume 12 channel	650 cfs	6.6
Patricia Creek	650 cfs	160.2
Clearwater No. 2 Waterway		
Rock cut	450 cfs (Rock cut at MP 0.6 from diversion)	11.6
Flume 4	200 cfs (MP 1.4, measured from diversion)	75.0
No Tunnel Creek	450 cfs	199.2
Unnamed channel	100 cfs (Approximately MP 4.5, measured from diversion)	43.5
Unnamed channel	150 cfs (Approximately MP 4.7, measured from diversion)	4.2
Unnamed channel	450 cfs (Approximately MP 5.2, measured from diversion)	34.6

Along the Fish Creek canal, specific drainage channels capable of accepting discharge from canal drainage pipe have not been identified.

5.1.1 Schedule

Design of the Fish Creek water shut-off and drainage system will begin in the latter half of 2003, and is expected to be complete by early 2004. Per the SA, construction of the Fish Creek drainage system will be complete one year after the new license becomes final. Design of the drainage systems for Lemolo No.2 and the Clearwater No. 2 systems will follow that for Fish Creek, with construction complete within 3 years after the new license becomes final.

5.2 **EROSION CONTROL MEASURES FOR CONSTRUCTION**

Erosion control measures will be implemented in conjunction with new construction projects. General erosion and sediment control procedures for all sites are described below. These measures will be superseded by site-specific erosion control plans developed for each construction project. The site-specific plans will be subject to review and approval by the USDA-FS. ODFW and other interested Parties will be consulted during the development of plans. Prior to the beginning of construction, the site contractor(s) will be required to provide a site-specific plan documenting the overall procedures to be used for construction of the new project facilities.

The contractor's plan will identify specific erosion control methods similar to the ones described below. These methods will be implemented throughout the construction period to provide compliance with water quality requirements and to limit erosion potential. The plan will be the basis for inspection and maintenance of the construction effort.

Runoff from construction areas will be controlled to retard and divert runoff to protected drainage courses. This will be accomplished with the following methods:

- diversion ditches
- benches
- straw bale barriers
- silt fences
- berms

Sediment from construction areas will be trapped in sediment basins. These basins shall be sized to accommodate runoff from the design storm. Temporary erosion and sediment control measures such as berms, dikes, ditches, drains, and sedimentation basins, will remain until construction is complete and/or until permanent drainage facilities are complete and operative.

Erosion and sediment control facilities will be installed in conjunction with initial clearing but prior to actual construction. Minor grading necessary to install the erosion control facilities will be done in a manner to ensure that sediment does not enter the natural drainage system.

The following is a description of the general type of temporary methods to be used.

5.2.1 Straw Bales

Straw bales will be used as a temporary berm, diversion, or barrier to help contain sediment on-site by catching and filtering runoff from a construction site. The barriers can be used across small swales, in ditches, and at slopes where there is a temporary, large volume of sediment runoff. Straw bales will be laid on their side (straw in bail is parallel to ground surface, i.e. cut ends are not on the top of the bail) and staked in place with either wooden or metal stakes. The stakes will be driven through the bale and at least 1-foot into the ground. Straw bale sediment barriers will be inspected on a regular basis and repaired or replaced when damaged.

5.2.2 Sediment Settling Pond

Sediment ponds will be constructed to allow settling of sediment before runoff from a construction site is discharged into any adjacent waterway. The ponds will be designed with a spillway so that sediment-free water will be decanted during periods of peak flow. Constructing a well compacted, circular-shaped berm at the lowest collection point on a bare slope will form ponds. Alternatively, settling ponds may be constructed through a combination of excavation and berm construction. The contractor will construct the berm using materials specified in the construction plans. The berm will be constructed high enough so that the pond can detain runoff water and any excess from a typical storm event for the area and season. Sediment ponds will be inspected on a regular basis, especially after storm events.

If required, accumulated sediment will be removed from within the settling pond, spread in a designated area, and seeded and mulched. Sediment ponds may be removed when construction is complete and stabilization is accomplished.

5.2.3 Silt Fences

Silt fences will be used to filter sediment out of runoff water before it is discharged. Silt fences will be erected in areas where there is a potential for construction runoff to be discharged. Silt fences will be used on small ephemeral drainages where surface water collects or leaves the construction site.

Silt fences will be constructed from filter fabric, steel fence posts, or wire. Fence posts will be spaced a maximum of 6 feet apart and driven securely into the ground. The fence posts and filter fabric will follow topographic contours (where feasible). Filter fabric will be placed in the maximum continuous lengths feasible, to minimize the use of joints. When joints are necessary, the filter cloth will be spliced together only at a support post, with a minimum of 6-inch overlap, and both ends securely fastened to the post.

A trench will be excavated on the uphill side of the planned fence location to a depth of at least 6 inches to allow the edge of the filter fabric to be buried. Filter fabric will be stretched between the posts and wired in place. The fabric will be lowered into the trench, covered with rocks, and the soil compacted so that water cannot wash out under the fabric.

Silt fences will be inspected periodically, especially during periods of high runoff, and will be cleaned and repaired on a regular basis. Silt fences will be removed when they have served their useful purpose but not before the upslope area has been permanently stabilized.

5.3 SEISMIC AND GEOLOGICAL HAZARD EVALUATIONS

During FERC Part 12 Inspections of the project works, PacifiCorp will perform analyses of potential seismic and geologic hazards facing the project according to methodologies and procedure approved by the Oregon Department of Geology and Mineral Industries (DOGAMI). PacifiCorp shall include such analysis, after review and comment by DOGAMI, in its Part 12 submissions to FERC. Data from the Part 12 Inspection Report which impacts erosion sites or potential erosion sites at the facility will be included in the following years Erosion Control Plan Annual Summary Report.

5.3.1 Schedule

Seismic and geologic hazard evaluations are conducted as part of the 18 CFR 12.38 FERC Part 12 inspection. Inspections generally occur at a 5-year interval. The inspection schedule is set by FERC, with the next inspection due in 2003.

5.4 RESERVOIR BANK EROSION CONTROL

An erosion survey of the Lemolo Lake and the Lemolo No. 1 forebay shorelines was conducted during North Umpqua Hydroelectric Project relicensing studies (Harza 1994). During that survey, areas of bank erosion were noted along the margins of both water bodies. These sites were considered low priority sites, reflecting the fact that sediment from these areas enters a waterway or impoundment rather than a river or stream.

Per SA Section 9.4, the feasibility of specific measures related to revegetation and erosion control of reservoir banks and areas subject to reservoir fluctuations will be determined during the development of either the Erosion Control Plan or the Vegetation Management Plan. This analysis is presented in the following sections of this Plan.

5.4.1 Overview of Geology/Soils of the Lemolo Lake Area

The majority of Lemolo Lake is surrounded by a thick layer of ash and pumice deposited during the eruption of nearby Mount Mazama (Crater Lake) about 6,800 years ago. The pumice deposits are white to pink in color, and unsorted with fragments ranging from

small silt and sand sized particles up to about 3/4-inch in diameter. The charred remains of tree trunks, alive at the time of the eruption, can be seen in several locations around the lake. These carbonized trees are evidence that the ash was very hot when it fell. The heat helped the ash deposits to become slightly welded together. As a result, the ash stands in near vertical banks when it is subject to erosion by undercutting. The ash deposits are very permeable, and little runoff occurs from undisturbed areas. However, the ash is very susceptible to gully erosion when concentrated water runs over it, such as at the outlet of a culvert or locations where parking lot or road runoff is concentrated.

Basaltic andesite is exposed along the western end of the Lemolo Lake shoreline, between Lemolo Lake Resort, the dam, and Bunker Hill Campground. This hard, dark rock is not susceptible to erosion, but forms an armor on the shoreline. It is also found along the shoreline under ash deposits in a few smaller areas such as the island off the Poole Creek Campground Boat Ramp.

5.4.2 Existing Erosion at Lemolo Lake and Lemolo #2 Forebay.

Areas of shoreline erosion in Lemolo Lake and Lemolo #2 Forebay were mapped and described as part of the 1994 Final Technical Report for the Erosion Survey Study (Harza 1994). No other areas of erosion were mapped at project impoundments. The following discussion includes data from the 1994 report as well as recent field observations made during a site visit on November 19, 2003.

Wave action on the shoreline of Lemolo Lake has caused bank erosion in several locations. Pumice deposits underlie shoreline areas susceptible to erosion. Erosion has resulted in unvegetated pumice cliffs 5 to 30 feet high along approximately 17,000 feet of shoreline. A map showing the location of these areas is included as part of the map set in Volume 2. Two areas of the Lemolo #2 Forebay totaling approximately 500 linear feet are also susceptible to erosion. These areas do not contribute sediment to a flowing river system, but do contribute sediment to an impoundment. These areas are characterized by local surface erosion or small slides and are typically intermittent along the length of the feature.

Table 10. Lemolo Lake Bank Erosion Areas.

Area	Approximate length (ft)	Feature
Northern central shoreline	800	20-25 ft high pumice cliff
Northeast shoreline	3,200	10-15 ft high pumice cliff, discontinuous
Extreme northeastern shoreline	400	10 ft high pumice cliff
South shore, east bank of major north-south embankment	3,500	20-25 ft high pumice cliffs
South shore, west bank of major north-south embankment	7,000	5 ft high pumice exposures
West shore, on north and south sides of Lemolo Resort boat ramp	1,100	5 ft high pumice exposures

Two erosion processes affect the shoreline along Lemolo Lake: surface erosion due to ravel; and mass wasting resulting from undermining due to wave action and possibly fluctuating water levels. Raveling is a minor erosional process since exposed cliffs are generally near vertical and in many locations overhanging mantles of roots and soil at the top of the cliffs provide protection from surface erosion.

The dominant cliff erosion process is mass wasting. This process occurs episodically, due primarily to undercutting of the cliffs by wave action. Damaging waves are generated by wind and motorboat wakes. Wave action can only undermine the cliffs when the lake is at or near full pool; this occurs in the spring when snowmelt runoff fills the lake, throughout the summer when the lake is kept high for recreational purposes, and in the winter during infrequent rain-on-snow storm events when the lake is filled by runoff. During the summer, the wind often increases in strength in the afternoon, and blows up the lake (from the northwest). As a result, wind-induced waves are directed at headlands and exposed banks along the southern shore, and to a lesser extent, along points on the northern shore.

5.4.3 Potential Results of Bank Erosion

One potential result of bank erosion is increased turbidity in areas close to the erosion sites during active erosion. Water quality studies completed as part of the initial relicensing effort did not indicate turbidity concerns in Lemolo Lake, and recent studies also did not find turbidity concerns (Eilers, Raymond and Eilers 2003). Observations of floating pumice on the lake surface during the 2003 investigation led to speculation that shoreline bank erosion may be an issue, however, the floating pumice could have come from a tributary stream or been re-entrained from shoreline deposits as lake levels rose.

Loss of upland habitat and vegetation is a result of bank erosion. As the banks erode and fall into the reservoir trees and vegetation along the shoreline are lost. Vegetation surrounding Lemolo Lake is typical of mid-elevations (3,000-5,000 feet) in the southern Oregon Cascade Mountains, and consists primarily of mid-successional conifer forest stands dominated by Douglas-fir and lodgepole pine (PacifiCorp 1995). Many of these stands, particularly those dominated by lodgepole pine, are characterized by a high density of small-diameter trees and a very sparse understory. The annual loss of small numbers of trees from shoreline erosion is insignificant on the local and landscape scales. There are about 22 acres of wetlands at the eastern end of Lemolo Lake. Located in level areas at the mouths of Lake Creek and the North Umpqua River, these wetlands represent some of the most diverse habitat associated with Lemolo Lake and support a variety of wildlife species (PacifiCorp 1995). These wetlands are not affected by bank erosion.

5.4.4 Discussion of Specific Measures

The following subsections provide descriptions of specific treatment measures and discussions of the potential benefits and drawback of each measure.

5.4.4.1 Revegetation with Native Plant Materials

Revegetation with native materials is not a viable stand alone treatment because of the inability of the vertical or near vertical pumice cliffs to support vegetation. For this reason, revegetation measures are evaluated as a component of several of the following specific measures. Any plants used for revegetation would need to meet the requirements of the UNF Native Plant Program (see VMP, PacifiCorp 2004). A mixture of shrubs, grasses, and forbs should be used to provide for soil stabilization and habitat. There are several willow species that can tolerate a range of soil moisture conditions and are easily propagated (Guard 1995); these species may be particularly well suited to stabilizing the base of a slope near the waterline. However, some level of protection (i.e. logs, rocks) would be needed to shield plantings from wave action. Areas outside the influence of waves can be revegetated with locally occurring upland species that are tolerant of relatively infertile and well drained soils (i.e. ceanothus and manzanita species).

5.4.4.2 Slope Flattening

This measure would entail laying the vertical pumice slopes back to a low angle of repose and revegetating them. Experience with pumice slopes in the area indicates that they are actually more stable in a near vertical configuration with a vegetative cap. The slight cementation in the slopes is lost when the slopes are laid back, enabling water to break down the cemented bonds, forming rills and gullies. For this reason, slope protection in the form of vegetation and/or additional slope protection measures would be required to limit rilling and gullying if slopes are flattened.

This treatment would create at least two large scale environmental impacts and has two physical limitations to its implementation on higher slopes. The environmental impacts include substantial loss of established upland habitat and increased erosion of the newly created slope. Disposal of large quantities of material generated from the slope flattening would also be a concern. Establishment of vegetation in a timely manner would be a concern on the newly exposed, relatively infertile pumice soils. Short-term slope protection as well as measures to increase soil fertility and water retention would be necessary for plants to survive.

Physical site constraints do not favor this approach along high banks or areas with steep slopes at the top of the banks. Where slopes are steep at the top of the eroded bank or if the bank is very tall, it would be impossible to create a satisfactory slope and daylight the new cut slope within a reasonable distance from the edge of the reservoir. These projects would require the removal and transport of large quantities of material and expose large areas of newly created pumice slopes to erosion. Shorelines with banks of less than four feet may be appropriate for this type of treatment when the natural slope at the top of the bank is close to flat.

Summary: Flatten steep banks, provide erosion protection and revegetate slopes.

Benefits: Few – not likely to be successful.

Disadvantages: Would create gentle pumice slopes that are likely to be more erodible than the existing near-vertical slopes. Newly exposed pumice is relatively infertile and excessively well drained; it would be difficult to establish new vegetation. Would result in a loss of upland vegetation as slopes are laid back. Would result in large quantities of spoil requiring disposal.

Likelihood of success: Not likely to be successful on slopes over a few feet high; pumice is more stable in vertical banks; likely to be difficult to revegetate newly exposed pumice.

5.4.4.3 Toe Armoring with Anchored Logs

In this scenario, logs would be placed at the toe of the slopes, anchored in place, and act to dissipate wave energy at the high water mark. The logs have a natural appearance and have relatively low cost compared to other measures. This is potentially the most feasible measure as it ameliorates the primary cause of the shoreline erosion. This measure does not require large quantities of earthwork and takes advantage of the natural stability of the near vertical pumice slopes.

Summary: Provide anchored logs at the base of eroding slopes to dissipate wave energy.

Benefits: Relatively inexpensive. Helps to reduce wave under-cutting by protecting the toe of the slope. Looks natural and leaves protective vegetation at top of slope in place.

Disadvantages: If waves work behind the woody debris, bank may continue to erode, leaving woody debris “stranded” away from the base of the bluff. Would likely slow wave undercutting, but may not stop it completely.

Likelihood of success: Likely to be successful in reducing the rate of undercutting as long as waves do not work around behind the logs.

5.4.4.4 Log Booms

Log booms consist of a string of logs connected together that are anchored in place but float on the surface at full pool. They act as wave dissipation devices, reducing the erosive energy at the water line. This measure also takes advantage of the natural stability of the vertical pumice slopes and leaves the protective established capping vegetation in place.

Summary: Provide anchored log booms to dissipate wave energy.

Benefits: Relatively inexpensive. Has proven to be somewhat successful along pumice slopes in other locations.

Disadvantages: Anchored log booms may be a hazard to boaters. Would likely slow wave undercutting, but may not stop it completely.

Likelihood of success: Likely to be somewhat successful in reducing the rate of undercutting.

5.4.4.5 Riprap

The exposed banks could be armored with riprap. The treatment could extend to few feet above the waterline, or could be extended to the top of the exposed bank. The intent of this repair would be to prevent undermining of the pumice slopes at the waterline. A natural example of this is displayed on the banks near the Poole Creek campground, where native rock materials are exposed at the high water line.

Placement of these materials would cause substantial disruption of the reservoir bed during construction since rip rap would need to be keyed in below the high water line for stability. This measure and biotechnical slope stabilization are the most costly of all measures identified and may not provide the protection needed if pumice soils move from underneath or behind the riprap or if waves work around behind the rip rap.

Summary: Place rip rap at the base of eroding slopes to dissipate wave energy.

Benefits: Reduces wave under-cutting by protecting the toe of the slope.

Disadvantages: Relatively expensive and disruptive to place. If waves work behind the rip rap, bank may continue to erode, leaving rip rap “stranded” away from the base of the bluff. Would likely slow wave undercutting, but may not stop it completely.

Likelihood of success: Likely to be successful in reducing the rate of undercutting as long as waves do not work around behind the rip rap.

5.4.4.6 Biotechnical Slope Stabilization:

These measures use of a combination of materials to construct a new slope that resists scour and can be vegetated. Riprap would be placed from the lake bottom to a few feet above the waterline to dissipate wave energy. A reinforced soil mass would be placed on top of the riprap. The reinforcements typically consist of synthetic materials to provide long-term stability. The soil mass would be planted with native plants to provide additional reinforcement. These methods are typically installed from the high water line to the full height of the bank. These measures may cause a loss of terrestrial habitat due to initial slope flattening necessary for installation.

This scenario would disturb the reservoir bottom during riprap placement and also could require the large scale removal of existing vegetation and soil material to lay existing vertical cliffs back. There would be the potential for increased erosion while vegetation became established and the need for soil improvements to increase survival. This type of treatment may be effective on slopes less than 10 feet in height.

Summary: Install rip rap at the base of eroding slopes to dissipate wave energy, lay back slopes, install erosion protection matting and vegetation on upper parts of slopes.

Benefits: Would help to reduce wave under-cutting by protecting the toe of the slope. Would help protect the upper parts of the slope by providing slope stabilization and vegetation. Looks natural once vegetation is established.

Disadvantages: Very expensive. Disruptive to shoreline during installation, requires removal of established upslope vegetation to lay back slopes. Disposal of large quantities of soil materials produced during laying back of slopes.

Likelihood of success: Likely to be successful in reducing the rate of undercutting as long as waves do not work around behind the rip rap at the base of the bluff, and as long as vegetation becomes established.

5.5 SPOIL MATERIAL REMOVAL AND DISPOSAL

Spoil material will be generated through implementation of ECP mitigation measures such as sidecast removal or remediation of individual erosion sites. Spoil will be disposed of in accordance with USDA-FS standard practices at locations that are specifically designated for that purpose. Appropriate erosion control measures will be implemented at spoil disposal sites to prevent erosion of newly placed materials.

6.0 COORDINATION REQUIREMENTS

6.1 CONSTRUCTION PERMIT AND APPROVAL PROCESS

Prior to performing construction work other than routine scheduled maintenance, PacifiCorp or its subcontractors will obtain the necessary Federal, State, and local permits and approvals from appropriate agencies in conformance with all federal, state, and county laws.

6.2 COORDINATION WITH OTHER PM&E MEASURES

The planning of erosion control activities in the ECP will be coordinated with other PM&E measures through the Resource Coordination Plan (RCP) process. The Vegetative Management Plan (VMP), Aesthetics Management Plan (AMP), Cultural Resources Management Plan and the Transportation Management Plan (TMP) influence the ECP, and cross-references to these plans have been provided. It is recommended that these plans be referenced prior to initiating work, to ensure that all remediation measures are being accounted for at specific sites.

6.2.1 Vegetation Management Plan Measures

Erosion control remediation measures will be coordinated with the VMP where necessary. The VMP should be referenced for specific guidance on vegetation management to be used in the ECP site specific plans.

6.2.2 Riparian Restoration Measures

PacifiCorp will restore riparian habitat along White Mule Creek below the USDA-FS road to the confluence with the North Umpqua and in areas along Potter Creek to the confluence of the North Umpqua. These restoration measures, which may include planting of native species, will be integrated with the site-specific erosion control activities planned at these sites, and will require coordination with the VMP.

6.2.3 Aquatic Connectivity Measures

PacifiCorp will reconnect Priority 1 and 2 intercepted tributaries and drainages as indicated in the SA, Schedule 10.6. Priority 1 and 2 Aquatic Connectivity sites associated with HIGH and MEDIUM Priority erosion sites are identified in Table 11 below. Erosion control site-specific designs will address these areas such that respective site needs will not impact the other. Maps included with this plan shows the locations of the HIGH and MEDIUM erosion sites and the Priority 1 and 2 Connectivity Sites in relationship to each other. These maps are presented in Appendix B.

Table 11. Correlation of erosion control work with aquatic connectivity sites.

Lemolo No.2		Clearwater No.2		Fish Creek	
Erosion Control Site	Aquatic Connectivity Site	Erosion Control Site	Aquatic Connectivity Site	Erosion Control Site	Aquatic Connectivity Site
LM2-15	L26	CW2-1	C24	FC5	F3
LM2-20	L23		C23	FC10	F6
LM2-23	L16, L17, L18, L20	CW2-3	C20		
LM2-25	L15	CW2-5	C14		
LM2-27	L11, L12, L13	CW2-6	C12		
LM2-30	L9, L8, L7, L6	CW2-10	C5		
		CW2-11	C4		

6.2.4 Big Game Bridges and Wildlife Underpasses

PacifiCorp will increase the width of 29 existing big-game bridges across the project waterway, install 34 new wildlife crossings, and excavate at least 9 wildlife underpasses below project penstocks according to Section 11 of the Settlement Agreement. If these locations correspond with any identified erosion sites, completion of these tasks will be coordinated with site-specific erosion control designs.

6.2.5 100-Year Flood Culvert Replacement

PacifiCorp will replace culverts associated with Priority 1 and 2 aquatic sites according to Section 10.7 of the Settlement Agreement. Culverts will be installed that are sufficient to accommodate a 100-year flood event as well as riparian and aquatic species connectivity. Site-specific plans for culvert removal and replacement will be included in the TMP. Completion of these tasks will be coordinated with site-specific erosion control plans. The locations of culverts to be upgraded that coincide with erosion control sites are shown on the Maps in Appendix B.

6.3 COORDINATION DURING UNCONTROLLED EVENTS

In the event of an accidental spill or discharge from the waterway or any other erosive event, PacifiCorp will follow the protocol below as per Settlement Agreement section 14.3

- USDA-FS during regular business hours and USDA-FS Umpqua National Forest Fire Dispatch outside of regular business hours.
- Oregon Emergency Response System within 24 hours of the event with a verbal report on location, duration and effect on water quality and aquatic life.
- ODFW's hydropower coordinator and watershed biologist in Roseburg within 24 hours if fish or wildlife habitat is harmed.
- PacifiCorp shall coordinate emergency response to waterway failure or other erosive event, and the subsequent remediation planning and implementation process will be initiated within 24 hours of the event.
- PacifiCorp shall develop site-specific plans for remediation of any failure in consultation with, and approved by the USDA-FS, ODFW, and ODEQ. Plans will include
 1. Immediate steps to remedy the failure and bring the waterway back into operation and
 2. Timing and performance criteria to be met for completion of needed remediation after an event.
- The implementation of the plan will be initiated according to a schedule determined by the consulting parties.
- Actions taken to remediate the waterway shall be designed to improve connectivity for associated terrestrial or aquatic species.
- The RCC will review the site-specific plans to ensure that other resource areas have been considered.
- The Parties recognize that, due to the nature of waterway failures or significant erosive events, coordination of remedial measures has the potential to change the actual number of reconnections and crossings and may shift the timing of the implementation for some PM&E measures in order to accommodate a timely response.
- PacifiCorp will provide an annual report to USDA-FS, ODEQ and ODFW by March 1 for the preceding calendar year describing each event and the action taken to remediate the impacts and the operational changes taken or proposed to reduce the reoccurrence of a spill.

7.0 MONITORING AND REPORTING REQUIREMENTS

Erosion control monitoring and implementation of erosion control measures will continue throughout the period of the new license. Monitoring will encompass three tasks:

- Daily monitoring performed by PacifiCorp operations staff as part of ongoing operation of the Project.
- Automated monitoring of water levels in the Lemolo No. 2, Clearwater No. 2 and Fish Creek waterways to provide rapid identification of any waterway failures.
- An annual survey conducted by PacifiCorp and consultant staff in cooperation with the USDA-FS.

The erosion control monitoring schedule is presented in Table 12.

Table 12. Monitoring schedule.

Monitoring Task No.	Monitoring Task	Duration (years)	Frequency (no./yr)	Timing
1	Monitor waterway areas for erosion	35	365	Daily/Weekly
2	Canal water elevation alarm system	35	365	Automated
3	Annual erosion monitoring.	35	1	Late spring / early summer
4	T-Line R/W during annual aerial surveys	35	1	As scheduled.

7.1 ROUTINE MONITORING BY OPERATIONS STAFF

Operations personnel visually monitor project waterways as part of their routine daily/weekly facility O&M duties. The operations personnel will contact the PacifiCorp Environmental Coordinator, Production Manager or Control Center if during this inspection a potential erosion hazard is noted or an erosion event discovered. The PacifiCorp Representative will contact the Federal and State agencies according to the protocols established in the Resource Coordination Plan. Between the effective date of the SA and before adoption of the RCP, PacifiCorp will use the protocol specified by SA Section 14.3.

Observations made during routine monitoring include rock blockage locations, water levels, and conditions of structural and control elements of the waterways. If rockfalls or debris flows have constricted flow in the waterway to the point that a portion of the flow in the waterway is being spilled, the operator will alert operations staff and the Environmental Coordinator. PacifiCorp will temporarily shut down the waterway, remove accumulated boulders, and place them in a location approved by the USDA-FS.

Prior to putting a waterway back in service, staff will conduct a follow-up inspection to ensure waterway function.

The Environmental Coordinator will record the locations of rockfalls or debris flows large enough to require the shutdown of the waterway for cleaning. These locations will be reported in the ECP Annual Summary Report so that areas consistently subject to rockfall are identified and remedial action taken as appropriate.

7.2 WATERWAY ELEVATION ALARM SYSTEM

The water level alarm system will be updated and expanded as part of the Flume Shut-Off and Drainage System (see Section 5.1). Per the SA, system designs will be done in consultation with appropriate agencies. Specific items to be addressed include: location and spacing and type of water level sensors; system power supply and back-up; water level sampling interval; alarm criteria; alarm transmission; automated response (headgate closure and/or drainage initiation); operator response; and frequency and method of system testing.

Water level alarms are currently installed at three locations along the Lemolo 2 waterway. These devices augment daily visual inspections. The locations for these alarm systems are:

- (1) Barkenburger Creek (immediately downstream of flume 4),
- (2) East of Potter Creek, and
- (3) West side of Potter Creek.

Each water level alarm system consists of a pair of sensors coupled to a telemetry system. Water level at each sensor in the flume is monitored at 2-minute intervals, with data transmitted to the Toketee Control Center.

7.3 ANNUAL EROSION SITE SURVEY

PacifiCorp will complete an annual survey of project facilities and existing erosion sites to identify new sources of erosion as well as to determine if the erosion site priority ranking is still accurate. New sites identified will be evaluated using the risk assessment process described in the Plan, and prioritized together with previously identified sites (See Section 4.3 for more discussion on New Sites).

The annual erosion site survey will include:

- Inspection of all identified erosion sites
- Project-wide inspection to identify any new erosion sites

Inspection of identified erosion sites will be done using a standard inspection form. The inspection form will be filled out for each site, and requires evaluation of slope stability, seepage, vegetation/surface cover, and a comparison with prior inspections of the same

site. A photograph will also be taken at each site to provide a record of surface conditions. In order to establish a consistent record of any movement in surface conditions, fixed locations for the photographic record of specific slopes will be established. A draft of this form is included in Exhibit B as part of the Annual Summary Report template. PacifiCorp and USDA-FS staff may modify this form following field evaluations.

Inspection of the transmission line corridors will be done as part of the annual aerial survey that is conducted of the transmission corridors. If the aerial surveys reveal evidence of erosion that could potentially damage transmission line structures or that may cause significant environmental impacts, follow-up inspections will be conducted on the ground. All other identified erosion sites and areas of the project will be inspected on the ground.

Qualified geotechnical staff will conduct the annual inspections and site evaluations. This may include engineering geologists, soil scientists, and/or geotechnical engineers. Staff will perform a detailed inspection of each site to identify and document field conditions. Inspection sheets and site photographs from prior years will also be reviewed to allow comparison with previous site observations. At sites where remedial measures have been put in place, the effectiveness of those measures will be evaluated. If remedial measures are not effective, additional measures will be proposed and implemented using the same process that is in place for new sites.

New sites identified as erosion sources and sites requiring maintenance will be reported in the Erosion Control Plan Annual Summary Report. A Site Remediation Assessment Form will be filled out for each new site, erosion hazard will be evaluated and rated, and where appropriate, the site will be prioritized for future remediation. Staff technical specialists and USDA-FS staff will then evaluate the newly identified sites to determine the erosion risk and impact rating.

If new erosion sites are identified that pose immediate hazards to project structures or the environment, PacifiCorp staff will immediately notify USDA-FS personnel by email or telephone; and the Oregon Emergency Response System (1-800-452-0311).

8.0 SEVEN YEAR UPDATE

This Plan was prepared by PacifiCorp in consultation with and approved by the Parties. Implementation of the ECP measures is expected to occur as detailed in the Plan through the term of the new license. However, some flexibility has been built into the Plan to address unanticipated change in conditions over time.

The Plan will be reviewed and potentially revised by PacifiCorp and the Parties at least every 7 years following issuance of a new license, or as agreed upon by PacifiCorp and the USDA-FS. This review will occur in conjunction with the annual meetings. Recommendations for changes to the Plan may be submitted by either party and will be discussed. Agreed-upon changes to the Plan will be incorporated into a revised Plan document by PacifiCorp. The revised Plan will be reviewed and approved by PacifiCorp and the Parties and will then be submitted to the FERC for final review and approval. Any disagreements on revisions to the Plan will be submitted to the RCC and/or FERC for resolution. Revisions to the Plan will not contradict overall decisions made and agreed upon in the SA.

Factors that may trigger revisions of the Plan include:

- Revisions and updates to the Umpqua National Forest FLRMP (2008 is next planned update, then approximately every 15 years);
- Catastrophic natural events, such as major forest fires or natural disasters, and;
- New federal and state policies, regulations, and laws that significantly affect geologic and soil resources in the Project area for the new license term.

9.0 REFERENCES

- Eilers, J., R. Raymond, and B. Eilers 2003. Lemolo Lake, Oregon: Monitoring and Modeling Water Quality. Report prepared for PacifiCorp. October 2003.
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- PacifiCorp. 1992. First Stage Consultation Document for Application for License for Major Project – Existing Dam. North Umpqua Hydroelectric Project, FERC Project No. 1927. May 1992.
- PacifiCorp. 1994. Draft Application for New License for Major Modified Project, Exhibit E, Section 10 - Geology and Soils, 1994.
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USDA-FS. 1998. Diamond Lake and Lemolo Lake Areas Watershed Analysis. North Umpqua National Forest. Roseberg, Oregon.

USDA-FS. 1999. Fish Creek Watershed Analysis. North Umpqua National Forest. Roseberg, Oregon.

USDA-FS. 2001. Calf-Copeland Watershed Analysis. North Umpqua National Forest. Roseberg, Oregon.

USDA-FS 2001. Middle North Umpqua Watershed Analysis. North Umpqua National Forest. Roseberg, Oregon.

10.0 EROSION SITES HISTORICAL PHOTO CD

A CD is included in the sleeve on the following page. This CD presents a compilation of photographs of erosion sites identified in the Plan. Photos of individual sites span the period from 1998 through 2003, though not all sites are represented in the photos from a given year. Many sites include multiple photos from a given year. Each photo is identified by site number, date taken, and in the case of multiple photos from a single site, as photo “a,” “b,” “c,” etc.

ECP EXHIBITS

- A Settlement Agreement (Section 14)
- B Erosion Control Plan Annual Summary Report Template
- C Umpqua National Forest Land and Resource Management Plan Soil Productivity Standards
- D USDI-BLM Record of Decision and Resource Management Plan, Best Management Practices
- E Rolling 5-Year Erosion Management Action Plan Template

EXHIBIT A

Settlement Agreement (Section 14)

North Umpqua Settlement Agreement

USDA-FS. Planning and scheduling for implementation of these activities will be coordinated by the RCC.

13.3 Helicopter Surveys. Commencing upon the Effective Date, helicopter surveys of Project transmission lines will comply with conditions outlined in the Rattlesnake Rock Peregrine Falcon nest site plan and the Toketee Lake Bald Eagle nest site plan.

13.4 Avian Agreement. PacifiCorp shall follow the existing Agreement for Management of Birds on Powerlines, among PacifiCorp, ODFW, and the USFWS dated February 18, 1988, which is incorporated into this Agreement by this reference to the extent that it applies to the Project lands and attached as **Appendix G**. This agreement promotes cooperation between PacifiCorp and the signatory agencies and includes procedures for dealing with bird mortality and problem nests. Records of dead birds found near Project facilities will be kept in a database and annual reports that summarize program activities within the Project area will be submitted to the USDA-FS. Information contained in such reports or databases will not be viewed as an admission on PacifiCorp's part of any violation of applicable law. The USDA-FS and BLM will review and determine the need to be signatories of the avian agreement by 2004.

SECTION 14. EROSION AND SEDIMENT CONTROL

14.1 Erosion-Control Plan. PacifiCorp shall finalize the existing draft erosion-control plan (the "ECP") (dated November 2, 2000) in consultation with the Governmental Parties. PacifiCorp shall complete the ECP by the end of 2001 and submit it to the Governmental Parties for review and approval. The ECP will include all of the specific erosion PM&E Measures set out below in this Section 14.

14.2 Flume Failures; Shutoff and Drainage Systems. Commencing upon the Effective Date, PacifiCorp shall develop, in consultation with the USDA-FS, ODEQ, and ODFW, a waterway drainage system that promptly redirects water with the goal of draining the affected waterway segment within 30 minutes in the event of a flume failure on any section of the Fish Creek, Lemolo 2, and Clearwater 2 Project Waterways. PacifiCorp shall develop site-specific plans, for approval by ODFW, ODEQ, and USDA-FS, for these shutoff and drainage systems, with initial priority on the Fish Creek waterway, upon submission of this Agreement to FERC. PacifiCorp shall develop a written operations and maintenance plan upon completion of the site plan for such system. If a drainage system that would meet the 30-minute goal is not possible to construct in a particular segment of any Project Waterway, PacifiCorp, in consultation with ODFW, ODEQ, and USDA-FS, shall identify alternatives through an engineering-feasibility study to isolate the system failure and to identify the most effective drainage system feasible for that waterway segment. PacifiCorp shall complete construction of shutoff and drainage systems as follows: (1) Fish Creek within one year after the New License becomes final and (2) Lemolo 2 and Clearwater within three years after the New License becomes final.

North Umpqua Settlement Agreement

14.3 Timely Response to Erosive Events. Should an accidental spill or discharge from the waterway system or other erosive event occur, or should the emergency shutdown system be tripped, PacifiCorp shall take the actions specified below.

14.3.1 Notification of USDA-FS and Response. PacifiCorp shall immediately notify and consult with the USDA-FS upon discovery of any of the events listed in Section 14.3 above. If an event occurs outside business hours, PacifiCorp shall contact the USDA-FS Umpqua National Forest Fire Dispatch.

14.3.2 Notification of State. PacifiCorp shall notify the Oregon Emergency Response System within 24 hours of an event with a verbal report on location, duration, and effect on water quality and aquatic life. If PacifiCorp observes or suspects that fish or wildlife or their habitat may be harmed, it shall immediately notify and consult with the hydropower coordinator and watershed biologist at ODFW's Roseburg office. In no case shall such contact occur later than the next business day. Additionally, PacifiCorp shall provide an annual report to ODEQ and ODFW by March 1 for the preceding calendar year, describing each event and action taken to remediate impacts and the operational changes taken or proposed to reduce the reoccurrence of the spill or discharge.

14.3.3 Coordination of Remedial Measures. PacifiCorp shall coordinate emergency response to waterway failure or other erosive event, and the subsequent remediation planning and implementation process will be initiated within 24 hours of the event. PacifiCorp shall develop site-specific plans for remediation of any failure in consultation with, and approved by, the USDA-FS, ODFW, and ODEQ. Plans will include (1) immediate steps to remedy the failure and bring the waterway back into operation and (2) timing and performance criteria to be met for completion of needed remediation after an event. Implementation of the remediation plan shall be completed within 30 days after the waterway is brought back into operation. Actions taken to remediate waterway failures also shall be designed to improve connectivity for associated terrestrial or aquatic sites. This will occur through development of site-specific plans in response to the failure and through the RCC. The Parties recognize that, due to the nature of waterway failures or significant erosive events, coordination of remedial measures has the potential to change the actual number of reconnections and crossings and may shift the timing of the implementation for some PM&E Measures in order to accommodate a timely response.

14.4 Erosion-Site Remediation. Erosion control standards referenced in Section 14.4.1 below used for remedial measures will be consistent with mitigation measures for other Umpqua National Forest activities and will integrate remedial measures for erosion control with terrestrial and aquatic measures.

14.4.1 Site-Specific Plans. Commencing upon the Effective Date, PacifiCorp shall develop site plans for prevention and remediation of erosion for 31 actions at high-priority erosion sites and 27 actions at medium-priority erosion sites identified in **Schedule 14.4**, in consultation with the USDA-FS, ODFW, and other interested agencies. Criteria to be used for determining appropriate remediation will be those found in the Umpqua National Forest

North Umpqua Settlement Agreement

Land and Resource Management Plan, chapter IV, Soil Productivity, 1990, using a least-cost, fit-to-site approach. PacifiCorp shall not implement such plans prior to review and approval of such plans by the USDA-FS. Site remediation will be evaluated on a case-by-case basis in the corresponding site plan to ensure that damage to life, property, facilities, soil, water, and fishery values are minimized. Design for any required remedial actions shall be completed by PacifiCorp at least two years prior to planned implementation.

14.4.2 High-Priority Sites. PacifiCorp shall implement remedial actions at all 31 high-priority erosion sites according to **Schedule 14.4**. Fish Creek high-priority sites will be completed by the second anniversary of the New License or 2006, whichever is earlier. All other high-priority erosion sites will be completed between the second and the sixth anniversary of the New License or between 2006 and 2010, whichever is earlier.

14.4.3 Medium-Priority Sites. PacifiCorp shall implement remedial actions at 27 medium-priority erosion sites according to **Schedule 14.4**. Where actions to be taken will be delayed until the New License is final, dates for completion of designs and plans shall not be so delayed. On unstable slope areas, PacifiCorp shall complete 10 actions on medium-priority erosion sites between the seventh and eleventh years after the New License becomes final except for portions of those sites for which an economic advantage would be gained by combining such action with other PM&E Measures to be completed between 2006 and 2010 (e.g., aquatic reconnections, drainage systems, high-priority erosion sites). The 10 sites are FC1, FC7, FC9, CW2-10, CW2-3, CW2-1, 43, LM2-30, LM2-25, and LM2-13.

14.5 Monitoring. Upon the Effective Date, PacifiCorp shall implement a monitoring program that both evaluates currently ranked erosion sites and identifies new erosion sites. Through monitoring, some medium-priority erosion sites may be redesignated as high-priority erosion sites. If an existing medium-priority site is redesignated as a high-priority erosion site, the site shall be remediated as soon as practicable as determined by the RCC. If a new site is discovered through monitoring, PacifiCorp shall develop a site-specific remediation plan in consultation with and subject to the approval of the USDA-FS, ODEQ, and ODFW as provided above. Implementation of the remediation for such new sites designated as high-priority sites will be scheduled as soon as practicable by the RCC. New sites designated as medium-priority will be monitored. PacifiCorp shall prepare and distribute an annual report of monitoring activities to the Parties.

14.6 Performance Bond. In the event the USDA-FS, in consultation with ODEQ and ODFW, determines that site-specific performance criteria are not being met, then PacifiCorp will provide a bond sufficient to ensure proper and timely remediation. The amount of the bond will be based on the estimated cost of remediation at the time the bond is established, with an upper limit of \$1 million.

14.7 Seismic and Geologic Hazard Evaluation. In conjunction with the next regularly scheduled FERC Part 12 inspection (year 2003) and future Part 12 inspections, PacifiCorp shall perform high-level analyses of potential seismic and geologic hazards facing the Project, according to methodologies and procedures approved by the Oregon Department of

North Umpqua Settlement Agreement

Geology and Mineral Industries ("DOGAMI"). PacifiCorp shall include such analyses, after review and comment by DOGAMI, in its Part 12 submissions to FERC.

14.8 Dam Safety. PacifiCorp shall continue to consult with OWRD's Dam Safety Section in conjunction with FERC engineering and safety inspection activities. PacifiCorp shall comply with relevant dam safety statutes and rules when modifying dams or other hydraulic structures at the Project.

SECTION 15. TRANSPORTATION MANAGEMENT

15.1 Transportation Management Plan. PacifiCorp included a draft transportation management plan in its 1995 license application to FERC. PacifiCorp shall complete, in consultation with BLM and the USDA-FS, a final Transportation Management Plan ("TMP") within 12 months after the Effective Date, containing the same principles as are incorporated in the draft and the specific provisions listed below. The TMP will include a traffic management plan detailing which PacifiCorp-Maintained Hydro Roads and PacifiCorp-Maintained Transmission Roads will be open to public access and under what conditions. The TMP shall also include a plan for monitoring roads and bridges for review of maintenance activities and for damage. PacifiCorp shall be required to comply with the TMP during the term of the New License. The final TMP will be subject to BLM and USDA-FS approval.

15.2 Maintenance Responsibility. Commencing on the Effective Date, PacifiCorp will assume 100 percent maintenance and capital improvement responsibility for roads listed on attached **Schedule 15.2** as PacifiCorp-Maintained Hydro and PacifiCorp-Maintained Transmission Roads. Maintenance and capital improvement activities will be consistent with USDA-FS requirements found at USDA-FS Manual sections 7730 and 7720, respectively, and corresponding sections of the USDA-FS Handbook for Road Maintenance section 7709.58 and BLM Manual 9100 Series and the Roseburg District Resource Management Plan (June 1995), Appendix D, Part H. **Schedule 15.2** includes maintenance levels required for each road.

15.3 Cost Sharing. Commencing in 2005, PacifiCorp and the USDA-FS will cost-share maintenance and capital improvements on roads listed on attached **Schedule 15.2** as Joint Use Hydro Maintenance, in accordance with the cost-sharing ratios and maintenance levels listed on **Schedule 15.2**. Cost-sharing ratios may be changed during the term of the New License as provided in the TMP. Maintenance and capital improvements shall be according to the USDA-FS Manual and Handbook provisions cited in Section 15.2. Payments for such cost sharing may commence before 2005 upon written agreement between PacifiCorp and USDA-FS.

15.4 Road Decommissioning. In cooperation with USDA-FS, PacifiCorp has identified PacifiCorp-Maintained Hydro Roads and PacifiCorp-Maintained Transmission Roads in need of decommissioning as shown on attached **Schedule 15.4**. The listed road segments, totalling 8.6 miles of road, will be decommissioned by PacifiCorp according to the

SCHEDULE 14.4

Schedule 14.4 High and Medium Erosion Site Remediation

	ERO. SITE NUMBER	AQ SITE NUMBER	DESCRIPTION	ERO PRIORITY	YEAR COMPLETED	YEAR
Clearwater 2						
	Shutoff/drainage system				2007	3
	CW2-4		Mudflow breccia above canal, slopes 30' high, erosion below road from overflow	HIGH	2007-2008	3-4
	CW2-5		Breccia outcrops above canal, 20 - 40' high	HIGH	2007-2008	3-4
	CW2-6		Slide area defined by 2 gullies w/ debris flows	HIGH	2007-2008	3-4
	CW2-8		Road fill failure at No Tunnel Creek crossing due to drainage from western side crossing road surface	HIGH	2007-2008	3-4
	CW2-9		Potential rockfall from basalt cliffs above canal	HIGH	2007-2008	3-4
	CW2-1		Basalt outcrop w/ unfavorable joint orientation above canal	MEDIUM	2008-2015	4-11
	CW2-2		Mudflow breccia w/ small slumps & wedges	MEDIUM	2010-2015	6-11
	CW2-3		1997 Flume failure location	MEDIUM	2008-2015	4-11
	CW2-7		Mudflow exposures 20 - 40' high upslope of canal, potential slumps or wedge failures	MEDIUM	2010-2015	6-11
	CW2-9		Sidecast along road through about 60% of this segment	MEDIUM	2010-2015	6-11
	CW2-10		Discontinuous mudflow breccia upslope of canal, 20 - 40' high	MEDIUM	2008-2015	4-11
	CW2-11		Slump in mudflow/ash deposit on slope above canal, 50 x 30 x 5' thick	MEDIUM	2008-2009	4-5
Fish Creek						
	Shutoff/Drainag				2005	1

	ERO. SITE NUMBER	AQ SITE NUMBER	DESCRIPTION	ERO PRIORITY	YEAR COMPLETED	YEAR
	e system					
	FC2		Spoil piles/sidecast going into river	HIGH	2006	2
	FC6		Active earthflow in 1980's failed canal, spoil pile/sidecast washed out by spill, eroded area has 30' vertical pumice that will continue to slump and deliver sediment to creek	HIGH	2006	2
	FC8		Active earthflow beneath waterway, which is in wood flume, slump rotational feature below road, activated/enhanced by seepage beneath canal	HIGH	2006	2
	FC10		Rockfalls potentially impact canal wall	HIGH	2006	2
	FC10		Spoil piles/sidecast below road	HIGH	2006	2
	FC1		Ash on upslope area overlain by basalt w/ adverse joint orientations, boulders could impact flume	MEDIUM	2006-2015	2-11
	FC3		Potential rockfall which could plug waterway	MEDIUM	2010-2015	6-11
	FC5		Spoil piles/sidecast below road	MEDIUM	2006	2
	FC7		Rockfalls potentially impact canal wall	MEDIUM	2006-2015	2-11
	FC7		Spoil piles/sidecast below road	MEDIUM	2006	2
	FC9		Rockfalls potentially impact canal wall	MEDIUM	2006-2015	2-11
	FC9		Spoil piles/sidecast below road, heavily vegetated	MEDIUM	2006-2007	2-3
Lemolo 1						
	43					
	Lemolo No. 1 canal - White Mule Creek		Rockfall from breccia and mudflow slope 15 - 20' high above canal	MEDIUM	2006-2015	2-11
	43					

	ERO. SITE NUMBER	AQ SITE NUMBER	DESCRIPTION	ERO PRIORITY	YEAR COMPLETED	YEAR
	Lemolo No. 1 canal - White Mule Creek		Sidecast below road	MEDIUM	2006	2
Lemolo 2						
	Shutoff/drainage system				2007	3
	LM2-4		Failure of Deer Cr access road, failed in 1997 along approx. 70 ft of road, slid directly into Deer Cr, failure height about 30 ft	HIGH	2006-2010	2-6
	LM2-6		Shallow slump, bulge in canal w/ geomembrane & gunite repair, spoil on downslope of canal	HIGH	2006-2010	2-6
	LM2-8		Alvin Cr, potential fill failure or debris flow plugging culvert and overtopping fill, scour at culvert outlet, shotgun culvert outlet	HIGH	2006-2010	2-6
	LM2-11		Patricia Creek crossing, potential fill failure or debris flow plugging culvert, shotgun culvert outlet	HIGH	2006-2010	2-6
	LM2-12		Oversteepened slope below road, seepage, w/ failure channels extending to bottom of slope	HIGH	2006-2010	2-6
	LM2-14		Sidecast fill below road	HIGH	2006-2010	2-6
	LM2-15		Spill structure upstream of Sag Pipe, erosion occurring in channel at base of culvert outlet	HIGH	2006-2010	2-6
	LM2-17		Nurse Creek crossing, potential fill failure or debris flow plugging culvert, shotgun culvert outlet	HIGH	2006-2010	2-6
	LM2-17		Sidecast fill below road	HIGH	2006-2010	2-6
	LM2-18		Laura Creek crossing, potential fill failure or debris flow plugging culvert	HIGH	2006-2010	2-6
	LM2-18		Sidecast fill below road	HIGH	2006-2010	2-6

	ERO. SITE NUMBER	AQ SITE NUMBER	DESCRIPTION	ERO PRIORITY	YEAR COMPLETED	YEAR
	LM2-19		Cutslope failure above canal and sidecast failures below, west of Potter Cr	HIGH	2006-2010	2-6
	LM2-20		Potter Cr, debris flow potential, unstable slopes above and below canal, spillway erosion at end of gunite section	HIGH	2006-2010	2-6
	LM2-21		Sally Creek crossing, potential fill failure or debris flow plugging culvert, two culverts, upper one shotgun	HIGH	2006-2010	2-6
	LM2-22		Dorothy Creek crossing, potential fill failure or debris flow plugging culvert, two culverts, upper one shotgun with trashrack at intake	HIGH	2006-2010	2-6
	LM2-22		Sidecast below road w/active sliding into N Umpqua	HIGH	2006-2010	2-6
	LM2-23		Steep, near vertical slope in alluvial/boulders above canal, slope 20'-30' high, sidecast removal over 70% of this section	HIGH	2006-2010	2-6
	LM2-26		Beverly Creek crossing, potential fill failure or debris flow plugging culvert, also sidecast fill failure potential	HIGH	2006-2010	2-6
	LM2-27		Mudflow breccia, boulders into canal, includes Flume 2 failure area	HIGH	2006-2010	2-6
	LM2-27		Spoil piles over 80% of this reach	HIGH	2006-2010	2-6
	LM2-28		Sidecast with 80% slopes	HIGH	2006-2010	2-6
	LM2-7		Fill failure on Potter Mtn Rd, 40' oversteepened fill	MEDIUM	2010-2015	6-11
	LM2-9		Potential fill failure or debris flow plugging culvert and overtopping fill	MEDIUM	2010-2015	6-11
	LM2-10		Sidecast fill below road	MEDIUM	2010-2015	6-11
	LM2-13		Rock slope above flume w/ large boulders, 0.5:1 slopes, site is at west end of Sag Pipe	MEDIUM	2006-2015	2-11
	LM2-13		Sidecast fill below road	MEDIUM	2006-2010	2-6

	ERO. SITE NUMBER	AQ SITE NUMBER	DESCRIPTION	ERO PRIORITY	YEAR COMPLETED	YEAR
	LM2-24		Norma Creek crossing, potential fill failure or debris flow plugging culvert	MEDIUM	2006-2010	2-6
	LM2-25		Slope 20'-30' high above canal, mudflow w/boulders, possible deposits in canal, includes Helen Cr crossing	MEDIUM	2006-2015	2-11
	LM2-29		Nancy Creek crossing, potential fill failure or debris flow plugging culvert, also sidecast fill failure potential, shotgun culvert outlet	MEDIUM	2006-2010	2-6
	LM2-30		Mudflow breccia, boulders into canal	MEDIUM	2006-2015	2-11
	LM2-30		Sidecast below road	MEDIUM	2006	2
Slide						
	Slide Creek Diversion Dam		Erosion and failure of timber crib retaining wall	MEDIUM	2010-2015	6-11
		ADDITIONAL NOTES:				
	Preparation of site-specific plans for high priority sites will begin with the signing of the Settlement Agreement					
	Because actions to prevent erosion may enhance aquatic connectivity, it is the goal to restore of identified erosion sites prior to beginning work at aquatic sites.					

EXHIBIT B

Erosion Control Plan Annual Summary Report Template

2008

EROSION CONTROL PLAN ANNUAL SUMMARY REPORT

1.0 Summary of Work Completed in the Past Year

Narrative summary of work accomplished since the time of the last ECP annual summary report.

2.0 Site Inspection Forms

A Site Inspection Form will be filled out for each identified erosion site, including those that have where remedial actions have been initiated or completed. See sample on following page.

At sites where remedial measures have been put in place, provide comments on the effectiveness of those measures, to include but not be limited to:

- Structural conditions
- Condition of vegetation
- Evidence of continued erosion or deformation
- Maintenance needs, such as regrading of road surface, placement of rock in ditches to prevent gullyng, etc.

At least one photograph shall be taken at each erosion site. Photos shall be taken at the same location as previous years' photographs, to allow year-to-year comparison of site features. Additional photographs may also be taken at each site. One photograph shall be included on the Site Inspection Form as a reference. Any additional photos shall be included on separate sheets.

Erosion Control Program Site Inspection Form		Site No.								
Structure type (circle one): Canal Single wall concrete flume Steel flume Double wall concrete flume	Date Inspected: Circle One New Site Existing Site	Inspection Performed by: 								
Has site been remediated? Yes No	If yes, provide comments on effectiveness and condition of remedial measures:									
Slope stability observations: ☐ No visible surface indication of movement ☐ Indications of ongoing creep (slumps, tree rotation, tension cracks, etc.) ☐ New surface deformation in area not previously observed ☐ N/A Describe observed deformation features: 	Seepage Observations: ☐ None ☐ Minor seepage at one or more locations on site ☐ Moderate seepage flow in one or more locations ☐ Extensive seepage across site Describe seepage locations: 	Vegetation/Surface Cover: ☐ Vegetation/rock/woody debris covers less than 20% of site ☐ Vegetation/rock/woody debris covers 20 - 50% of site ☐ Vegetation/rock/woody debris covers more than 50% of site Describe changes, if any: 								
Comparison with prior year: ☐ Unchanged based on comparison with previous years' photographs ☐ Minor changes in surficial conditions over less than 30% of site ☐ Changes in erosion features over 30-50% of site area ☐ More than 50% of site area shows significant new erosion Describe changes, if any: 	Site Photo 									
Additional Notes: 		Hazard Rating: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%; text-align: left; padding: 5px;"><i>Prior year evaluation</i></th> <th style="width: 50%; text-align: left; padding: 5px;"><i>Current evaluation</i></th> </tr> <tr> <td style="padding: 5px;">Impact Rating _____</td> <td style="padding: 5px;">Impact Rating _____</td> </tr> <tr> <td style="padding: 5px;">Risk Rating _____</td> <td style="padding: 5px;">Risk Rating _____</td> </tr> <tr> <td style="padding: 5px;">Overall Priority _____</td> <td style="padding: 5px;">Overall Priority _____</td> </tr> </table>	<i>Prior year evaluation</i>	<i>Current evaluation</i>	Impact Rating _____	Impact Rating _____	Risk Rating _____	Risk Rating _____	Overall Priority _____	Overall Priority _____
<i>Prior year evaluation</i>	<i>Current evaluation</i>									
Impact Rating _____	Impact Rating _____									
Risk Rating _____	Risk Rating _____									
Overall Priority _____	Overall Priority _____									

3.0 Site Remediation Assessment Forms

New sites may be identified during the period between annual erosion inspections, or during the inspections. PacifiCorp's Environmental Coordinator will be responsible for noting any sites identified as candidates for inclusion in the ECP, and bringing them to the attention of the resource team performing the annual inspection. The resource team will complete a Site Remediation Assessment Form for each new site, using the same format presented in Appendix A for existing sites.

Conceptual remediation plans shall be developed per the schedule and included in the ECP Annual Summary Report for all newly identified erosion sites as they are prioritized. The level of detail in the conceptual remediation plans will be similar to that shown in Appendix A for identified sites.

EXHIBIT C

Umpqua National Forest Land and Resource Management Plan Soil Productivity Standards

FORESTWIDE RESOURCE PROGRAMS

SOIL PRODUCTIVITY**FOREST GOAL**

Land management activities shall be planned and conducted to maintain and enhance soil productivity and soil stability.

FOREST OBJECTIVES

To provide for the protection of soil productivity, water quality and riparian habitats by controlling soil compaction, displacement, puddling, severe burning, loss of organic matter, surface erosion and mass wasting.

To provide for monitoring of soil disturbances to determine effects upon soil productivity, water quality and riparian habitat.

To provide for refining and updating current soil resource inventory (SRI) and the current unsuitable land inventory.

To provide for rehabilitation of unacceptable soil conditions.

**FORESTWIDE MULTIPLE-USE RESOURCE MANAGEMENT
STANDARDS & GUIDELINES: SOIL PRODUCTIVITY**

1. The combined total amount of unacceptable soil condition (detrimental compaction, displacement, puddling or severely burned) within an activity area (e.g., cutting unit, range allotment, site preparation area) should not exceed 20 percent. All roads and landings, unless rehabilitated to natural conditions, are considered to be in detrimental condition and are included as part of this 20 percent.

Criteria for unacceptable soil conditions are:

- a. Detrimental compaction: A physical change to soil resulting from mechanical forces such as weight and vibration that increase soil bulk density and decreases soil porosity.
 - (1) Volcanic ash/pumice soils: An increase in soil bulk density of 20 percent or more over the undisturbed level.
 - (2) Other soils: An increase in soil bulk density of 15 percent or more over the undisturbed level, or a macropore space reduction of 50 percent or more.
- b. Detrimental puddling: The physical change to soil structure that results when traffic ruts and molds a soil to a depth of 6 inches or more.
- c. Detrimental displacement: The horizontal removal by mechanical means of 50 percent or more of the A1 or AC horizons from 100 square feet and where one dimension is at least 5 feet (an area at least 5 by 20 feet).

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- d. Severely burned: A surface soil condition where the top layer has significantly changed color (usually more red) and the next half-inch contains blackened or charred organic matter because of soil heating.
2. To meet acceptable levels of surface soil loss, resulting from gravity, water, or wind action on land dedicated to the production of vegetation, provide for at least a minimum amount of effective ground cover to exist within the first year following the end of a ground-disturbing activity, as specified in Table IV-15.

Table IV-15

Minimum Ground Cover Requirements

Erosion Hazard Class ¹	Minimum Percent of ² Effective Ground Cover
Low	25%
Moderate	45%
High	65%
Very High	85%

¹ Erosion hazard class ratings should be based on acceptable procedures such as those described in Forest Service Handbook 2509.14.

² Effective ground cover is considered to be all living or dead herbaceous or woody materials, synthetic materials, and rock fragments greater than three-fourths of an inch in diameter that is in contact with ground surface and considered to be stable and resistant to downslope movement.

3. Surface organic material (litter, duff and wood) needed to maintain soil productivity, will be planned for all ground-disturbing activities, including post-wildfire activity. Minimum litter and duff needed for mineral soils with cold climatic conditions, low nutrient levels, and/or low water holding capacities will be similar to the amount of effective ground cover needed for soils with high to very high erosion hazard ratings. (See Table IV-15.)
4. Large woody material (LWM) needed to maintain long-term soil productivity shall be left onsite following regeneration harvest, catastrophic salvage, and site preparation in all forest ecoclasses. This material provides sites for a wide variety of flora and fauna that are part of the essential network of nutrient recyclers and nitrogen accumulators. The amount, condition, and distribution of LWM needed are not clearly established with current research. The recommendations in Table IV-16 reflect the current best estimate based on limited data and experience. Up to 60 percent of the total required woody material may be left as "standing wood" (green culls and/or snags) at regeneration harvest. In shelterwood units, up to 100 percent of total required woody material may be left as "standing wood" at initial harvest entry.
5. Soil mass movement potentials shall be evaluated on all project areas. A risk and hazard analysis shall be made by an interdisciplinary team process when there is a chance of triggering mass movement events which either:
 - a. Have the potential risk of one or more 300-square-yard and larger mass movement event for a period of 15 years following an activity, or

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- b. Have the potential hazard to damage life, property, facilities, soil, water, and/or fishery values.

Decisions regarding the nature of the proposed activities should consider the results of this risk-and-hazard analysis and ensure that minimum soil, water, and fish habitat standards and guidelines are met. When management activities would significantly increase the potential risk or hazards in items a. and b., alternative prescription(s) will be developed and evaluated.

Table IV-16
Specifications For Large Woody Material ¹

	Unit of Measure	Forest Ecoclass	
		CH-CW, CD-CP, CF-CR	CM-CL
Minimum residual large woody material ²	Linear Ft	250 ³	250 ⁴
Standing Wood Diameter at small end Deterioration ⁵	Inches Stages	>20" 1,2,3,4,5,6	>10 1,2,3,4,5,6
Down Wood Diameter at small end Length Decomposition ⁵	Inches Feet Class	>20 " >10 1,2,3	>10 " >10 1,2,3

¹ Conifer species preferred but hardwoods acceptable.

² Un-utilized cull logs, green cull trees and snags left on site.

³ 250 linear feet of 20" diameter = 550 cu. ft. = 3,000 bd. ft. = 8.3 tons.

⁴ 250 linear feet of 10" diameter = 138 cu. ft. = 750 bd. ft. = 2.0 tons.

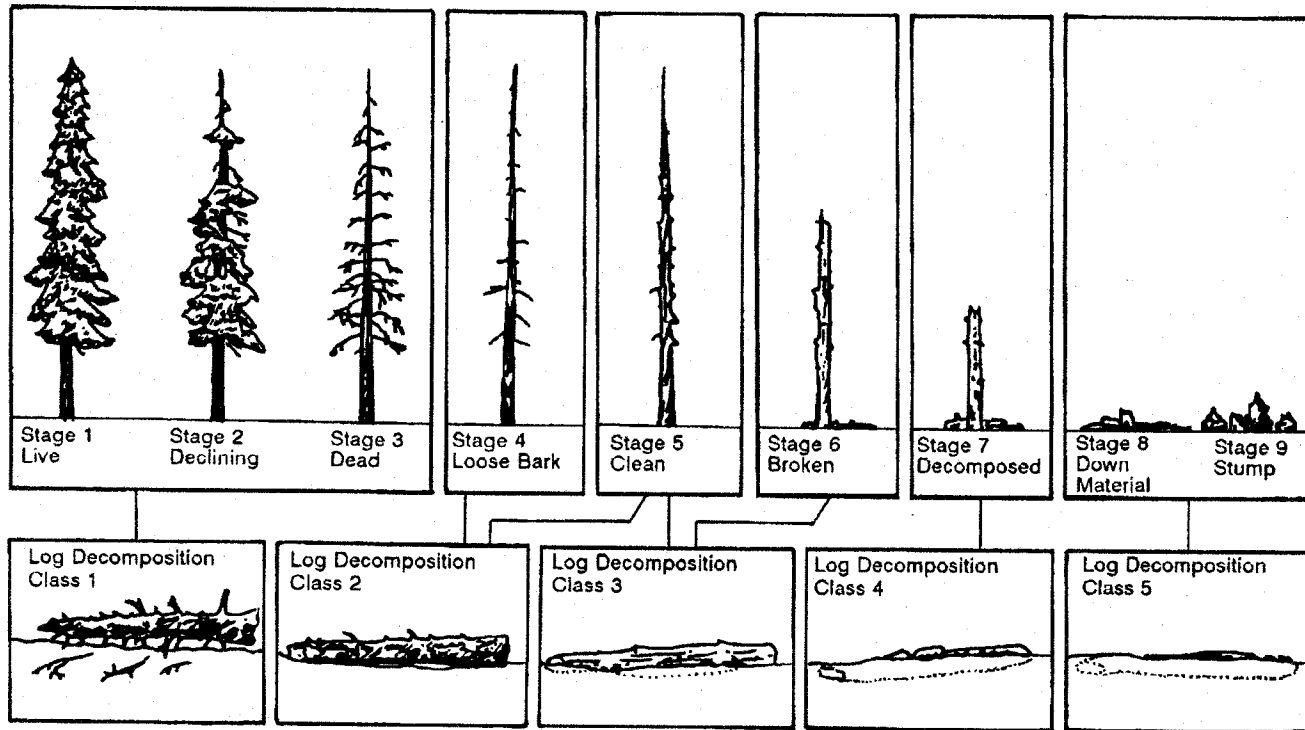
⁵ Douglas-fir tree and snag deterioration stages and Douglas-fir down wood decomposition classes are described in Figure IV-2, Appearance and Relationship of Trees and Snag Stages Relative to Log Decomposition Classes, and Table IV-17, Physical Characteristics of Down Wood Decomposition Classes to be Applied to All Conifer Species adapted from "Management of Wildlife and Fish Habitats of Western Oregon and Washington," USDA Forest Service, R6 - F&WL, 192-185, June, 1985, Chapter 8.

⁶ When the amount and size of standing and down material available is less than required standards (>20" x 10'), then smaller material (>15' x 15') should be left on the site.

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Figure IV-2

Appearance and Relationship of Trees and Snag Stages Relative to Log Decomposition Classes



When they fall, trees and snags immediately enter one of the first four log decomposition classes (reproduced from Maser et al., 1979, fig. 44, p. 80)

Table IV-17

Physical Characteristics of Down Wood Decomposition Classes to be Applied to all Conifer Species

Log Characteristics	Log Decomposition Classes				
	1	2	3	4	5
Bark	intact	intact	trace	absent	absent
Twigs < 3cm (1.18")	present	absent	absent	absent	absent
Texture	intact	intact to partly soft	hard, large pieces	small, soft, blocky pieces	soft and powdery
Shape	round	round	round	round to oval	oval
Color of Wood	original color	original color	original color to faded	light brown to faded brown or yellowish	faded to light yellow or gray
Portion of log on ground	log elevated on support points	log elevated on support points but sagging slightly	log is sagging near ground	all of log on ground	all of log on ground

FORESTWIDE RESOURCE PROGRAMS

6. Areas identified as high risk for mass movement will be delineated and permanently stored on District inventory maps.
7. Timber harvest and road building activities planned on Soil Resource Inventory (SRI) Mapping Units 21, 211, 212, 213, 215, 242, 342, 412, 71, and 712 are to have no timber cutting (including salvage) and no road or trail construction within a slope stability buffer zone along all streams where sideslope gradients exceed 50 percent. This no-cut stability buffer will start from the streambank or from the upslope terrace edge, when present. It will extend upslope for a distance that is three times the average slope gradients exceeding 50 percent (slope distance measured in feet). The no-cut buffer requirement can be waived or modified following documented, site-specific soil, geologic, and watershed investigations when little risk to soil, stream habitat or other related values exist.
8. All lands classified as unsuitable due to irreversible soil damage, including all steep (greater than 60 percent gradient), granitic soils found in SRI Mapping Units 61, 612, 617, 621, 623, 624, 631, and 673, will not have tree cutting or any other ground-disturbing activities that likely will increase the risk of mass movements.
9. SRI mapping units with landtypes 8, 31, 41, 46, 51, 91, and 96 on slopes exceeding 60 percent have scattered sites with high mass movement potentials. When these landtypes are encountered during project planning, site-specific soil, geologic and watershed evaluations for movement risk and hazards shall be made. Pages 71-78 of the SRI report displays the landtype component by percent area for each SRI mapping unit.
10. Project analysis will address how the proposed activities plan to meet soil standards and guidelines. Mitigating measures (or additional alternatives) will be developed and evaluated when detrimental soil conditions are expected as a result of the proposed action.
11. During and after ground-disturbing activities, soil conditions will be monitored to determine if soil management objectives are being met.
12. Plan and conduct restoration projects on lands where range, road construction, timber harvest, or other management activities cause soil and watershed conditions that do not meet standards and guidelines. Evaluate for use of KV funds.
13. Designed erosion control measures should have effective ground cover and erosion control structures applied on construction sites, including new road construction and reconstruction, by the beginning of the rainy season. Erosion control measures and drainage structures will be maintained current with operations. Any soil disturbed during the rainy season in excess of 0.5 acre will have effective ground cover provided. Forestwide, the rainy season is considered to be November 1 through April 30. Effective ground cover is considered to be the amount of cover necessary for maintaining a disturbed site in a low hazard category for erosional processes. See Table IV-12 for minimum requirements for effective ground cover material. Alternate erosion control measures may be substituted for effective ground cover if considered equal by the Forest Service.
14. Site-specific analysis will be performed and documented for activities which affect evapotranspiration within the runoff source area (watershed) of active slump/earthflow areas. The analysis will, at a minimum, recommend ways to schedule or mitigate effects of the proposed activity on earthflow movement.

FORESTWIDE RESOURCE PROGRAMS

15. Soil chemical and physical characteristics should be evaluated to aid in the prioritization of fertilization projects.
16. Erosion control needs will be identified where developed areas, including recreation sites, roads, trails, rockpits and others, produce erosion/ sedimentation that may affect water quality and beneficial uses in surface waters (lakes, streams, springs, ponds).

Layng Creek Municipal Watershed

Identify and carefully manage lands associated with high soil erosion and/or high landslide risk to maintain water quality. Watershed restoration activities on such lands should be encouraged.

RESOURCE SUMMARY: SOIL PRODUCTIVITY

Soil protection and restoration, in conjunction with other resource management activities, are principal components of the watershed program on the Umpqua National Forest. The soils program is grouped into several parts: 1) coordinating with other resources to provide for soil productivity protection; 2) monitoring the effects of management activities which cause soil disturbance; 3) restoring damaged soils; 4) conducting soil inventories, and 5) coordinating with universities, government agencies, organizations and interested parties in soils management activities.

The major coordination effort is with the timber management program. Protection of the soil resource is tied to development of individual timber sales and associated roads. It involves tailoring practices to soil characteristics and evaluation of management practices on completed timber sales and roads. Other coordination is done with range, geology and minerals, fuels management, fisheries, wildlife, land management planning, recreation management, engineering, and non-timber sale silviculture work such as reforestation, seed orchard siting and fertilizer projects.

Soils will remain productive except where landings, roads and skid trails are not restored or where excessive surface erosion and mass wasting is not prevented. Disturbances, principally in the form of compacted, displaced, or severely burned soils, will be minimized by placing limitations on timber harvest equipment and slash burning techniques. Erosion will be minimized primarily through groundcover protection. Mass wasting will be minimized mainly by avoiding high risk or high hazard sites as a result of a risk-and-hazard analysis (including cumulative effects) during project planning and design. When high risk or hazard sites are disturbed, the adverse effects will be minimized by stabilization structures and other controls.

Consistent implementation of Forestwide multi-resource standards and guidelines and management prescriptions will allow for acceptable changes in soil conditions. Soil productivity will be monitored as described in Chapter 5 of this plan. Soil productivity should not be significantly reduced or impaired as a result of onsite activities. Watershed restoration projects on the Umpqua National Forest will normally involve soil tillage and erosion control.

EXHIBIT D

U.S. Department of the Interior Bureau of Land Management

Record of Decision and Resource Management Plan

Best Management Practices

Appendix D. Best Management Practices.

Introduction

Best Management Practices are identified and required by the Clean Water Act as amended by the Water Quality Act of 1987. Best Management Practices are the primary mechanism to prevent and control to the "maximum extent practicable" nonpoint source pollution and achieve Oregon water quality standards. Best Management Practices are also identified in this document for the protection of soil productivity.

Through the implementation of Best Management Practices, the Bureau of Land Management fulfills the requirement for federal agencies to comply with all State requirements and programs to control water pollution from nonpoint sources (per Clean Water Act Section 313 and Executive Order 12088). The Bureau of Land Management under a memorandum of agreement with the Oregon Department of Environmental Quality is a "Designated Management Agency charged with implementing and enforcing natural resource management programs for the protection of water quality on federal lands under its jurisdiction" through Best Management Practices.

Best Management Practices are defined as methods, measures or practices which are site specific to protect water quality or soil protective. Best Management Practices include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. In this document, Best Management Practices are a compilation of existing policies and guidelines and commonly employed practices to protect water quality and soil productivity.

Best Management Practices are selected during the NEPA interdisciplinary process on a site specific basis to meet overall ecosystem management goals. This document does not provide an exhaustive list of Best Management Practices. Additional measures may be identified during watershed analysis or the NEPA process for a specific activity. The selection and implementation of Best Management Practices initiates an iterative process that includes monitoring the effectiveness and modification when water or soil goals are not achieved.

Best Management Practices

I. Project or Activity

A. Project Planning and Design.

Objectives: Use the planning process to ensure that timber sales are designed to maintain favorable conditions of soil productivity, water flow, and water quality for the beneficial uses in the watershed.

Practices:

1. Use information from watershed analysis to prepare project level plans.
2. Use Timber Production Capability Classification to identify areas classified as unsuitable for timber production.
3. Use Timber Production Capability Classification and field investigations to identify areas classified as fragile suitable, restricted.
4. Use the planning process to identify, evaluate, and map potential problems (e.g. slump prone areas, saturated areas, and slide areas). Design appropriate preventive measures.
5. Design proposed harvest units to avoid, mitigate, or minimize potential adverse impacts to soil and water. Evaluation factors include the following: soil characteristics, watershed physiography, current watershed and stream channel conditions, proposed roads, skid trails, and logging system design.

6. Plan mitigation measures if adverse impacts to water quality/quantity or soil productivity may result from the proposed action.
7. Analyze watershed cumulative effects and provide mitigation measures if necessary to meet water quality standards.
8. Disperse activities over time and space.
9. Include the location of all stream channels and wetlands (spring, meadows, lakes, bogs, etc.) on timber sale maps and/or contracts.
10. Location of fragile (nonsuitable and suitable) areas that require special management practices.
11. Include on timber sale maps and/or contracts the location of protection required for each stream channel, wetland, and fragile area.

B. Riparian Reserve Protection

Objectives: To prevent damage to riparian ecosystems and disturbance to streambanks, protect the natural flow of streams and preserve nutrient cycling from woody debris consistent with the Aquatic Conservation Strategy.

Practices:

1. Allow no mineral lease operations, chemical loading operations, or similar toxic pollutant activities within 200 feet of all water bodies.
2. Directionally fell trees to protect Riparian Reserves when harvesting within a tree length of any Riparian Reserve.
3. All snags in the Riparian Reserve would be left except where safety dictate removal, consistent with the Aquatic Conservation Strategy.
4. Nonmerchantable down logs, including trees or logs down prior to logging, would be left in the Riparian Management Area; all down logs would be left in stream channels.
5. Avoid disturbance of unstable banks and headwalls.

C. Yarding Methods.

Objectives: To minimize loss of soil productivity and reduce potential for surface runoff and subsequent degradation due to surface disturbance or compaction.

Practices:

1. Cable.
 - a. Use partial suspension when yarding on erodible or ravel prone areas, where practical.
 - b. Use full suspension when yarding on fragile soils, where practical.
 - c. Use seasonal restriction if appropriate suspension cannot be achieved by yarding equipment.
 - d. Avoid downhill yarding where practical.
 - e. Hand waterbar cable yarding corridors immediately after use on sensitive soils (Category 1) where gouging occurs.

2. Ground-based

- a. Use existing skid roads wherever possible.
- b. Limit new skid trails to slopes less than 35 percent.
- c. Use designated skid roads to maintain compaction levels of skid roads plus landings at less than 10 percent.
- d. Restrict tractor operations to these trails and limiting operations to periods of low soil moisture, when soils have the most resistance to compaction (dry season).
- e. In partial cut areas, locate skid roads so that they can be used for final harvest.
- f. Till all compacted trails, including skid trails from previous entries, with a properly designed self-drafting winged subsoiler.
- g. Avoid tractor yarding on areas where soil damage cannot be mitigated due to physical conditions.
- h. Avoid placement of skid roads through areas of highwater tables or where the skid roads would channel water into unstable headwall areas.
- i. Waterbar skid roads to minimize erosion.
- j. Avoid use of wide track vehicles or more than one machine on a skid road at any given time to minimize the width of the skidroads. (On multiple pass skid roads, wide track vehicles result in wider skid roads, and after multiple passes, drive the compaction deeper than a regular width track; however, they are good for one pass operations such as incidental scattered salvage or site preparation).
- k. Leave large downed woody debris on site.
- l. Rip existing tractor skid trails prior to felling timber with a properly designed winged subsoiler.

II. Roads

A. Planning

Objective: To plan road systems in a manner that meets resource objectives and minimize resource damage.

Practices:

1. Use an interdisciplinary process to develop an overall transportation system.
2. Establish road management objectives that minimize adverse environmental impacts given the use of the road.
3. Avoid fragile and unstable areas or plan appropriate mitigation measures.
4. Minimize the percent of the land base converted to roads and landings; avoid heavy concentrations of roads and landings to minimize impacts from increased peak flows and erosion of the compacted surfaced.

B. Location

Objectives: To minimize mass soil movement, erosion, and sedimentation.

Practices:

1. Locate roads out of Riparian Reserves where practical alternatives exist.
2. Locate roads on stable positions (e.g. ridges, natural benches, and flatter transitional slopes near ridges and valley bottoms). Implement extra mitigation measures when crossing unstable areas is necessary.
3. Avoid headwalls whenever possible.
4. Avoid construction on unstable areas where practical.
5. Locate roads to minimize heights of cuts. Avoid high, steeply sloping cuts in highly fractured bedrock.
6. Locate roads on well drained soil types.
7. Locate stream crossing sites where channels are well defined, unobstructed, and straight.

C. General Design Features

Objective: To design the lowest standard of road consistent with use objectives and resource protection needs.

Practices:

1. Road design standards and design criteria are based on road management objectives such as traffic requirements of the sale and the overall transportation plan, an economic analysis, safety requirements, resource objectives, and the minimization of damage to the environment.
2. Consider future maintenance concerns and needs when designing roads.
3. Preferred road gradients are two to ten percent with a maximum grade of 15 percent. Consider steeper grades in those situations where they will result in less environmental impact (such as a ridge top spur road). Avoid grade less than two percent.
4. Outsloping - Outsloping of the road prism for surface drainage is normally recommended for local spurs or minor collector roads where low volume traffic and lower traffic speeds are anticipated. It is also recommended in situations where long intervals between maintenance will occur and where minimum excavation is desired. Outsloping is not recommended on gradients over eight to ten percent.
5. Insloping - Insloping of the road prism is an acceptable practice on roads with gradients over ten percent where the underlying soil formation is very rocky and not subject to appreciable erosion or failure.
6. Minimize excavation through the following actions whenever possible: use of balanced earthwork, narrow road width, and endhauling where slopes are greater than 60 percent.
7. Locate waste areas suitable for depositing excess excavated material.
8. Endhaul waste materials generated during road and ditch maintenance if side slopes exceed 60 percent or where unacceptable environmental damage may occur.

9. Endhaul excess materials where slopes have been over loaded.
10. Surface roads if they will be subject to traffic during wet weather. The depth and gradation of surfacing will usually be determined by traffic type, frequency, weight, maintenance objectives, and the stability and strength of the road foundation and surface materials.
11. Provide for vegetative or artificial stabilization of cut and fill slopes in the design process. Avoid establishment of vegetation where it inhibits drainage from the road surface or where it restricts safety or maintenance.
12. Prior to completion of design drawings, field check the design to assure that it fits the terrain, drainage needs have been satisfied, and all critical slope conditions have been satisfied, and all critical slope conditions have been identified and adequate design solutions applied.
13. Avoid diverting water into headwalls — roll the grade to channel water away from headwalls — check maintenance on existing roads to ensure water isn't allowed to remain on the road and/or diverted into unstable headwall areas.
14. Unless a road is needed for continued resource management, use a temporary road and put it to bed after use, using methods such as blocking, ripping, seeding, mulching, fertilizing, and waterbarring.
15. Minimize potential erosion on a road — if unsurfaced, put it to bed; otherwise apply rock to minimize surface erosion.
16. Approve location of all landings and landing clearing limits prior to clearing.
17. Select landing locations on the basis of the least amount of excavation and erosion potential where sidecast will not enter drainages or damage other sensitive areas.
18. Avoid landing locations alongside or in meadows, or other wetland areas.
19. Restore the shape of landings back to the natural configurations or shape to direct the runoff to preselected spots where water can be dispersed to natural, well-vegetated, stable ground.

D. Design of Cross Drains

Objectives: To minimize concentrated water volume and velocity on the road prism, thus to reduce movement and sedimentation.

Practices:

1. Design placement of all surface cross drains to avoid discharge onto erodible (unprotected) slopes or directly into stream channels. Provide a buffer or sediment basin between the cross drain outlet and the stream channel.
2. Locate culverts or drainage dips in such a manner to avoid outflows onto unstable terrain such as headwalls and slumps or block failure zones. Provide adequate spacing to avoid accumulation of water in ditches or surfaces through these areas.
3. Provide energy dissipators or armoring at cross drain outlets or drain dips where water is discharged onto loose material or erodible soil or steep slopes.
4. Use the guide for drainage spacing by soil erosion classes and road grade shown in Table D-1.
5. Consider using drainage dips in lieu of culverts on roads which have gradients less than ten percent or where road management objectives result in blocking roads. Avoid drainage dips on road gradients over ten percent.

6. Locate drainage dips where water might accumulate, or where there is an outside berm which prevents drainage from the roadway.
7. Cut all cannon culverts to the proper length, downspout, and provide for energy dissipation.
8. When sediment is a problem, design cross drainage culverts or drainage dips immediately upgrade of stream crossings to prevent ditch sediment from entering the stream.
9. Rolling gradients is a recommended design practice in erodible and unstable soils to reduce surface water volume and velocities and culvert requirements.
10. Consider use of slotted riser inlets on granitic and schist soils to prevent culvert plugging.

E. Design of Stream Crossings

Objective: To preclude stream crossings from being a direct source of sediment to streams thus minimizing water quality degradation and provide unobstructed movement for aquatic fauna.

Practices:

1. Pipe arch culverts are appropriate on most fishery streams. Bottomless arch culverts and bridges will be necessary in some instances where gradients greater than .5 percent, stream discharge and value of the fishery resource dictate that special engineering considerations are necessary to ensure uninterrupted fish passage. A round culvert is suitable for nonfishery streams since fish passage is not a concern in these instances.
2. Use the theoretical 100 year flood as design criteria for new culverts, bridges, and other stream crossings.
3. Minimize the number of crossings on streams.
4. Where feasible, design culvert placement on a straight reach of stream to minimize erosion at both ends of the culvert. Design adequate stream bank protection (e.g. riprap) where scouring would occur. Avoid locations that require stream channel to be straightened beyond the length of a culvert to facilitate installation of a road crossing.
5. Evaluate the advantages and disadvantages of a temporary versus permanent crossing structure in terms of economics, maintenance, and resource requirements for access to the area during all seasons over the long term.
6. Minimize the number of temporary crossings on a particular stream.
7. Low ford stream crossing is appropriate only when site conditions make it impractical or uneconomical to utilize a permanent or temporary crossing structure.

F. Construction

Objective: To create a stable roadway that will minimize soil erosion and water quality degradation.

Practices:

1. Limit road construction to the dry season (generally between May 15 and October 15). When conditions permit operations outside of the dry season, keep erosion control measures current with ground disturbance, to the extent that the affected area can be rapidly closed/blocked and weatherized if weather conditions warrant.

2. Manage road construction so that any construction can be completed and bare soil can be protected and stabilized prior to fall rains.
3. Confine construction of pioneer road to within the roadway construction limits.
4. Conduct pioneering so as to prevent undercutting of the designated final cutslope and prevent avoidable deposition of materials outside the designated roadway limits. Conduct slope rounding included in the design during the pioneering stage when the pioneer road cut slope is the same as the road backslope. This avoids excess amounts of soil being moved after excavation and embankment operations are completed.
5. Construct embankments of appropriate materials (no slash or other organic matter) using one or more of the following methods:
 - a. layer placement (tractor compaction)
 - b. layer placement (roller compaction)
 - c. controlled compaction (85-90 percent maximum density).
6. Avoid sidecasting where it will adversely affect water quality or weaken stabilized slopes.
7. Place surface drainage prior to fall rains.
8. Clear drainage ditches and natural watercourses above culverts of woody material deposited by construction or logging prior to fall rains.
9. Confine major culvert installation to the period of June 15 to September 15 to minimize sedimentation and the adverse effects of sediment on aquatic life.
10. Divert the stream around the work area to minimize sedimentation effects downstream.
11. Install the culvert as close to zero percent slope as possible on fishery streams but not to exceed 0.5 percent. Place culverts on larger nonfishery streams in the streambed at the existing slope gradient. Energy dissipators (e.g. large rock) placed at the outfall of culverts on small nonfishery streams are recommended to reduce water velocity and minimize scour at the outlet end.
12. Countersink culvert 20 percent of culvert diameter below the streambed to minimize scouring at the outlet. Increase culvert diameters accordingly.
13. Confine activities by heavy equipment in the streambed to the area that is necessary for installation of the structure. Restrict construction equipment to within the approved right-of-way and out of the streambed.
14. Permanent stream crossing structures on fishery streams are recommended to be in place before heavy equipment moves beyond the crossing area. Where this is not feasible, install temporary crossings to minimize stream disturbance.
15. Place riprap on fills around culvert inlets and outlets where appropriate.
16. Where possible, limit the installation and removal of temporary crossing structures to once during the same year and within the prescribed work period. Installation and removal should occur between June 15 and September 15 to minimize adverse effects of sediment on aquatic life.
17. Use backfill material that is as soil free as practicable over temporary culverts. Whenever possible use washed river rock covered by pit run or one inch minus as a compacted running surface.

18. Spread and reshape clean fill material to the original lines of the streambed after a crossing is removed to ensure the stream remains in its channel during high flow.
19. Limit activities of mechanized equipment in the stream channel to the area that is necessary for installation and removal operations.
20. Remove stream crossing drainage structures and in-channel fill material during low flow and prior to fall rains. Reestablish natural drainage configuration.
21. Use washed rock/gravel in a low water ford crossing if it will be used much.
22. Rock the road approaches with 150 feet of each side of a low water ford to prevent washing and softening of the road surface.
23. Construct adequate waterbars on roads, spurs, and skid trails prior to fall rains.
24. Use the following table for waterbar spacing, based on gradient and erosion class.

Table D-1. Guide for Drainage Spacing by Soil Erosion Classes and Road Grade.

Water Bar Spacing (in feet)

Gradients (%)	Erosion Class		
	High	Moderate	Low
3-5	200	300	400
6-10	150	200	300
11-15	100	150	200
16-20	75	100	150
21-35	50	75	100
36+	50	50	50

Spacing is determined by slope distance and is the maximum allowed for the grade.

G. Road Renovation/Improvement

Objective: To restore or improve a road to a desired standard in a manner that minimizes sediment production and water quality degradation.

Practices:

1. Improve flat gradients to a minimum of two percent or provide raised subgrade sections (turnpike) to avoid saturation of the road prism.
2. Reconstruct culvert catchbasins to specifications. Catchbasins in sold rock need not be reconstructed provided that culvert entrance specifications are met.
3. Identify potential water problems caused by offsite disturbance and add necessary drainage facilities.

4. Identify ditchline and outlet erosion caused by excessive flows and add necessary drainage facilities and armoring.
5. Replace undersized culverts and repair damaged culverts and downspouts. Improve existing culverts, bridges, and other stream crossings to accommodate at least a 100 year flood when they pose a substantial risk to riparian conditions.
6. Add additional full-rounds, half-rounds, and energy dissipators as needed.
7. Correct special drainage problems (i.e. high water table, seeps) that affect stability of subgrade through the use of perforated drains, geotextiles, drainage bays, etc.
8. Eliminate undesirable berms that impair drainage away from the road prism.
9. Restore outslope or crown sections.
10. Avoid disturbing backslope while reconstructing ditches.
11. Surface inadequately surfaced roads that are to be left open to traffic during wet weather.
12. Require roadside brushing be done in a manner that prevents disturbance to root systems (i.e. avoid using excavators for brushing).
 - Exposed soil would be seeded or protected when necessary to keep surface erosion within accepted standards.
 - Install stabilization features such as debris racks, bin walls, and rock blankets as needed.
13. Reconstruct poorly built stream crossings with bridges or culverts, insuring proper alignment and grade.

H. Maintenance

Objective: To maintain roads in a manner which provides for water quality protection by minimizing surface erosion, rutting failures, sidecasting, and blockage of drainage facilities.

Practices:

1. Provide the basic custodial required to protect the road investment and to ensure that damage to adjacent land and resources is held to a minimum.
2. Perform blading and shaping in such a manner as to conserve existing surface material, retain the original crowned or outsloped self-drainage cross section, prevent or remove rutting berms (except those designed for slope protection) and other irregularities that retard normal surface runoff. Avoid wasting loose ditch or surface material over the shoulder where it will cause stream sedimentation or weaken slump prone areas. Avoid undercutting of backslopes.
3. Keep road inlet and outlet ditches, catchbasins, and culverts free of obstruction, particularly before and during prolonged winter rainfall. However, hold routine machine cleaning of ditches to a minimum during wet weather.
4. Remove slide material when it is obstructing road surface and ditchline drainage and either utilize for needed road improvement elsewhere or place in a stable waste area. Avoid sidecasting of slide material where it will damage, overload, or saturate embankments, or flow into downslope drainage courses.

5. Retain vegetation on cut slopes unless it poses a safety hazard or restricts maintenance activities. Accomplish roadside brushing by cutting vegetation rather than pulling it out and disturbing the soil.
6. Patrol areas subject to road damage during periods of high runoff.
7. Reclaim/revegetate all roads not needed for future management activities.
8. Exposed soil would be seeded or protected when necessary to keep surface erosion within accepted standards.
9. Stabilize major failures (landslides) by subsurface drainage, rock blankets, or other methods.

I. Road Closures

Objectives: To prevent erosion and sedimentation of streams from unmaintained roads, and restore site productivity to roads no longer needed.

Practices:

1. Barricade or block road surface using gates, guard rails, earth/log barricades, boulders, logging debris or a combination of these methods. Avoid blocking roads that will need future maintenance (i.e. culverts, potential slides, etc.) with unremovable barricades. Using guardrails, gates or other barricades capable of being opened for roads needing future maintenance.
2. Follow-up on road closures to ensure they are maintained in accordance with design criteria.
3. Install waterbars, cross drains, cross sloping, or drainage dips if not already on road to assure drainage.
4. Till with a winged subsoiler, revegetate for erosion control and site productivity restoration.

J. Water Source Development

Objective: To supply water for road construction, dust abatement and fire protection while maintaining existing water quality and supply and consistent with the Aquatic Conservation Strategy.

Practices:

1. Design and construct durable, long-term water sources.
2. Avoid reduction of downstream flow that would detrimentally affect aquatic resources, fish passage, or other uses.
3. Direct overflow from water holding developments back into the stream.
4. Locate road approaches to instream water source developments to minimize potential impacts in the riparian zone. Rock surface these approaches to reduce the effects of sediment washing into the stream.
5. Avoid use of road fills for water impoundment dams unless specially designed for that purpose.
6. Construct water sources during the dry season (generally between May 15 and October 15).

K. Restoration of Rock Quarries

Objective: To minimize sediment production from quarries that are susceptible to erosion due to steep sideslopes, lack of vegetation, or their proximity to water courses.

Practices:

1. Wherever possible, prior to excavation of the site, remove and stockpile topsoil for surface dressing during the post-operation rehabilitation.
2. Stabilize pit sides and smooth the general pit area.
3. Use seeding, mulching, and drainage to minimize erosion.
4. Rip, waterbar, block, fertilize, and seed access roads to rock pits where no future entry is planned. Rehabilitate or restore quarries in this category to renewable resource levels.

III. Silviculture

A. Riparian Reserve Protection

Objectives: To prevent damage to riparian ecosystems, disturbance to streambanks, deterioration of water quality, and accumulation of slash in streams.

Practices:

1. Directionally fell trees to protect Riparian Reserves when slashing within a tree length of a Riparian Reserve.

B. Mechanical Methods of Site Preparation

Objectives: To maintain soil productivity and water quality while meeting the silviculture objectives.

Practices:

1. Limit the use of tracked equipment that would cause unacceptable soil disturbances or compaction to areas of less than 30 percent slopes.
2. Do not compact skeletal or shallow soils.
3. Till all compacted areas with a properly designed winged subsoiler. This could be waived if inspection reveals that less than two percent of the area is compacted. Compaction of less than two percent is considered to equal less than one percent growth loss.
4. On sites which do not annually dry out enough to provide resistance to traditional tracked equipment, use low-ground-pressure, tracked-type excavators (including: backhoe/grapple/loader/slasher).
5. Restrict tractor operations to dry conditions with less than 25 percent soil moisture content in the upper six inches of soil.
6. Avoid piling concentrations of large logs and stumps.
8. Pile small material (3-8" diameter size predominantly).
9. Burn piles when soil and duff moistures are high.

C. Chemical Methods

Objectives: To protect water quality from pollution, and to enhance soil productivity.

Practices:

1. Refer to vegetation Management EIS.
2. Avoid aerial application when wind speeds would cause drift.
3. Locate heliports and storage areas away from stream channels.
4. Restrict the application within Riparian Reserves.

D. Broadcast Burning

Objectives: To maintain long term soil productivity, organic matter and duff, water quality, retain legacy, and to meet hazard reduction objectives.

Practices:

1. Evaluate need for burning based in soils, plant community, and site preparation criteria. Burn under conditions when a light or moderate burn can be achieved (see guidelines below) on all units to protect soil productivity. The following standards should be followed.
 - a. Category 1 Soils (highly sensitive). Avoid burning.
 - b. Category 2 Soils (moderately sensitive). Reduce disturbance, fire intensity, and duration by using the following methods:
 - Burn under conditions that result in low intensity fires.
 - Burn when soils and duff are moist.
 - Avoid burning sparsely vegetated areas on slopes greater than 65 percent.
 - Gross yard to break up heavy slash concentrations, and reduce burn intensities.
 - Pull slash and woody debris adjacent to landings onto landings before burning.
 - c. Category 3 Soils (least sensitive). Write prescriptions to protect a large percentage of the nutrient capital and other beneficial properties in the soil and the forest floor. (Low and moderate intensity burns.)
2. Firetrails.
 - a. Construct tractor fire trails with one pass construction during periods of dry soil moisture.
 - b. Where the fire trail construction has resulted in compacted surfaces, rip, and waterbar the fire trail (use properly designed winged ripper).
 - c. Avoid the placement of tractor constructed fire trails on slopes in excess of 35 percent.
 - d. Avoid the placement of any fire trails where water would be channeled into areas of instability or headwalls.
 - e. Waterbar all fire trails that may carry water to minimize surface erosion.

E. Thinning

Objectives: To protect soil productivity, water quality, and riparian ecosystems.

Practices:

1. Refer to timber harvest.

IV. Other Activities

A. Firewood.

Objectives: To prevent erosion from road use and water quality degradation.

Practices:

1. Seasonal restriction on firewood cutting when access to cutting area is on an unsurfaced road.
2. Clean all road surfaces, ditches, and catchbasins of debris from wood cutting.

B. Wildfire Control

Objectives: To minimize water quality degradation and maintain soil productivity while achieving rapid and safe suppression of wildfire.

Practices:

1. Limit use of heavy equipment near Riparian Reserves and on steep slopes when possible. Where fire trail entry into a Riparian Reserves is essential, angle the approach rather than have it perpendicular to the Riparian Reserves.
2. Attempt to keep fire retardant out of water sources.
3. Utilize information from burned area surveys to determine if watershed emergency fire rehabilitation is needed.
4. Develop a fire rehabilitation plan through an interdisciplinary process.
5. Select treatments on the basis of on-site values downstream values, probability of successful implementation, social and environmental considerations (including protection of native plant community), and cost as compared to benefits.
6. Examples of emergency fire rehabilitation treatments include: 1) seeding grasses or other vegetation as needed to provide a protective cover as quickly as possible; 2) mulching with straw or other suitable material; 3) fertilizing; 4) channel stabilization structures; 5) trash racks above road drainage structures; and 6) waterbars on firelines.

C. Watershed Rehabilitation and Fish Habitat Improvement Projects

Objectives: To mitigate and minimize damage to riparian vegetation, streambanks, and stream channels.

Practices:

1. Employ good project planning by an interdisciplinary team.

2. Use corrective measures to repair degraded watershed conditions and restore to predisturbance conditions with a vegetative cover that will maintain or improve soil stability, reduce surface runoff, increase infiltration, and reduce flood occurrence and flood damages.
3. Carefully plan access needs for individual work sites within a project area to minimize exposure of bare soil, compaction, and possible damage to tree roots. Utilize existing trails to the extent practical.
4. Confine work in the stream channels to between June 15 and September 15 to minimize the area of the stream that would be affected by sedimentation during the low flow period.
5. Keep equipment out of streams to extent possible.
6. Limit the amount of streambank excavation to the minimum that is necessary to ensure stability of enhancement structures. Place excavated material as far above the high water marks as possible to avoid its reentry to the stream.
7. Whenever possible obtain logs for habitat improvement structures from outside the riparian zone or at least 200 feet from the stream channel to maintain integrity of riparian habitat and streambanks.
8. Inspect all mechanized equipment daily to help ensure toxic materials such as fuel and hydraulic fluid do not enter the stream.
9. Utilize waterbars, barricades, and seeding to stabilize bare soil areas.

D. Mining

Objectives: To minimize disturbance to soils, riparian ecosystems, streambanks, and stream channels within constraints of surface mining regulations.

Practices:

1. Require the claimant to obtain all required state and federal operating permits.
2. Locate, design, operate and maintain sediment settling ponds in conformance with State Department of Environmental Quality (DEQ) requirements.
3. Design, locate, and construct stream crossings in conformance with Practices described in Sections II.C and II.D.
4. Use existing roads, skid trails, and stream crossings whenever possible.
5. Prior to the first wet season, rip, waterbar, seed, mulch, and barricade according to BLM specifications, all roads and trails constructed for exploratory purposes that are unnecessary for the mining operation.
6. Waterbar and barricade all natural surface roads and trails when the operation concludes.
7. Rip, waterbar, seed mulch, and barricade all natural surface roads and trails when the operation concludes.
8. Construct a berm or trench between disturbed areas and water courses.
9. Stockpile topsoil for use during reclamation of the site. Construct a berm or trench immediately downslope of the stockpile.

10. Stabilize and contour the area, replace topsoil and mulch, seed and plant the area with tree seedlings in accordance with specifications when no further mining is contemplated.
11. During the period from October 15 to May 15 contour and mulch disturbed areas that will not be mined for at least 30 days.
12. Retain an undisturbed riparian buffer strip between mining operations and water courses to protect integrity of streambanks, provide for water temperature control and for filtration of sediment from surface runoff.
13. Confine operations to bench areas rather than allow encroachment on the stream whenever possible.
14. Locate and maintain sanitation facilities in accordance with State DEQ Regulations.

E. Wetlands

Wetland protection: Maintaining the integrity and functional ability of wetlands by avoidance whenever possible. All wetlands destroyed by construction activities will be ameliorated by creating replacement wetland areas. Protection is accomplished in these areas during timber harvest activities by: a) avoiding disturbance of permanent high water table areas; b) falling and yarding away from wetlands; c) utilizing seasonal restrictions or full suspension over areas when entry is determined to be required; d) avoiding the use of tractors or other ground-basket equipment which may cause disturbance of the wetlands.

EXHIBIT E

Rolling 5-Year Erosion Management Action Plan Template

ROLLING 5-YEAR EROSION CONTROL ACTION PLAN CALENDAR YEAR _____

North Umpqua Hydroelectric Project
FERC Project No. 1927

AUTHORIZATIONS

**Final
Approved:** PacifiCorp _____ (date) _____ (signature)
USDA – FS _____ (date) _____ (signature)
USDI – BLM _____ (date) _____ (signature)

ATTACHMENTS

PacifiCorp PPL Project Work Plan #s: _____ (insert #s)
USDA–FS FS Project Work Plan #s: _____ (insert #s)

SUMMARY OF PLANNED ECP ACTIVITIES FOR CALENDAR YEAR (____)
(insert bulleted summaries and PWP #s)

1.1 Lemolo No. 2 High and Medium Priority Site Remediation

-

1.2 Clearwater No. 2 High and Medium Priority Site Remediation

-

1.3 Fish Creek High and Medium Priority Site Remediation

-

1.4 Other High and Medium Priority Site Remediation

-

1.5 Flume Shut-Off and Drainage Systems

-

1.6 Periodic Monitoring and Inspections

-

1.7 Reporting

-

ECP ACTIVITIES SUMMARY BY CALENDAR YEAR

ECP Activities	PRIOR YEAR CY _____ Dates.....\$		CURRENT YR. CY _____ Dates.....\$		OUT YEAR #1 CY _____ Dates \$		OUT YEAR #2 CY _____ Dates \$		OUT YEAR #3 CY _____ Dates \$	
<u>Lemolo No. 2 High and Medium Priority Site Remediation</u>										
• Work description (PWP # __):										
• Work description (PWP # __):										
• Work description (PWP # __):										
<u>Clearwater No. 2 High and Medium Priority Site Remediation</u>										
• Work description (PWP # __):										
• Work description (PWP # __):										
<u>Fish Creek High and Medium Priority Site Remediation</u>										
• Work description (PWP # __):										
• Work description (PWP # __):										
<u>Other High and Medium Priority Site Remediation</u>										
• Work description (PWP # __):										
• Work description (PWP # __):										
<u>Flume Shut-Off and Drainage System</u>										
• Work description (PWP # __):										
• Work description (PWP # __):										
• Work description (PWP # __):										
<u>Periodic Monitoring and Inspections</u>										
• Work description (PWP # __):										
• Work description (PWP # __):										
• Work description (PWP # __):										

ECP Activities	PRIOR YEAR CY _____ Dates.....\$		CURRENT YR. CY _____ Dates.....\$		OUT YEAR #1 CY _____ Dates \$		OUT YEAR #2 CY _____ Dates \$		OUT YEAR #3 CY _____ Dates \$	
Reporting										
• Rolling 5-Year Action Plan Development										
• Annual Notification to the RCC										
• Periodic Reporting to the FERC										
• Tracking of Expenditures Reporting										

SUMMARY OF RESULTS FROM THE PREVIOUS CALENDAR YEAR ACTION PLAN

(Insert bullet summaries below)

Projects Completed Last Year

-

Projects Not Completed and Carried forward to the Current Year

-

Unanticipated Events Summary

-

Annual Calendar Year Balance Sheet (Enter in Excel)

Item by PWP #	Budget Planned \$	Budget Spent \$	Budget Variance \$	Comments

SUMMARY OF PLANNED ACTIVITIES FOR THE NEXT THREE CALENDAR OUT-YEARS

(Insert bullet summaries below)

2.1 Lemolo No. 2 High and Medium Priority Site Remediation

-

2.2 Clearwater No. 2 High and Medium Priority Site Remediation

-

2.3 Fish Creek High and Medium Priority Site Remediation

-

2.4 Other High and Medium Priority Site Remediation

-

2.5 Flume Shut-Off and Drainage Systems

-

2.6 Periodic Monitoring and Inspections

-

2.7 Reporting

-

CHANGES IN ECP RESPONSIBILITIES OF THE PARTIES: ASSUMPTIONS, RATIONALE, AND PERCENTAGES

Provide a description below:

-