

Yale Lake IP Road Trail

Implementation Plan

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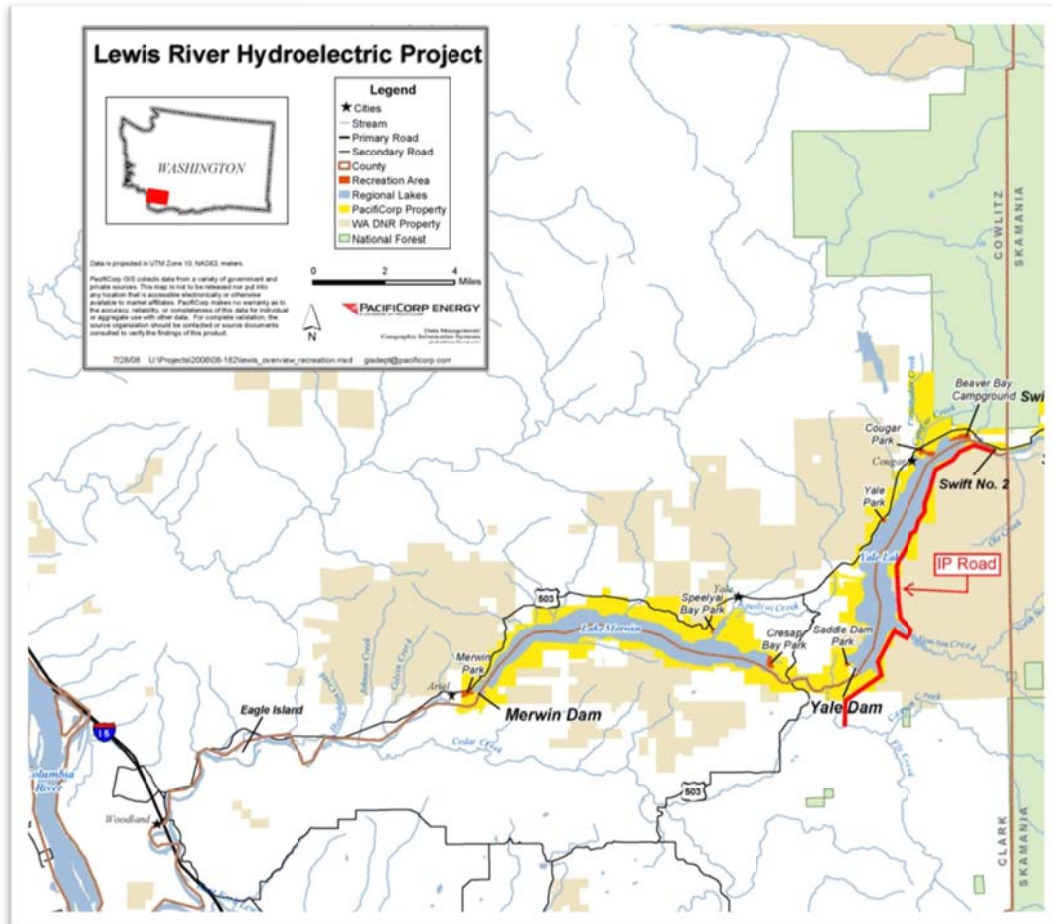
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1. EXECUTIVE SUMMARY

1.1 PROJECT OVERVIEW

The Yale Lake IP Road Trail project is a Federal Energy Regulatory Commission license requirement for the Yale Hydroelectric Project on the Lewis River.

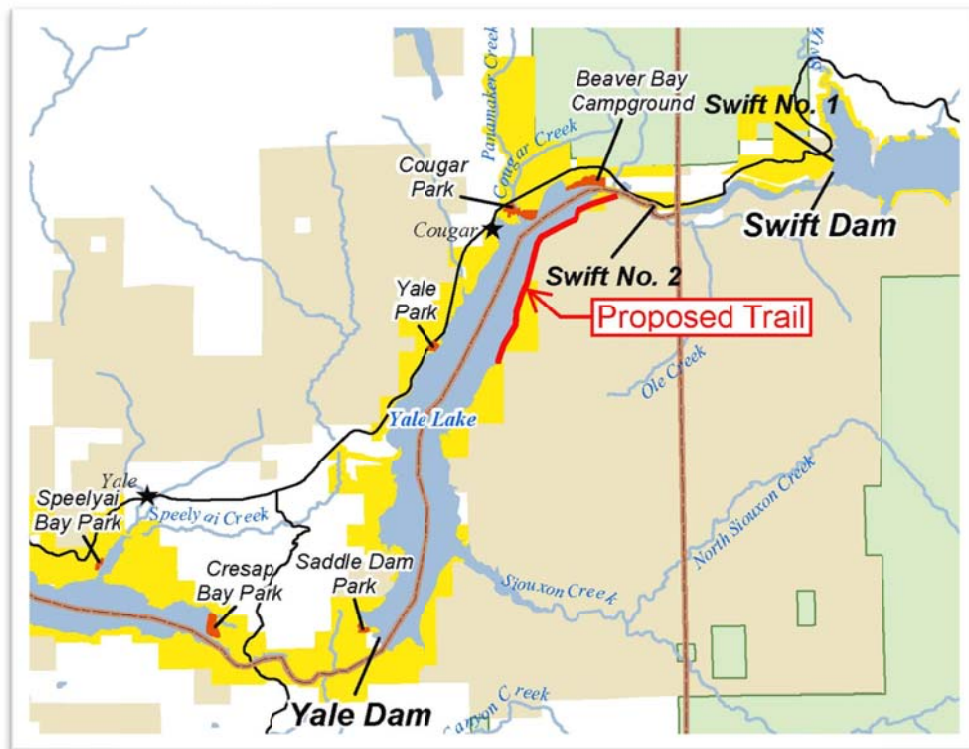
On June 26, 2008, the Federal Energy Regulatory Commission issued a new operating license for PacifiCorp Energy’s Yale Hydroelectric Project (P-2071). Article 406, *Yale/International Paper (IP) Road Trail Plan*, of this license directs PacifiCorp to complete a trail technical assessment for approximately ten miles of former logging road on the eastern shore of Yale Lake, by the fourth anniversary of issuance of the new license (December 26, 2012). Furthermore, on June 28, 2012 PacifiCorp received an order granting an extension of time to submit for Commission approval by March 1, 2013. Much of this road has been closed since 2008 due to illicit activities and unsafe road conditions caused by erosion, landslides, and rock fall hazards.



Prior to the Implementation Plan, a Technical Assessment Report was completed in September 2011 (Appendix A) in order to provide more detailed locations, identification, and assessment of the hazards identified in the preliminary site reconnaissance conducted on September 14, 2011, and to assess if the IP Road can be used in its current condition as a new trail on the eastern side of the

reservoir. This document describes an implementation plan to construct improvements based upon results of the technical assessment. The construction is limited to improvements upon PacifiCorp property and focuses on improvements necessary to provide a usable trail.

The proposed trail is 3.75 miles in length. A trail head will be developed with parking, vault toilet, picnic table and informational kiosk. The trail will allow biking, but will require dismounting at certain stream crossings. Non-motorized access to additional shoreline area is available but due to land owner concerns, the trail is not developed off of PacifiCorp property. The proposed trail alignment is shown in Appendix B.



1.2 ASSESSMENT

The Technical Assessment Report presents the analysis of Yale Lake IP Road in four segments. The Assessment indicates that the road has greatly deteriorated since 2004 due to major storm events which destroyed multiple sections of the road, i.e. road slumps, landslides, rockfall and slope erosion. In addition, adjacent landowners, including Washington Department of Natural Resources and Weyerhaeuser (Appendix D), will not allow PacifiCorp to secure a public access easement for trail improvements across their lands. Segments three and four contain far greater portions of destroyed road and adjacent landowner constraints than segments one and two.

Based on the results of the Technical Assessment Report, the recommended approach is to provide a 3.75 mile trail (7.5 mile round trip). The major components include repairs to areas impacted by landslides and rockfall as well some minor pavement repairs to the existing roadway to provide a minimum of an 8-foot wide paved trail that will accommodate two-way bicycle traffic. Slope erosion

will not be addressed at this time as those are improvements that are not essential to the trail in the short term but may be necessary in the future.

1.3 CONCLUSIONS

PacifiCorp maintains the proposed Yale Lake IP Road Trail is consistent with section 11.2.2.2 of the Lewis River Settlement Agreement which directs PacifiCorp to use best reasonable efforts, at the lowest cost possible, to secure a non-motorized multi-use recreational access on the entire extent of the Yale Lake IP Road. If a continuous trail is not achievable in the near term, the company shall pursue an out-and-back trail. In addition, the proposed trail is consistent with Lewis River Settlement Agreement stakeholders intent to create a designated trail opportunity on the Yale Lake IP Road that will be maintained for the life of the Yale license.

The major features of project implementation include:

- Utilizing the existing roadway prism for the trail alignment minimizes environmental, right-of way, hydrologic and geotechnical impacts. The existing roadway prism will accommodate a trail typical section consisting of, at minimum, an 8-foot wide path with two-foot shoulders for two-way bicycle and pedestrian traffic for the majority of the trail.
- Constructing a parking lot with 12 parking spots and trailhead with kiosk, toilet and other amenities at the north end of the trail.

2. PROPOSED TRAIL

2.1 PROJECT AREA

The project area extends from just south of the Lewis River Bridge to an area approximately 3.75 miles south where the existing roadway has been washed out by a large debris flow that occurred in January 2009.

The majority of the trail is located on property owned by PacifiCorp but there are portions that are on State and Federal land. All of the major trail improvements and work will be within PacifiCorp property with the exception of a couple of areas where rockfall debris needs to be moved or removed. Actions taken on non-PacifiCorp properties will only be done with landowner permission. Maps showing the location of required improvements are shown in Appendix B.

2.2 EXISTING CONDITIONS

The trail route currently contains a variety of roadway and geotechnical issues that must be addressed in order to establish a multi-use trail.

2.2.1 Road Slumps

Road slumps were observed in several areas of the alignment adjacent to the lake shore in areas with relatively steep hillside cut/fill slopes. The road slumps are typically identified by ground cracks on the downhill side of the road. An approximate 200-foot-long set of ground cracks is located just north of the landslide blocking access to the remainder of the southern portion of the road at Station 45+00.



Figure 1: Slumped and Rutted Pavement Areas in Segment 2

2.2.2 North Landslide

This landslide located at approximate Station 48+00 represents the first location blocking vehicular access past the gate at the north end of the trail. The landslide blocks about 100 to 150 feet of the trail, extends about 60 to 80 feet up from the road, and about 30 to 50 feet down to the lake. The estimated volume of landslide material is 500 cubic yards. Preliminary field observations indicate the landslide removed significant portions of the soil overburden down to the underlying rock surface. Access to the landslide is currently limited to a narrow (several feet wide) trail through the landslide debris.



Figure 2: North Landslide

2.2.3 Rockfall and Small Landslide

Approximately seven separate rockfall areas are present, including portions of the road owned by others (identified in Appendix B). The rockfall debris consists of cobble- to boulder-size material

originating from the rock slope on the uphill (east side) of the road alignment. Larger rockfall with pieces in excess of 10 cubic yards are present in at least two locations along the segments. In some areas, outcrops that are several hundred feet high are the source of the rockfall. The estimated amount of rockfall debris on the trail or within the catchment areas is on the order of 500 cubic yards. One small landslide with on the order of 50 cubic yards of debris is also present.



Figure 3: Examples of Larger Rockfalls (2 views)

2.2.4 Slope Erosion

There are approximately 1,300 linear feet (LF) of slope erosion that varies from minor to severe. There are several different remedies that can be considered for repair or improvement of existing conditions. Some remedies should be combined for areas of severe erosion while some areas with minor erosion may require no action.

2.3 IMPLEMENTATION

2.3.1 Parking Lot and Trailhead

The proposed trail does not connect to any other bike and pedestrian trails and will have no outlet. Therefore, this plan includes a parking lot and trailhead at the north end of the project area. The parking lot will accommodate 12 vehicles and will include an information kiosk at trailhead as well as a vault toilet, as shown in Appendix B. Information provided at the kiosk will include a trail map, general rules and notice to users of natural conditions that may pose a hazard along the trail. Vehicular traffic access beyond the parking lot will be deterred by the use of bollards or by utilizing rockfall to strategically place boulders in the roadway. The same type of treatment is proposed at the terminus of the trail to deter trail user access beyond the designated area.

2.3.2 Road Slumps

The least expensive and most feasible remediation alternative to increase the stability of these slumps will likely be to remove or replace plugged or damaged culverts, improve the uphill drainage, and re-grade the areas of slope movement to reduce the potential for future ground movement. If a culvert is removed a creek crossing may be required.

This project will close and re-grade the ground cracks with mechanical effort to improve culvert function and uphill drainage where surface water is observed to pond.

2.3.3 North Landslide

This project will provide an eight-foot paved trail with one-foot shoulders through this portion of the trail. This width is sufficient to allow two pedestrians to walk side by side but would require bicyclists to use caution. Signage will be required to alert bicyclists to the narrow passage.

Some selective regrading, mechanical scaling, and rockfall mitigation will also likely be required for the upslope portion of the landslide to improve safety through the landslide area. On the order of 50 to 100 cubic yards of mechanical scaling above the road is anticipated. Down slope material will be left in place.

Additional geotechnical field work (test pits and additional mapping) will be completed as needed to better define quantities and establish toe conditions for repair slope. The field work will help evaluate suitability of on-site materials for use as structural fill.

2.3.4 Rockfall and Small Landslide

This project will clear accumulated rockfall and loose landslide debris from ditch areas and re-establish catchment areas. Scaling and installation of rockfall nets or rock bolts may be appropriate for certain areas with higher risk.

2.3.5 Slope Erosion

In areas of severe erosion it is recommended that the trail alignment shift as far away from the shoreline as possible and if necessary narrowed to allow for safe passage.

2.3.6 Implementation Schedule

Upon Commission approval of the IP Road Trail Implementation Plan, PacifiCorp proposes the following schedule:

12/31/13 – Complete all required environmental and land use permitting, right-of-way easements, geotechnical exploration and culvert and hydraulic assessments necessary prior to construction.

12/31/14 – Receive all necessary federal, state and county permits from regulatory agencies.

12/31/15 – Complete construction of the proposed Yale Lake IP Road Trail.

3. APPENDICES

***Appendix A – Yale Lake IP Road:
Technical Assessment Report
September 2011***

Yale Lake IP Road

Technical Assessment Report

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1. PROJECT OVERVIEW

1.1 BACKGROUND

The Yale Lake IP Road project is associated with the relicensing agreements for the Merwin, Swift, and Yale hydroelectric projects on the Lewis River. As part of the Yale Lake relicensing, PacifiCorp has been directed to complete a trail feasibility analysis for approximately ten miles of former logging road on the eastern shore of Yale Lake. Much of this road has been closed since 2008 due to illicit activities and unsafe road conditions caused by erosion, landslides, and rock fall hazards.

Yale Lake is located at about elevation 485 feet and was formed in 1953 by construction of the Yale and Saddle dams along the Lewis River drainage. IP Road is located on the east side of Yale Lake at the foot of an unnamed upland. The approximate location of the project alignment is shown on the Vicinity Map in Appendix B. Road design typically involved cut slopes excavated on the east side (upslope) and embankment fills constructed on the west side (downslope) of the road alignment. Some areas of the road are constructed away from the lake and are essentially at grade with the adjacent ground surface.

1.2 TECHNICAL ASSESSMENT OVERVIEW

On June 9, 2011, Washington licensed engineers from David Evans and Associates, Inc. (DEA), Geotechnical Resources, Inc. (GRI), and Flowing Solutions performed a site reconnaissance that began at the north end of the alignment adjacent to a landslide that currently blocks vehicle access to the road. The remainder of the reconnaissance was completed on mountain bikes proceeding south along the road to Saddle Dam Park. Approximately eight hours were spent on-site assessing geotechnical, hydrological, hydraulic, environmental, and existing roadway conditions. The purpose of the inspection and reconnaissance was to provide a general assessment of IP Road, identify localized areas of failure or significant defect, and make a determination whether IP Road can be used in its current condition as a new trail system on the eastern side of the lake.

For this first phase of the proposed trail project, we have limited our documentation of the above-mentioned hazards to representative photographs, descriptions, and preliminary mitigation concepts. For discussion purposes, the proposed trail alignment is being presented in four segments, based on the location of structures or significant geologic hazards along the alignment. The proposed trail alignment segments are shown in Appendix A. More detailed locations, identification, and assessment of these hazards should be completed pending the results of the team's preliminary work.

1.2.1 Roadway and Shoreline

The roadway assessment related to IP Road was prepared based on review of historic air photos, contour mapping, Global Positioning System (GPS) data provided by PacifiCorp, and a site visit by land to review roadway and shoreline conditions and exposure to environmental conditions present in the reservoir.

The pool was at 481.5 feet during the site visit, allowing visual review of the upper shoreline and identification of erosion and areas of instability. The shoreline has a mix of conditions, ranging from generally stable rock and gravel, to overstep eroding fine material. The underlying geology varies along the IP Road alignment, and in some areas significant fill may have been used to create a level road bed. Some areas of erosion are severe and damage to the roadbed is imminent.

Pool operations generally vary from 490 feet at high pool to 430 feet for testing and maintenance. Summer recreation levels are generally above 480 feet. Water is drawn down in September, in anticipation of fall high flows, to manage flooding, and the reservoir is refilled before summer (TER_6).

Prevailing wind is from the North/West during summer months and East or South during winter months. Because of the terrain and steep gorge configuration, air flow is redirected and channelized along orientation of the linear reservoir. Afternoon winds are also likely created by the mountain/valley heating and cooling pattern, which creates reliable wind and resulting waves.

The shoreline erosion is caused primarily by wind waves, although some vessel waves possibly contribute to the shoreline erosion during the short seasonal use period. The fetch varies up to three miles depending on the location on shore. However, significant wave height that is capable of moving large rock occurs frequently. The pool elevation varies regularly based on management and operational constraints. The changing elevation results in concentrated erosion at defined levels based on pool height. If water levels remain at a fixed height during a windy period upslope scour and down slope shoaling may occur, creating an "S" shaped profile. Shoreline erosion is most obvious when a high pool is combined with a strong wind event. Erosion and shoreline adjustments do occur at lower pool elevations, however the fine grain soil has been washed away long ago and thus movement only consists of rock, gravel and sand motion.

Review of historical charts indicates that, before the dam was constructed, the thalweg of the Lewis River meandered from shore to shore in the Yale Lake Reservoir. Review of bathymetry also indicates steep underwater slopes near points of erosion in some, but not all, cases. Several factors appear to be contributing to the erosion, including thalweg location, fetch distance, steepness of upper slope, and bank material compositions. It is difficult to determine how much of the slope was material imported for the construction of IP Road and how much was native soil/rock.

Where IP Road is near the shore, the slopes are generally steep and upslope cliffs are common. Previous studies have mapped in-water benches and shallow areas exposed by low pool. Areas of erosion observed are located in areas of steep in-water slopes.

1.2.2 Culvert Assessment

The culvert assessment included a geographic information system (GIS) dataset evaluation and a brief field evaluation for erosion and other deficiencies. The GIS dataset was provided by PacifiCorp, and it is assumed to be the latest data available. A table has been included in the main report that includes pertinent data from the GIS dataset, and a separate field/column for comments. The data fields/columns are defined as follows:

Table 1: Culvert Assessment

Culvert ID:	Culvert label or identification number.
Material:	Material of construction for the culvert.
Diameter:	Diameter of the culvert in inches.
Type:	Indicates whether the culvert conveys stream flow or roadside ditch flow.
Fish Present:	From the GIS database and not field verified, but indicates whether fish can be present in the stream (N = no; Y = yes).
Basin ID:	Drainage basin identification number corresponding to the basin number (Basin ID) in the Hydrologic and Hydraulic Assessment.
Photo:	Indicates whether a photo or photos for this culvert are contained in the appendix (N = no; Y = yes).
Comment:	Comment field.

The GIS database has some significant data gaps that need to be addressed for the Hydrologic and Hydraulic Assessment. These include culvert length, upstream and downstream inverts, roadway overtopping elevation, and entrance and exit coefficients, where applicable. Based on our assessment it is recommended that a detailed field evaluation, including survey, be undertaken to provide the missing data that will be required for future design phases of the project.

1.2.3 Geotechnical

Yale Lake is located on the west side of the Cascade Range. Rock units exposed on the east side of the lake include Tertiary volcanic rocks (basalt/andesite, breccias, and volcanic sandstones) and younger Quaternary volcanic and sedimentary rock units deposited by eruptions from Mt. St. Helens. A geologic map of the project area is provided in Appendix B.

The Tertiary volcanic rocks tend to be resistant and form steep mountain uplands, and are typically exposed in cut slopes on the east side of IP Road. The Quaternary units tend to be less resistant, are typically exposed along the lake shore on the west side of IP Road, and are prone to erosion by wave action along the shore of Yale Lake. We understand that heavy precipitation in January 2009 caused numerous rockfalls, landslides, road slumps, and debris flows that affected the road.

The predominant geologic hazards identified during the site visit include: (1) landslides, (2) rockfall, (3) debris flows, (4) road slumps, and (5) shoreline erosion that has undermined the road. GRI and PacifiCorp representatives utilized handheld GPS units to record the locations of representative areas of road damage and geologic hazards.

1.2.4 Hydrologic and Hydraulic Assessment

The hydrologic and hydraulic assessment included several steps, but started with building a GIS dataset to determine drainage areas upstream from the culverts. This dataset was built using the 20-foot contour interval coverage provided in the GIS dataset. Each drainage area also has a unique numerical ID assigned to it. Currently these Basin ID numbers are sequential numbers in multiples of ten, but they can be assigned any number or text value during later phases of the project. Regression equations were taken from the publication “Magnitude and Frequency of Floods in Washington,” U.S. Geological Survey, Water-Resources Investigations Report 97-4277 (1998).

The data required by the regression equations included the drainage area in square miles and the mean annual rainfall in inches. According to the geological survey report, the mean annual rainfall in the vicinity of the trail ranges from 90 inches to 120 inches, so an average of 105 inches was used in the calculation. The results of the hydrologic and hydraulic assessment have the flow rates for the 2-year, 10-year, and 50-year return intervals included Table 2. The data fields/columns are defined as follows:

Table 2: Hydrologic and Hydraulic Assessment

Basin ID:	Drainage basin identification number.
Area:	Basin area measured in GIS in square miles.
Acres:	Basin area measured in acres.
Culvert ID:	Culvert identification number corresponding to the culvert number (Culvert ID) in the Culvert Assessment.
2 Yr Flow:	The 2-year flow in cubic feet per second (cfs).
10 Yr Flow:	The 10-year flow in cubic feet per second (cfs).
50 Yr Flow:	The 50-year flow in cubic feet per second (cfs).
Comment:	Comment field.

The culverts were not evaluated for actual hydraulic capacity. While the GIS dataset included culvert type and size, it did not contain invert elevations, culvert length, or roadway elevations for overtopping calculations. This data will need to be collected for a full hydraulic assessment for later phases of the project.

1.2.5 Environmental Assessment

Protected environmental resources including wetlands, fish, and wildlife (including listed threatened and endangered species) may be affected by restoration of IP Road to a trail. If proposed work involves earthwork outside of the existing road prism, wetland fill permits may be required.

Washington State fish passage statutes and Hydraulic Project Approval will require passable culverts on streams that support native salmonids.

Methods for environmental assessment included a review of PacifiCorp relicensing documents, state and federal environmental regulations, and an on-site inspection. In addition, the PacifiCorp GIS database includes specific notes on whether each stream supports fish. Table 3 summarizes environmental regulations that are likely to require compliance consideration during project design and construction.

Table 3: Environmental Regulations Potentially Affecting Trail Construction

Regulation	Agency Responsible	Project Activity Regulated	Typical Agency Review Timeframe	Notes
Clark County Wetland Protection Ordinance (Clark County Code 40.450)	Clark County	Wetland filling.	No statutory timeframe. Typically several months.	Will apply only to earthwork beyond existing road prism.
Clark County Habitat Conservation Ordinance (CCC 40.440)	Clark County	Clearing in designated habitat areas.	No statutory timeframe. Typically several months.	Much of IP Road alignment lies within designated "Riparian" areas.
Clark County Geologic Hazard Area code (CCC 40.430)	Clark County	Clearing or earthwork within designated geologic hazard areas.	No statutory timeframe. Typically several months.	Project area includes regulated landslide hazard areas.
Washington State Shoreline Management Act (SMA)	Clark County	All activity along Shorelines of the State including Yale Lake.	No statutory timeframe. Typically several months.	County reviews proposal to issue "substantial development permit."
Washington Hydraulic Project Approval (HPA)	Washington Department of Fish and Wildlife (WDFW)	Culvert replacement or other work in stream channels.	45 days from application.	
Migratory Bird Treaty Act (MBTA)	U.S. Fish and Wildlife Service (USFWS)	Vegetation removal; regulates timing to protect active bird nests.	Compliance does not require permitting, but clearing season limited to fall and winter.	Applies to "federal actions" including projects requiring federal permits.
Clean Water Act Section 404	U.S. Army Corps of Engineers (USACE)	Earthwork within streams or wetlands.	Six months to one year.	Will be required for culvert replacement.

Regulation	Agency Responsible	Project Activity Regulated	Typical Agency Review Timeframe	Notes
Federal Endangered Species Act (ESA)	National Marine Fisheries Service (NMFS); US Fish and Wildlife Service (USFWS)	Any action potentially affecting listed species. Likely required at least for bull trout on IP trail.	135 days, but may be exceeded.	Documentation requirements apply only to "federal actions" including projects requiring federal permits. Coordination with USACE, NMFS, and USFWS is needed to determine whether IP trail is already covered by overall Federal Energy Regulatory Commission (FERC) relicensing consultation.
National Environmental Policy Act (NEPA)	Federal Energy Regulatory Commission (FERC)	Overall project.	N/A	IP trail is likely already covered by 2006 Final Environmental Impact Statement for system FERC relicensing.
Washington State Environmental Policy Act (SEPA)	Clark County or WDFW will likely be designated as lead agency	Overall project.	Concurrent with state permit (HPA) processing; likely up to six months.	

Of the regulations summarized above, the wetlands protection regulations will apply only if the project involves earthwork outside of the existing road fill prism. Hydraulic Project Approval (HPA) will be required for culvert removal or replacement, and will require the installation of fish-passable culverts on all streams that would naturally be fish passable, as discussed in the specific segment sections below (Sections 2 through 5).

Federal endangered species consultation was conducted for the following species as part of the dam relicensing: bull trout, bald eagle, northern spotted owl, and Lower Columbia River chinook salmon, coho salmon, chum salmon, and steelhead trout. Bald eagles have since been delisted but are still protected under the Bald and Golden Eagle Protection Act. Construction may be restricted near active nests to prevent disturbing bald eagles. The anadromous salmon and steelhead are not yet present in Yale Lake. Therefore, bull trout and northern spotted owl are the listed species of primary concern to the proposed IP trail project. **It is likely that consultation for the overall system relicensing is sufficient to cover the specific IP trail project, but coordination between PacifiCorp staff and USFWS is needed to confirm this.**

A relicensing study showed that Yale Lake bull trout spawn in Cougar Creek, which is not within the project area (Pratt 2003). Other streams discharging to Yale Lake, including all of those in the project area, were considered to be insufficiently cold to allow for bull trout egg incubation and survival. Because there is a possibility that bull trout could be incidentally present in the streams or in lake waters adjoining the trail, agencies will assume that the project may affect bull trout and will require compliance with the existing Biological Opinion or an additional one.

The 2006 Lewis River Relicensing Biological Opinion for U.S. Fish and Wildlife Service (USFWS) documented several northern spotted owl home ranges along the eastern shore of Yale Lake in the project area. Therefore, any IP trail development activity will require compliance with the conditions of the relicensing Biological Opinion, and possibly additional documentation. Impacts to this species can be minimized by avoiding the removal of mature trees for trail realignment. A biological assessment may be required to address potential impacts from trail realignment and potential construction noise-related impacts to nesting spotted owls.

National Environmental Policy Act (NEPA) requirements have likely already been satisfied by the overall system relicensing compliance. However, the project will need to comply with the Washington State Environmental Policy Act (SEPA). This process is designed to run concurrently with the state permit applications, in this case the HPA, and will likely take up to six months.

2. SEGMENT 1 (“IP” 0+00 TO “IP” 40+00)

2.1 SEGMENT DESCRIPTION – LEWIS RIVER BRIDGE TO LANDSLIDE

Segment 1 extends from Lewis River Bridge at station 0+00, which for discussion purposes is considered the beginning of the proposed trail, for approximately three-quarters of a mile into an area where a hillside landslide blocks the roadway at approximate station 40+00.

2.2 ROADWAY ASSESSMENT

Our initial assessment of the paved roadway is based on the assumption that future use of the road will be for non-motorized vehicles and pedestrian traffic only. Overall the roadway in Segment 1 is in adequate condition for restoration as a paved trail. In our estimation, 25 percent of the paved surface of this segment is identified as seriously damaged due to landslides and pavement failure, 60 percent is in adequate condition, and 15 percent is in good condition.

A major slide and toe erosion exists near station 30+00 in Segment 1. This area has less than one mile fetch, and wave erosion is not likely the cause of damage. River currents have possibly scoured away some slide material; however, the extent of woody debris indicates that limited scour has occurred since the slide.



Figure 1: Toe Erosion in Segment 1

This area of the roadway will require reconstruction to make it viable for bike and pedestrian traffic. In addition to the slide, there are also several portions of the road that show signs of pavement failure. These areas commonly referred to as slumps, will require regrading and repaving for safe use as a paved trail.



Figure 2: Slide Area in Segment 1

In the areas considered to be in adequate condition, there are vegetation growth and other debris on the roadway, which is to be expected on a roadway that has been unused for several years. Cleanup and minor maintenance is needed, but no major issues were noted that would require reconstruction. In areas considered to be in good condition, the roadway would require minor cleanup and reconditioning.



Figure 3: Adequate Condition Area in Segment 1

2.3 CULVERT ASSESSMENT

Table 4: Segment 1 Culvert Assessment

Culvert ID	Material	Diameter	Type	Fish Present	Basin ID	Photo	Comment
2130C1	METAL	18	DITCH	N	30	N	According to the database, the culvert drains a roadside ditch.

2.4 GEOTECHNICAL ASSESSMENT

Road Slumps. Road slumps were observed throughout the majority of the alignment adjacent to the lake shore in areas with relatively steep hillside cut/fill slopes. The majority of the slumps are visible as circular-shaped surface offsets encroaching into the downhill fill slope or road prism section. The first photograph shown below (Figure 4) was taken just north of the landslide that blocks access to the remainder of the southern portion of the road. At this location, the slope movements have occurred in the vegetated shoulder below the road. In other areas, the slope movements have offset the paved asphaltic concrete (AC) surface several inches.

Slump-type slope movements are very common in relatively steep hillside road cut/fill situations, and continued movements should be anticipated in the current, unmitigated condition. A significant portion of the slump movements along the alignment correlates to areas of poor drainage on the uphill/cut side of the road. An example of standing water in a ditch due to a plugged culvert is shown in the second photograph below (Figure 5). Water infiltration increases the hydrostatic pressure within the slope and tends to decrease the overall factor of safety of the road fill prism.

Potential options for repairing these roadside slumps include:

1. improve the uphill drainage,
2. regrade with granular fill,
3. regrade and repave,
4. overexcavate and replace, or
5. make a structural repair, such as a retaining wall.

The least expensive remediation alternative to increase the stability of these slumps will likely be to repair plugged or damaged culverts, improve the uphill drainage, and regrade the areas of slope movement. Even with improved drainage, some maintenance and additional movement of these slumps and other fill slope movements should be anticipated. In this regard, a paved trail surface will likely be more expensive to maintain than an unpaved trail surface. Structural repairs could include options such as soil-nail or soldier pile walls. The options for structural repairs or overexcavation and replacement will result in significantly less future maintenance, but we anticipate these alternatives will likely be cost-prohibitive for the majority of the slump locations.



Figure 4: Slump of Downhill Fill Slope



Figure 5: Poor Ditch Drainage Due to Blocked Culvert

North Landslide. This landslide represents the first location blocking vehicular access past the gate at the north end of the trail. The photographs below (Figures 6 and 7) show the slope uphill of the landslide and the landslide debris that was carried into the lake. Preliminary field observations indicate that the landslide removed significant portions of the soil overburden down to the underlying rock surface. Access across the landslide is currently limited to a narrow (several feet wide) trail through the landslide debris. Remediation of the landslide to create a full-width trail would require significant earthwork that would likely include a new downslope rock buttress fill or other structural modification. A narrower trail could be established with significantly less downslope earthwork and upslope grading. Some selective regrading, scaling, and rockfill mitigation will also likely be required for the upslope portion of the landslide to improve safety through the landslide area. Additional

discussion regarding rockfall mitigation is provided in the Segment 2 discussion of rockfall hazards (see Section 3.4).



Figure 6: Slope Uphill of Landslide



Figure 7: Landslide Debris in Lake

2.5 HYDROLOGIC AND HYDRAULIC ASSESSMENT

Table 5: Segment 1 Hydrologic and Hydraulic Assessment

Basin ID	Area, mi ²	Acres	Culvert ID	2 Yr Flow, cfs	10 Yr Flow, cfs	50 Yr Flow, cfs	Comment
10	0.0575	36.83	-	8	14	21	GIS database indicates that a stream crosses the road, but no culvert is shown.
20	0.0784	50.19	-	10	18	27	GIS database indicates that a stream crosses the road, but no culvert is shown.
30	0.0290	18.55	2130C1	4	8	11	Area appears to drain to a roadside ditch.

2.6 ENVIRONMENTAL ASSESSMENT

This section of the road is separated from the shore of Yale Lake by steep slopes, and none of the streams would appear to be naturally passable to fish. Portions of this section may be within northern spotted owl home ranges, which will require consultation and may limit removal of mature trees.

3. SEGMENT 2 (“IP” 40+00 TO “IP” 220+00)

3.1 SEGMENT DESCRIPTION – LANDSLIDE TO CANYON WASHOUT

Segment 2 extends from the landslide at approximate station 40+00 for 3 miles to an area at approximate station 220+00, where the existing roadway has been washed out by a debris flow that occurred in January 2009.

3.2 ROADWAY ASSESSMENT

Overall the paved surface in Segment 2 is in good condition for use as a trail. In our estimation, 10 percent of the surface in this segment is identified as seriously damaged due to pavement failure, 35 percent is in adequate condition, and 55 percent is in good condition.

There are approximately ten portions of the road in Segment 2 that show significant pavement failure that will require repaving, reconstruction, and possibly realignment to provide continued through access on the trail.



Figure 8: Slumped and Rutted Pavement Area in Segment 2

Limited areas of slope failure caused by wave erosion are present along this segment. These areas are losing material over time, but given the size of the existing trees, the rate appears slow.



Figure 9: Slope Failure Area in Segment 2

Some minor bank erosion is also located at several culverts that have been plugged, causing flow over the roadway. The water cascading down the bank has created areas of limited failure.



Figure 10: Bank Erosion Area in Segment 2

In areas of adequate condition there is rock fall debris, mud, vegetation growth, and other obstacles that will need to be removed. Cleanup and minor maintenance is needed, but no major issues were visible that would require reconstruction or significant repairs. In areas of good condition the roadway would require minor cleanup and reconditioning.



Figure 11: Rock Fall and Other Debris Area in Segment 2



Figure 12: Pavement in Good Condition in Segment 2

3.3 CULVERT ASSESSMENT

Table 6: Segment 2 Culvert Assessment

Culvert ID	Material	Diameter	Type	Fish Present	Basin ID	Photo	Comment
2130C2	METAL	18	DITCH	N	40	N	According to the database, the culvert drains a roadside ditch.
2130C3	METAL	18	DITCH	N	50	N	While the database indicates the culvert drains a roadside ditch, GIS does show a stream crossing the road approximately 540 feet to the northeast.
2130C4	METAL	24	STREAM	N	60	Y	According to the database, the culvert conveys runoff from a stream. Photos show damaged exit.
2130C5	METAL	24	STREAM	N	70	Y	According to the database, the culvert conveys runoff from a stream. Photos show damaged entrance and exit.
2130C6	METAL	24	STREAM	N	80	Y	According to the database, the culvert conveys runoff from a stream. Photos show damaged culvert, damaged exit, and roadside washout.
2130C7	METAL	18	STREAM	N	90	Y	According to the database, the culvert conveys runoff from a stream.
2200C1	METAL	60	STREAM	Y	140	N	According to the database, the culvert conveys runoff from a stream.
2200C2	METAL	24	STREAM	N	150	N	According to the database, the culvert conveys runoff from a stream.
2200C3	METAL	24	DITCH	N	160	N	According to the database, the culvert conveys runoff from a stream. However, this culvert is only 175 feet north of culvert "2200C4" and appears to drain an insignificant area.
2200C4	METAL	48	STREAM	Y	165	Y	According to the database, the culvert conveys runoff from a stream.

Culvert ID	Material	Diameter	Type	Fish Present	Basin ID	Photo	Comment
2200C5	METAL	24	DITCH	N	170	N	According to the database, the culvert drains a roadside ditch.
2200C6	METAL	72	STREAM	Y	180	Y	According to the database, the culvert conveys runoff from a stream. Area and road are completely washed out.
2200C7	METAL	24	DITCH	N	190	N	According to the database, the culvert drains a roadside ditch.

3.4 GEOTECHNICAL ASSESSMENT

Rockfall. Rockfall areas are present along significant portions of Segment 2. An example of typical rockfall debris along the alignment is shown in the first photograph below (Figure 13). The rockfall debris consists of cobble- to boulder-size material originating from the rock slope on the uphill (east side) of the road alignment. Larger rockfall, with pieces in excess of 10 cubic yards (cy), as shown in the second photograph (Figure 14), are present in at least two locations along Segment 2. In some areas, outcrops that are several hundred feet high are the source of the rockfall.

Potential options for mitigation of rockfall areas include:

1. clearing and establishment of catchment/drop areas,
2. selective scaling of rock slopes,
3. installation of rockfall nets,
4. installation of rock bolts, or
5. combination of options 1, 2, 3, and 4.

The least expensive remediation alternative will likely be to clear accumulated rockfall debris from ditch areas and re-establish catchment areas. Scaling and installation of rockfall nets or rockbolts involve greater costs but may be appropriate for areas with higher future risk. Signage may be appropriate in some areas to reduce the potential for risk to future trail users. It should be anticipated that complete elimination of all rockfall hazards will be cost-prohibitive, and some level of future maintenance (i.e., clearing of future rockfall from catchment areas) will be required.



Figure 13: Typical Rockfall Debris



Figure 14: Example of Larger Rockfall Debris

Road Slumps. Approximately ten locations with varying amounts of road fill movement are present along Segment 2. The majority of slumps that were observed along Segment 2 involve offsets of the paved AC surface and present an uneven traveling surface. The description of road slumps and potential mitigation measures presented in Segment 1 is also applicable to Segment 2.

3.5 HYDROLOGIC AND HYDRAULIC ASSESSMENT

Table 7: Segment 2 Hydrologic and Hydraulic Assessment

Basin ID	Area, mi ²	Acres	Culvert ID	2 Yr Flow, cfs	10 Yr Flow, cfs	50 Yr Flow, cfs	Comment
40	0.0234	15.00	2130C2	3	6	9	Area appears to drain to a roadside ditch.
50	0.1098	70.29	2130C3	14	25	36	GIS database indicates that the area is conveyed by a stream that crosses the road, but no culvert is shown, although a culvert is shown 540 feet to the southwest.
60	0.0463	29.63	2130C4	6	12	17	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
70	0.0330	21.09	2130C5	5	9	13	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
80	0.0500	32.01	2130C6	7	12	18	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.

Basin ID	Area, mi ²	Acres	Culvert ID	2 Yr Flow, cfs	10 Yr Flow, cfs	50 Yr Flow, cfs	Comment
90	0.0777	49.73	2130C7	10	18	27	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
100	0.0531	34.01	-	7	13	19	GIS database indicates that a stream crosses the road, but no culvert is shown.
110	0.0304	19.49	-	4	8	12	GIS database indicates that a stream crosses the road, but no culvert is shown.
120	0.0424	27.11	-	6	11	16	GIS database indicates that a stream crosses the road, but no culvert is shown.
130	0.0753	48.17	-	10	18	26	GIS database indicates that a stream crosses the road, but no culvert is shown.
140	0.4308	275.74	2200C1	45	81	119	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
150	0.0960	61.44	2200C2	12	22	32	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
165	0.3494	223.62	2200C4	37	68	99	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
170	0.0483	30.93	2200C5	7	12	18	Area appears to drain to a roadside ditch.
180	1.5224	974.36	2200C6	136	246	357	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
190	0.0639	40.92	2200C7	8	15	22	Area appears to drain to a roadside ditch.

3.6 ENVIRONMENTAL ASSESSMENT

This road segment generally follows the shoreline closely. Three streams, at culverts 2200C1, 2200C4, and 2200C6, are documented as supporting fish. The 2200C4 culvert discharges directly to Yale Lake at an impassable outlet, and a steep cascade immediately upstream of the road forms a natural impassable barrier to migration. Resident trout and other native fish species may occur upstream of this barrier. The 2200C6 culvert was completely washed out at the time of the inspection, leaving an open channel that forms a gap in IP Road. This stream appears passable for bull trout, salmon, steelhead, and other migratory fish. Portions of this section may be within northern spotted owl home ranges, which will require consultation and may limit removal of mature trees.

4. SEGMENT 3 (“IP” 220+00 TO “IP” 360+00)

4.1 SEGMENT DESCRIPTION – CANYON WASHOUT TO SIOUXON BRIDGE

This segment of IP Road extends from the existing Canyon Washout at approximate station 220+00 to the Siouxon Bridge at approximate station 360+00.

4.2 ROADWAY ASSESSMENT

Overall the pavement surface in Segment 3 is in poor condition for use as a trail. In our estimation, 40 percent of the surface is identified as seriously damaged due to the roadway being washed away, landslides, bank erosion and debris flow; 35 percent is in adequate condition; and 25 percent is in good condition.

A moderate-sized slope failure has occurred over time near station 205+00. Limited rock exists along the toe, and bank material is fine gravel. With a combination of high pool and waves from the optimal direction, additional erosion is likely. Erosion along the toe will likely cause additional slope failure.



Figure 15: Slope Failure at Approximate Station 205+00 (2 views)

A much larger slope failure exists at approximate station 215+00. This section of bank is much higher, the exposed face is steeper, and the bench at the pool elevation is steep and has limited armor. Erosion has occurred over a very long period of time, and a majority of the trees have fallen and washed away. Limited vegetation exists to control surface water erosion.



Figure 16: Slope Failure at Approximate Station 215+00 (2 views)

Because of the size of the reservoir, significant wave growth caused by steady wind is possible. Waves are generated when wind blows for an extended period of time over a length of open water, the distance known as Fetch, varies in restricted water bodies. The mountains, topography and shape of the water body impact the fetch and compass angle of the prevailing seasonal winds. The erosion at observed sites has significant exposed fetch distances that vary from 1.5 to three miles in the direction of likely wind. Shorter fetches are not as likely to have a combination of sustained winds necessary to generate significant waves. A longer Southwest fetch does exist, although a shallow gravel bar may block or limit wave growth at certain pool elevations. The slope is very steep and material appears loose. It appears to have been in this condition for many years, as indicated by large rocks placed along the edge to prevent cars from driving off, when the road was open to vehicles.

A small area of erosion is located just upstream from the bridge at approximate station 260+00. The exposed fetch is one to 1.5 miles; however, a two-mile fetch in the prevailing summer direction exists if wave refraction around the point is factored in. Small waves, combined with erodible soil and limited slope protection, likely were the cause of this erosion.



Figure 17: Slope Failure at Approximate Station 260+00

These areas of erosion damage will require major repairs and possible realignment away from the erosion area. The existing width of pavement will allow for a narrower portion of trail for through access.

A portion of the road at approximate station 300+00 is under a hillside landslide that will likely require reconstruction and rehabilitation to make it usable for bike and pedestrian traffic.



Figure 18: Slide Area in Segment 3

In areas considered to be in adequate condition there is mud, vegetation growth, and other debris that will need to be removed. Cleanup and minor maintenance is needed, but no major issues were visible that would require reconstruction or significant repairs. In areas considered to be in good condition the roadway would require minor cleanup and reconditioning.



Figure 19: Mud and Debris Area in Segment 3 (2 views)

4.3 CULVERT ASSESSMENT

Table 8: Segment 3 Culvert Assessment

Culvert ID	Material	Diameter	Type	Fish Present	Basin ID	Photo	Comment
2200C8	METAL	96	STREAM	Y	200	Y	According to the database, the culvert conveys runoff from a stream.
2200C9	METAL	12	DITCH	N	210	Y	According to the database, the culvert drains a roadside ditch. Portions of the culvert and road have been washed out.
2200C10	METAL	36	STREAM	Y	230	N	While the database does indicate that this culvert conveys a stream under the road, the GIS does not indicate a stream exists except in the upper reaches of the watershed.
2300C1	METAL	24	STREAM	N	270	N	According to the database, the culvert conveys runoff from a stream.

4.4 GEOTECHNICAL ASSESSMENT

Canyon Washout. As shown in the first photograph below (Figure 20), several hundred feet of the road have been completely removed by a debris flow that occurred during the major January 2009 storm. For this report, this area is termed the “Canyon Washout.” The second photograph (Figure 21) shows the upstream debris flow deposits that contributed to the failure of the culvert and road section. The road fill and culvert were washed out and transported into Yale Lake.

Potential options for mitigation of the Canyon Washout area include:

1. replacing the road fill and install a new culvert,
2. installing a new bridge crossing, or
3. installing a dip crossing.

Although it is a relatively low-cost option, a dip crossing will be subject to inundation from streamflow and accumulation of debris on the crossing. The most cost-effective option for repairing the washout will likely be replacing the culvert and road fill. Geotechnical earthwork considerations for this alternative are relatively straightforward. However, it should be acknowledged that this repair will not significantly reduce the risk of a similar, future debris flow during a significant storm event.



Figure 20: Washout Looking Along Trail Alignment Figure 21: Upstream Debris Flow Deposits

Older Landslide. Based on discussions with PacifiCorp, we understand the landslide shown in the first photograph below (Figure 22) occurred prior to the January 2009 storm event. The landslide has deposited significant amounts of debris into the middle of the road alignment as shown in the first photograph (Figure 22). The second photograph below (Figure 23) shows the location of the headscarp and additional landslide debris above the alignment. Some regrading, drainage improvements, and repair of this upslope debris will likely be necessary to reduce the risk of future trail closures at this location.



Figure 22: Tree and Landslide Debris in Middle of Road



Figure 23: Upslope Headscarp and Landslide Debris

Debris Flow. A moderate-sized debris flow is currently blocking the alignment south of the older landslide described above, as shown in the first photograph below (Figure 24). Remediation efforts at this location will likely involve removal of the accumulated debris and repair/replacement of the culvert. A lesser amount of downslope fill and regrading will also likely be necessary to repair the surface erosion features shown in the second photograph below (Figure 25).



Figure 24: Debris in Trail Looking South



Figure 25: Debris and Road Undermining, Looking North

Bank Erosion/Trail Undermining. Several areas of bank erosion and undermining of the road are present within Segment 3. Some of the areas appear related to variable erosional resistance of Quaternary volcanic and sedimentary rock units from Mt. St. Helens. We understand that Flowing Solutions is providing recommendations for documenting and mitigating these bank erosion areas. As a cost-effective repair consideration, much of the rockfall debris along the alignment appears suitable for reuse as structural fill to repair bank erosion areas.

Other Debris. Other areas of rock and soil debris are present over the road at several locations along Segment 3. Common sources for this debris include surficial upslope landslides or small debris flows caused by plugged culverts. Examples of this type of debris are shown in the photographs below (Figures 26 and 27).



Figure 26: Small Landslide Debris



Figure 27: Debris Over Road Caused by Plugged Culvert

Road Slumps. Similar but fewer road slumps were identified along Segment 3 compared to Segment 2. The description of road slumps presented in the discussion of Segment 1 is also applicable to Segment 3.

Rockfall. Segment 3 generally contains fewer rockfall hazards than Segment 2; however, rockfall debris is currently blocking the road just north of the Siouxon Bridge. We understand that a portion of this debris may have been intentionally placed to restrict vehicular access. Where rockfall is present, the discussion of potential mitigation techniques discussed in Section 2 is applicable.

4.5 HYDROLOGIC AND HYDRAULIC ASSESSMENT

Table 9: Segment 4 Hydrologic and Hydraulic Assessment

Basin ID	Area, mi ²	Acres	Culvert ID	2 Yr Flow, cfs	10 Yr Flow, cfs	50 Yr Flow, cfs	Comment
200	0.3968	253.92	2200C8	42	76	111	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
210	0.0800	51.18	2200C9	10	19	27	Area appears to drain to a roadside ditch.
220	0.3013	192.82	-	33	60	87	GIS database indicates that a stream crosses the road, but no culvert is shown.
230	0.1730	110.71	2200C10	20	37	54	GIS database indicates that there is a stream in the upper reach of the drainage area, but it does not show it being conveyed to the culvert.
240	0.2994	191.62	-	33	59	86	GIS database indicates that a stream crosses the road, but no culvert is shown.
250	0.1333	85.32	-	16	29	43	GIS database indicates that a stream crosses the road, but no culvert is shown.
260	0.0477	30.50	-	7	12	17	GIS database indicates that a stream crosses the road, but no culvert is shown.
270	0.0992	63.49	2300C1	12	23	33	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
280	0.0257	16.43	-	4	7	10	GIS database indicates that a stream crosses the road, but no culvert is shown.
290	0.0405	25.94	-	6	10	15	GIS database indicates that a stream crosses the road, but no culvert is shown.

4.6 ENVIRONMENTAL ASSESSMENT

Culvert 2200C8 conveys a stream that is listed as supporting fish, but the channel and culvert have been partially filled by gravel and debris from upstream, and the stream was not conveying surface flow at the time of the inspection. Flow has been altered by the deposits, and the culvert does not presently appear passable. Little potential fish habitat was visible upstream from IP Road.

Culvert 2200C10 is on a stream that is listed in PacifiCorp's database as supporting fish, although the GIS graphics show the culvert several hundred feet south of the stream location. The field inspection shows that a culvert in that vicinity conveys flow converging from several small channels under a

deep roadway fill. Little potential fish habitat was visible upstream from IP Road, due to the small size and low seasonal flow of the channels. Portions of this section may be within northern spotted owl home ranges, which will require consultation and may limit removal of mature trees.

5. SEGMENT 4 (“IP” 360+00 TO “IP” 500+00)

5.1 SEGMENT DESCRIPTION - SIOUXON BRIDGE TO TRAIL END

This segment of IP Road extends from the Siouxon Bridge at approximate station 360+00 to the project site end at approximate station 540+00.

5.2 ROADWAY ASSESSMENT

Overall the path surface in Segment 4 is in good condition for use as a trail. The beginning of the segment is at the Siouxon Bridge, which is in good condition but which will require guardrail and handrails for bicycle and pedestrian safety. However, this segment of the trail contains a large portion of unpaved road. In addition to the condition of the trail, there are several gates that limit access to the entire segment.



Figure 28: Siouxon Bridge at the Beginning of Segment 4

In our estimation, five percent of the surface of this segment is identified as seriously damaged and in need of major repair or reconstruction, 50 percent is in adequate condition, and 45 percent is in good condition. The portion of the trail in Segment 4 that is composed of a gravel surface is considered to be in adequate condition for use as a trail but would require a pavement overlay to match the rest of the trail.

IP Road leaves the shoreline and is located landward in this segment. One limited area of eroded cut bank was identified that would require major repair. Upslope water may be contributing to the issue because the soil appeared to be well saturated.



Figure 29: Eroded Cut Bank in Segment 4

The paved portion of the trail that is in good condition would require minor cleanup and repair, if any. There are several gates in this part of the trail that make it inaccessible to the general public. If this area is to remain closed, an alternative terminus will need to be determined.



Figure 30: Gates and Unpaved Areas on Segment 4 (2 views)

5.3 CULVERT ASSESSMENT

Table 10: Segment 4 Culvert Assessment

Culvert ID	Material	Diameter	Type	Fish Present	Basin ID	Photo	Comment
2300C2	METAL	24	STREAM	N	310	N	According to the database, the culvert conveys runoff from a stream.
2300C3	METAL	12	DITCH	N	320	N	According to the database, the culvert drains a roadside ditch.
2300C4	METAL	18	DITCH	N	330	N	According to the database, the culvert drains a roadside ditch.
2300C5	METAL	24	STREAM	N	340	N	According to the database, the culvert conveys runoff from a stream.
2300C6	METAL	48	STREAM	Y	350	N	According to the database, the culvert conveys runoff from a stream.
1150C2	METAL	24	STREAM	Y	360	N	According to the database, the culvert conveys runoff from a stream.
1150C1	METAL	18	STREAM	Y	370	N	According to the database, the culvert conveys runoff from a stream that is then conveyed to culvert 1150C2.

5.4 GEOTECHNICAL ASSESSMENT

Road Slumps, Bank Erosion, and Rockfall. A few locations with road slumps, bank erosion, and small rockfall areas exist in Segment 4. The majority of these features are located along the portion of this segment that follows the edge of the lake before the end of the trail. In general, Segment 4 appears to have the least number of geotechnical-related or engineering geology-related hazards of all the segments.

Potential mitigation techniques previously presented are appropriate for conditions observed in Segment 4.

5.5 HYDROLOGIC AND HYDRAULIC ASSESSMENT

Table 11: Segment 4 Hydrologic and Hydraulic Assessment

Basin ID	Area, mi ²	Acres	Culvert ID	2 Yr Flow, cfs	10 Yr Flow, cfs	50 Yr Flow, cfs	Comment
300	0.0478	30.56	-	7	12	17	While the area would appear to drain to a roadside ditch, no culvert is shown.
310	0.0705	45.09	2300C2	9	17	24	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
320	0.0692	44.26	2300C3	9	16	24	Area appears to drain to a roadside ditch.
330	0.0888	56.84	2300C4	11	20	30	Area appears to drain to a roadside ditch.
340	0.0354	22.64	2300C5	5	9	13	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
350	0.9036	578.3	2300C6	86	156	227	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
360	0.1336	85.54	1150C2	16	29	43	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert.
370	0.0640	40.98	1150C1	8	15	23	GIS database indicates that the area is conveyed by a stream that crosses the road in a culvert. This area is routed through drainage area "#360."

5.6 ENVIRONMENTAL ASSESSMENT

The stream conveyed by culverts 2300C6, 2300C1, and 2300C2 are listed as supporting fish. All three culverts appear to be passable, requiring ESA documentation for bull trout. Portions of this section may be within the buffer zone surrounding northern spotted owl home ranges, which will require consultation and may limit removal of mature trees.

6. BRIDGE ASSESSMENT

On July 13, 2011, DEA bridge engineers Ling Shang, PE, and Tom Whiteman, PE, performed a walk-through inspection of the Siouxon Bridge and Lewis River Bridge. They spent approximately two hours at each site. The purpose of the inspection was to provide a general assessment of each bridge's structural integrity, identify localized areas of failure or significant defect, and make a determination of whether the bridges are structurally safe to be used, in their current condition, as pedestrian bridges as part of a new trail system on the eastern side of Yale Lake.

6.1 SIOUXON CREEK BRIDGE



Built in 1951, this steel girder and steel truss bridge is roughly 645 feet long. The two longest spans are trusses (about 140 feet and 110 feet). The bridge is straight at the north end and follows a well-defined curve at the south end. The trusses' lower chord was about five feet below water during this inspection and could not be properly inspected. The bridge deck is concrete. The deck width is 12 feet. There is a 2.5-foot wide sidewalk supported on brackets on the west (lake) side of the bridge.

Figure 31: Siouxon Creek Bridge

The bridge's general structural condition can be summarized as satisfactory. This means that structurally the bridge's principal components, such as the deck, girders, beams, truss elements, and gusset plates, are sound but contain some minor defects. These defects do not have a measurable effect on the bridge's principal load-carrying capacity.



Figure 32: Siouxon Creek Bridge Defects (4 views)

The defects are summarized as follows:

- East and west deck overhang rail anchor zones and overhang in general contain concrete spalls with exposed corroded rebar (numerous locations). Some loose rail anchors have come loose.
- The paint has outlived its useful life. The steel contains areas of minor surface corrosion. The bearings are probably frozen.

6.1.1 Conclusion

We believe that this bridge can adequately be rated to support current AASHTO pedestrian loading of 75 pounds per square foot (psf), given that it has successfully supported logging trucks in the past and there are no significant defects to suggest a measurable loss of strength to any to the major load path components. Furthermore, we believe that it may not be necessary to perform an analysis to verify the bridge's capacity to support current AASHTO pedestrian loading requirements. However, if the client wishes to know exactly what the bridge capacity is and how much reserve capacity is necessary to support code specific pedestrian loads, then a full analysis would be required.

6.1.2 Recommendations

A new standard pedestrian railing per Washington State Department of Transportation (WSDOT) or Oregon Department of Transportation (ODOT) Design Manuals (54 inches high) should be attached for full length of the bridge on both sides. Rail can be attached over the existing girder lines for a clear trail space of 8 feet and to ensure that is being anchored into solid concrete. Also, the existing sidewalk and rail should be removed because of the deterioration noted in the anchor system. The spalled concrete should be patched and "No Rust" paint should be applied to the exposed and rusty rebar.

6.2 LEWIS RIVER BRIDGE

The Lewis River Bridge, which spans Lewis River was built in 1967. This bridge is a high level pre-stressed (Bulb-T) concrete bridge with a total length of 325 feet (130-130-65). No defects were noted on the bridge, and all primary load carrying members appear fully structurally sound.

The bridge contains a 14-foot-wide roadway and a 3.5-foot-wide sidewalk.



Figure 33: Lewis River Bridge (4 views)

6.2.1 Conclusion

We believe that this bridge can be adequately rated to support current AASHTO pedestrian loading of 75 psf, given that it has successfully supported logging trucks in the past and there are no significant defects to suggest a measurable loss of strength to any to the major load path components. Furthermore, we believe that it may not be necessary to perform an analysis to verify the bridge's capacity to support current AASHTO pedestrian loading requirements. However, if the client wishes to know exactly what the bridge capacity is and how much reserve capacity is necessary to support code specific pedestrian loads, then a full analysis would be required.

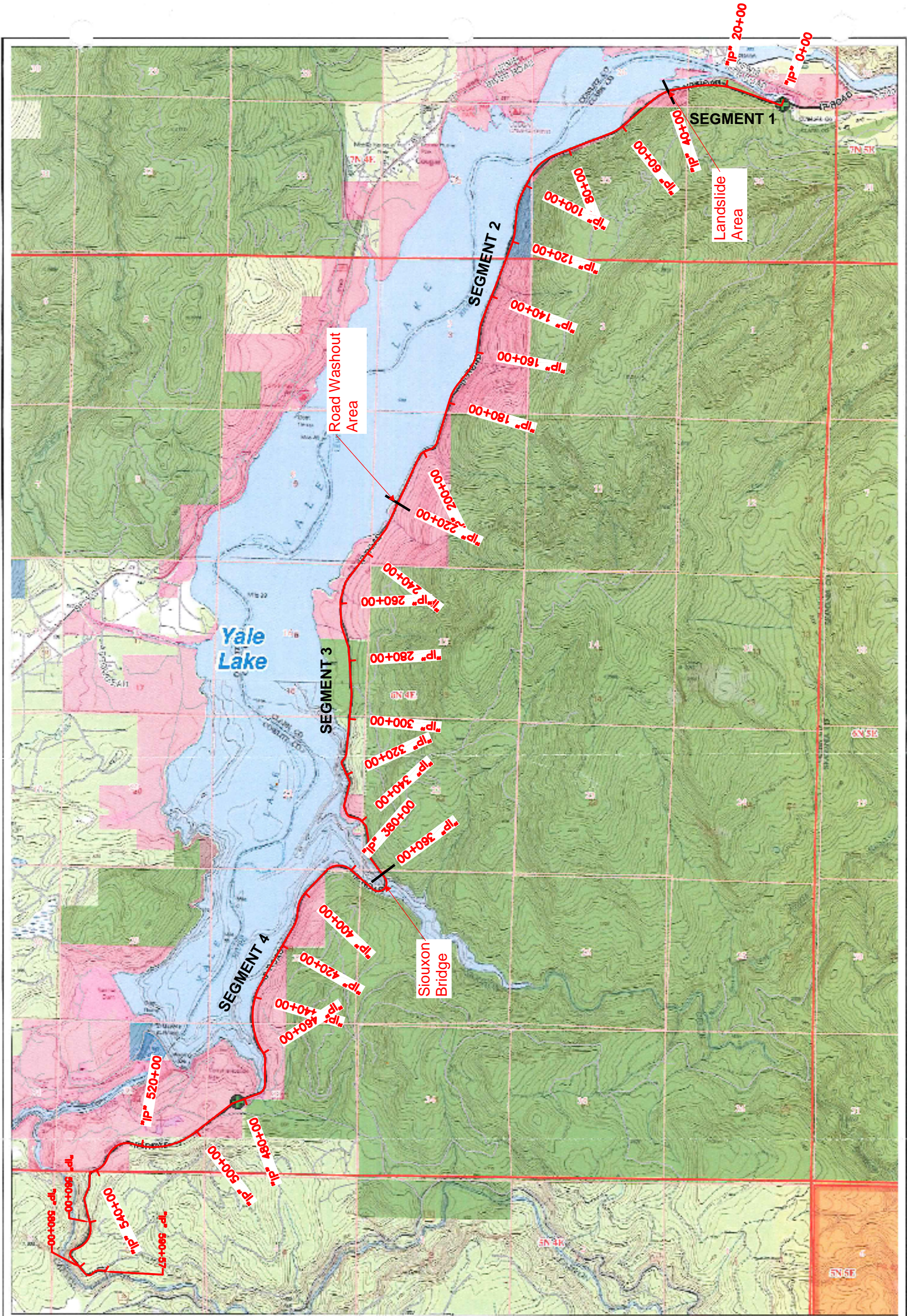
6.2.2 Recommendations

New standard pedestrian railing should be attached per WSDOT Design Manual (54 inches high) for full length of the bridge on both sides. Nw rail can replace the existing rail and a similar format should be added on other side of road so both sides have rail.

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7. APPENDICES

Appendix A – Segment Map



IP ROAD TRAIL ALIGNMENT & SEGMENTS

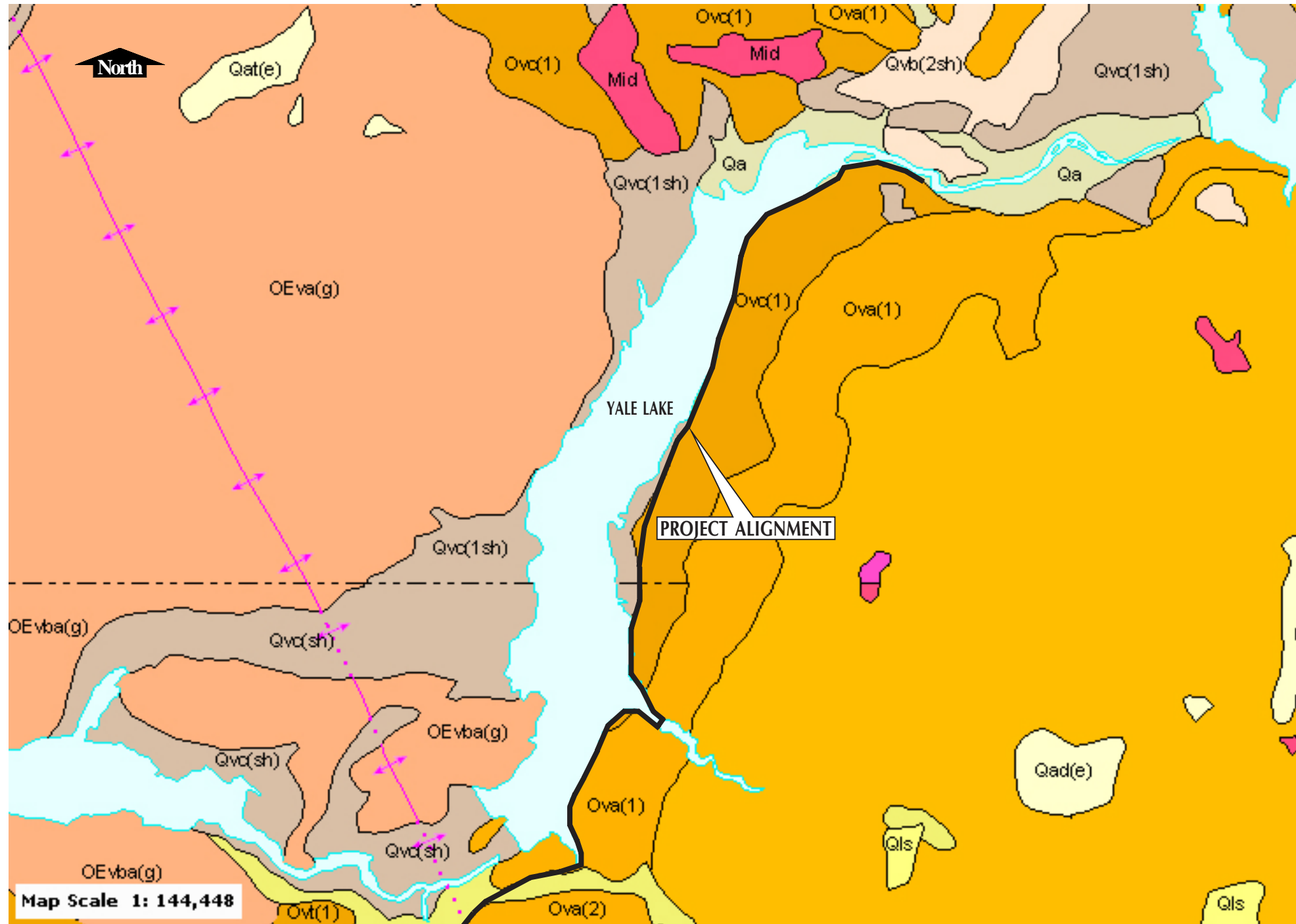


Data Management/
Geographic Information Systems
p4d@pacificorp.com

Date: 01/04/2011 10:40:00 AM

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Appendix B – Geotechnical Exhibits



LEGEND

Surface Geology

Geologic Units 100K

Unconsolidated Sediments

Quaternary alluvium, dune sand, loess, and artificial fill

Volcanic Rocks and Deposits

- Quaternary volcanic rocks
- Oligocene–Eocene volcanic rocks
- Quaternary volcaniclastic rocks, tuffs, lahars, and pyroclastic rocks
- Miocene–Oligocene volcaniclastic rocks
- Oligocene–Eocene volcaniclastic rocks, tuffs, and tuff breccias

Intrusive Igneous Rocks

Pliocene–Miocene intrusive igneous rocks

Other Geologic Units or Features

Water

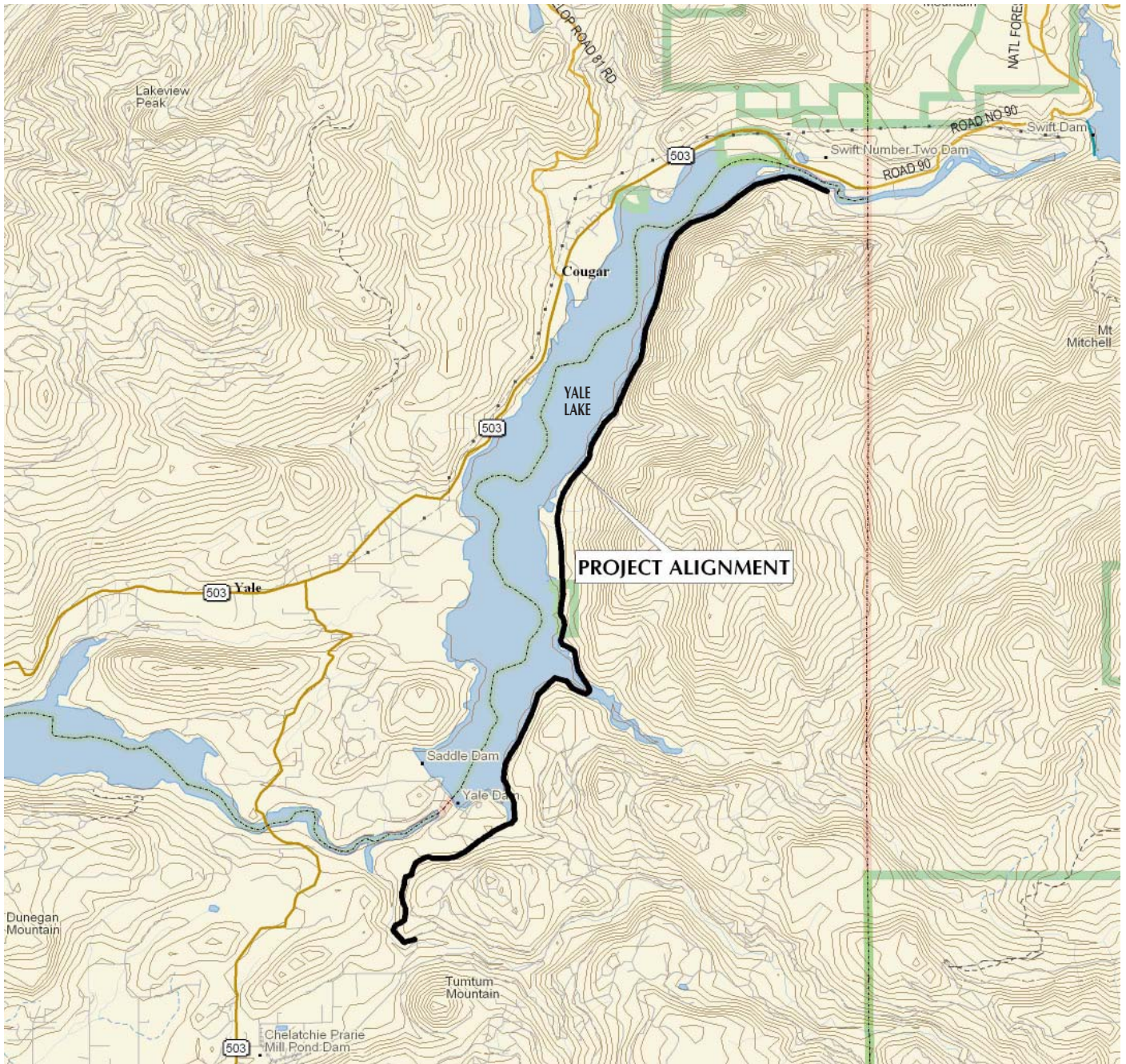
Contacts 100K

- Contact - Identity and existence certain, location accurate
- Shoreline

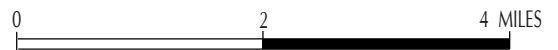
FROM: WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

GRI DAVID EVANS AND ASSOCIATES, INC.
YALE LAKE IP ROAD / PACIFICORP

GEOLOGIC MAP



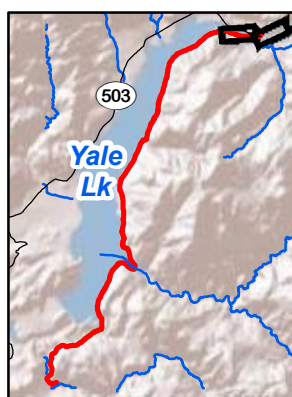
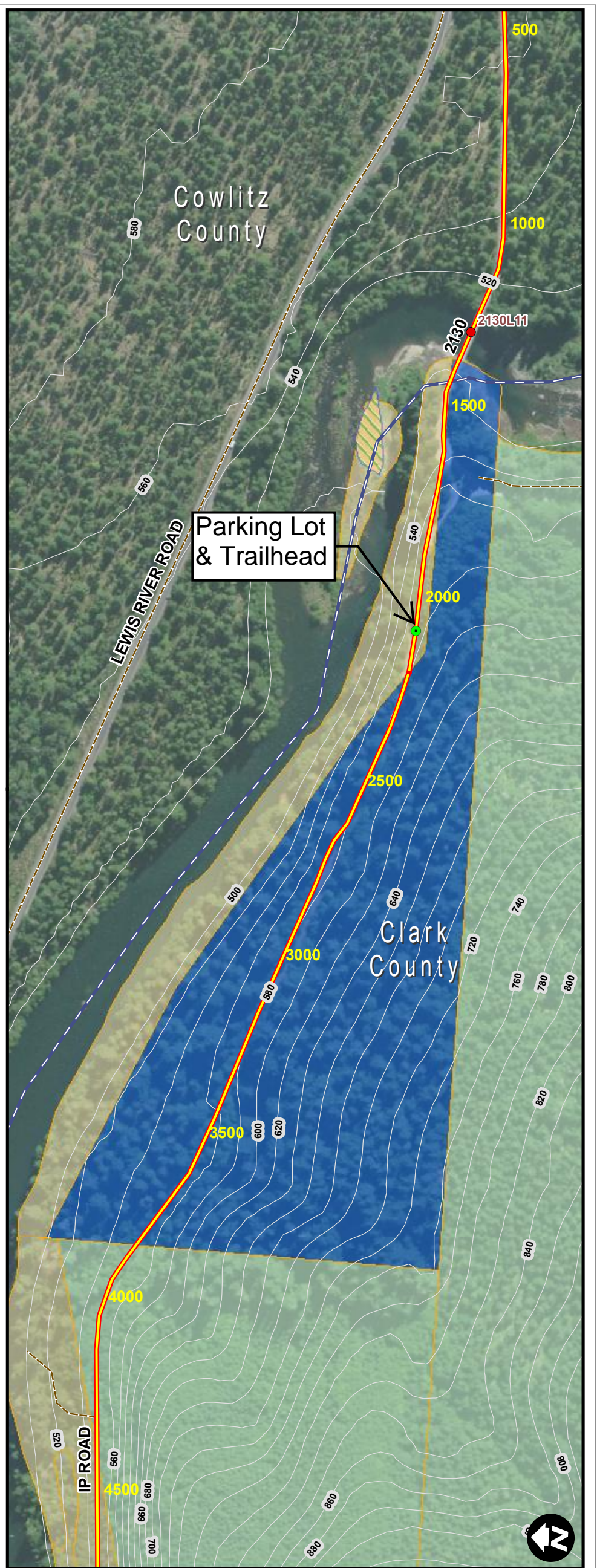
DELOME 3-D TOPOQUADS, WASHINGTON
 COUGAR, WASH. (4aa, 4ab, 4ba, 4bd, 4ca, 4cb, & 4cc) 2004
 YALE DAM, WASH. (1bb, 1bc, 2ad, 2da, 2db, 2dc, & 2cd) 2004



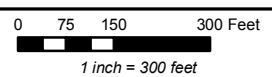
GRI DAVID EVANS AND ASSOCIATES, INC.
 YALE LAKE IP ROAD / PACIFICORP

VICINITY MAP

***Appendix B – Proposed Trail, Parking Lot
and Trailhead Improvements***

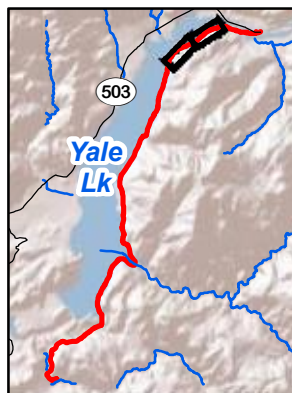
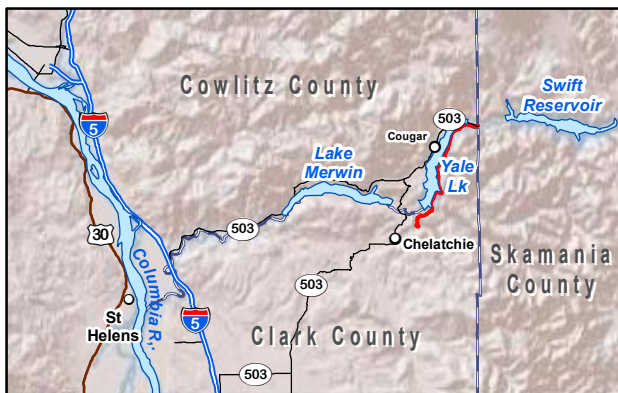
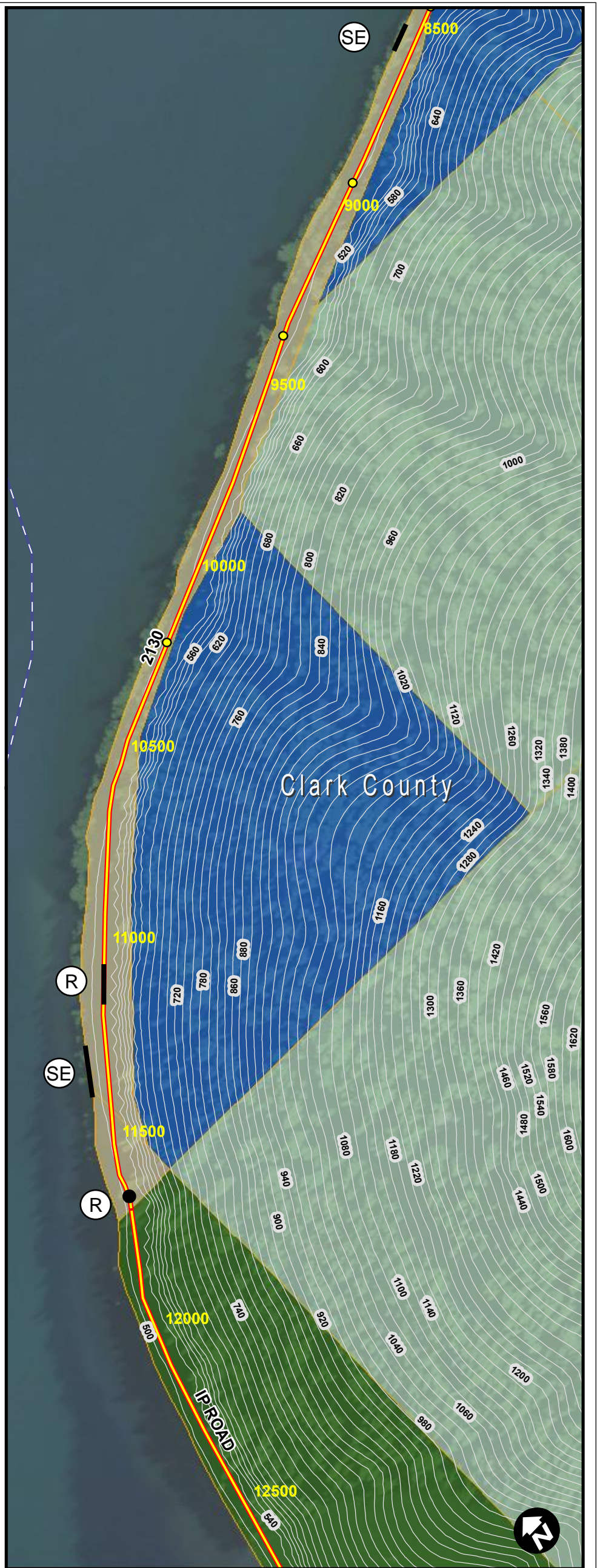


Yale Lake IP Road Area - Proposed Trail

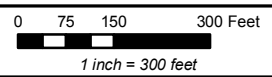


- | | | |
|--------------------|---------------|---------------------------|
| (L) Landslide | 2500 Stations | County Tax Parcel |
| (R) Rockfall | | Pacific Power & Light Co. |
| (DF) Debris Flow | | Clark County |
| (SE) Slope Erosion | | State Land |
| | | BLM |
| | | DNR |
| | | Weyerhaeuser |
| | | Private |

Source Data: Clark County, EDAA, ESRI, USGS, PacifiCorp (2001-11)

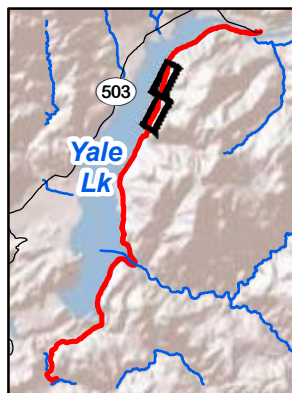
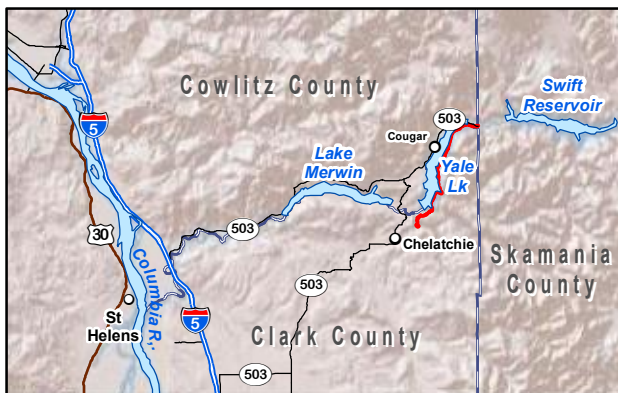
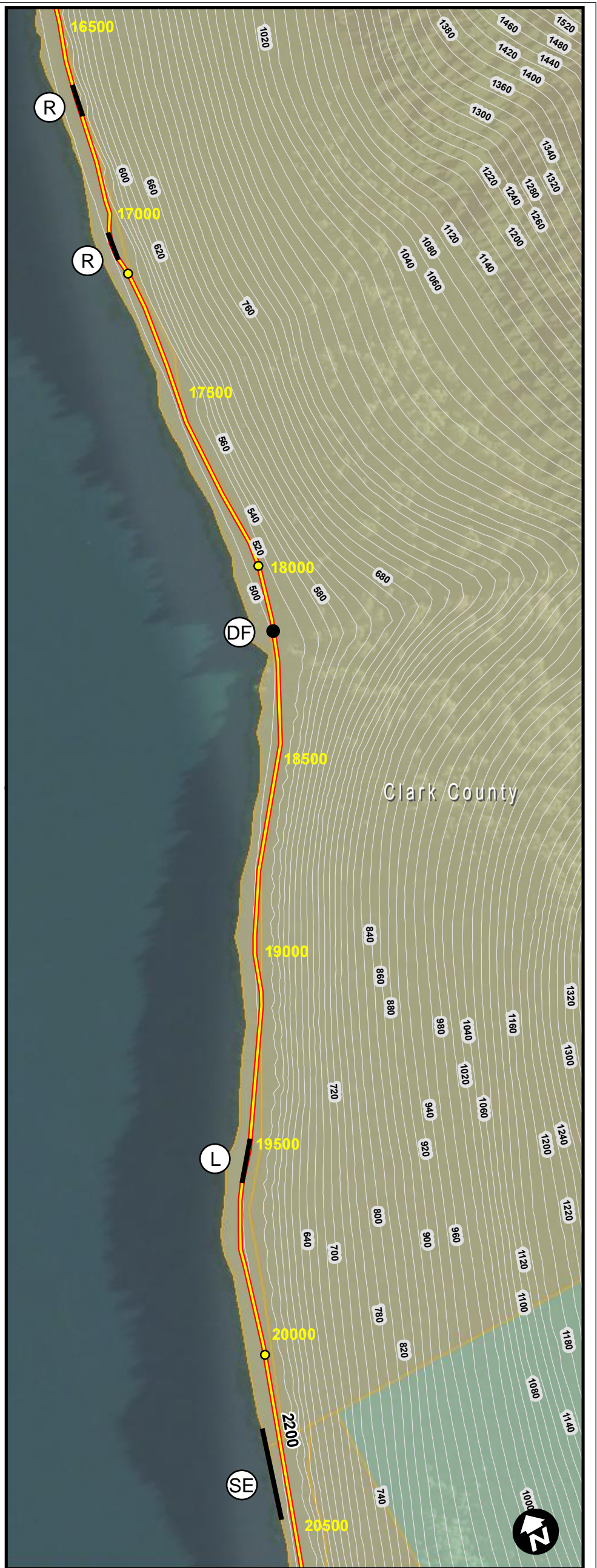
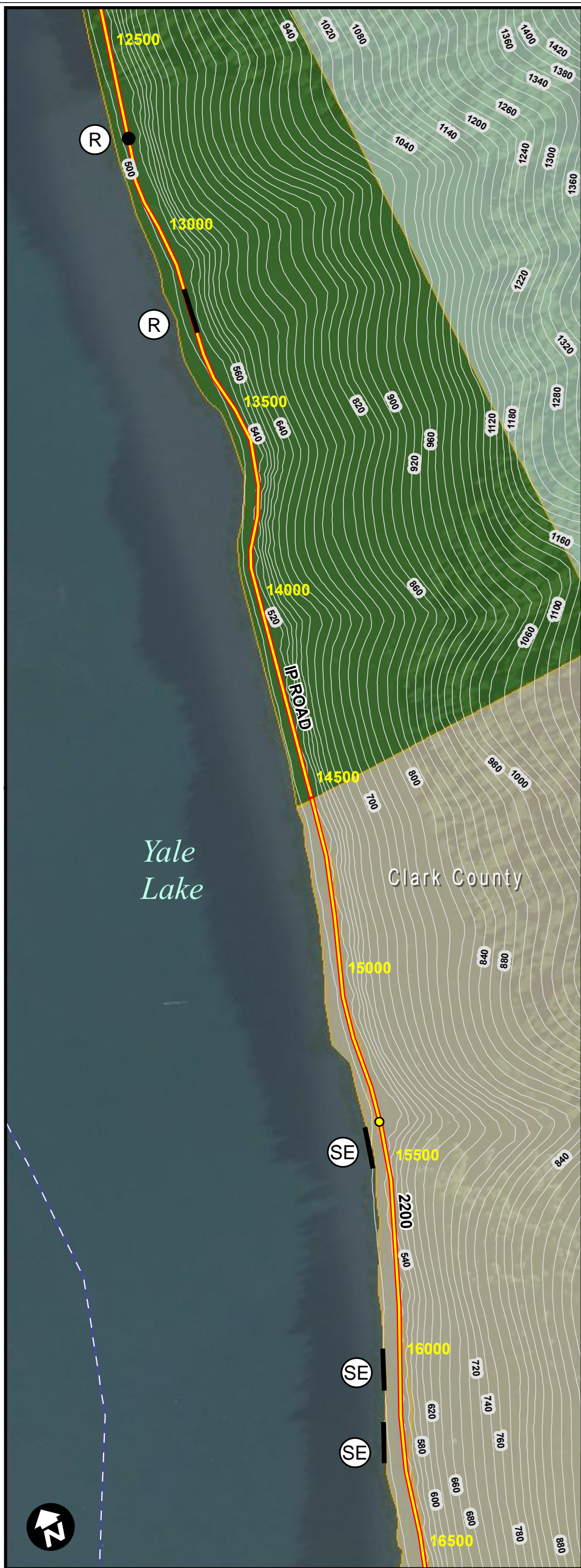


Yale Lake IP Road Area - Proposed Trail

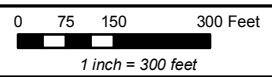


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| (L) Landslide | 2500 Stations | County Tax Parcel |
| (R) Rockfall | | Pacific Power & Light Co. |
| (DF) Debris Flow | | Clark County |
| (SE) Slope Erosion | | State Land |
| | | BLM |
| | | DNR |
| | | Weyerhaeuser |
| | | Private |

Source Data: Clark County, EDWA, ESRI, USGS, PacifiCorp (2001-11)

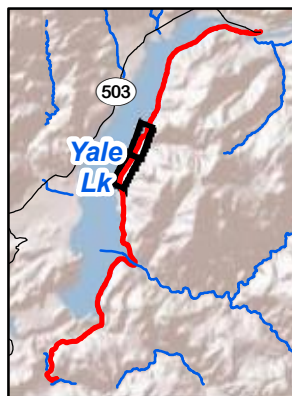


Yale Lake IP Road Area - Proposed Trail

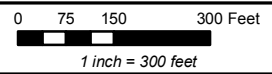


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| (SE) Slope Erosion | | State Land |
| | | BLM |
| | | DNR |
| | | Weyerhaeuser |
| | | Private |

Source Data: Clark County, EDWA, ESRI, USGS, PacifiCorp (2001-11)



Yale Lake IP Road Area - Proposed Trail

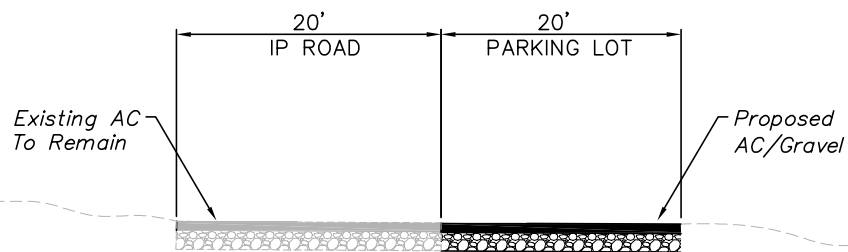
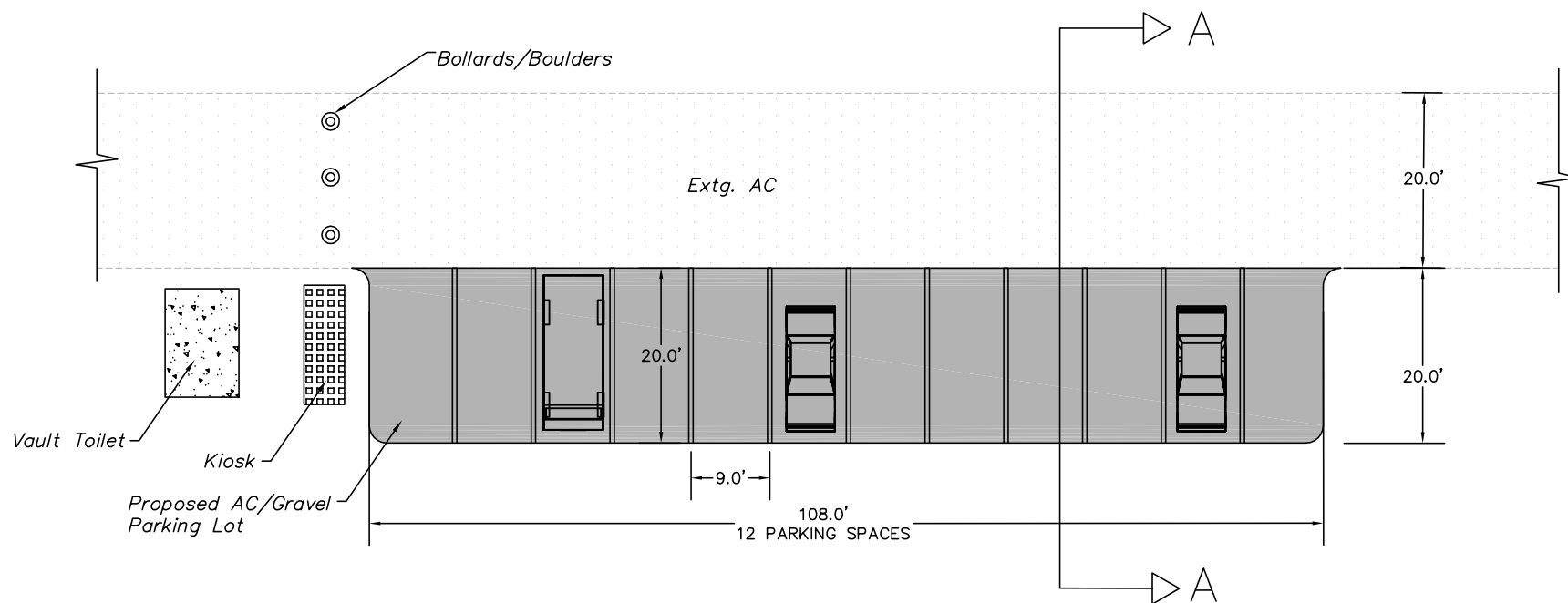


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| | | BLM |
| | | DNR |
| | | Weyerhaeuser |
| | | Private |

Source Data: Clark County, EDAA, ESRI, USGS, PacifiCorp (2001-11)

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IP ROAD PARKING LAYOUT





NOTICE

WELCOME TO THE IP ROAD TRAIL

- TRAIL IS OPEN TO NON-MOTORIZED MULTIPURPOSE RECREATIONAL USE.
- NO MOTORIZED VEHICLE ACCESS ALLOWED.
- ROCK FALL HAZARDS MAY BE PRESENT ABOVE AND NEAR THE TRAIL.
- SHEER AND ERODING CLIFFS MAY BE PRESENT BELOW AND NEAR THE TRAIL.
- ALL PERSONS USING THIS TRAIL DO SO AT THEIR OWN RISK.
- PLEASE BE SAFE.

***Appendix C – Lewis River Recreation Committee (LRC)
Comment Matrix***

Appendix D – Landowner Consultation



December 15, 2011

Jordana T. Taylor
Property Agent
PacifiCorp Real Estate Management
825 NE Multnomah Street, Suite 1700
Portland, OR 97232

RE: Right of Way Application for IP-100 Trail

Dear Jordana:

The Department of Natural Resources (DNR) has reviewed PacifiCorp's Right of Way Application to create a pedestrian trail across DNR managed trust land along the existing IP-100 forest road. DNR currently maintains an easement and right of way on the IP-100 road across PacifiCorp property and also on DNR trust land. This road provides long term forestry access to DNR managed trust land within our Siouxon Landscape. DNR will not release any of our current easement rights to use this right of way as a "logging road" nor do we want to have a pedestrian trail on DNR managed trust land. We respectfully request that the IP-100 Road remains a forest road.

Sincerely,

A handwritten signature in blue ink that reads "Michelle Metcalf".

Michelle Metcalf
Asset Management Specialist

c: Easement 55-001405
Jim Shank, DNR



Longview Forest Area
PO Box 190
500 Burma Road
Castle Rock, WA 98611
360-274-3057
ross.graham@weyerhaeuser.com

November 5, 2010

Jordana T. Taylor
Property Agent
PacifiCorp Real Estate Management
825 NE Multnomah Street, Suite 1700
Portland, OR 97232

Dear Ms. Taylor:

Subject: IP Mainline Recreation Trail

PacifiCorp requested comments regarding a proposed recreation trail on the old IP Mainline located along the south shore of Yale Reservoir and including Weyerhaeuser property near Canyon Creek. We respectfully request that you exclude any Weyerhaeuser property and that the trail be managed and located to minimize impact on our forestland. Our land use goals include the safety of our employees and contractors as a high priority, minimizing encumbrances that may impact the management of our timberlands, and protecting our investments from fire, trespass and nuisance use of our property. I think you can understand that your proposal is not compatible with our resource goals and desired management flexibility over the long term. In addition, the trail as currently proposed is located on our existing access roads.

We appreciate your consideration of our concerns and thank you, for allowing us to comment on this proposal.

Sincerely yours,

Ross E. Graham
Forest Land Use Manager
Longview Forest Area