Eagle Cliff Trail Feasibility Study Report

PREPARED BY:
Alta Planning + Design
711 SE Grand Avenue
Portland, OR 97214
www.altaplanning.com

PREPARED FOR:
PacifiCorp

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PacifiCorp
David Moore

Lewis River Recreation Coordination Committee

Gifford Pinchot National Forest,
USDA Forest Service
Bill Uyesugi, Recreation & Facilities Manager

Washington State Department of Fish & Wildlife
David Geroux, Habitat Biologist

Alta Planning + Design
George Hudson, Principal
Chris Bernhardt, Project Manager
Hagen Hammons, Designer
Kim Voros, Planner

PBS Engineering + Environmental
Skip Haak, Senior Scientist

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I. Introduction

As part of the Federal Energy Regulatory Commission (FERC) relicensing effort for the Lewis River Hydroelectric System, a new non-motorized trail is proposed to connect from Eagle Cliff Park to the Gifford Pinchot National Forest, creating a new experience for hikers, equestrians, and mountain bicyclists. The area is a mix of public and private lands, combined with steep slopes and waterways, presenting a design challenge. The river adjacent to the site contains Bull Trout, a federally protected species, so the proposed Eagle Cliff trail must minimize impacts to the aquatic and riparian habitat. This report outlines an innovative approach to creating a trail facility despite these challenges.

The project site viewed from across the Lewis River.

Project location.

Approach

PacifiCorp, the landowner and agency in charge of the planning effort, retained Alta Planning + Design to examine the feasibility of developing the trail. This report is the result of that investigation. The plan development involved several phases: stakeholder participation; site

Approach

PacifiCorp, the landowner and agency in charge of the planning effort, retained Alta Planning + Design to examine the feasibility of developing the trail. This report is the result of that investigation. The plan development involved several phases: stakeholder participation; site inventory; design options and assessment; public participation; and the selection of a preferred alternative. The process included:

- Presenting the project approach to PacifiCorp staff and other stakeholders;
- Touring the site with PacifiCorp staff and other stakeholders;
- Reviewing existing documents, including habitat and wildlife reports, maps, and meeting notes from various vested agencies;
- Preparation of topographic and boundary exhibits; and
- Interviewing other trailbuilding professionals to verify cost and effort assumptions.

Stakeholder Involvement

The site and the proposed action required the involvement of a variety of stakeholders, including:

- The USDA Forest Service (USFS), who manage the land to which the proposed Eagle Cliff trail will connect;
- The US Fish and Wildlife Service, whose regulations apply to Bull Trout habitat areas;
- The Washington Department of Natural Resources (DNR), across whose land a portion of the trail is proposed to traverse;
- The Washington Department of Fish and Wildlife (WDFW); and
- The Lewis River Recreation Coordination Committee (LRC).

PacifiCorp, representatives from public agencies, and consultants visited the site to assess the natural resources and to determine the feasibility of various trail alignments.

PacifiCorp coordinated with the DNR prior to the commencement of the project. PacifiCorp and the consultant team met with representatives of the the USFS and WDFW at the beginning of the project to discuss potential positive and negative impacts of the proposed trail. This was followed by a visit to the site with a representative from WDFW, and contact by the consultant team with US Fish and Wildlife Service. After a potential connection point from the project site to the Gifford Pinchot National Forest had been established, the USFS was contacted to verify that such a location was acceptable.

II. Existing Conditions

Site Description

The Eagle Cliff site is located west and north of the unincorporated community of Northwoods, in Skamania County (WA), 45 miles northeast of the City of Vancouver and 13 miles southeast of Mt. St. Helens. The site consists of approximately 33 acres of PacifiCorp land and approximately 119 acres of property managed by the DNR.

The Lewis River creates the primary north and west boundary of the site, with a small portion of this border adjacent to private property. Most of the southern boundary also abuts private property, and the eastern line of the DNR property is adjacent to the Gifford Pinchot National Forest (GPNF).

Several old logging roads can be found on the site, although they are overgrown with vegetation.

Basalt cliff faces, including the namesake Eagle Cliff, and generally steep terrain define much of the site. These terrain features contrast with several flatter "bench" areas, particularly in the northwest corner of the site. The soils are primarily pumice-based in the flatter areas, owing to the volcanic activity in the region, while the sideslopes are rocky with mineral soil from the degrading basalt. There are no permanent structures or obvious utilities, but abandoned logging roadbeds are present in various locations. What appears to be an overgrown utility corridor cut is located along the far east edge of the DNR property.

The site is within Skamania County's Swift Subarea, and has an interim zoning designation of "Swift Recreational (SR)".

Environmental Conditions

Forest

Conifers present on the site appear to be second or third growth with a handful of larger specimens left from previous timber harvests. Groves of Western Red Cedar (*Thuja plicata*) and Douglas Fir (*Pseudotsuga menziesii*) are present in various locations with Western Hemlock (*Tsuga heterophylla*) and Big Leaf Maple (*Acer macrophyllum*) dominating the understory. The majority of groundcover throughout the site include Oregon Oxalis (*Oxalis oregano*), Sword Fern (*Polystichum munitum*), Vine Maple (*Acer circinatum*), Red Huckleberry (*Vaccinium parvifolium*), Red Elderberry (*Sambucus racemosa*), Spreading Woodfern (*Dryopteris expansa*) and Western Trillium (*Tillium ovatum*).

Waterways

Two small drainages were observed to be flowing south-to-north through the DNR property and down to the Lewis River. The creeks did not appear to be fish-bearing, as they descend steep terrain, have low water volumes, and may be ephemeral.

Terrestrial Habitat & Species

Priority Habitat and Species (PHS) information obtained from WDFW indicates the presence of a Bald Eagle communal winter roost and Northern Spotted Owl management circle intersecting the eastern end of the proposed trail. The PHS information also indicates that the general area of Eagle Cliff is winter range for elk with regular concentrations of elk.

The remains of deer were found in several locations, and deer and elk scat were observed. No other direct evidence of large mammals was discovered, although the site likely provides habitat for cougar and bear. Several other medium-to-small mammal species (e.g., raccoon, coyote, rabbit, vole) are also likely present.

Bald Eagles were observed flying over the river adjacent to the site and PacifiCorp has historic documentation of the Bald Eagle communal winter roost.

Aquatic Habitat & Species

Eagle Cliff is adjacent to the Lewis River, upstream of the Swift Reservoir. The Lewis River, many of its tributaries, and the reservoir are home to many fish species, including Bull, Cutthroat, and Rainbow Trout. These fish can move freely between the river and reservoir, but access to areas further downstream are restricted by dams below the Swift, Yale, and Merwin reservoirs. Salmon and steelhead are generally not found near Eagle Cliff; however, PacifiCorp has been releasing Coho adults upstream of Swift Dam and has future plans for providing fish passage past the dams, so salmon and steelhead may be found in the area at some time in the future. Bull Trout is listed as threatened under the Endangered Species Act.

III. Constraints and Opportunities

Site constraints and opportunities were identified through a series of meetings and site visits.

Constraints

Eagle Cliff

The namesake Eagle Cliff basalt wall extends from the east bank of the Lewis River upwards approximately 1,500 feet. The slope of the face varies, with the upper reaches of the cliff going past vertical. Eagle Cliff eliminates simple land-based access from National Forest (NF) Road 90 to the northern portion of the project site. Eagle Cliff serves as a major constraint because it would be costly and, in many places, impossible to build a trail directly on the cliff face.

The lower face of Eagle Cliff precludes easy passage along the subject property.

Lewis River

The Lewis River forms the northern and western property boundaries to the majority of the site. Its minimum width along the site is as narrow as 100 feet, although the banks are typically in excess of 200 feet apart. The river forms a physical barrier that reduces options for access.

Listed Species

The portion of the Lewis River adjacent to the subject site has been identified as habitat for Bull Trout, a threatened species. Any improvements to the site must take into consideration what impacts, if any, would be made to Bull Trout habitat and to Bull Trout fish specimens.

Bull Trout (Salvelinus confluentus) are listed as a threatened species under the U.S. Endangered Species Act.

The eastern end of the proposed trail intersects a Northern Spotted Owl management circle. The trail itself will not have an adverse effect on Northern Spotted Owl habitat; however, construction activities could disrupt nesting by owls. Construction activities should therefore be restricted to avoid disturbing nesting owls. This issue is addressed in more detail in Section V – Recommendations.

Private Property

The study site is adjacent to private property in several locations, and it is not physically possible to develop a trail system that connects from NF Road 90 to the western end of the GPNF without passing through at least a small portion of private land. Trail alignments that propose utilizing private lands will require legal instruments to allow passage of not only trail users, but also access by construction contractors and maintenance personnel. The ability of PacifiCorp to obtain legal access to adjacent private properties is unknown, but the process could be difficult, lengthy, or costly, and possibly a combination of all three.

Opportunities

Views

Surrounded by cliffs, mixed deciduous and coniferous forests, and the Lewis River, the site is rich in scenic views. Any proposed trail alignments should take advantage of the uniques views that present themselves, both passively by traversing the beautiful landscape and actively by leading trail users to specific overlooks and vistas.

Views of adjacent cliffs (above) and of the Lewis River (below) highlight the diverse natural beauty of the area.

Terrain & Soils

With a few notable exceptions, the combination of terrain and soils within the study area is well-suited to the development of a recreational trail system. Well-draining pumice soil on flatter sideslopes can sustain non-motorized use well, particularly in the wetter climate present in the area. Many of the flatter "bench" areas along the northwest and far easter portion of the site fit this category, and promote the use of low-impact, inexpensive trail construction techniques. Soils along sideslopes are typically rocky and also drain well.

Extension of Lewis River Trail

Approximately 1.5 miles southeast of the project site is the southern terminus of USFS Lewis River Trail #31. The Lewis River Trail is a popular non-motorized multi-use trail that parallels the river through a portion of the GPNF. The southern trailhead at Curly Creek Falls on FS Road 9039 is a frequent starting point for many trail users, particularly those who travel from the Portland-Vancouver metropolitan area.

The Eagle Cliff site can facilitate the extension of the Lewis River Trail west from the Curly Creek Falls trailhead. Discussions with the USFS have indicated their willingness to investigate extending the trail to the eastern edge of the subject property. The lengthening of the trail would serve to disperse trail users along a greater distance and would decrease travel times for the majority of people coming from the Interstate 5 corridor in southwest Washington.

Existing Trailhead

The Eagle Cliff parking lot across the river from the site could provide parking for future users of the Eagle Cliff trail. The parking lot is scheduled for upgrades, including improved surfacing and a restroom, which will further enhance the experience for future users of the Eagle Cliff trail at no additional cost to this project.

Existing trailhead across from Eagle Cliff.

Abandoned Roadbeds

Typically, existing roadbeds do not make good trails because roads are created for natural resource extraction and trails are for outdoor recreation. At the Eagle Cliff site, however, several abandoned logging roadbeds are in good condition and generally follow a sustainable alignment; with some modifications, they could be used as recreation trails. The benefit of this is two-fold: first, developing a trail on an existing roadbed reduces impacts to the landscape by utilizing a disturbed corridor; and second, the cost of new trail construction is reduced.

A game track along an abandoned logging road shows the potential for trail development.

Increased Recreation Options

People desire new and stimulating outdoor recreation opportunities, and the subject site has much to offer. The surroundings are scenic and secluded, the views of the river and cliffs are unique, and the ability to extend the popular Lewis River Trail would be an advantage to hikers, equestrians, and mountain bicyclists who seek to increase or vary the duration of their outing. Fishing and wildlife viewing options would also be provided in an area where they are currently limited by difficult access.

Fly fisherman in the Lewis River downstream from Eagle Cliff.

Public Lands

The adjacent Gifford Pinchot National Forest and the DNR lands that are part of the study area are public lands that offer options for trail routing. Use of these lands is more likely compared to private lands, and make it possible to extend the trail from the Eagle Cliff parking lot to the Lewis River Trail.

IV. Trail Alignment Options

Alignments

The goal of the trail alignment evaluation process is to develop a non-motorized trail route that:

- Minimizes environmental and property impacts;
- Utilizes PacifiCorp property;
- Is cost-effective to construct and maintain; and
- Provides a safe and enjoyable user experience.

Options were developed for consideration that were likely to achieve these ends based on experience with similar projects, research of existing site data, field observations, and interviews with PacifiCorp staff and the staff of relevant public agencies.

This report identifies three alignment options to provide non-motorized trail access through the Eagle Cliff site. For the majority of the trail length, the three alignments are the same, differing only in one important aspect: the solution to passing the Eagle Cliff escarpment as it plunges into the Lewis River. The limiting of options for most of the trail alignment is because the property boundaries and topography created few reasonable alternatives for the development of a sustainable, enjoyable, cost-effective trail design. In particular, the use of adjacent private property was determined to be difficult to access because of steep slopes and because of the likelihood that procuring the land or access for such an alignment would be cost-prohibitive.

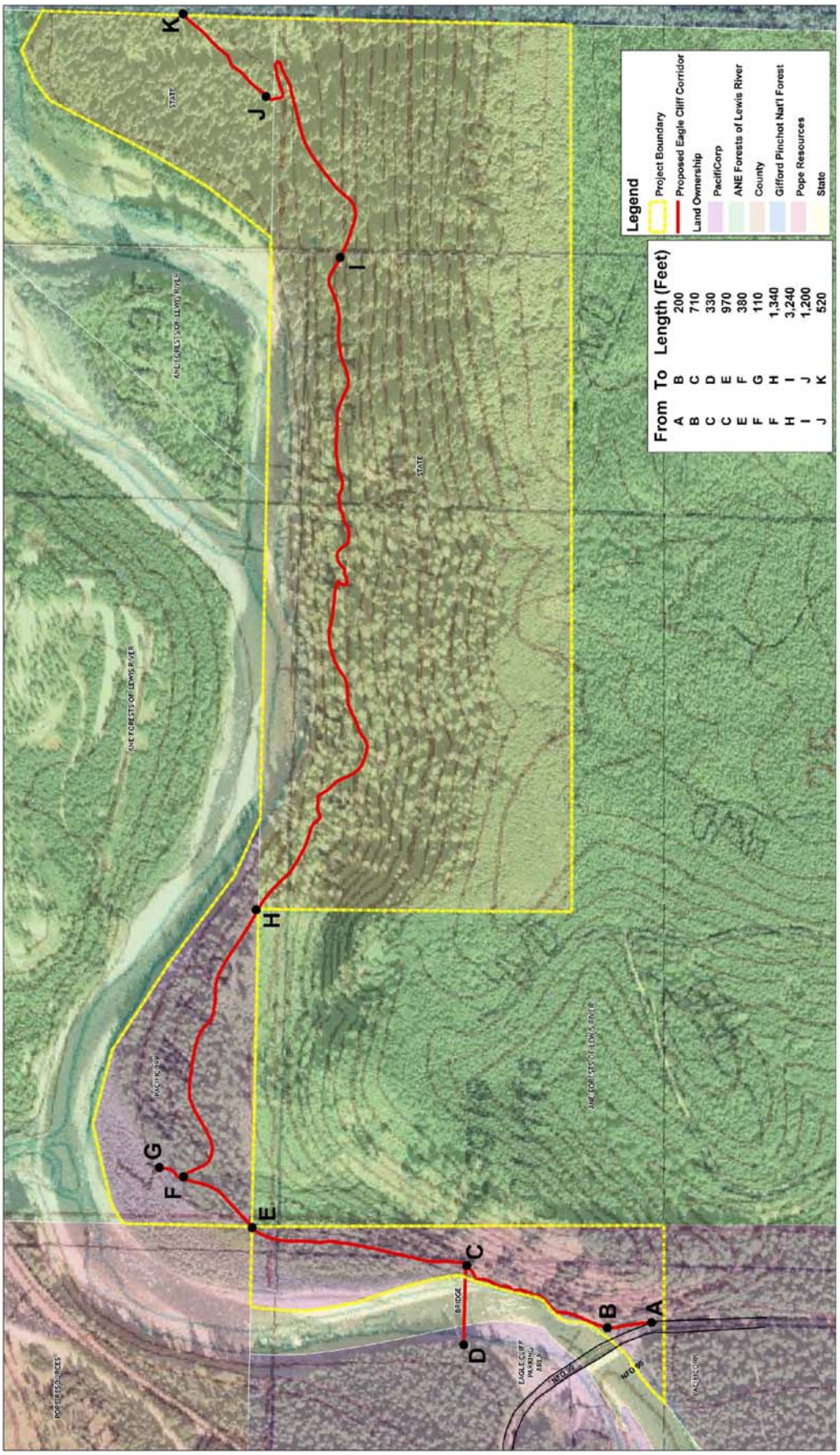


Figure 1 - Proposed Trail Locations

Skamania County, WA
Draft Eagle Cliff Trail Feasibility Study Report
Source: PacifiCorp, Skamania County, Alta Planning + Design
Date: February, 2009

Use of Adjacent Private Lands

As mentioned earlier, it is not physically possible to develop a trail alignment from the west end of the project area to the east end without utilizing at least a small portion of adjacent private land. This constraint is identified as Point E on the attached Figure 1 – Proposed Trail Locations exhibit (Appendix A). The physical impact of the trail is minimal and will likely manifest itself with the need for a 20-foot wide trail easement in the vicinity of the property corner.

Several severe constraints resulted in the immediate dismissal of potential alignments that utilized private property to the south and east owned by ANE Forests of Lewis River. The rationale for this decision was as follows:

A logical constraint to the potential use of adjacent private property with any trail development is to limit the impact of the trail on private lands, and this is typically done by keeping the trail as close as possible to the property boundaries. This must be tempered by the need to adhere to sustainable trail design guidelines and to make the trail appropriate for the intended users. In the case of the ANE property, it would extremely difficult, to the point of near-impossibility, to build a cost-effective trail that would meet these requirements.

The topography between the ANE property to the southwest of the Eagle Cliff site is extremely steep, with several cliff faces. Any trail development close to the boundaries between the two properties between Point A and Point E would be expensive and ultimately result in a steep trail that climbs and descends significantly over a short distance. This trail would be marginally sustainable and poorly suited for the intended users.

Looking south from the Eagle Cliff site onto property owned by ANE Forests of Lewis River.

An alignment that would be both sustainable and enjoyable for users would be one that more gently followed the contours of the landscape from the southwest corner of the ANE property (in the vicinity of Point A) to the eastern boundary of the National Forest. There are three primary problems with this alignment: first, the use of Eagle Cliff site is completely unnecessary; second, it is highly unlikely that the private property owner would permit a recreational trail that nearly bisects their parcel; and third, this alignment does not provide access to the river, which is desirable to a number of users. This combination of factors conspired to preclude the reasonable likelihood that the trail could utilize an alignment other than what is proposed in this document.

Section Descriptions

The alignment options were segmented to allow better understanding and manipulation of potential development scenarios.

Section A – B

Length: 200 feet

Description: Rocky talus slope from north edge of FR Road 90 to the base of Eagle Cliff. To make a level trail tread area, rock material will be removed from the upper part of the excavated trail and placed on the lower portion. Smaller material will then be filled into the tread; this is a common trailbuilding technique on talus slopes.

Section A - B looking north (upstream).

Section B – C

Length: 710 feet

Description: Base of Eagle Cliff along east bank of Lewis River. The steep river bank means that the trail will either have to be blasted from the cliff face or a metal walkway structure attached to it.

Section B – C: (above) looking at the base of Eagle Cliff from the west bank of the Lewis River and (below) looking north at the vertical cliff face.

Section C – D

Length: 330 feet

Description: Bridge crossing alignment across Lewis River in lieu of traversing the face of Eagle Cliff. The span will start just north of the Eagle Cliff parking lot on the west bank and terminate on the east bank where the cliff departs from the river's edge. If this option is utilized, then Sections A – B and C – D will not be necessary.

Section C – D: (above) proposed bridge termination on the west side of Lewis River just north of the Eagle Cliff parking lot and (below) approximate bridge termination location on the east side where the cliff departs from the river's edge.

Section C – E

Length: 970 feet

Description: Flat, mostly open tract set slightly above the river level. Well-draining pumice soils indicate that trail construction efforts in this area will be minimal. The trail will cross private property in the vicinity of Point E.

Section C - E

Section E – F

Length: 380 feet

Description: Mostly flat bench area on shelf of land. The trail will curve around a small depression in the center of this area.

Section E - F.

Section F – G

Length: 110 feet

Description: Southern bank of the Lewis River. A short connector will afford access from the main trail to the beach. Where the trail heads down the bank it will need to be rock armored to guard against erosion.

Section F - G.

Section F – H

Length: 1,340 feet

Description: Shelf of land that gradually slopes upwards to the east, with remnants of old logging roads. The trail will curve around a small depression in the center of this area, climb another "step", and then head towards the property corner of Point F. The final pitch of this portion of trail will need to be rock armored to guard against erosion.

Section F - H.

Section H - I

Length: 3,240 feet

Description: Land consists of moderate-to-steep sideslopes heading downhill toward the river. An abandoned logging roadbed will form the basis of the trail system in this area, although the trail will occasionally leave the roadbed when it is too steep. Two small drainage crossings may need to be armored.

Section H - I.

Section I - J

Length: 1,200 feet

Description: Steeply sloping terrain quickly transitions to flatter area on shelf, with additional abandoned logging roads. The trail leaves the previous roadbed, traverses a sideslope, and then wraps back around onto a roadbed to drop to a lower shelf.

Section I - J.

Section J - K

Length: 520 feet

Description: Flat terrain with well-draining, pumice soils. Trail traverses an abandoned utility corridor before terminating at the east end of the project boundary.

Section J - K.

Alignment Options

Alignment options were created by assembling the above-noted sections into three different combinations that resulted in a continuous trail from the southwest corner of the project site to its eastern boundary. The titles given the options are based upon their method of providing passage past the Eagle Cliff precipice, as this is the defining characteristic of each alignment.

Cost Opinion

The approximate construction cost of each alignment was evaluated, based upon Alta Planning + Design's experience on similar project; this information was then confirmed in interviews with other professional trailbuilders. The total and per foot costs for each option are noted below, with details provided in Appendix B. It is important to note that the actual length of a constructed trail is typically 20 percent greater than the designed length, due to the turns and undulations of a trail tread on the landscape.

The costs noted in this report include construction permits (e.g., structural, blasting) but do not include environmental permitting costs, which are addressed separately in the final section of this report.

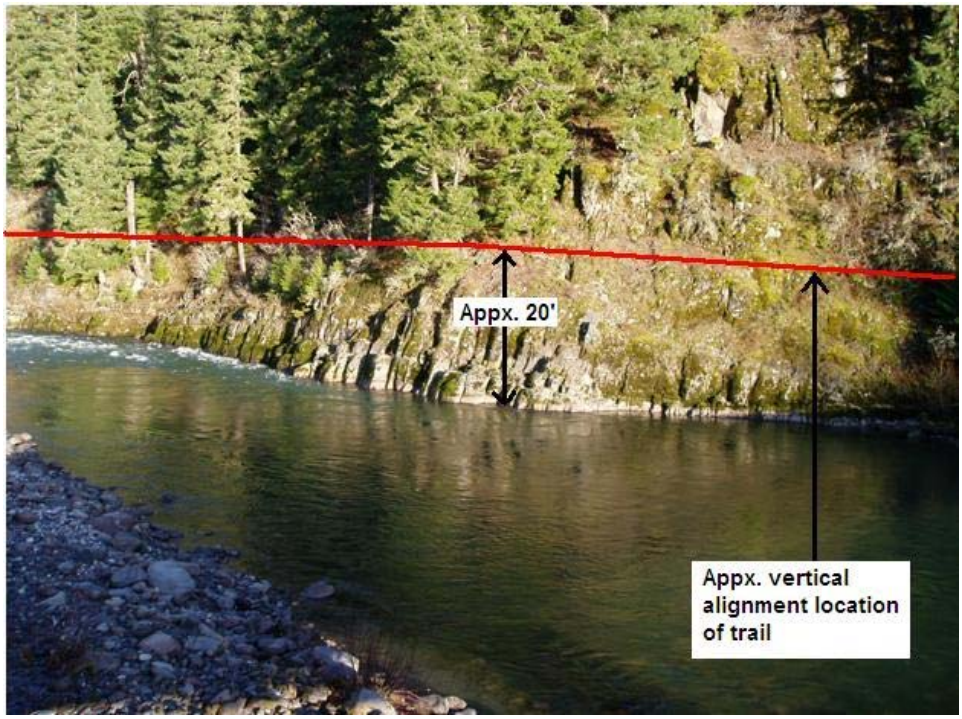
Option #1 – Cantilevered Structure

An engineered cantilevered structure could be constructed around the base of Eagle Cliff to provide access along Section B – C. With a metal frame, decking, and railing, the structure would be relatively durable and withstand snow, wind, sun, and rain. Future rockfall could damage the structure, particularly the railing, and require periodic repairs.

The structure will be placed approximately 20 feet above the water, and will be cantilevered over the water for approximately 200 feet around the base of the cliff. The remainder of the section will be cantilevered over a rock shelf that is too rugged for normal passage by the average trail user.

The cantilevered structure will be physically attached to the rock with a combination of mechanical fasteners. Anchor bolts, drilled into the basalt face and then secured with an adhesive material designed for such a purpose, will support brackets on the structure. In addition, holes drilled into the rock face can be made large enough to accept support struts, which will also be secured with an adhesive material. The details of the attachment mechanisms will be determined by an engineer during the design phase.

Examples of a cantilevered trail structure. (Image courtesy of Trail Dynamics)



The cantilevered structure would be located approximately 20 feet above the waterline.

This solution provides a high degree of safety for bicyclists and pedestrians. Equestrians with "skittish" horses, however, may find it difficult to convince their horse to enter a structure with railings, as the animal may balk at feeling "caged" on the trail. The structure will also need to be engineered to accommodate the weight and considerable pressure exerted by horses.

The structure would significantly impact the landscape along the scenic Eagle Cliff, and be visually dominant to people across the river in the Eagle Cliff parking lot and on the NF Road 90 bridge crossing the Lewis River. The importance of this flaw should not be minimized, as Eagle Cliff is an important scenic resource.

Approximate costs for Option #1

Entire trail:	$135,000
Per linear foot:	$15.50

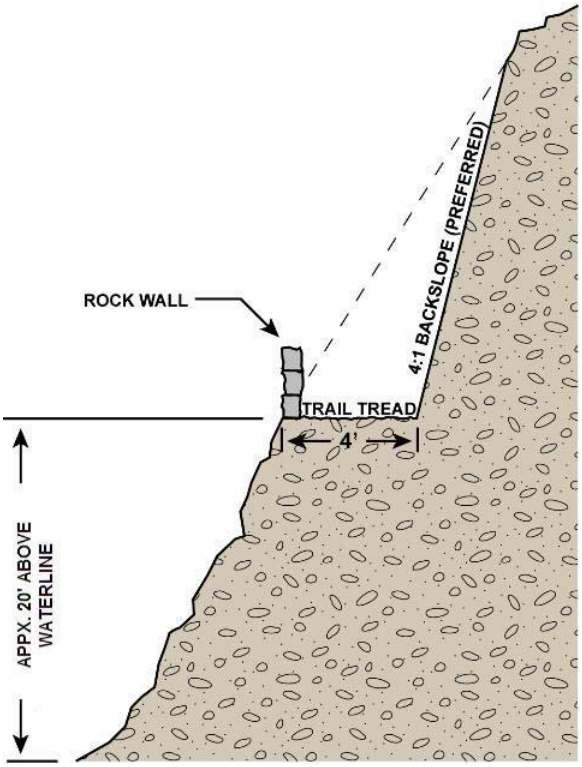
Option #2 – Blasted Bench/Cantilevered Structure

Instead of providing an engineered cantilevered structure along the entire length of Section B – C, a structure would only be used for the northern portion of the section, with the trail tread being blasted from the base of Eagle Cliff where it is exposed to view. The trail tread would be augmented with a short stone wall at the outside edge to decrease the perception of exposure on the part of users.

Example of a trail bench blasted from a basalt cliff near Bonneville Dam in Oregon.

The primary benefit of this option is that the tread of a cantilevered structure will be susceptible to damage by rockfall, whereas a blasted bench is more durable and unlikely to sustain damage. If the retaining wall is damaged, it can be fixed with native materials, site-mixed mortar, and hand masonry tools, as opposed to requiring off-site fabrication, importation of materials, and welding equipment.

The visual impact of the cut in the cliff will be obvious, particularly in the years immediately after construction. The blasting will require the removal of several large trees in order to create the backslope, which will degrade the natural beauty of the area. Over time, perhaps several decades, moss and other vegetation will regrow along the backslope area and along the face of the wall and soften the visual impact of the trail. This will not happen with the cantilevered structure, which will always draw the eye with its angles, uniformity, and relief from the base of the cliff.



Typical cross-section of blasted bench alignment for Eagle Cliff.

For cost-efficiency purposes the cantilevered structure can still be employed on the northern half of Section B – C, where the likelihood of damage is lower due to reduced rockfall and where it is more obscured by vegetation.

Less-experienced mountain bicyclists and hikers will gain a margin of safety from the rock wall. Fortunately, the most challenging portion of the entire trail is at the beginning; in fact, users will be able to see it when they step out of their cars at the parking lot, allowing them to make an immediate decision about whether to use it. This is in

contrast to a scenario where a difficult section occurs several miles in, where users are forced to attempt a passage or be required to backtrack the last several hours of effort.

Equestrians with less-experienced horses will continue to have problems with this section, as the cantilevered structure will be present in places. Equestrians who do not have confidence in their horses may also feel a bit exposed while on the blasted bench, as they sit quite high above the trail tread and look down into the river. This is mostly psychological, as the exposure present on this trail is no greater than that on backcountry trails throughout western North America, including many in the nearby Columbia River Gorge. The section is also short enough that the passing abreast of two horses will be extremely infrequent. Two small "turnout" sections on either side of the blasted bench section will facilitate the safe resolution of any encounters.

Most, if not all, of the rock blasted from the wall to create the bench will end up in the river, as it is not possible to catch or retrieve the significant amount of material removed by explosive charges. Because the bench will be created adjacent to the river and material will fall into the river, permits from local, state, and federal agencies will be required.

PacifiCorp staff indicated to PBS Engineering & Environmental that Bull Trout overwinter in the Swift Reservoir from October to March, so rock that would fall into the water during this time would not affect the fish. Bull Trout habitat is unlikely to be adversely affected by the material falling into the river. This material will be of similar composition to the existing rock in the river and should be relatively coarse in size. In addition, under normal conditions, the material will be widely distributed by high wintertime flows.

Approximate costs for Option #2

Entire trail:	$193,000
Per linear foot:	$22.30

Option #3 – Bridge

The third option is to avoid the face of Eagle Cliff altogether and instead install a bridge over the Lewis River, connecting just north of the parking lot to just north of the cliff. The primary benefit of this option is that it would obviate the need for a difficult and potentially unsightly trail across Eagle Cliff.

All trail users are familiar with bridges. As mentioned previously, some horses may be uncomfortable with being confined by the railings on a bridge, thus potentially eliminating a portion of this user group from the trail.

To avoid impacts to Lewis River the bridge would have to be a free-span structure, with no intermediary supports placed in the river channel. It would also need to be placed outside the flood zone on both sides of the river, resulting in a span distance of over 300 feet. The combination of these factors makes this option a costly proposition, with a per-foot average more than double what is typically considered to be high-cost trail construction. Bridges are also susceptible to catastrophic floods, and they are more expensive to repair when damage does occur.

Suspension bridge connecting parking area to trail across Eagle Creek, Oregon.

Approximate costs for Option #3

Entire trail:	$556,000
Per linear foot:	$56.24

Evaluation of Alignments

The various alignment options were evaluated for their relative suitability to the project, based upon the criteria described below. The alignments were graded as positive ("+"), neutral ("0"), or negative ("-"), and then placed into a matrix for quick comparison. The grading of the options was based upon the professional experience of Alta Planning + Design and PBS Engineering & Environmental on similar projects, and on consultation with other trailbuilding and natural resource specialists for this specific project.

Evaluation Criteria

The evaluation criteria were as follows:

Minimizes Negative Impacts to Bull Trout Habitat – Construction or use of trail considers adjacent Bull Trout habitat and minimizes potential negative impacts.

Minimizes Negative Impacts to Natural Resources – Construction or use of trail considers potential negative impacts such as erosion, sedimentation, and impacts to wildlife, and attempts to minimize them.

Minimizes Permitting Efforts –Construction required to develop trail is likely to avoid complicated or expensive permitting requirements.

Minimizes Construction Costs – Labor and materials to construct the trail are cost-effective without compromising a quality trail experience.

Ease of Maintenance – Once constructed, the trail will require minimum maintenance to keep it operational for hikers, equestrians, and mountain bicyclists.

Sustainability – Once constructed, the trail will meet accepted guidelines for facility development that minimizes soil erosion, degradation of water quality, disturbance to wildlife, propagation of invasive species, and off-trail travel.

Minimizes Negative Impacts to Adjacent Lands – Alignment reduces, to the extent possible, the use of adjacent private lands; where trail is on or near private lands, its design discourages trespassing.

Quality of User Experience – Meets the expectations of the typical backcountry hiker, equestrian, and mountain bicyclist for trail length, difficulty, tread quality, immersion in natural environment, and seclusion.

Access to River – Trail provides opportunities to access the Lewis River with minimal effort.

Minimizes Negative Visual Impacts – Trail blends into the landscape and is not visually obtrusive when viewed at a distance from adjacent lands.

Evaluation Matrix

Eagle Cliff Trail Alignment Evaluation Matrix											
Alignment Option	Alignment Description	Minimizes Neg Impacts to Bull Trout Habitat	Minimizes Neg Impacts to Natural Resources	Minimizes Permitting Efforts	Minimizes Construction Costs	Ease of Maintenance	Sustainability	Minimizes Neg Impacts to Adjacent Lands	Quality of User Experience	Access to River	Minimizes Negative Visual Impacts
1	Cantilevered Structure	+	o	-	o	-	+	+	-	+	-
2	Blasted Bench/Cantilevered Structure	o	o	-	-	o	+	+	o	+	-
3	Bridge	+	o	-	-	-	+	+	o	+	-

V. Recommendations

Preferred Trail Alignment

Upon review of the costs and benefits it is recommended that Option #1 be the preferred alignment. Use of the cantilevered structure to gain passage around Eagle Cliff is relatively cost-effective, carries an acceptable maintenance burden, can be enjoyed by a majority of trail users, and does not unduly impact local habitat.

Natural Resource Impacts of Preferred Alignment

PBS Engineering & Environmental investigated the potential impacts to the surrounding natural resources created by the construction and use of the preferred alignment option.

Bull Trout

In general, there were no impacts associated with the use of the trail that would have a negative impact on Bull Trout. This is primarily because the trail would be, for the most part, located considerably inland from the Lewis River. Once constructed, it would be stable and not contribute to sedimentation of adjacent waterways.

Swift reservoir contains an adfluvial population of Bull Trout that spawn in North Fork Lewis River tributaries upstream of Swift reservoir. Bull Trout are known to stage in the area during pre- and post-spawning migrations from May through October. Based on screw trap data collected in 2002, juvenile emigration from the upper basin typically occurs from April through June.

Although Bull Trout are present in this area during certain times, no spawning occurs in the area based on measured water temperatures in the area during expected spawn time (August and September). Water temperatures in the area average greater than 10 degrees Celsius during this time. Bull Trout require very cold water temperatures in the range of 4 to 8 degrees Celsius to be successful.

The cantilevered trail section is not expected to affect in any way Bull Trout residing in the Eagle Cliff pool or have any adverse effects on migrating adult and juvenile Bull Trout through the project area. The reasons for this assertion are:

1. Once completed, the cantilevered section of the trail will be approximately 20 feet above the water surface elevation of the river. This separation will limit interaction between trail users and Bull Trout.
2. The slope of the cliff below the trail section and the west-facing aspect of the cliff wall will eliminate any shadows that may be cast from the cantilevered section onto the water.
3. The cantilevered section will be posted as "No Fishing" to protect Bull Trout from incidental or targeting ("poaching") capture by anglers.

The work window is November 1 through February 28 to avoid the presence of Bull Trout in the project area. On-site work that will impact the waterway is not expected to exceed six weeks; otherwise, the construction will adhere to standard trailbuilding practices, which will result in only minor excavation of soil, all of which will occur at least several hundred feet from the river. The take of Bull Trout is not expected because all work will be done out of the water and all construction debris that may accumulate will be captured and prevented from entering the North Fork Lewis River. Furthermore, the probability of Bull Trout being present in the area at the time the work will take place is not probable.

A related issue is the illegal capture or targeting ("poaching") of Bull Trout in the vicinity of the project, and how such practices might be accelerated by the access provided by the trail. In interviews with land and game management staff from the USFS, PacifiCorp, and the WDFW it was discussed that poachers prefer road access to their fishing spots so that they can hear or see the vehicles of approaching game enforcement officials. As part of the FERC relicensing effort PacifiCorp is funding a game enforcement officer position and this action will help to mitigate any poaching that might occur as a result of the new trail.

Bald Eagle

There is a Bald Eagle winter roost activity in the project area. Neither the construction or use of the trail is likely to have negative impacts upon the winter roosting habits of Bald Eagles, as the birds use the roost only in the winter after sunset and before sunrise. While construction may occur during late fall it is extremely unlikely to take place at night due to the remote nature of the site and lack of accessible power for lights. Trail use is also extremely unlikely to occur at night in the winter, as the area is quite cold, dark, and typically covered in snow. Specific seasonal construction restrictions relating to noise generation are discussed below.

Northern Spotted Owl

Northern Spotted Owl habitat is assumed to be present on or near the property. Construction activities that have the potential to disturb the birds (e.g., blasting, use of mechanized/motorized equipment) should be limited. Specific seasonal construction restrictions are discussed below.

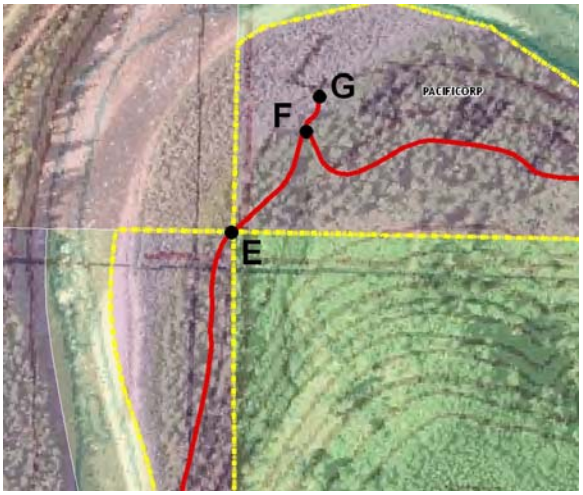
Implementation

Private Property Impacts

All alignments have private property impacts; they cannot be avoided based upon the configuration of the properties and the desired starting and ending points of the trail. An access agreement will need to be obtained, or the necessary land otherwise purchased, to locate a permanent recreation trail across one or both of the private properties surrounding Point E. A portion of land at least 20 feet wide will be needed for the trail alignment and to provide construction and maintenance access. Because this situation is unique, previous easement or property purchases cannot be used to perform a comparable evaluation. These costs are therefore not included in the estimated cost to develop the trail.

Public Property Easements

The placement of the trail across state property managed by the DNR will require that an easement be obtained to assure perpetual public access. Whether the easement will have to be purchased, and if so, at what cost, is unknown. This information is therefore not included in the estimated cost to develop the trail.



The proposed trail will cross private property at Point E.

Timing

The project is proposed to be completed in 2012, based upon the draft schedule provided in Appendix D. If the construction of the Eagle Cliff trail occurs prior to the extension of the Lewis River Trail, then signage should be placed at the trailhead to alert users that the trail is an out-and-back route that terminates after two miles. Signage should also be placed at the end of the trail indicating that in the future the trail may connect through National Forestlands to the Lewis River Trail. Providing this information will help set user expectations of the experience and also provide information about the potential future extension of the trail.

Design Considerations

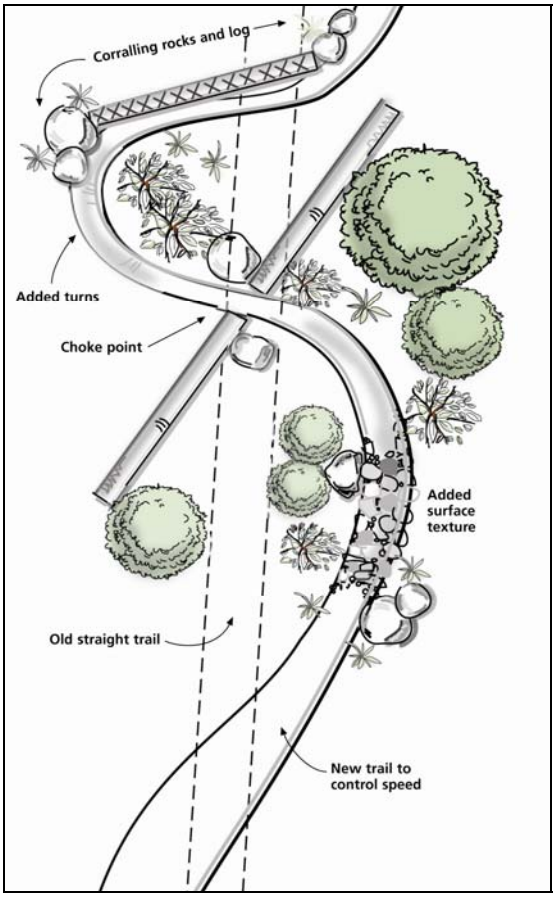
The alignments presented in this report will need to be refined in the field to create a sustainable, enjoyable non-motorized trail. The trail must adhere to the most-demanding design standards required of the various users. The trail tread and any structures should be designed and constructed to withstand the forces exerted by horses, and the corridor should be similarly cleared for their height and width.

The specific alignment of the trail tread should be built to accommodate mountain bicyclists, as they will be able to obtain speeds greater than a hiker or horse. Information for trail design and

construction can be obtained from *Trail Solutions: IMBA's Guide to Building Sweet Singletrack* and *Managing Mountain Biking: IMBA's Guide to Providing Great Riding*, both published by the International Mountain Bicycling Association (IMBA).

Trail sections that use existing abandoned roadbeds should not follow a straight line through the existing corridor, as this alignment would not have the natural, organic feel that is intrinsic to backcountry trails. Instead, the trail should meander along the roadbed, utilizing trees, rocks, and logs to provide minor changes in direction. In some cases where the roadbed steepens to an unsustainable grade the trail will have to briefly leave and then rejoin the road corridor.

A professional engineer should be utilized to design the cantilevered structure and to estimate the quantity of material to be removed during blasting; these activities will likely required a more detailed topographic survey of this area. This information will be useful for both the construction bid documents and for submitting the necessary permits (discussed in detail below).



Retrofitting a trail onto an abandoned roadbed requires creative techniques to make it more enjoyable to non-motorized users. (Image courtesy of IMBA)

Construction

Prior to construction, and preferably prior to the release of bid documents, the trail corridor identified in this report should be located in the field, using a combination of ribbon flagging, stakes, pin flags, and paint. The contractor will be expected to construct the trail within the identified corridor, which can be assumed to be approximately 50 feet wide, property boundary constraints notwithstanding.

The flatter areas that comprise a portion of the trail alignment do not need to be benchcut into the hillside as is typically required for sustainable trails, because these locations contain well-draining pumice-based soil. Conversely, where topography and/or property constraints preclude other options and the trail has to be routed up and down steep terrain, it will need to armored with rock to resist user-created erosion of the tread.

For the construction of the trail it is recommended that PacifiCorp hire a professional trailbuilder with experience in developing multi-use non-motorized trails on public land. Use of a contractor who is a member of the Professional Trailbuilders Association (PTBA) is strongly recommended, as these contractors are more likely to understand the specific needs, materials, and techniques associated with trailbuilding. The use of contractors primarily experienced in road construction is not recommended as these firms and individuals are not versed in the needs of trail users.

The contractor selected to blast the bench into Eagle Cliff will need to be licensed for such activities in the State of Washington, and any bid documents for the project should make this clear. It may also be possible to combine the construction of the Eagle Cliff trail with the effort necessary to extend the Lewis River Trail, thereby reducing the overall cost through efficiencies gained by reduced bidding, mobilization, etc.

A separate trailbuilding project manager should be retained to oversee the selected contractor. This is to protect PacifiCorp's interests if the organization does not have someone experienced in the area of trailbuilding, which is a specialty field. The trailbuilding project manager will review contractor bids and qualifications, coordinate on-site activities, and provide quality control to ensure that the work meets expectations.

A trail marking system should be established once the trail is installed. The signage system should be coordinated with that for the Lewis River Trail to provide continuity for users. It is recommended that painted or plastic blazes be placed on trees at eye level and at intervisible locations, particularly in the flatter areas where leaf litter may partially obscure the trail tread during the fall.

To reduce impacts to Bald Eagles and Northern Spotted Owls, the following restrictions should be placed on the use of construction methods that create significant noise levels, such as the use of mechanized/motorized equipment, blasting, and the driving of piles. It is assumed that the use of hand tools to construct the trail will not be subject to restrictions.

Eagle Cliff Trail Noise-Producing Construction Restrictions

Species	Restricted Dates	Notes
Bald Eagle	Nov. 15 - March 15	If construction extends past November 14, then do daily restrictions from 2 hours after official sunrise to 2 hours before official sunset
Northern Spotted Owl	March 1 - June 30	

Permitting

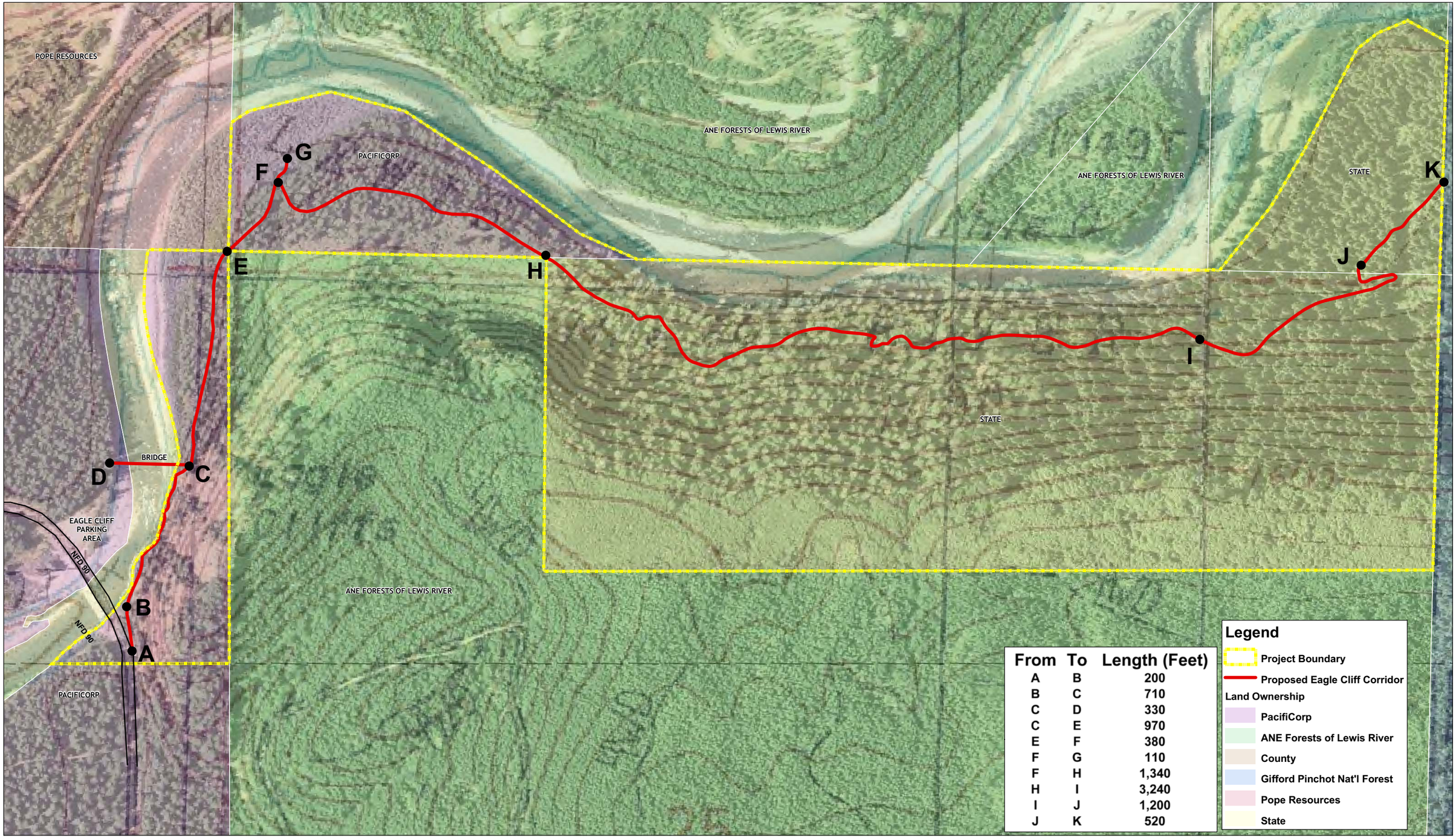
Permits from local, state, and federal agencies will be required. Skamania County will require a critical areas permit, shoreline permit, and SEPA Checklist. The WDFW will require a Hydraulic Project Approval for the nearshore work and deposition of material in the river from the blasted bench section. Likewise, the USACE will require a permit for the material deposited in the river.

A biological assessment will be required to address potential impacts to listed species in the area. Also, Skamania County may require a wildlife management plan to address impacts to critical areas, which will depend on comments received from WDFW. Other supporting documents, such as a wetland delineation report, will likely not be required. The cost to submit the permit applications, SEPA Checklist, and to have a consultant assist with the request is estimated to be $15,000, exclusive of permit fees charged by the regulatory agencies. The cost to prepare a biological assessment is estimated to be $10,000.

It is recommended that the permits be obtained by a permitting specialist, and not by a trailbuilding contractor, as the areas of expertise required are sufficiently different. Other permits associated with

construction (e.g., structural, blasting) are included in the construction costs estimates for the alignment.

Appendix A – Proposed Trail Locations



From	To	Length (Feet)
A	B	200
B	C	710
C	D	330
C	E	970
E	F	380
F	G	110
F	H	1,340
H	I	3,240
I	J	1,200
J	K	520

Legend

- Project Boundary
- Proposed Eagle Cliff Corridor

Land Ownership

- PacifiCorp
- ANE Forests of Lewis River
- County
- Gifford Pinchot Nat'l Forest
- Pope Resources
- State

Figure 1 - Proposed Trail Locations

Skamania County, WA
Draft Eagle Cliff Trail Feasibility Study Report
Source: Pacificorp, Skamania County, Alta Planning + Design
Author: KAV
Date: February, 2009

0 200 400 Feet

alta PLANNING + DESIGN

PACIFICORP

Appendix B – Cost Opinion

Eagle Cliff Trail Alignment Cost Estimate
Option #1 (Cantilevered Structure)

Section	Alignment Description	Facility Type	Map Length (LF)	Trail Length (LF)*	Appx Width (LF)	Unit	Cost/Unit	Feature Cost	Cost
A - B	NFD 90 to south end of Eagle Cliff	Singletrack trail	200	240	5.0	LF	$ 20.00		$ 4,800
B - C	Face of Eagle Cliff	Cantilevered structure	710	781	4.0	LF	$ 100.00		$ 78,100
C - E	North end of Eagle Cliff to property corner	Singletrack trail							$ 3,192
	Singletrack trail		930	1,116	2.0	LF	$ 2.00	$ 2,232	
	Armoring near property corner		40	48	2.0	LF	$ 20.00	$ 960	
E - H	Property corner to west end of state property	Singletrack trail with armored section							$ 5,232
	Singletrack trail		1,680	2,016	2.0	LF	$ 2.00	$ 4,032	
	Armoring near property corner		50	60	2.0	LF	$ 20.00	$ 1,200	
F - G	Connector to beach on Lewis River	Singletrack trail	110	132	2.0	LF	$ 10.00		$ 1,320
H - I	Western three-quarters of state property	Singletrack trail on abandoned road bed	3,240	3,888	2.0	LF	$ 2.00		$ 7,776
I - J	Eastern portion of trail	Singletrack trail	1,200	1,440	2.0	LF	$ 5.00		$ 7,200
J - K	Eastern portion of trail	Singletrack trail	520	624	2.0	LF	$ 5.00		$ 3,120
								Subtotal	*$ 107,620*
								Engineering & Const Admin (5%)	$ 5,381
								Contingency (20%)	$ 21,524
								Option #1 Total	**$ 134,525**

* Constructed trail length is typically 20% greater than designed length.

Eagle Cliff Trail Alignment Cost Estimate
Option #2 (Blasted Bench/Cantilevered Structure)

Section	Alignment Description	Facility Type	Map Length (LF)	Trail Length (LF)*	Appx Width (LF)	Unit	Cost/Unit	Feature Cost	Cost
A - B	NFD 90 to south end of Eagle Cliff	Singletrack trail	200	240	5.0	LF	$ 20.00		$ 4,800
B - C	Face of Eagle Cliff	Blasted bench with cantilevered structure				LF			$ 122,100
	Blasted bench		400	440	4.0	LF	$ 200.00	$ 88,000	
	Cantilevered structure		310	341	4.0	LF	$ 100.00	$ 34,100	
C - E	North end of Eagle Cliff to property corner	Singletrack trail							$ 3,192
	Singletrack trail		930	1,116	2.0	LF	$ 2.00	$ 2,232	
	Armoring near property corner		40	48	2.0	LF	$ 20.00	$ 960	
E - H	Property corner to west end of state property	Singletrack trail with armored section							$ 5,232
	Singletrack trail		1,680	2,016	2.0	LF	$ 2.00	$ 4,032	
	Armoring near property corner		50	60	2.0	LF	$ 20.00	$ 1,200	
F - G	Connector to beach on Lewis River	Singletrack trail	110	132	2.0	LF	$ 10.00		$ 1,320
H - I	Western three-quarters of state property	Singletrack trail on abandoned road bed	3,240	3,888	2.0	LF	$ 2.00		$ 7,776
I - J	Eastern portion of trail	Singletrack trail	1,200	1,440	2.0	LF	$ 5.00		$ 7,200
J - K	Eastern portion of trail	Singletrack trail	520	624	2.0	LF	$ 5.00		$ 3,120
								Subtotal	*$ 154,740*
								Engineering & Const Admin (5%)	$ 7,737
								Contingency (20%)	$ 30,948
								Option #2 Total	**$ 193,425**

* Constructed trail length is typically 20% greater than designed length.

Eagle Cliff Trail Alignment Cost Estimate
Option #3 (Bridge)

Section	Alignment Description	Facility Type	Map Length (LF)	Trail Length (LF)*	Appx Width (LF)	Unit	Cost/Unit	Feature Cost	Cost
A - B	NFD 90 to south end of Eagle Cliff	Singletrack trail	200	240	5.0	LF	$ 20.00		$ 4,800
C - D	Crossing of Lewis River	Bridge	330	330	5.0	SF	$ 250.00		$ 412,500
C - E	North end of Eagle Cliff to property corner	Singletrack trail							$ 3,192
	Singletrack trail		930	1,116	2.0	LF	$ 2.00	$ 2,232	
	Armoring near property corner		40	48	2.0	LF	$ 20.00	$ 960	
E - H	Property corner to west end of state property	Singletrack trail with armored section							$ 5,232
	Singletrack trail		1,680	2,016	2.0	LF	$ 2.00	$ 4,032	
	Armoring near property corner		50	60	2.0	LF	$ 20.00	$ 1,200	
F - G	Connector to beach on Lewis River	Singletrack trail	110	132	2.0	LF	$ 10.00		$ 1,320
H - I	Western three-quarters of state property	Singletrack trail on abandoned road bed	3,240	3,888	2.0	LF	$ 2.00		$ 7,776
I - J	Eastern portion of trail	Singletrack trail	1,200	1,440	2.0	LF	$ 5.00		$ 7,200
J - K	Eastern portion of trail	Singletrack trail	520	624	2.0	LF	$ 5.00		$ 3,120
								Subtotal	*$ 445,140*
								Engineering & Const Admin (5%)	$ 22,257
								Contingency (20%)	$ 89,028
								Option #3 Total	**$ 556,425**

* Constructed trail length is typically 20% greater than designed length.

Appendix C – Communication Record: PBS-PacifiCorp

PBS | Engineering + Environmental

COMMUNICATION RECORD

Project Number: 75095.000	Project Name: ☒ Current Project ☐ Prospect ☐ Past Project ☐ Meeting ☐ Admin. ☐ Marketing	Date: November 18, 2008 Time: 15:30
Contact Name/Title: Erik Lesko		PBS Employee: Skip Haak
Company: Pacificorp		Phone: 503-813-6624 Fax:
☐ Interview ☐ Meeting ☐ Incoming Call ☒ Outgoing Call		

Summary of Information Obtained:

I called Erik to ask him about whether construction of a trail along the face of Eagle Cliff would be a concern to bull trout. I also discussed concerns to other species and potential concerns with poaching and targeted fishing on bull trout. Work along other portions of the trail is much less likely to have an effect on bull trout.

Erik said that from about October to March bull trout overwinter in the reservoir, so construction of the trail along the cliff face could be done with little or no impact on bull trout. Rock that may fall into the water during this time period would not affect bull trout. Sometime in April and May, bull trout arrive at the Eagle Cliff area on their way upstream to spawn. The area near Eagle Cliff is used as a staging area, so fish hold in this area before continuing their migration upstream. Some fish hang around this area all summer.

Erik said a catch-and-release fishery is present in the area of Eagle Cliff. He said some people target bull trout. I mentioned the potential for increased poaching. Erik said Pacificorp has funded an enforcement position to address poaching. He wasn't able to address whether the new trail would increase, decrease, or have no effect on poaching or people targeting bull trout.

Erik did not think the proposed project would raise concerns regarding potential effects on other species.

Although fish may not be adversely affected, a permit is likely from the Corps of Engineers for any rock that falls in the river, which would be considered fill.

Appendix D – Draft Eagle Cliff Trail Development Schedule


Task Name
Eagle Cliff Trail
Conduct a detailed trail routing study for a trail connection between Eagle Cliff Park and the USDA-FS boundary
Study by USFWS for 30-day review of final design and location of the trail
Respond to USFWS comments
Submit to FERC for approval
Obtain FERC Approval
Engineer, design and permit the trail
Obtain construction permits
Construct Eagle Cliff trail
David Moore
6/25
Half 2, 2007
Half 1, 2008
Half 2, 2008
Half 1, 2009
Half 2, 2009
Half 1, 2010
Half 2, 2010
Half 1, 2011
Half 2, 2011
Half 1, 2012
Half 2, 2012
Project: Eagle Cliff Schedule.mpp
Date: Tue 5/19/09
Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline
Page 1

Alta Planning + Design
711 SE Grand Avenue
Portland, OR 97214
www.altaplanning.com