CONCEPTUAL STORMWATER MANAGEMENT PLAN
for the White Pass Ski Area
Master Development Plan Proposal
Environmental Impact Statement

December 8, 2006

Prepared by

3245 146th Place
Bellevue, WA 98007

1.0 INTRODUCTION

This technical memorandum provides a description of the Conceptual Stormwater Management Plan (CSMP) for the proposed parking area within the Special Use Permit (SUP) boundary for White Pass. Two conceptual plans are presented in this memorandum as different parking areas are proposed under the alternatives. One concept has been developed for the parking area proposed under Modified Alternative 4, and a second for the configuration proposed in Alternatives 6 and 9. As this plan is conceptual in nature, no sizing of stormwater facilities has been undertaken. This step will be undertaken for the selected alternative parking area and detailed in the Final Construction Plans. Figure 1 provides a vicinity map of White Pass.

The remainder of this memorandum defines the objectives of the CSMP, presents concepts for the proposed facilities, and describes the flow of water through the system. Conceptual site plans are provided for Alternatives 4, 6 and 9. Snow management practices are also described and would be utilized for all alternatives. During the site-specific approval process, alternative means of achieving the desired stormwater management objectives may be evaluated.

2.0 DESIGN OBJECTIVES AND CRITERIA

The primary objective of the CSMP is to help attain the following water quality, sediment regime, and in-stream flow Aquatic Conservation Strategy Objectives (ACSOs; USDA et al.):

> Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities;
>
> Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include timing, volume, rate, and character of sediment input, storage, and transport; and maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

While maintaining the above primary objectives, additional quantitative criteria are proposed in an effort to complement the ACSOs and provide a measurable basis for assessing the CSMP performance. Performance should be measured at the basin scale, which can be accomplished as the design nears finalization. Table 1 provides a summary of the design goals used to develop this CSMP.

Table 1:
Proposed Quantitative CSMP Performance Goals For All Parking Lots Combined

Event	Water Quality	Sediment Regime	In-stream Flows
6-month, 24-hour	Maintain or reduce effluent concentrations of TSS[b] and oil and grease	Maintain or increase the sediment trap efficiency[c]	N/A
2-year, 24-hour	N/A	Same as for the 6-month, 24-hour event	Reduce the existing condition peak discharge by at least 50%[d]
10-year, 24-hour	N/A	Same as for the 6-month, 24-hour event	Maintain or reduce the existing condition peak discharge[d]
100-year, 24-hour with snowmelt[a]	N/A	Same as for the 6-month, 24-hour event	Maintain or reduce the existing condition peak discharge[d]

[a] Methods for calculating snowmelt are discussed in Section 3.
[b] Total Suspended Solids.
[c] Sediment trap efficiency (STE) is calculated: STE = (Tons sediment in – Tons sediment out)/Tons sediment in * 100% STE refers to the efficiency of the entire system, including swales, catch basins, and detention ponds.
[d] Standard water quantity criteria in the state of Washington for basins draining to Puget Sound (WSDOE, 2005).

2.1 TREATMENT OBJECTIVES

As previously stated, the design objective of the CSMP for the White Pass Ski Area is to address water quality parameters related to the ACSO. In an effort to achieve the design objective the following treatment objectives are proposed:

- collection, detention and routing of surface runoff,
- improvement of water quality /sediment retention, and
- treatment for petroleum hydrocarbon contaminants.

The following presents a brief description of each treatment objective.

Collection, Detention and Routing of Surface Runoff

Collection of stormwater would be accomplished by intercepting flows from impervious surfaces at intervals that are sufficient to minimize concentrated flows on the impervious surface (e.g., parking lot). Such collection methods include in-sloping the parking lots to drain to conveyance channels, as well as the establishment of curb and gutter to prevent runoff from leaving the parking area untreated.

Upon collection of the stormwater, the water is conveyed to a treatment facility that is designed to detain flow in a basin, vault or bioswale. Once the basin has filled to its design volume, the 6-month, 24-hour storm in this case, the water is released at a specified rate no more than the 2-year, 24-hour flow rate.

Released water is then routed to a designated discharge location via ditches, pipes or other means of conveyance.

Water Quality Treatment/ Sediment Retention

Reductions in sediment yield from the parking lot would be accomplished by routing surface runoff to catchments and/or detention basins, as described above, to allow fine sediments to settle out into the detention structure. These fine sediments would be retained in the basin along with other contaminants that are known to attach to these sediments. Retention of these sediments would significantly reduce the contribution of fine grained sediments from impervious surfaces into adjacent streams or wetlands.

Treatment for Petroleum Hydrocarbon Contaminants

Oil and grease contaminants are often present in stormwater from parking lots and roads. These contaminants can be removed through the installation of oil water separators (OWS) at each parking lot discharge location, after collection of stormwater and prior to detention. The OWS would be sized to treat anticipated runoff corresponding to the design criteria outlined in Section 1.0. Schematics of an OWS are provided as examples in Attachment A for various flow ratings.

The feasibility of the conceptual stormwater facilities proposed in this report is based on preliminary design assessments specific to the site. No site-specific topographic survey was available for this CSMP. A detailed topographical survey will be required to support the final design. Typical diagrams/schematics for individual stormwater facility components are provided in Attachment A.

3.0 PROPOSED STORMWATER MANAGEMENT PLAN

This conceptual CSMP presents recommendations for a treatment system for Alternatives 4, 6 and 9. Snow management strategies (Section 4) for effective stormwater management are also provided. The concepts presented herein are intended to be flexible, and may be modified and/or blended in the final CSMP design.

3.1 CONCEPTUAL TREATMENT SYSTEM

A basic treatment system is presented in order for each Alternative, which could be used in the final CSMP design. As previously stated, this basic system may be modified.

The basic treatment system consists of (in series) paved surfaces, drop inlets, conveyance pipes/ditches; OWS; detention pond with a rip-rap lined pipe inlet, passive riser to control outflow rates, and a rip-rap lined emergency spillway; and level spreaders to diffuse pond effluent and prevent stream bank erosion.

The basic treatment system focuses primarily on water quantity and sediment regime. By implementing the use of an oil-water separator and detention ponds within the system, water quality would maintain in it current state and/or improve.

The following modifications could be made to the facilities in order to enhance the treatment system:

- Place the OWS before the detention pond;
- Enlarge the swales as necessary to safely convey the 25-year, 24-hour event;
- Enlarge the detention ponds as necessary in order to meet the water quantity goals (Section 1); and
- Add catch basins at drop inlets.

3.2 RECOMMENDED TREATMENT SYSTEMS AND SITE PLANS BY EIS ALTERNATIVE

This section provides the conceptual layout of stormwater facilities for Alternatives 4, 6 and 9 of the White Pass FEIS. Alternatives 6 and 9 contain the same parking lot design and will be analyzed together. The Modified Alternative 4 parking lot design will be analyzed separately.

The final design of stormwater facilities will be determined during project-level review of the proposed resort. A topographical survey will be completed prior to design and construction of the stormwater facilities. Adjustments may be made to the site-specific plan if site topography or substrate is not suitable for the conceptual design as presented in the CSMP.

3.2.1 Modified Alternative 4

The proposed parking lot in Modified Alternative 4 is located approximately 250 feet east of the *Lower Cascade Chairlift* (refer to Figure 2). At approximately 7 acres, the parking lot would be insloped at 2-3 percent to route stormwater to an underground conveyance pipe. A series of drop inlets would be installed that would collect and route runoff to the pipe which would in turn convey water to an oil water separator. Water would be treated by the OWS before being released to a detention pond located on the north side of the parking lot. Snow storage would be located on the south and upslope side of the parking lot. A vegetated swale with 3:1 sideslopes would be constructed to contain the snow. A rock lined ditch would run along the east perimeter of the parking lot and route water from the snow storage area to the detention pond on the north side of the parking lot during the spring melt. Additionally, a curb and gutter would be placed around the parking lot to prevent stormwater runoff from entering nearby streams and riparian zones. The outlet of the detention pond would consist of several elements. These elements would include a riser, low-flow outlet, and an emergency overflow outlet. All flows out of the detention pond

will be routed to a rock-lined ditch. Outlet protection would be incorporated at every outfall to reduce erosion. The proposed discharge for stormwater would be the roadside ditch adjacent to US 12. Alternative discharge points would be the streams to the East or West of the parking lot. The actual discharge point would be determined in the final construction plans and is subject to review and approval by the USFS.

3.2.2 Alternatives 6 and 9

The proposed parking lot in Alternatives 6 and 9 is located approximately 250 feet from the *Lower Cascade Chairlift.* (refer to Figure 3). At approximately 2.5 acres the parking lot would be insloped at 2-3 percent to convey stormwater to a pipe that would run through the center of the lot. An OWS would treat this stormwater prior to entering a detention pond on the north side. A curb and gutter would be placed around the parking lot to prevent stormwater runoff from entering nearby streams and riparian zones. Snow storage would be located on the south and upslope side of the parking lot. A vegetated swale with 3:1 sideslopes would be constructed on the south-east side to contain the snow. A rock lined ditch would run along the east perimeter of the parking lot and route water from the snow storage area to the detention pond on the north side of the parking lot during the spring melt. Water from the detention pond would then be routed through an outlet to a rock lined ditch. The outlet of the detention pond would consist of several elements. These elements would include a riser, low-flow outlet, and an emergency overflow outlet. All flows out of the detention pond will be routed to a rock-lined ditch. Outlet protection would be incorporated at this junction to reduce erosion. The proposed discharge for stormwater would be the roadside ditch adjacent to US 12. Alternative discharge points would be the streams to the East or West of the parking lot. The actual discharge point would be determined in the final construction plans and is subject to review and approval by the USFS.

4.0 SNOW MANAGEMENT

Managing snow represents one of the biggest challenges in the design of a stormwater management plan for cold climates (CWP 1997). Because the domain for the CSMP for White Pass consists of parking lots which receive abundant snowfall and are managed partly by frequent application of road sands, a well designed and executed snow management plan is essential for helping to meet the goals of the CSMP.

This section discusses a literature and regional agency regulations review conducted in order to gain a broad sense of how other cold climate regions design and manage CSMP's. Based on findings from this review preliminary snow management strategies for White Pass are recommended.

4.1 REVIEW OF LITERATURE AND REGIONAL PRACTICES

In the Stormwater Best Management Practice (BMP) Design Supplement for Cold Climates (CWP 1997), permeable, vegetated BMPs, such as dry grass-lined swales, infiltration basins, and/or vegetated filter

strips (BMP which disperses flow along its width and provides treatment as runoff travels as sheetflow through the vegetation) are recommended to decrease peak snowmelt runoff rates and encourage infiltration. The authors note, however, with no recommended solution, that stockpiled snow with sand can cause plugging, and consequently, premature failure of the facility.

The Northwest Colorado Council of Governments (NCCG), Water Quality Protection Standards (1997) were also reviewed as a benchmark for this preliminary conceptual design. This document was deemed relevant due to climate similarities between White Pass and Northern Colorado, and the abundance of ski resorts in Northern Colorado which should be reflected in the stormwater management regulations. In summary, the NCCG standards require design of snow storage facilities, preferably vegetated, which cover 30 percent of the area to be developed (area may be modified to reflect site specific modeling) and meet the following hydrologic condition:

> Runoff from the storage facility must maintain the existing peak flow rates for storms up to and including the 25-year, 24-hour rainfall event, in combination with 2 inches of melt in 24 hours.

Several county regulations in Washington state were also reviewed, including Pierce County and Benton County. Pierce County uses an algorithm which is a function of elevation to compute a melt rate to be added to the 25-year and above storm. The algorithm produces 24-hour melt rates in excess of 12.5 inches for White Pass, which is considered to be unrealistic for the site. Benton County, WA suggests including snowmelt in the design of BMPs by increasing the design storm runoff flow rate by 10 percent.

4.2 PROPOSED STRATEGIES

Designated storage zones are proposed for stockpiling plowed snow from the parking lots. Figures 2 and 3 show the proposed snow storage zones. Criteria used to select the preliminary locations included:

- Locations should be close to parking lots;
- Snow storage should not impede automobile or pedestrian traffic;
- Snow storage areas should minimize loss of parking;
- When possible, use long, relatively flat, vegetated areas; and
- When possible, storage areas should drain into the detention ponds.

Because the snowmelt runoff typically contains a high concentration of sediment (mostly road sands) and oil, among other possible pollutants (CWP 1997), the storage areas should drain to the detention ponds when possible.

Additional recommendations for managing snow and snowmelt runoff include:

- Specifying a coarse-grained sand for parking lot maintenance to reduce the source of fine sediments – coordination with Lewis County may be necessary;
- When snow storage areas encroach on riparian areas, move snow before onset of major spring melt event (after ski season) to preferred locations consistent with stormwater management facilities; and
- Evaluate the use of de-icer and anti-icer products to reduce road sanding.

5.0 CONCLUSION

The White Pass CSMP is designed to address water quality related to the Aquatic Conservation Strategy Objectives. The two proposed parking lot designs described in this document both provide stormwater runoff control through collection and detention of water, and the treatment of water through sediment removal and hydrocarbon treatment. Both designs utilize designated snow management areas, complete with a rock-lined ditch that routes snow melt to the detention pond. The final stormwater management plan will be determined based on USFS approval of a selected alternative for the White Pass Expansion. Sizing of stormwater facilities (pipes, ditches, detention) will occur following approval of the selected alternative. As such, the stormwater design described for each alternative in this plan may change. Any changes to this CSMP are subject to review and approval by the USFS during the preparation of the final construction plans.

6.0 REFERENCES

Benton County, 1979, Hydrology Manual and Drainage Design Review Procedure, July.

Center for Watershed Protection (CWP), 1997, Stormwater BMP Design Supplement for Cold Climates, Prepared for US EPA Office of Wetlands, Oceans and Watersheds and US EPA Region 5.

Eastside Consultants, Inc., White Pass Resort, Parking Area Sedimentation Control, 1992.

Golder Associates, 2000, Draft Technical Memorandum on Streamflow Analysis for Silver Creek.

Montgomery Watson, 2000, Revised General Sewer and Facilities Plan for White Pass Sewer District, February.

Northwest Colorado Council of Governments (NCCG), 1997, Water Quality Protection Standards, Version: 12/30/1997.

United States Department of Agriculture, Forest Service, United States Department of the Interior, and Bureau of Land Management, Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl: Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.

Washington State Department of Ecology (WADOE), February, 1992, Stormwater Management Manual for the Puget Sound Basin (The Technical Manual).