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January 31, 2003

Ms. Magalie R. Salas
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

**Re: North Umpqua Hydroelectric Project (P-1927-008); Explanatory
Statement Supporting Amendment to the North Umpqua
Hydroelectric Project Settlement Agreement**

Dear Ms. Salas:

On November 1, 2002, PacifiCorp, on behalf of the North Umpqua Hydroelectric Project Settlement Agreement ("the Settlement Agreement") parties (collectively, "the Parties"), transmitted to the Commission Amendment No. 1 to the Settlement Agreement. In doing so, the Parties indicated an intent to file with the Commission an explanatory statement supporting this amendment.

Enclosed for your review and inclusion in the record is a final explanatory statement supporting Amendment No. 1. Please feel free to contact me at (503) 813-6688 if you have any questions concerning this matter.

Sincerely,

A handwritten signature in black ink, appearing to read "John Sample".

John Sample
Senior Hydropower Attorney
PacifiCorp

Enclosure

Cc: North Umpqua Settlement Agreement Parties
Service List
John Smith, FERC

EXPLANATORY STATEMENT
for
AMENDMENT NO. 1 TO THE
JUNE 13, 2001, SETTLEMENT AGREEMENT
AMONG
PACIFICORP
USDA FOREST SERVICE
NATIONAL MARINE FISHERIES SERVICE
USDI FISH AND WILDLIFE SERVICE
USDI BUREAU OF LAND MANAGEMENT
OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
OREGON DEPARTMENT OF FISH AND WILDLIFE
OREGON WATER RESOURCES DEPARTMENT

CONCERNING THE RELICENSING OF THE
NORTH UMPQUA HYDROELECTRIC PROJECT
FERC PROJECT NO. 1927-008
DOUGLAS COUNTY
OREGON

**EXPLANATORY STATEMENT FOR
AMENDMENT NO. 1 TO THE
NORTH UMPQUA HYDROELECTRIC PROJECT SETTLEMENT AGREEMENT
FERC Project No. 1927-008**

1. INTRODUCTION

Pursuant to the Federal Energy Regulatory Commission's ("FERC") regulations, PacifiCorp ("PacifiCorp" or "Licensee") is submitting this Explanatory Statement on behalf of the settlement parties which describes the rationale behind agreed-upon terms in Amendment No. 1 to the North Umpqua Settlement Agreement.¹

In 1995, PacifiCorp filed with FERC an application for a new license (the "New License") for the North Umpqua Hydroelectric Project, also known as FERC Project No. 1927-008 (the "Project"). After lengthy discussions between PacifiCorp, state and federal agencies, and various nongovernmental organizations, PacifiCorp submitted an Offer of Settlement describing the terms under which PacifiCorp and the agencies will support FERC's issuance of the New License. The Offer of Settlement includes a Settlement Agreement dated June 13, 2001 (the "Settlement Agreement" or "the Agreement"), among PacifiCorp, an Oregon corporation; USDA Forest Service ("USDA-FS"); USDI Fish and Wildlife Service ("USFWS"); USDI Bureau of Land Management ("BLM"); National Marine Fisheries Service ("NMFS"); Oregon Department of Environmental Quality ("ODEQ"); Oregon Department of Fish and Wildlife ("ODFW"); and Oregon Water Resources Department ("OWRD"), referred to collectively as the "Settlement Parties" or "the Parties."

On November 1, 2002, PacifiCorp, on behalf of itself and the other Settlement Parties, filed Amendment No. 1 to the Settlement Agreement, amending and modifying sections 5.1, 7.1, 7.2, and 8.3 of the Settlement Agreement ("the Amendment"). The purpose of this Explanatory Statement is to summarize the basis for the Amendment. Nothing in this Explanatory Statement is intended to modify the terms of Amendment No. 1 or the Settlement Agreement. The USDA-FS, BLM, NMFS, USFWS, ODEQ, ODFW, and OWRD, collectively, "the Governmental Parties," intend to submit final terms, conditions, and prescriptions consistent with this Amendment. In the event this Amendment is rejected or materially altered by FERC or through subsequent litigation, the Parties will employ dispute resolution procedures contained in the Settlement Agreement to resolve inconsistencies.

The Settlement Parties resubmit that the Settlement Agreement and this Amendment are fair and reasonable and in the public interest within the meaning of FERC Rule 602, 18 C.F.R. § 385.602(g)(3), for the following reasons:

¹ On December 9, 2002, a group of non-governmental organizations ("the NGOs") submitted a letter to FERC objecting to the Amendment. A number of the comments contained in the NGO letter reflect an incomplete understanding of measures contemplated by the Amendment. The Parties address many of these objections in this Explanatory Statement.

- (1) The Settlement Agreement and Amendment contain specific measures that will substantially improve environmental conditions in the Umpqua River Watershed;
- (2) The Settlement Agreement and Amendment provide that certain important resource protection measures will be implemented immediately, providing immediate benefit to fish and other natural resources;
- (3) The Settlement Agreement and Amendment provide for various interests and waterway uses, including power production and natural resource values; and
- (4) The Settlement Agreement and Amendment establish a process for the Parties to collaborate to manage and enhance natural resources in the Umpqua River Watershed throughout the term of the New License.

For these reasons, the Parties request that FERC accept and incorporate, without material modification, as license articles in the New License all relevant provisions of the Settlement Agreement, the Amendment, and the provisions of Governmental Parties' Final Terms and Conditions filed with FERC in connection with the Settlement Agreement and this Amendment.

2. BACKGROUND AND NEED FOR AMENDMENT

Section 8.3 of the Settlement Agreement, entitled the "Soda Springs Bypass Reach Alluvial Restoration Project," provides for the restoration of spawning habitat in the Soda Springs bypass reach. Section 8.1 of the Agreement states that in carrying out actions under section 8.3, PacifiCorp shall maximize spawning habitat in areas described within section 8.3, with a priority on chinook salmon spawning, given the natural constraints of the river channels.

Upon submittal of the Settlement Agreement, the Settlement Parties began implementing section 8.3 of the Agreement in accordance with its terms and schedules. Section 8.3.1 of the Settlement Agreement requires PacifiCorp to prepare a study plan analyzing the feasibility, costs, and benefits of this restoration measure. Section 8.3.4 of the Settlement Agreement requires PacifiCorp to prepare a baseline habitat survey of areas within the Soda Springs bypass reach to evaluate the benefit of habitat restoration efforts in this reach. In accordance with the terms of the Settlement Agreement, in late 2001 PacifiCorp began collecting field data to prepare a baseline habitat survey. Baseline spawning habitat conditions, as well as channel topography and hydraulic conditions, were assessed within the Soda Springs bypass reach (Stillwater Sciences 2002a; Stillwater Sciences 2002b). The results and conclusions derived from these assessments are summarized below. Based upon these results, the Settlement Parties conclude that the Parties' original goals and objectives with respect to section 8.3 of the Settlement Agreement can not be satisfactorily met due to natural river constraints in the Soda Springs bypass reach.

2.1 Reach Description

The Soda Springs enhancement reach is located within the mainstem Soda Springs bypass reach and extends from the Soda Springs powerhouse upstream approximately 210 m (700 ft). The

reach was selected as a potential enhancement area due to the relatively unconfined channel morphology of the reach, which is uncommon in the mainstem North Umpqua River (Stillwater Sciences 1998). The channel width in this reach averages approximately 110 m (350 ft), compared with channel widths of approximately 40 m (130 ft) upstream and downstream of the enhancement reach. On signing the Settlement Agreement, the Parties believed that the relatively unconfined channel morphology in this reach would allow the channel to be manipulated to increase storage of spawning gravels in this reach.

The enhancement reach does not currently provide any significant spawning habitat. The channel bed is dominated by large boulders and bedrock outcrops, and gravel deposits suitable for spawning are absent. Several reasons exist for the lack of spawning habitat in this reach. The most important constraint is the steep channel slope, which averages five percent through the study reach. Channels this steep do not typically retain gravel because of the high shear stresses generated during even moderate discharge events. A second constraint is the frequency of high discharges from natural storm events that are released through the dam spillway, which for example exceed 5,000 cfs every other year on average. Frequent high discharges, in combination with the steep channel slope, make it especially difficult to create stable gravel deposits, and to satisfy flow and velocity requirements suitable for spawning. Due to the steep channel slope and frequent high discharges, the study reach likely did not provide spawning habitat under historical (pre-project) conditions. The enhancement reach is bounded on both banks by deep-seated landslides that supply the boulders that dominate the channel bed. The steep channel slope predates the dam construction, and is partly responsible for the location of the dam and bypass reach.

2.2 Methods of Reach Evaluation

In August 2001, Stillwater Sciences conducted a detailed topographic survey of the study reach using a laser total station, tied to permanent survey benchmarks on the dam, penstock, and powerhouse (Stillwater Sciences 2002a). A network of semi-permanent benchmarks was established throughout the study reach for use in any subsequent channel modification construction work. Stillwater Sciences mapped the significant geomorphic features, such as the principal base flow pathways, bank full channel boundaries, boulders large enough to create localized eddies of diminished velocity or gradient, and large woody debris, and characterized the channel substrate materials. These field observations were used in combination with salmonid spawning habitat criteria to examine the potential for habitat enhancement. Spawning salmonids require extensive deposits of well-sorted gravel in which to build their redds. In addition, the flow velocity must be sufficient (> 1 ft/s) to maintain flow through the surface gravel but not so great (< 3 ft/s) as to prevent redd construction. The water depth must be greater than 0.8 ft to provide sufficient hydraulic head, and the gravel deposit must be greater than 2 ft deep to allow for redd construction. Furthermore, the gravel must remain immobile throughout the incubation period, otherwise redds will be destroyed before the eggs can hatch.

Baseline spawning habitat conditions were assessed on September 4 and 5, 2001, in the Soda Springs enhancement reach (Stillwater Sciences 2002a). Flows in the Soda Springs bypass reach were approximately 40 cfs ($1.1 \text{ m}^3/\text{s}$) during the survey. Potentially suitable spawning patches were identified in the field by Science Team members and their suitability was assessed based on

area, depth, velocity, particle size, hydraulics, and other physical characteristics of the patches. On the first day of each survey, members of the Science Team conducted a walking survey of the reach and identified all spawning gravel patches considered to be potentially suitable for chinook salmon and/or steelhead. For each patch, the team determined the extent of the patch (including division of patches into subpatches where different substrate facies were evident) and whether each patch was most likely suitable for chinook salmon and/or steelhead. A qualitative ranking of overall suitability from 1 (poor) to 10 (good) was assigned to each subpatch based on an overall impression of physical patch characteristics (e.g., depth, velocity, particle size, hydraulics). Only patches considered potentially suitable for spawning under flows proposed in the Settlement Agreement (i.e., 275 cfs [7.79 m³/s] in the Soda Springs bypass reach were included.

Additional information regarding baseline quality and quantity of spawning habitat in the enhancement reaches was measured by Stillwater Sciences subsequent to each initial survey. For each patch identified by the survey team, a sketch of each patch was made to scale and used to calculate patch area. Photographs and video documentation were used to supplement data collection. The following physical parameters were measured for each patch and/or subpatch to evaluate the quality of the patches:

- D₅₀,
- Sorting (very well sorted, well sorted, moderately sorted, poorly sorted, very poorly sorted)
- Angularity (very angular, angular, sub-angular, sub-rounded, rounded, well rounded)
- Estimate of patch substrate depth
- Water depth
- Distance from wetted channel under current conditions
- Causal mechanism of patch formation.

Substrate permeability was measured within each patch and/or subpatch (when possible) at a depth of 23 cm (0.75 ft) using a modified Mark VI standpipe (Terhune 1958, Barnard and McBain 1994) to quantify intergravel flow conditions. Egg-to-emergence survival based on gravel permeability was predicted for each location where permeability was measured, based on a relationship developed from studies by Tagart (1976) using coho salmon, and McCuddin (1977) using chinook salmon.

2.3 Soda Springs Bypass Reach Evaluation Results

Results from hydraulic calculations suggest that channel slope should not be steeper than 0.007 and discharge per unit width should be at least 0.8 ft²/s to have potential spawning habitat in the lower bypass reach within normal flow conditions (i.e., areas without flow obstructions). The current channel has a slope of more than 0.05, except in a very short reach (120 ft) at the upstream end (the “upper base-flow reach”), and thus does not provide potential spawning habitat under current conditions, even with adequate gravel supply. These calculations indicated that the limiting factors for potential spawning habitat are water depth and flow velocity for low-flow conditions, and flow velocity for high-flow conditions. Small patches in the lee of boulders where normal flow conditions do not occur could support conditions favorable for spawning. These areas were addressed during the baseline habitat survey (Stillwater Sciences 2002a).

Baseline habitat evaluations indicate a total of seven potential spawning gravel patches (composed of 12 subpatches) in the Soda Springs bypass reach. In general, patches in this reach were small, occurred as thin layers, and had poor to fair suitability. Subpatch area ranged from 0.5 to 20.1 m² (5.4 to 216 ft²) and averaged 4.2 m² (45 ft²). Three subpatches (in two patches) were identified as being potentially suitable for chinook salmon, and 11 subpatches (in seven patches) were identified as being potentially suitable for steelhead. No patches in this reach were identified as having “good” suitability for either chinook salmon or steelhead. All patches and subpatches were associated with boulders that led to patch formation.

Substrate permeability was measured at three locations within the reach. Since only one of the seven patches was completely submerged at the time of the survey, few permeability samples could be collected in this reach. Two of the permeability samples were collected adjacent to Patch 3 where suitable sample sites were available in patches that were too small to be classified as being suitable for spawning. Results of the permeability sampling effort indicate that permeability varied substantially among locations. Predicted egg-to-emergence survival for the three locations sampled was 35%, 55%, and 59%.

2.4 Conclusions Regarding the Soda Springs Bypass Reach Evaluation

As discussed in section 8.1 of the Settlement Agreement, PacifiCorp is required under section 8.3 to maximize spawning habitat for anadromous fish in the Soda Springs bypass reach, with a priority on chinook salmon spawning, subject to natural constraints of the river channel. As discussed in section 8.3 of the Settlement Agreement, the Settlement Parties intended that approximately 5,000 to 15,000 square feet of spawning habitat would be created or restored in the Soda Springs bypass reach, subject to the provisions of section 8.1.

Based upon fieldwork and analysis conducted after the signing of the Settlement Agreement, the Settlement Parties conclude that the Parties’ original goals and objectives with respect to section 8.3 of the Settlement Agreement would not be satisfactorily met due to natural river constraints in the Soda Springs bypass reach. The Parties found this site was not an alluvial site and through detailed physical surveys and hydrological modeling, found the channel gradient to be too steep to hold significant amounts of spawning gravel. Available data indicate that due to the steep gradient and existing channel configuration in the Soda Springs bypass reach, coupled with anticipated stream velocities in this area, only about 1,500 square feet of spawning habitat could be created or restored in this reach. In view of these circumstances, the Settlement Parties agreed to devise an alternative strategy for addressing the Parties’ habitat goals as they relate to section 8.3 of the Settlement Agreement.

2.5 Related Agreement Sections

After concluding that revisions to section 8.3 of the Settlement Agreement were warranted, the Settlement Parties commenced a detailed review of the Settlement Agreement to ascertain what, if any, related sections required amendment in view of contemplated changes to section 8.3. The Settlement Parties determined that sections 5.1, 7.1, and 7.2 required amendment as a result of amendments to section 8.3.

Section 5.1 of the Settlement Agreement states that “PacifiCorp shall implement Table 1 flows for the Soda Springs bypass reach in 2003, upon completion of the Soda Springs bypass alluvial restoration project in accordance with Section 8.3 of this Agreement.” The Parties agree that the requirement for increasing bypass reach flows upon completion of measures conducted pursuant to section 8.3 necessitates amending section 5.1 to clarify when, and in what amount, instream flows could be increased in view of changes to measures contained in section 8.3.

Section 7.1 of the Settlement Agreement states that “PacifiCorp shall continue the ongoing gravel augmentation below Soda Springs dam until completion of the Soda Springs Bypass Reach Alluvial Restoration Project required under Section 8.3 of this Agreement.” The Settlement Parties agree that the requirement for continued ongoing gravel augmentation below Soda Springs dam until completion of measures conducted pursuant to section 8.3 necessitates amending section 7.1 to clarify the nature and timing of gravel augmentation required in view of changes to measures contained in section 8.3.

Section 7.2 of the Settlement Agreement states that beginning in 2004, “PacifiCorp shall provide gravel augmentation in coordination with the Soda Springs bypass reach alluvial restoration project after consulting with the USDA-FS, ODEQ, NMFS, USFWS, and ODFW, regarding the quantity, quality, and timing of gravel augmentation.” The Settlement Parties agree that the requirement that gravel augmentation be provided in coordination with measures conducted pursuant to section 8.3 necessitates amending section 7.2 to clarify the nature and timing of gravel augmentation required in view of changes to measures contained in section 8.3.

3. DISCUSSION OF AND RATIONALE FOR AGREEMENT AMENDMENTS

As an alternative to the Soda Springs bypass reach enhancements contemplated in the Settlement Agreement, the Settlement Parties have agreed to (1) devise an alternative habitat restoration/creation program and schedule of bypass reach flow augmentation that will maximize usable spawning habitat for anadromous fish, with a priority on chinook salmon spawning, given the natural constraints of the river channels; and (2) devise a gravel augmentation program in view of amendments to section 8.3 of the Settlement Agreement to enhance habitat downstream from Soda Springs dam.

3.1 North Umpqua River Habitat Restoration/Creation Project (Amendment Section 4; Settlement Agreement Section 8.3)

Numerous studies conducted during the watershed analysis and subsequent investigations provide the technical basis for determining the effects of the Project and the expected effectiveness of the spawning habitat enhancement measures contained in the Settlement Agreement (PacifiCorp 2001b). Investigations conducted to assess spawning gravel availability and redd superimposition indicate that spawning gravel availability in the main-stem North Umpqua River limits spring chinook salmon production in the basin.

A summary of issues related to anadromous salmonid habitat in the main-stem North Umpqua River is provided in Section 7 of the Synthesis Report (“Anadromous fish passage and off-site mitigation”). Additional reports concerning anadromous fish spawning habitat include:

- Appendix 7-1 of the Synthesis Report (“Bed substrate mobility in the North Umpqua River, Copeland gauging station”),
- Appendix 7-2 of the Synthesis Report (“Spawning gravel availability and redd superimposition among spring chinook salmon in the North Umpqua River”),
- “Assessment of historical habitat conditions in the reach of the North Umpqua River currently inundated by Soda Springs Reservoir” (Stillwater Sciences 1998),
- “Preliminary assessment of issues related to sediment augmentation at Soda Springs Dam” (Stillwater Sciences 1999),
- “Geomorphic effects of Soda Springs Dam and potential effects on aquatic habitat” (Stillwater Sciences 2000),
- “Potential spawning habitat for anadromous salmonids in the upper reach of Soda Springs Reservoir” (Stillwater Sciences 2000), and
- “Assessment of spawning gravel in the North Umpqua River reach upstream of Slide Creek Dam” (Stillwater Sciences 2000).

In view of the natural constraints existing in the Soda Springs bypass reach, the Parties agree to amend section 8.3 of the Settlement Agreement by striking entirely the previous version of section 8.3, and replace it with a program the focus of which is broader than simply the Soda Springs bypass reach. The amended section 8.3 provides for the restoration or creation of salmonid habitat below Soda Springs dam, both within select areas of the bypass reach, as well as the mainstem North Umpqua below the Soda Springs powerhouse, and tributary areas below Soda Springs powerhouse. Habitat restoration efforts may focus on areas in the upper Soda Springs bypass reach, and areas between Soda Springs dam and Rock Creek that are conducive to such efforts.

Similar to the previous section 8.3, the amended section 8.3 requires PacifiCorp to prepare a feasibility assessment, implementation plan, and monitoring plan in conjunction with the Agencies as part of this habitat restoration project. Further, prior to initiation of habitat restoration efforts, PacifiCorp shall prepare a baseline habitat survey of habitat restoration sites to evaluate the benefits of such measures. Aside from ongoing monitoring and gravel augmentation efforts, restoration or creation measures conducted pursuant to amended section 8.3 will be completed by December 31, 2004.

Originally, the Settlement Parties agreed to restore and/or create about 5,000 to 15,000 square feet of salmonid spawning habitat in the Soda Springs bypass reach, subject to the natural constraints of the river channel. However, after conducting preliminary baseline surveys, the Parties determined that only about 1,500 square feet of marginal salmonid spawning habitat could potentially be created in this reach due to limitations arising from the steep gradient and high water velocities. To achieve similar habitat benefits in other areas conducive to habitat restoration, the Parties agree that PacifiCorp will fund habitat restoration projects in an amount not to exceed \$410,000 in 2002 dollars.² This funding level covers all aspects of the habitat

² In arriving at this funding level, the Settlement Parties evaluated the estimated costs of restoring or enhancing spawning habitat in the Soda Springs bypass reach and in other areas downstream from Soda Springs Dam. After reviewing and discussing such estimates, the Settlement Parties concluded that this funding level would

restoration project contemplated in amended section 8.3, including, but not limited to, the planning, design, permitting, construction, monitoring and ongoing maintenance (including gravel augmentation) of habitat restored and/or created.

In establishing PacifiCorp's financial obligation under amended section 8.3, the Parties evaluated a variety of technical information, including (1) the amount of suitable spawning habitat that could be created in the Soda Springs bypass reach given natural constraints; (2) potential habitat restoration/creation at alternative sites; and (3) the estimated cost of habitat restoration measures in the bypass reach and alternative areas. Cost estimates were extrapolated to estimate the cost of providing equivalent habitat benefits in the upper Soda Springs bypass reach and areas downstream from Soda Springs dam, relative to the anticipated benefits of the previous section 8.3. The Parties conclude the resulting financial obligation on the part of PacifiCorp to fund habitat restoration measures associated with amended section 8.3 in an amount not to exceed \$410,000, coupled with the anticipated benefits of amended section 7.2 described below, fully satisfy the Parties' goals, objectives, and legal mandates, as they relate to the previous section 8.3.

3.2 Timing of Instream Flows (Amendment Section 1; Settlement Agreement Section 5.1)

Instream flows are an important component of the physical and ecological processes that influence aquatic and riparian habitat conditions in the North Umpqua basin. Instream flows are discussed in Section 4 of the Synthesis Report (Stillwater Sciences 2001).

Amended section 5.1 strikes the last sentence in the original section 5.1 and replaces that sentence as follows:

Commencing on September 1, 2003, PacifiCorp shall increase the minimum instream flow in the Soda Springs bypass reach to 95 cfs. Commencing on September 1, 2005, PacifiCorp shall increase the minimum instream flow in the Soda Springs bypass reach to 275 cfs for the term of the New License.

Originally section 5.1 of the Settlement Agreement required that instream flows in the Soda Springs bypass reach increase to 275 cfs in 2003, upon completion of habitat restoration activities in this reach. In revising section 5.1 of the Settlement Agreement, the Settlement Parties agree to increase instream flows prior to completion of activities under amended section 8.3 to provide enhanced habitat conditions in this reach. The Settlement Parties agree that increasing flows to 95 cfs by September 1, 2003, will provide increased near-term habitat benefits for spawning salmonids.³ For example, available information indicates that increasing

provide sufficient financial resources to achieve the Parties' original ecological objectives associated with section 8.3 of the Agreement.

³ The NGOs comment in their December 9, 2002, letter that the Settlement Parties provide no explanation why the Amendment alters the timetable for increasing instream flows in the Soda Springs bypass reach. In arriving at the agreement reflected in amended section 5.1, the Parties evaluated the biological benefits of increasing instream flows in the Soda Springs bypass reach prior to completion of habitat restoration actions contemplated under amended section 8.3. The Parties conclude that increasing instream flows in this reach to 95 cfs will provide substantial interim benefits to aquatic species as indicated in Stillwater Sciences (1998), and that increasing instream

instream flows in the Soda Springs bypass reach to 95 cfs increases available weighted usable area (WUA) for spawning spring chinook salmon (PacifiCorp 1995). After carefully considering the potential biological benefits and economic costs of increasing instream flows in this reach, the Parties conclude that increasing instream flows to 95 cfs meet their respective near-term objectives for this reach as originally contemplated in section 5.1.

As with the original section 5.1, the Parties agree to increase instream flows to 275 cfs upon completion of habitat restoration measures in the Soda Springs bypass reach, and in areas below this reach. The Settlement Parties previously determined that increasing instream flows in this reach to 275 cfs would result in substantial benefits to spawning salmonids (PacifiCorp 2001b).

3.3 Continuation of Ongoing Gravel Augmentation until Completion of Habitat Restoration Project under Amended Section 8.3 (Amendment Section 2; Agreement Section 7.1)

Fluvial geomorphic processes influence stream channel morphology and the types and quality of aquatic and riparian habitats found within a watershed. The hydrologic regime, sediment regime, riparian vegetation, and LWD are important components of fluvial geomorphic processes. The watershed analysis examined the effects of the Project, forest management activities, and other land uses on fluvial geomorphic processes, channel morphology, and aquatic and riparian habitats in the North Umpqua River basin. A summary of these analyses is presented in Section 2 of the Synthesis Report (“Fluvial geomorphic processes, channel morphology, and aquatic and riparian habitats”).

The Settlement Parties agree to amend section 7.1 of the Settlement Agreement by striking “until completion of the Soda Springs Bypass Reach Alluvial Restoration Project required by section 8.3 of this Agreement” and replacing it with “until December 31, 2004. The second sentence of section 7.1 is amended by striking “until the commencement of the Soda Springs Bypass Reach Alluvial Restoration Project” and likewise replacing it with “until December 31, 2004.” This amendment results in a requirement for PacifiCorp to continue its existing ongoing gravel augmentation program below Soda Springs dam (consisting of passing 400 cubic yards of gravel per year past the dam at a cost of up to \$5,000 per year) until December 31, 2004.

Originally, the first and second sentences of section 7.1 of the Settlement Agreement, conflicted since the first required PacifiCorp to continue its ongoing gravel augmentation program below Soda Springs dam until completion of measures required by section 8.3 while the second sentence required ongoing gravel augmentation until commencement of measures required by section 8.3. The Parties resolved this inconsistency by agreeing that ongoing gravel augmentation would continue until December 31, 2004, a date corresponding with the completion date of habitat restoration measures under amended section 8.3 (see amended section 8.3.6).

The purpose of the ongoing gravel augmentation program is to continue gravel supplies below Soda Springs dam until completion of habitat restoration measures required by amended section

flows to 275 cfs in this reach is not required until completion of habitat restoration measures contemplated by amended section 8.3, resulting in the creation of additional salmonid spawning habitat in this reach.

8.3. Upon completion of measures under section 8.3, alternative gravel augmentation measures will commence that focus on restored or created habitat areas. Further, as discussed below, upon completion of measures required by amended section 8.3, a more comprehensive gravel augmentation program will commence to enhance habitat below Soda Springs dam.

3.4 Amended Gravel Augmentation Program (Amendment Section 3; Settlement Agreement Section 7.2)

Numerous studies conducted during the watershed analysis and subsequent investigations provide the technical basis for determining the effects of the Project and the expected effectiveness of the measures contained in the Settlement Agreement. Investigations conducted as part of the sediment budget analysis indicates that Project impoundments trap nearly all bed load transported from upstream reaches. Bed load delivery to the Soda Springs bypass reach and the reach from Soda Springs powerhouse to Boulder Creek has been reduced. Available estimates suggest that gravel recruitment has been reduced by about 4,000 tons a year in this area (Stillwater Sciences 1998). The magnitude of bed load supply reductions downstream of Soda Springs dam decreases in a downstream direction between Boulder Creek and Steamboat Creek, due to increased sediment production associated with roads and timber harvest in tributary basins. Downstream of Steamboat Creek, the sediment budget analysis indicates that bedload supply is higher than under pre-project conditions.

Additional investigations (e.g., geomorphic effects analyses) indicate little evidence of substantial change in channel morphology due to Soda Springs dam downstream of Boulder Creek (USDA-FS 1999). Upstream of Boulder Creek, however, the changes were evident as a result of reduction of bed load supply from the upper basin. Similarly, the effects of Soda Springs dam on downstream aquatic habitat are limited to the reaches just below the dam, and there is little evidence of channel change downstream of Boulder Creek (USDA-FS 1999).

Additional reports concerning fluvial geomorphic processes in the watershed include:

- Appendix 2-1 of the Synthesis Report (“Sediment budget report”),
- Appendix 4-1 of the Synthesis Report (“Daily average hydrographs for in-stream flow studies”),
- Appendix 7-1 of the Synthesis Report (“Bed substrate mobility in the North Umpqua River, Copeland gauging station”),
- “Geomorphic effects of Soda Springs Dam and potential effects on aquatic habitat” (Stillwater Sciences 2000),
- “Criteria for evaluation of management alternatives for connectivity at Soda Springs Dam” (Stillwater Sciences 1999),
- “Methods for achieving connectivity at Soda Springs Dam under a dam-in-place scenario” (Stillwater Sciences 1999),
- “Dam-in-place alternative: further responses to questions from the Soda Springs Connectivity Subgroup” (Stillwater Sciences 1999),
- “Summary of existing information related to connectivity at Soda Springs Dam” (Stillwater Sciences 1999), and

- “Preliminary assessment of issues related to sediment augmentation at Soda Springs Dam” (Stillwater Sciences 1999).

Originally, section 7.2 of the Settlement Agreement provided that beginning in 2004, PacifiCorp would provide gravel augmentation in coordination with the previous Soda Springs Bypass Reach Alluvial Restoration Project (previous section 8.3). Implementation of the previous Soda Springs Bypass Reach Alluvial Restoration Project (December 31, 2003) coincided with the initiation of the gravel augmentation program required under the previous section 7.2.

The Settlement Parties discussed at length the purpose and need for a gravel augmentation program below Soda Springs Dam. In doing so, the Settlement Parties designed a gravel augmentation program that meets all of the Parties’ goals and objectives. Below follows a brief summary of an analysis on this subject completed by Stillwater Sciences at the direction of PacifiCorp. A more detailed discussion of this analysis is contained in Stillwater Sciences (2002c).

The watershed analysis report “Geomorphic Effects of Soda Springs Dam and Potential Effects on Aquatic Habitat” (Stillwater Sciences 2000) describes the gravel deposits and other channel features downstream of the dam. In addition to the agency and Stillwater representatives on the Science Team, this report was produced in consultation with and reviewed by Dr. Gordon Grant of the USDA Forest Service and Dr. Bill Dietrich of the Geology Department at U.C. Berkeley, who directed the research and helped develop the conclusions contained in this report. There was little evidence of substantial change in channel morphology due to Soda Springs dam downstream of Boulder Creek; change appears to be limited to the reach between Soda Springs dam and Boulder Creek. The report documented that eddy zones appear to be undersaturated upstream of Boulder Creek, and saturated downstream of Boulder Creek. Therefore, the most direct way of addressing the morphological effects of Soda Springs dam is to augment gravel in the reach between Soda Springs dam and Boulder Creek, in those places that would have had gravel patches (or larger patches) before the Project was constructed, but do not have them now. This approach would have the additional advantage of creating spawning habitat over and above what would be created as a result of the Section 8.3 habitat enhancements.

Since gravel bars are absent in the reach from Soda Springs dam to Boulder Creek, the sites most likely to have contained gravel under historical conditions are eddies associated with both boulders and irregularities in the channel bank. The dynamics of sediment deposition in eddies associated with boulders are poorly understood, and are therefore difficult to predict. In addition, the gravel saturation of the eddy zones under pre-Project conditions is unknown, and is therefore limited to our best scientific estimates. Stillwater Sciences mapped the extent of gravel deposits in the reach in December 1998, and found that two of ten eddy zones had some gravel associated with them. Since Soda Springs dam has been in place for a long period of time, it is likely that these gravel deposits resulted from gravel augmentation that began in 1992 upstream of the Soda Springs Powerhouse. About 770 tons of gravel per year has been added to the Soda Springs Bypass Reach between 1992 and 1998, and no other sources of equivalent magnitude occur between Soda Springs dam and the confluence with Boulder Creek. With the above considerations, the Settlement Parties have designed a two-stage augmentation program, as described below.

Stage 1: PacifiCorp will add a large pulse of gravel to the river downstream of Soda Springs dam, and monitor where new gravel patches form (or existing patches expand) to assess which locations are most likely to retain gravel. In order to assess which sites may have contained gravel patches under reference conditions, the volume of gravel augmentation should be equivalent to the estimated annual supply prior to dam construction. Since gravel depositional dynamics change based on the flow regime, the locations where gravel should be stable likely change depending on the magnitude of high flows. Therefore, the results of this pulse can be used to indicate locations where gravel deposition could have occurred, and these locations can be monitored and/or directly augmented in the future in an effort to re-create the pre-dam patterns of gravel deposition. Identified sites would then be maintained using a targeted, site-specific gravel augmentation program over the course of the New License. Using these considerations, the Parties will add a one-time pulse of about 4,000 tons gravel to the reach to identify potential depositional zones. The gravel pulse would be conducted during the first year of the gravel augmentation program. Monitoring before and after the pulse would allow identification of the affected depositional zones. The depositional zones affected by the pulse would be used as the augmentation sites for the second stage of the program.

Stage 2: The depositional zones identified after the Stage 1 gravel pulse would serve as the initial gravel augmentation sites. For budgeting purposes, the Settlement Parties assume that 5 of the sites will be identified that are able to retain gravel, and thus will be periodically augmented over the term of the New License. The Settlement Parties further assume that augmentation will take place every five years, i.e., gravel deposits will be augmented seven times during the 35-year license period. The amount of gravel to be augmented at each site is assumed to be 20 tons, or roughly 13.5 cubic yards. This will allow for a gravel patch of 100 square ft with a depth of about 3.65 ft. Larger or deeper patches are unlikely to occur because the gravel in larger patches would be lost during high-flow events. As part of Stage 2, the Parties will conduct a monitoring program that includes pre-augmentation monitoring to document the pre-implementation condition of the reach, and three post-implementation monitoring visits to document the evolution of the augmented gravel.

The Settlement Parties agree that PacifiCorp's commitment to fund the proposed gravel augmentation program in an amount not to exceed \$227,500 (2002 dollars), coupled with the Settlement Parties' agreement to potentially use the USDA-FS mitigation fund for additional costs, fully satisfies the Settlement Parties' respective goals, objectives, and legal mandates. In arriving at this cost estimate, the Settlement Parties considered the costs of a one time pulse experiment and associated monitoring, as well as the costs of site specific gravel augmentation, oversight, permitting, and monitoring (Stillwater Sciences 2002b). The Settlement Parties agreed to adjust preliminary cost estimates (\$175,000) upwards by 30 percent to account for uncertainty; thus, the resulting funding level represents a conservative estimate of the potential cost of program implementation. Finally, the Settlement Parties agree that if actual program costs exceed \$227,500, additional funding may be made available through use of USDA-FS mitigation funds.

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