Chapter 2: Alternatives

Introduction

This chapter describes four management strategies (alternatives) that the National Park Service (NPS) is considering to achieve resource protection and visitor experience goals in the Lake Crescent and Sol Duc areas of Olympic National Park as identified in the 2008 General Management Plan (GMP) and 1998 Lake Crescent Management Plan (LCMP) related to the development of a non-motorized, multiple use trail along the general route of the historic Spruce Railroad grade. These alternatives were developed through an interdisciplinary planning process that included discussions among subject matter experts, agency officials, partner agencies, American Indian tribes, and comments received from members of the public during initial project scoping.

Alternative 1 is the no-action alternative, which describes current management of the existing Spruce Railroad Trail and associated parking lots and trail access. The no-action alternative provides a baseline against which other alternatives may be compared.

Alternatives 2, 3, and 4 (Action Alternatives) describe a range of reasonable approaches to meet the purpose and need for taking action, and to achieve management goals and objectives described in Chapter 1. The goals of this plan are:

Goal 1: Protect Natural and Cultural Resources
Goal 2: Improve Visitor Experience

The Action Alternatives described in this chapter vary in how the park proposes to meet the management objectives defined for each goal, but differ primarily in the extent to which the objectives of Goal 2 are met. The objectives of Goal 2 are:

Resource Education and Interpretation Objectives:

- Improve interpretation of historic Spruce Railroad Grade.
- Interpret lake ecology and unique resources: plants, fish, water quality, geologic history.
- Improve visitor orientation, interpretation, and visitor services to better serve visitors traveling along the US 101 corridor.

Visitor Access Objectives:

- Provide safe pedestrian and bicycle access through the Lake Crescent area for visitors and the traveling public and reduce conflicts between non-motorized and motorized uses.
- Provide adequate parking and vehicle turnaround space at the Lyre River trailhead for safe pedestrian use.
- Provide all visitors, including those with disabilities, the opportunity to visit, learn about, and enjoy the unique natural and cultural resources of the area.

Visitor Experience Objectives:

- Provide opportunities for a variety of outdoor experiences and recreation uses that minimize conflicts between recreational users, and are compatible with the protection of park resources and values.
- Protect views from Lake Crescent and Highway 101.
- Provide appropriate facilities to support visitor use. This may include, but is not limited to: benches, picnic tables, comfort stations, trash receptacles, and a means for proper pet waste disposal.

Park Operational Objectives:

- Design the improvements to the historic Spruce Railroad grade and the existing SRRT to facilitate effective and sustainable ongoing management, maintenance, and visitor use.
- Protect the trail from future damage by including sustainable trail design measures at stream crossings and slide areas.
- Design trail to preclude unauthorized vehicular access.
- Provide for the continued use of private property within the Lake Crescent watershed while minimizing the impacts and effects of private development on the visitor experience, lake ecology, scenic and visual quality, and the historic setting.

All Action Alternatives considered were developed in accordance with the 2009 Final Draft Accessibility Guidelines for Outdoor Developed Areas published by the federal Access Board. These guidelines apply to the construction or alteration of new facilities on federal lands or on behalf of the federal government.

These guidelines provide an exception for new construction or alteration of existing facilities where:

- Compliance is not feasible due to terrain.
- Compliance cannot be accomplished with the prevailing construction practices.
- Compliance would fundamentally alter the function or purpose of the facility or the setting.
- Compliance is precluded by the:
    - Endangered Species Act (16 U.S.C. §§ 1531 et seq.);
    - National Environmental Policy Act (42 U.S.C. §§ 4321 et seq.);
    - National Historic Preservation Act (16 U.S.C. §§ 470 et seq.);
    - Wilderness Act (16 U.S.C. §§ 1131 et seq.); or
    - Other Federal, State, or local law the purpose of which is to preserve threatened or endangered species; the environment; or archaeological, cultural, historical, or other significant natural features.

This chapter is organized as follows:

- Alternative 1 (No-Action, Continue Current Management Approach)
- Activities Common to All Action Alternatives
- Alternative 2 (Recreation Trail Emphasis)
- Alternative 3 (NPS Preferred Alternative)
- Alternative 4 Clallam County Proposal
- Alternatives Considered but Dismissed
- Environmentally Preferred Alternative
- Summary Table of Alternatives
- Summary Table of Environmental Consequences

Alternative 1 - No Action (Continue Current Management, Routine Maintenance Only)

Under the No Action Alternative, the National Park Service would not implement additional trail improvement actions identified in the 2008 GMP and 1998 LCMP. Only routine maintenance of the existing trail system would occur. No new infrastructure would be built. The current situation, as described below would continue. See Chapter 3 (Affected Environment) for a more detailed profile of the project area.

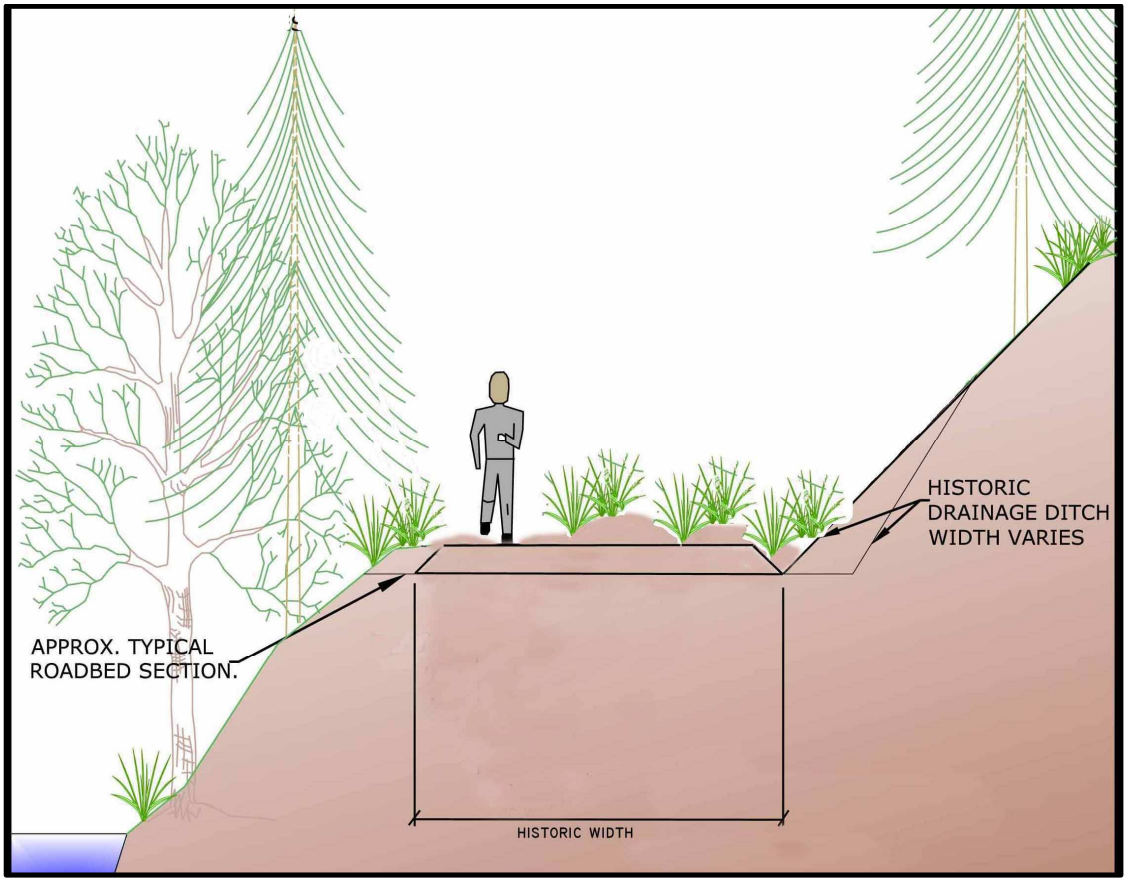


Figure 1. Trail profile (historic railroad segments) existing conditions

Spruce Railroad Trail – existing conditions

Olympic National Park manages a trail system that includes over 600 miles of trail. Trails are maintained in accordance with park-specific trail standards adopted by Olympic National Park during the development of the General Management Plan (GMP) in 2008.

The Spruce Railroad Trail (SRRT) addressed in this document is approximately 4 miles long and contains several distinct segments, described below. This trail was developed primarily along a portion of the historic Spruce Railroad grade adjacent to Lake Crescent. The trail is unpaved and varies in width from approximately 36 inches of clear trail tread up to approximately 6 feet of clear tread in highly compacted areas on the rail grade. Several small drainages cross the existing trail. One of the drainages flows year-round, others flow seasonally. The trail is located along a steep hill slope that descends to Lake Crescent below. Rock slides occur in several locations and have partially buried several sections of the rail grade and associated ditches.

Current maintenance is routine. Seasonal repairs consist of removing downed trees from the trail and limited cleaning of drainage structures. The SRRT was not originally developed to meet accessibility guidelines or to meet a specific park trail standard. The SRRT is best defined as a Multipurpose Bicycle Trail. Maintenance and use is most consistent with the "nature" and "all-purpose" trail standards described below. Volunteers complete most routine trail maintenance. NPS staff maintains the trailheads and parking areas.

Olympic National Park Trail Standards (2008 General Management Plan)

STANDARD	NATURE	ALL-PURPOSE & MULTIPURPOSE BICYCLE	SECONDARY & FOOT	PRIMITIVE
Tread width	60" maximum	24" standard 30" maximum	18" standard 24" maximum	18" standard 18" maximum
Clearing and Brushing	8' lateral 10' vertical	8' lateral 10' vertical	6' lateral 8' vertical	4' lateral 8' vertical
Maintenance frequency	Annual +	Annual	Usually semi-annual	Occasional (for route definition & resource protection)
Bridge width	8' decking maximum	6' decking maximum	6' decking maximum	None
Puncheon width	60" maximum	48" maximum	48" maximum	None
Turnpike width	60" maximum	48" maximum	36" maximum	Not generally allowed, 24" maximum

Nature Trails — These trails are generally paved or gravel surfaced, and are designed for large numbers of relatively inexperienced users. Stock is prohibited except for occasional administrative use, or when a nature trail is the only trail available for stock to access all-purpose or secondary trails. Nature trails are maintained to a standard for higher use volumes.

All-Purpose Trails — These trails are main routes; they are open to hikers and stock, and are maintained to a standard for stock travel.

Multipurpose Bicycle Trails — Located outside of wilderness, these trails are open to hikers, stock, and bicycles, and are maintained to all-purpose standards.

Secondary Trails — These trails are open to hikers and stock, and will be maintained to a standard for foot travel. These trails are designed for experienced horses and riders.

Foot Trails — These trails are open to hikers, and are maintained to a standard for foot travel. They are closed to stock, except for occasional administrative use.

Primitive Trails — These trails are open to hikers only, for high elevation or low-use area access. Primitive trails include both constructed trails and trails established by continual use. These trails have minimal improvements — enough to protect the resources. Occasional maintenance is performed, as time and budget allow keeping routes open and protecting park resources.

Universally Accessible Trails — These trails are accessible to and usable by people with disabilities.

The SRRT is immediately bordered by trees and herbaceous plants that have established since the railroad was abandoned and later closed to vehicular access. In several areas the cut slope above the trail has slumped onto the railroad grade, burying the trail and abandoned railroad ditches, reducing the width of exposed railroad corridor and providing a medium for the growth of both native and non-native vegetation.

The SRRT is located on a south-facing terrace with scenic views of Lake Crescent and the surrounding mountains and is a popular, year-round destination.

For the purpose of this EA, the existing SRRT is broken into four separate planning segments:

- **Segment A** (from the western end of the SRRT at Camp David Junior Road (CDJR) to the west side of the short railroad tunnel,
- **Segment B** (the trail segment between the two historic railroad tunnels),
- **Segment C** (the trail east of the long railroad tunnel near Lake Crescent on the historic railroad grade),
- **Segment D** (the trail between Lake Crescent and the current Spruce Railroad Trail parking lot near the Lyre River – not on the historic railroad grade).

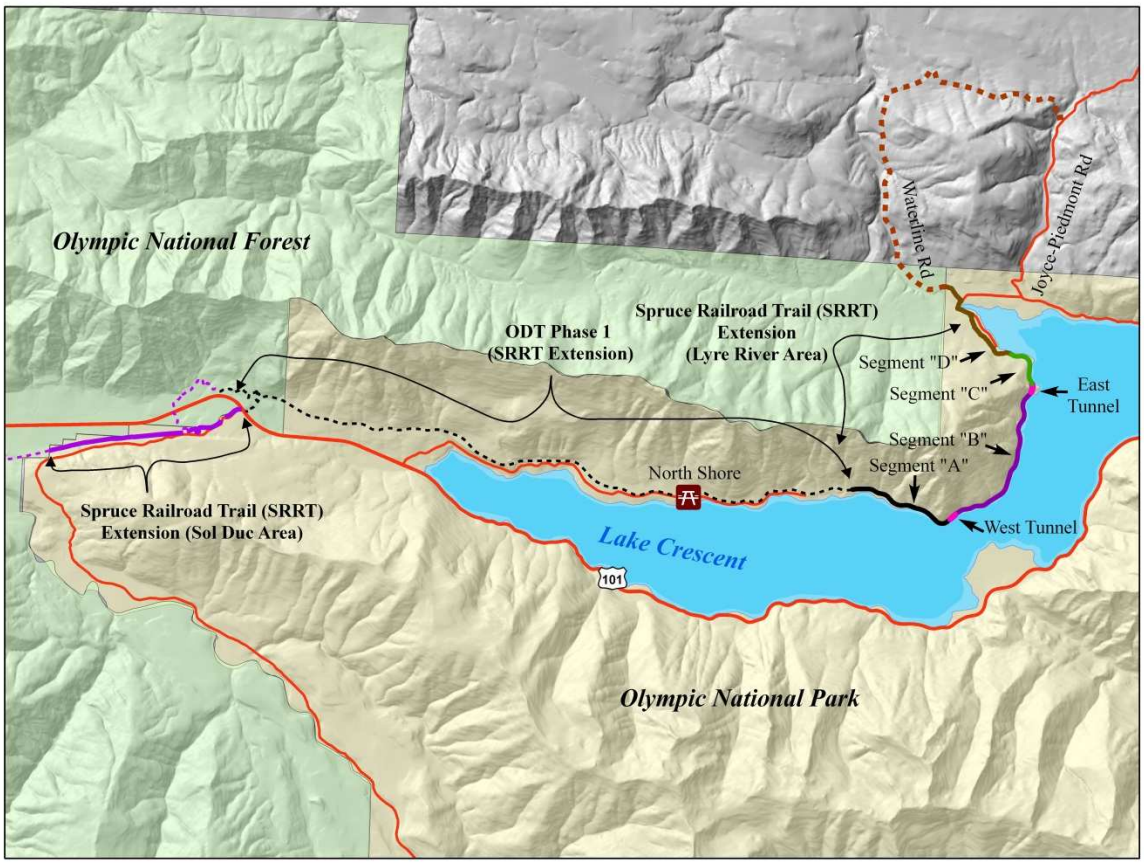


Figure 2. Project Area Map (Only lands within the boundary of Olympic National Park are addressed in this EA)

Segment A: The trail begins in the west at a trailhead located at the end of Camp David Junior Road (milepost (MP) 0.0 to MP 1.07). The trailhead is identified by a small sign and bulletin board at the end of the road. A spur trail climbs a short distance to reach the historic Spruce Railroad grade. The trail continues east along the railroad grade for approximately one mile to the partially collapsed, west railroad tunnel (short tunnel) and bypass trail. There are five downslope bank failures located in Segment A, including four with exposed, historic wood cribbing.

West Railroad Tunnel (short tunnel) & Bypass: A geotechnical evaluation of the western railroad tunnel (short tunnel) was conducted in late 2010 (PanGEO, 2011). This evaluation found that the short tunnel is approximately 140 feet long, and is oriented northeast-southwest. The tunnel ranges between 19 to 22 feet in width and between 25 to 30 feet in height. In the past, attempts to close the tunnel through the use of blasting resulted in a large debris pile at the east tunnel portal. An approximately 425 foot long bypass trail provides access around the tunnel to the south between MP 1.07 and MP 1.13. The bypass trail averages three feet in width and is immediately adjacent to Lake Crescent.

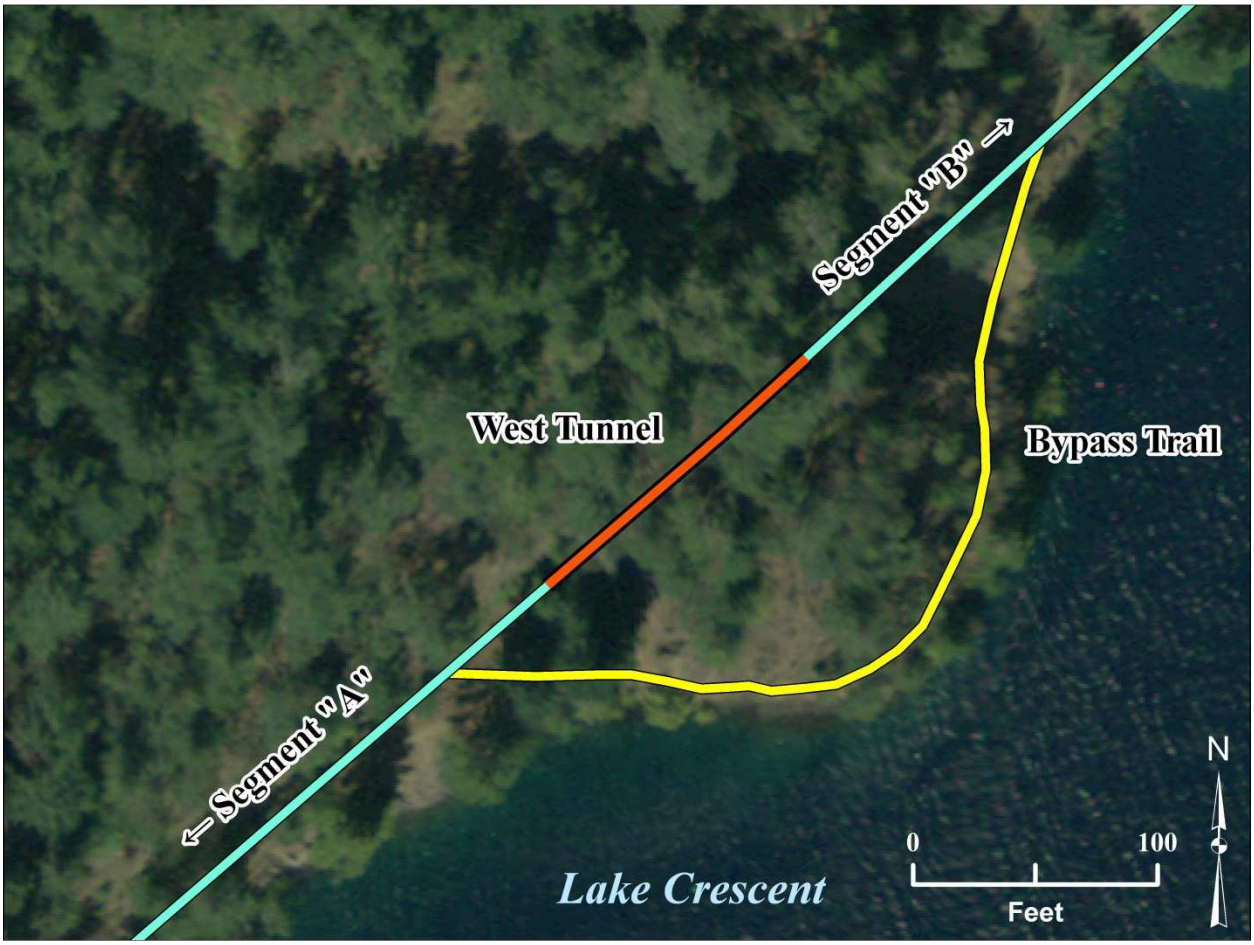


Figure 3 West railroad tunnel and bypass trail

Segment B: The trail continues from the east side of the west (short) railroad tunnel along the historic railroad grade (MP 1.13 to MP 2.72). The grade has eroded in several places, both above and below the trail, leaving a narrowed trail corridor. This trail segment continues east for approximately 1.59 miles to a second partially collapsed railroad tunnel and bypass trail. There are nine downslope bank failures located in Segment B. This includes two bank failures with exposed, historic wood cribbing and two locations with historic dry laid rock. In one location the dry laid rock is intact, in the second the dry laid rock has failed.

East Railroad Tunnel (long tunnel) & Bypass: A geotechnical evaluation of the eastern railroad tunnel (long tunnel) was conducted in late 2010 (PanGEO, 2011). This evaluation found that the long tunnel is approximately 390 feet long, and is generally oriented north-south with a constant, gentle curve to the west. The tunnel ranges between 21 to 24 feet in width and between 26 to 28 feet in height. In the past, attempts to close the tunnel through the use of blasting resulted in large debris piles at the tunnel portals, leaving as little as three feet of clearance at the north portal where a large volume of rock is accumulated.

A bypass trail between MP 2.72 and MP 2.80 provides access around the long tunnel and to the Devil's Punchbowl, a small, deep bay with steep drop-offs located along the southern edge of the rock outcrop containing the railroad tunnel. The bypass trail is approximately 1,225 feet in length and averages three feet in width. The Devil's Punchbowl is a destination for trail users, including those who are not planning to hike the full length of the Spruce Railroad Trail. It is also a destination for many boaters on Lake Crescent. The Devil's Punchbowl is reached via a rocky trail that departs from the Spruce Railroad grade on both sides of the long tunnel to an existing footbridge. The bridge crosses the small bay and connects trail users to the bypass trail grade.

The footbridge is a steel box truss pedestrian bridge with wood decking. The bridge is approximately 85 feet long and 6 feet wide. A routine inspection of the bridge recently found that it is no longer structurally suitable for use by people traveling with stock. The park is in the process of posting updated safety information to notify trail users of this change in conditions. The bridge remains suitable for use by people traveling on foot or by bicycle.

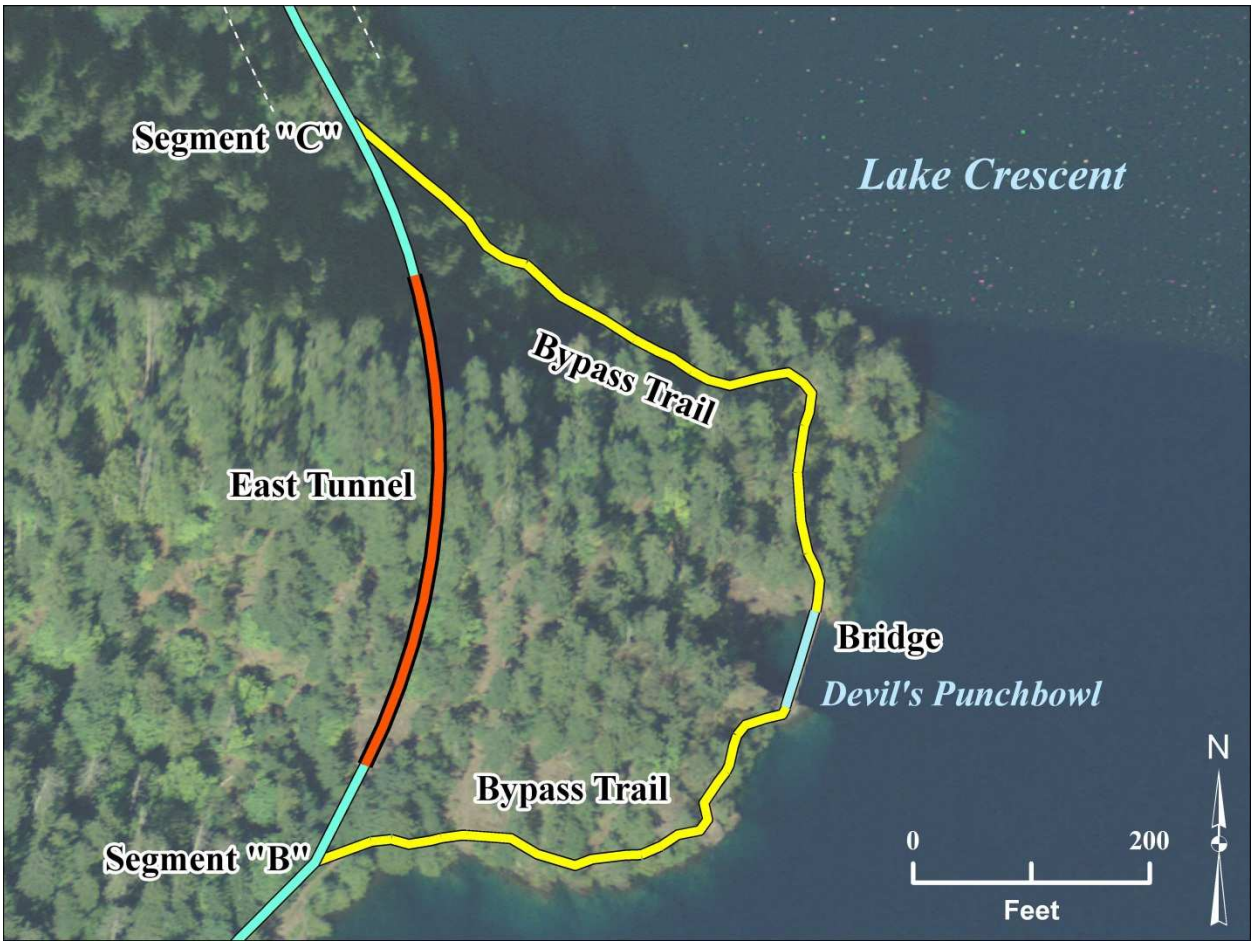


Figure 4 East (long) railroad tunnel, bypass trail and Devil's Punchbowl bridge

Segment C: The trail continues east along the railroad grade for approximately 0.5 miles from the east side of the long railroad tunnel (MP 2.80 to MP 3.27). This trail segment contains multiple seasonal water crossings and is frequently wet or muddy.

Segment D: The easternmost segment of the existing trail leaves the historic railroad grade near the shore of Lake Crescent and climbs approximately 90 feet to bypass private property before descending to the eastern trailhead parking lot at the end of East Beach Road near the Lyre River (MP 3.27 to MP 3.86). There are three small bridges located on the current trail that cross small drainages and wetland areas.

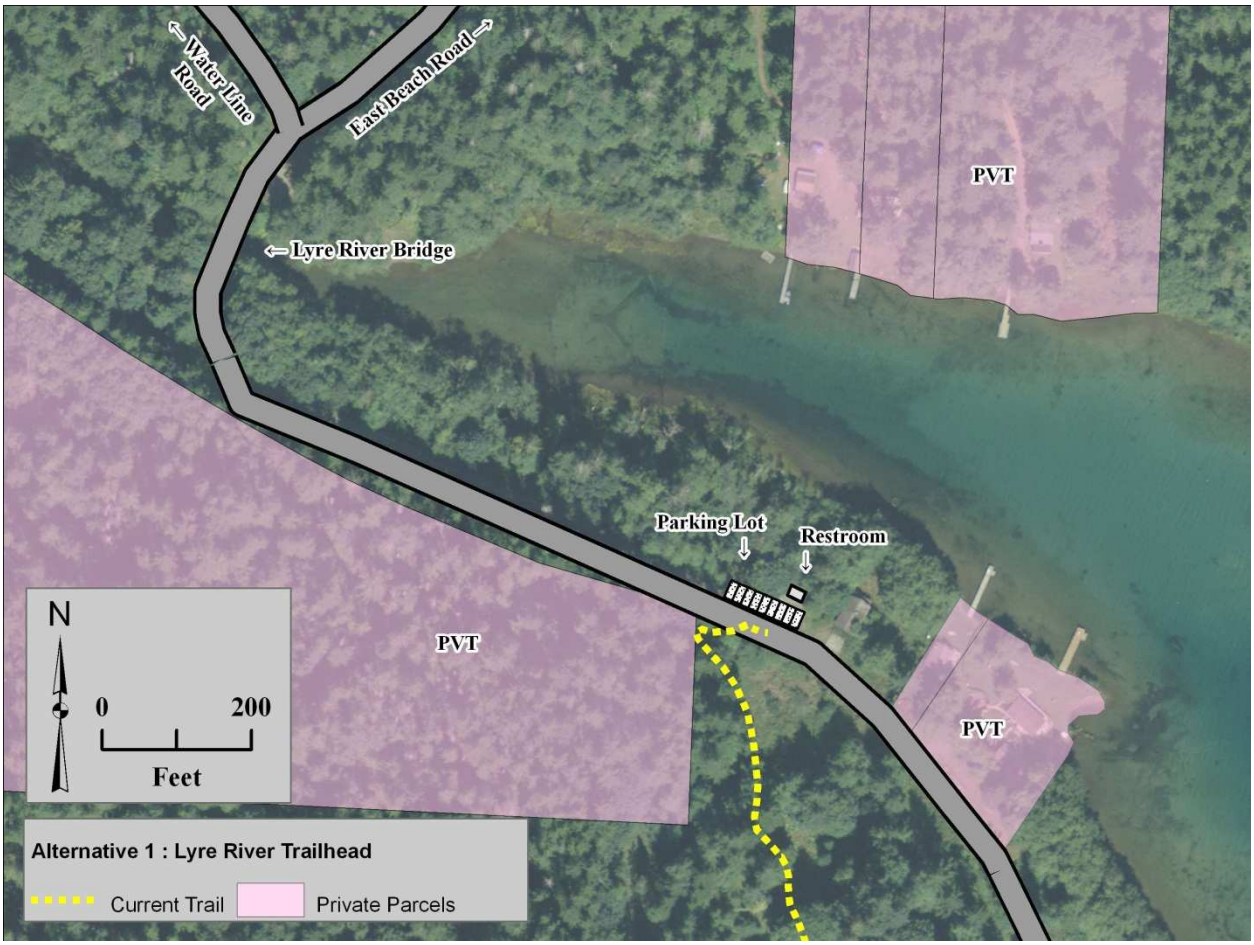


Figure 5. Existing Configuration of Spruce Railroad Trail parking lot area.

Spruce Railroad Trailhead Parking Lot: A small, unpaved parking lot is located at the eastern end of the trail, west of the Lyre River. The parking lot does not provide adequate turnaround space for vehicles with a large turning radius, such as large motorhomes or vehicles towing trailers. The trailhead contains one unisex vault toilet, one picnic table, and a bulletin board with visitor information about the park and trail. The NPS owns a vacant building located immediately adjacent to the current parking area. This structure has been identified for removal. A small, abandoned dock associated with the property remains in Lake Crescent near the outlet to the Lyre River and has also been identified for removal.

Private Lands: Several private landowners access their property on Lake Crescent via a spur road that continues west beyond the existing parking lot. A short segment of the existing Spruce Railroad Trail bisects the corner of a private parcel.

Olympic Discovery Trail – Phase 1 existing conditions

Clallam County received approval from the NPS to construct approximately 6.5 miles of new trail on the historic Spruce Railroad grade above Camp David Junior Road in 2009. This new

trail segment remains under construction at the time this environmental analysis is being completed.
This new trail segment begins outside the boundary of Olympic National Park adjacent to Highway 101 to the west of Fairholme and north of the NPS entrance road to the Sol Duc area of the park. The trail extends northeast from Highway 101 into the park. Within the park the trail varies between 12.5 to 14 feet in width. This includes an asphalt paved section that is between 8 and 10 feet in width, and adjacent gravel shoulders that vary between 0.5 to 4 feet in width on each side. This new trail segment follows the Spruce Railroad grade to the east, paralleling Camp David Junior Road and ending near the western end of the existing Spruce Railroad Trail.

Clallam County proposes to extend the trail to the west on U.S. Forest Service (USFS) and other lands, eventually connecting with the community of LaPush at the Pacific Ocean as part of a regional trail system known as the Olympic Discovery Trail (ODT). Work on USFS lands was addressed in an environmental assessment completed by Olympic National Forest, Department of Agriculture in 2006. Construction of a new trail section by Clallam County on USFS lands is proposed to begin in late 2011.

Sol Duc – Spruce Railroad grade – existing conditions

The historic Spruce Railroad grade continues to the southwest of the Lake Crescent area. A portion of the railroad grade was buried during the construction of Highway 101. The railroad grade continues on private lands near the highway. The historic Spruce Railroad grade re-enters the park and continues west within the Sol Duc area for approximately 1.5 miles before reaching the park's western boundary in the project area. The railroad grade continues west outside the park on USFS lands.

This section of the Spruce Railroad grade is described in greater detail in Chapter 3: Affected Environment. This section of the railroad grade has not been rehabilitated or developed as a trail. It is currently unmaintained.

The Sol Duc area of the park is accessed via a paved road to the south of Highway 101. A small improved parking lot with space for eight vehicles is maintained by the NPS adjacent to the Sol Duc Road just off Highway 101. The parking lot is paved and includes an unstaffed visitor information area with several interpretive exhibits. A vault toilet is also located in the parking area. There is currently no developed access to the railroad grade in the Sol Duc area.

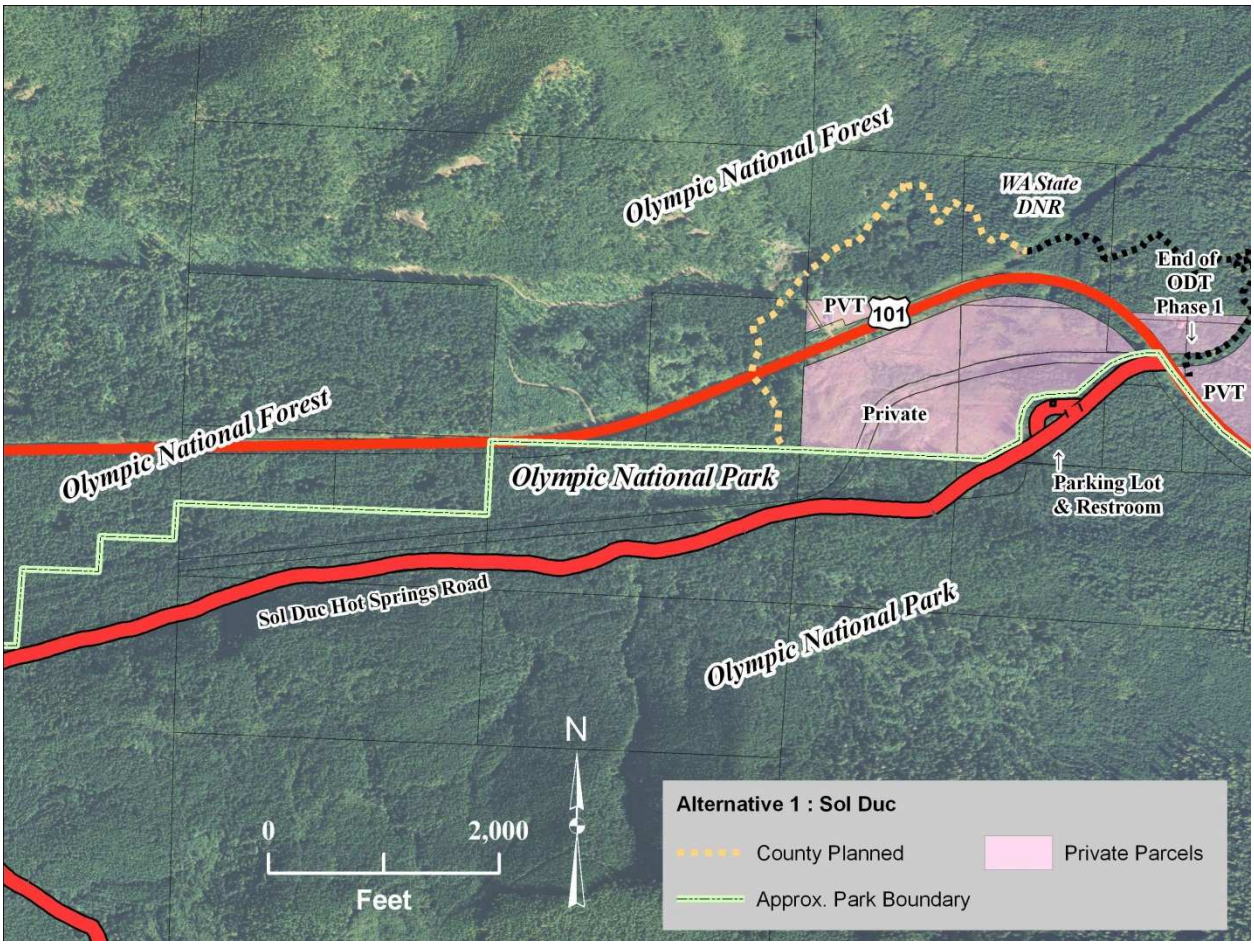


Figure 6. Sol Duc area, existing conditions (replace photo with no action)

Activities Common to All NPS Action Alternatives

The following activities are included in all NPS action alternatives (Alternatives 2, 3). See Chapter 3 (Affected Environment) for a more detailed profile of the current environmental situation in the project area. The conceptual design for trailhead improvements and trail rehabilitation and development presented in this document may be modified during final design to best accommodate site-specific conditions and minimize resource impacts.

Construction, maintenance, and use of the trail would be managed under all alternatives to provide for the safety of the visiting public and to provide a safe and healthful workplace for NPS employees, volunteers, and partners.

The Spruce Railroad Trail would be closed to visitor access during construction activities. The length and extent of the closure would depend on the alternative selected and site conditions encountered during construction.

Traffic control would be required along East Beach Road, Camp David Junior Road, the park's Sol Duc Road, and portions of Highway 101 during construction. The extent and duration of traffic control would depend on the alternative selected. Traffic control would be implemented in coordination with the applicable state or local transportation management agency.

Camp David Junior Road Construction Access

Vehicular access for trucks and other construction equipment would be established from Camp David Junior Road (CDJR) at milepost 4.6 as measured from Highway 101. This construction access point would be located approximately 300 feet from the eastern end of the road. Construction vehicles would enter the project site via Highway 101 onto CDJR. Trailered equipment would be unloaded on CDJR before moving up the access to the work area.

A new construction access is required to avoid damage to the trail constructed above CDJR in 2009 (ODT Phase 1). A graded gravel ramp would be constructed at an approximately 12% grade. Construction would include removal of all vegetation in the access corridor, including trees < 11" dbh. Construction would include grading and placement of fill between CDJR and the ODT Phase 1. The grade would be stabilized through the placement and compaction of 1-1/4-inch minus road base. All materials would come from a park-approved, weed-free source.

Table 2.1, Installation of a construction access ramp along Camp David Junior Road

Construction Requirements	Quantities
Length of access ramp	250 linear feet
Width of access ramp	20' wide at bottom, 14' wide at top
Volume of excavation/cut required	N/A
Volume of fill required	1200 cubic yards
Volume of base material placed	125 cubic yards
Volume of asphalt placed	N/A
Volume of rip rap placed	N/A
Number of trees removed (≥ 11" dbh)	N/A

Work type	Duration (approx.)
Clearing and grubbing, placing fill and base	4 days

Camp David Junior Road (CDJR) Trailhead Development

Under all NPS action alternatives two accessible parking spaces would be constructed along Camp David Junior Road (CDJR) in an existing widened turnout area adjacent to the existing North Shore Picnic Area parking lot. The accessible parking spaces would be designated and signed for use by people with disabilities only. The widened area of CDJR would be graded.

Gravel (1-1/4-minus) would be placed over an area 35-feet long and 12-feet wide. Asphalt would be placed on the gravel with an additional six inches of asphalt in a turndown edge along the road. The entire area would be graded so that the asphalt elevation matches the adjacent gravel road elevation.

Compacted gravel and asphalt six feet in width would be extended from the accessible parking spaces across CDJR to connect with an accessible spur trail. The spur trail would provide access to the newly constructed ODT Phase 1 trail segment and the expanded Spruce Railroad Trail.

The centerline of the spur trail would be marked using tape and stakes at intervals to clearly identify both straight and curved sections. Once the alignment is marked, a tracked loader would be used to clear duff and vegetative overburden to a width of ten feet. This material would be loaded onto trucks, removed from the park, and disposed of at an approved site.

The trail grade would be constructed along the hillside through the removal of trees and other vegetation and the excavation of the trail grade. The spur trail would include switchbacks on the hill above CDJR at a grade of five percent. In areas where an upslope cut bank is exposed, class 2 and 3 rip rap would be placed to support the exposed bank while leaving the full width of trail.

After the base of the trail is in place and the cut banks supported, 1-1/4-inch minus gravel would be placed and compacted to a depth of six inches and a width of seven feet for the entire length of the spur trail. The gravel would be compacted in place; asphalt three-inches thick and six-feet wide would be placed on the compacted gravel base and centered so that six inches of compacted gravel remains on each side of the trail outside the edges of the asphalt. Additional gravel would be placed and compacted outside of the edges of asphalt to raise the gravel elevation to level with the completed asphalt grade.

Table 2.2, Construction of new universally accessible parking and trail access along Camp David Junior Road near the North Shore Picnic Area parking lot.

Construction Requirements	**Quantities**
Length of trail segment	495 linear feet
Area of accessible parking development	420 square feet
Volume of excavation/cut required	155 cubic yards
Volume of fill required	325 cubic yards
Volume of base material placed	64 cubic yards
Volume of asphalt placed	28 cubic yards
Volume of rip rap placed	30 cubic yards
Number of trees removed (≥ 11” dbh)	3

Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	13 days

Animal-resistant trash receptacles and recycling containers would be placed at the CDJR trailhead to accommodate increased visitor use. Additional or improved restroom facilities may also be located at the trailhead if the existing toilet in the nearby North Shore picnic area parking lot is found inadequate to meet visitor demand. Trail information and interpretation signs would also be installed.

Establishing Primary Trail Centerline (Lake Crescent and Sol Duc)

The trail centerline would be surveyed and staked for horizontal alignment and vertical grade as established in the construction drawings. Olympic National Park (ONP) archeology staff would inspect and adjust the surveyed alignment as necessary to conform to the historic railroad alignment (where present) to establish a final centerline.

The final centerline would be used to establish the construction limits. The width of the construction limits varies and is described for each alternative considered. The construction limits would be marked using flagging or other accepted means to allow for identification of the area to the contractor. The construction limits identify the external boundary where construction-related disturbance may occur. The approved construction limits would be of sufficient size to accommodate trail development, construction access, passing zones, turnaround, resting, and staging areas. Construction limits would be minimized and kept within previously disturbed areas to the greatest extent possible.

Site Preparation – Vegetation Removal and Grading

After the construction limits are marked and identified to the contractor, the area would be cleared of vegetation, duff, and overburden. Trees within the construction limits would be cut as close to ground level as possible using a chain saw. Overhanging limbs in the construction limits would be pruned using approved horticultural standards to create a clear zone up to 12-feet high. Once cut, trees would be dispersed into the surrounding forest using an excavator. Some trees may be utilized during trail development. This may include using logs to rehabilitate historic wood cribbing, to help delineate portions of the trail, or to develop benches or other appropriate trail features. Small woody material up to six inches in diameter would be disposed of outside the Park or mechanically shredded and placed in the surrounding forest to avoid the creation of large piles of material. Removed vegetation would be loaded onto a dump truck using either a loader or excavator and disposed of at a permitted location outside the Park. Areas containing invasive plant species would be cleared of those plants and protected from reintroduction of non-native plants until the entire project is revegetated through the application of weed-free mulch.

After vegetation removal is complete, removal of duff and other overburden from the trail corridor would be completed using a small bulldozer and/or grader. Where feasible, the duff layer would be salvaged from areas free of non-native plants as identified by the park's vegetation specialist and applied to newly finished slopes following trail construction. Where the

historic Spruce Railroad grade is within the construction limits, the overburden would be removed to an elevation identified by a park archeologist as the top of the railroad ballast or higher. The intent would be to minimize disturbance to remaining historic materials to the greatest extent possible while allowing for the development of a firm and stable surface for trail construction. The overburden would be loaded into trucks using construction equipment (excavator, loader) and disposed of at a permitted location outside the Park.

If excessively muddy or wetted areas are encountered within the construction limits the contractor would place and compact 1-1/4-inch minus gravel from a park-approved source as necessary to stabilize the surface and allow passage of trucks and construction equipment along the route.

Upslope Bank Failures

Upslope bank failures have deposited rock and debris across the proposed trail corridor at approximately five locations within trail segment A and seven locations within trail segment B. In segment A, all slide materials within the construction limits would be removed, as appropriate to maintain slope stability and trail integrity, by loading materials onto a dump truck using either a loader or excavator. Slide materials would be removed down to the grade of the railroad ballast or higher, creating a vertical cut against the slope. Where necessary, the slope would be stabilized through the placement of Class 2, 3 and 4 rip rap against the vertical cut, raised to a height sufficient to support the entire exposed face and prevent continued migration of slide materials onto the trail. Work would be accomplished using a tracked excavator and dump truck.

Treatment of upslope bank failures in segment B varies by alternative. If park staff determine that the removed slide material is acceptable for use in other areas of proposed trail construction it would be transported and stockpiled for later use. Suitability for reuse would be based on whether or not the materials are suitable from an engineering standpoint. Best management practices would be utilized to ensure that such use does not introduce or spread non-native plants within the park. If materials are not acceptable for such use they would be removed from the park to a permitted disposal site.

Downslope Bank Failures

Where bank failures have occurred along proposed trail segments, the desired width would be established either through modifying the alignment to move the trail away from the bank failure or through the placement of downslope bank stabilization. The proposed method for downslope bank stabilization varies by location and is described by trail segment for each alternative. However, all areas of the existing trail that propose the use of large construction equipment would be rehabilitated and stabilized to provide a stable corridor for construction and maintenance access and trail use.

Trail Drainage

Areas where water flows across the trail would be contained through the placement of a buried plastic culvert, a trail bridge, boardwalk, or a low water crossing. The number of areas varies by alternative. Where culverts are placed, the trench would be excavated using a tracked excavator and the culvert placed in the trench at the design slope. The trench would be backfilled using native material and compacted. The inlet and outlet ends would be protected through the placement of class 2 and 3 rip rap. Where low water crossings are installed, the trail grade would be slightly depressed at the location of the crossing, rising for 25 feet on each side to match the trail grade. Concrete, rather than asphalt, would follow the swale, providing a flow path for water. Where necessary to direct the water and maintain the channel alignment, the inlet and outlet sides of the low water crossing would be channelized through the placement of 3-inch minus rock from a park-approved source. Culvert installation and development of low water crossings would require use of a tracked excavator and dump truck. The placement of a bridge would require specific design suited to the terrain and use.

Asphalt Paving Sequence

In areas where a paved trail surface is proposed, following establishment of the approved construction limits and site preparation described above, the contractor would compact the sub-base of the entire route using a mechanical compactor. Once compacted, 1-1/4-inch minus gravel road base would be centered in the construction limits and placed to the width and depth identified in the approved alternative. This would be completed using dump trucks to supply the road base and bulldozers and graders to spread the material. The road base would be compacted to 90 percent of a standard proctor using a mechanical compactor. The compacted base would be tested for compaction utilizing industry standard tools and methods.

Once the road base is placed and compacted, the contractor would pave each approved trail segment with hot mix asphalt using an asphalt mix design submitted in advance of the work by the contractor and approved by the park. Asphalt would be placed between 2 and 3 inches thick to the width identified in the approved alternative. The thickness of asphalt would be increased to the 3 inch section in areas where the base material is less stable. This would be completed using dump trucks to supply hot mix asphalt which would be placed using an approved laydown machine and then mechanically compacted. Material would be compacted per Washington State Department of Transportation guidelines (WSDOT 5.04), including testing for compaction.

Construction Equipment Used

A variety of equipment would be used to construct the trail. The table below provides an estimate of the noise level that would be generated for each type of construction equipment.

Equipment Used	Noise Level (dBA) [1] Avg. L_{max} at 50'
Tracked Excavator	81 (170)
Wheeled Front End Loader	79 (96)
Dump Truck	76 (31)
Dozer	82 (55)
Grader	85 --
Paver	77 (9)
Compactor	80 (57)
One Man Lift	84 (46)
Pickup Truck	55 (1)
Shotcrete Applicator (Concrete Pump)	81 (30)
Rock Scaler - Manual	n/a
Rock Screen (Excavator)	81 (170)
Rock Drill	81 (3)

From FHWA Construction Noise Handbook (2009) and WSDOT Environmental Assessment Preparation, Advance Training Manual (2010) as submitted by Clallam County

Rehabilitation of Construction-related Disturbed Areas

At the completion of construction, areas intended for use as permanent passing or resting areas for trail users would be developed as such. Temporary construction, truck staging and turning areas would be rehabilitated to natural conditions through removal of any gravel surfacing, tilling of the surface using construction equipment, and seeding with a park-approved seed stock to avoid the introduction or spread of non-native plant species, or placement of weed-free duff salvaged from the project area.

Precluding Unauthorized Vehicles

Administrative vehicle use would occur on sections of the new trail to support trail maintenance and emergency response by park staff. Steel bollards, approximately four to six inches in diameter, would be placed on all trail access points where the width of the trail would otherwise allow automobile access. Bollards would be bolted into concrete foundations and would be designed with a hinged base to fold down to accommodate authorized vehicle access. Bollards would be spaced to allow access for pedestrians, bicyclists, and equestrians. Adequate clearance would be maintained to provide wheelchair access to universally accessible trail segments.

Installation of Minor Trail Features to Improve Visitor Experience

Once the entire route is paved, interpretive media, pet sanitation facilities, and trash receptacles would be placed at trailheads and at select points along the trail as indicated on the construction

drawings. The work would entail the use of a small utility truck, tracked loader fitted with an auger, and a portable concrete mixer.

Private Lands

NPS would coordinate with adjacent property owners to avoid or minimize impacts related to trail improvements. This includes ensuring continued access during and after construction, minimizing noise during construction, and protecting water supplies that are within the project area. NPS would confirm ownership of land prior to new development and would seek permission from private land owners regarding any proposed access on private lands associated with trail construction. Additionally, a fence or vegetative screen would be installed between the Spruce Railroad Trail parking area and adjacent private property to discourage trespassing and to improve privacy for residents.

Mitigation Measures to Avoid or Reduce Impacts to Natural and Cultural Resources

The National Park Service has identified mitigation measures that would be implemented under all Action Alternatives in order to avoid or minimize adverse effects to natural and cultural resources and visitor experience. Detailed descriptions of these actions are included in Appendix A.

Alternative 2 – Recreation Trail Emphasis

Spruce Railroad Trail

Under Alternative 2, the NPS would make improvements to the Spruce Railroad Trail (SRRT) as described below. The trail alignment would remain in its current location. Neither railroad tunnel would be re-opened. Lake Crescent Trail Segment A would be developed to provide an accessible trail surface. The limitations and constraints posed by the existing outdoor environment currently preclude developing an accessible grade and width beyond Segment A due to the large volume of rocky debris located within the west (short) railroad tunnel; and the narrow, uneven, rocky bypass trail that the current trail follows to bypass the closed railroad tunnel. The NPS would not make not make substantial improvements to the existing SRRT beyond Segment A, but would improve routine clearing and maintenance of the existing trail.

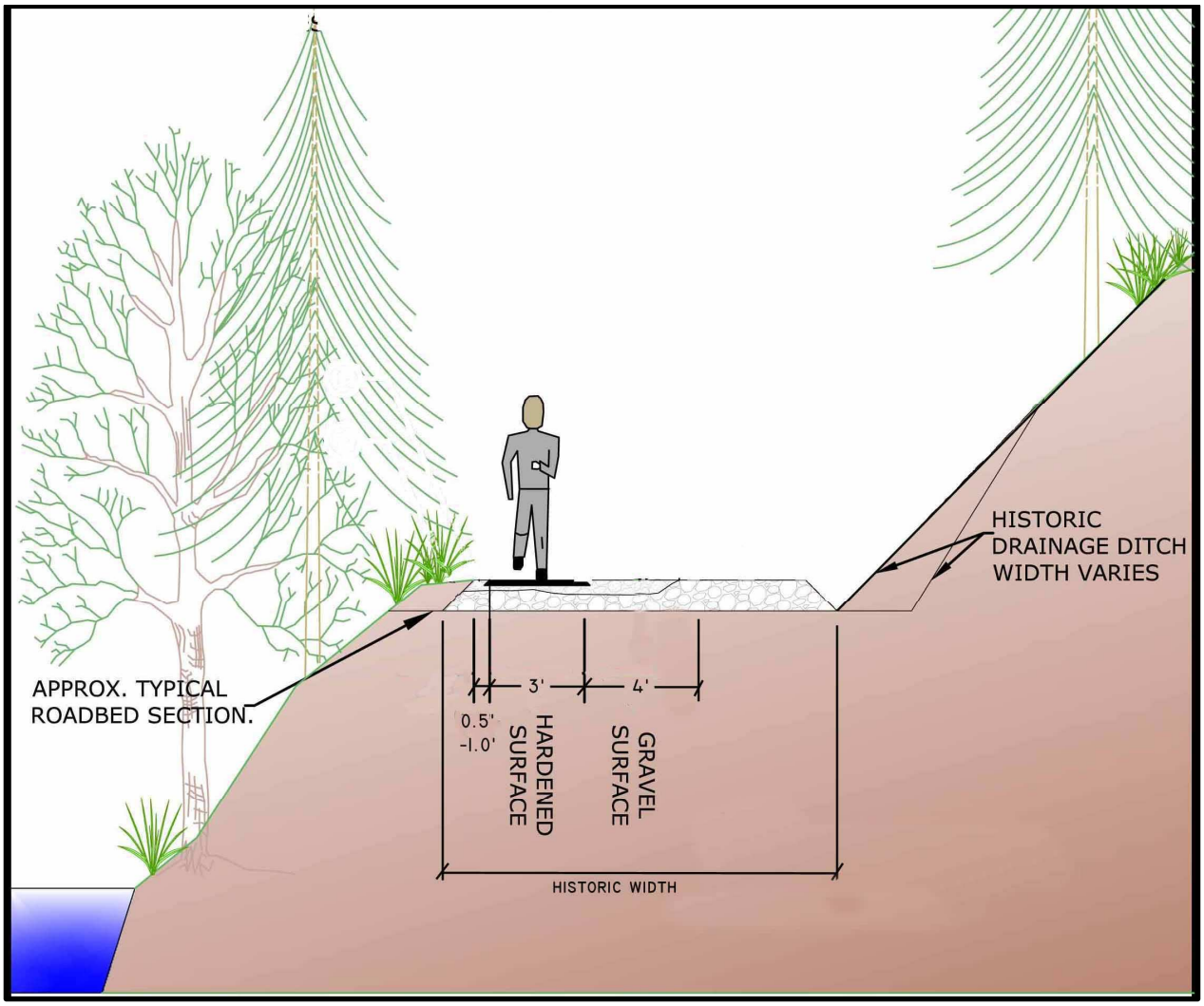


Figure 7. Trail profile (Segment A) for Alternative 2

Segment A: This trail section would be developed to meet the minimum guidance for providing an accessible trail as described in the Draft Final Accessibility Guidelines for Outdoor Developed Areas published on October 19, 2009 (Access Board, 2009). These guidelines are proposed by the Architectural and Transportation Barriers Compliance Board (Access Board) pursuant to the Architectural Barriers Act (ABA) for camping facilities, picnic facilities, viewing areas, outdoor recreation access routes, trails, and beach access routes that are constructed or altered by or on behalf of the Federal government. This would amend the range of existing park trail standards as described in the 2008 General Management Plan (GMP).

TRAIL STANDARD	ACCESSIBLE RECREATION TRAIL (Alt 2, Segment A)
Firm & Stable Tread width	36” minimum 5’ maximum
Gravel or Natural Tread width	48" maximum
Clearing and Brushing	12' lateral 12' vertical
Maintenance frequency	Annual +
Bridge width	8' decking maximum
Accessible Recreation Trails — these trails are open to hikers, stock, and bicycles and are designed to meet federal outdoor accessibility guidelines for recreational trails. These trails are a combination of firm & stable (hardened) surface and gravel or natural tread surface (in areas where stock use is permitted), and are designed for relatively inexperienced users. Accessible recreation trails are maintained to a standard for higher use volumes.	

The specific guidelines that would apply to Segment A are included below.

1017 Trails (Access Board, 2009)

1017.1 General. Trails shall comply with 1017.

EXCEPTIONS: 1. where an entity determines that a condition in 1019 does not permit full compliance with a specific requirement in 1017 on a portion of a trail, that portion of the trail shall comply with the specific requirement to the maximum extent feasible. The entity shall document the basis for the determination, and shall maintain the documentation with the records for the construction or alteration project.
2. Where an entity determines that it is impracticable for an entire trail to comply with 1017, the trail shall not be required to comply with 1017. The entity shall document the basis for the determination, and shall maintain the documentation with the records for the construction or alteration project.

Advisory 1017.1 General Exception 1. Exception 1 can be applied to specific requirements in 1017 on a portion of a trail where full compliance with the requirement cannot be achieved due to any of the conditions in 1019.

Advisory 1017.1 General Exception 2. An entity should first apply Exception 1 to determine the portions of a trail where full compliance with the specific requirements in 1017 cannot be achieved. An entity should then evaluate the entire trail, taking

into account the portions of the trail that can and cannot fully comply with the requirements in 1017 and the extent of compliance where full compliance cannot be achieved to determine whether it would be impracticable for the entire trail to comply with 1017. The determination is made on a case-by-case basis.

1017.2 Surface. The surface of trails and their related passing spaces and resting intervals shall be firm and stable.

Advisory 1017.2 Surface. A stable surface remains unchanged by applied force so that when the force is removed, the surface returns to its original condition. A firm surface resists deformation by indentations.

1017.3 Clear Tread Width. The clear tread width of trails shall be 36 inches (915 mm) minimum.

EXCEPTION: The clear tread width shall be permitted to be reduced to 32 inches (815 mm) minimum for a length of 24 inches (610 mm) maximum provided that reduced width segments are separated by segments that are 48 inches (1220 mm) long minimum and 36 inches (915 mm) wide minimum.

1017.4 Passing Spaces. Trails with a clear tread width less than 60 inches (1525 mm) shall provide passing spaces complying with 1017.4 at intervals of 1000 feet (300 m) maximum. Where the full length of the trail does not comply with 1017, the last passing space shall be located at the end of the trail segment complying with 1017. Passing spaces and resting intervals shall be permitted to overlap.

Advisory 1017.4 Passing Spaces. Entities should consider providing either a 60 inches (1525 mm) minimum clear tread width, or passing spaces at shorter intervals if the clear tread width is less than 60 inches (1525 mm), where a trail is:

- Heavily used;
- A boardwalk; or
- Not at the same level as the ground surface adjoining the trail.

Where the full length of the trail does not comply with 1017, placing the last passing space at the end of the trail segment complying with 1017 enables a person using a wheelchair to turn around and exit the trail.

1017.4.1 Size. The passing space shall be either:

1. A space 60 inches (1525 mm) minimum by 60 inches (1525 mm) minimum; or
2. The intersection of two trails providing a T-shaped space complying with 304.3.2 where the base and the arms of the T-shaped space extend 48 inches (1220 mm) minimum beyond the intersection. Vertical alignment at the intersection of the trails that form the T-shaped space shall be nominally planar.

1017.5 Obstacles. Tread obstacles on trails and their related passing spaces and resting intervals shall comply with 1017.5.

1017.5.1 Concrete, Asphalt, or Boards. Where the surface is concrete, asphalt, or boards, tread obstacles shall not exceed ½ inch (13 mm) in height measured vertically to the highest point.

1017.5.2 Other Surfaces. Where the surface is other than specified in 1017.4.1, tread obstacles shall not exceed 2 inches (50 mm) in height measured vertically to the highest point.

Advisory 1017.5 Tread Obstacles. The vertical alignment of joints in concrete, asphalt, or board surfaces can be tread obstacles. Natural features, such as tree roots and rocks, within the trail tread can also be tread obstacles. Where possible, tread obstacles should be separated by a distance of 48 inches (1220 mm) minimum so persons who use wheelchairs can maneuver around the obstacles.

1017.6 Openings. Openings in the surface of trails and their related passing spaces and resting intervals shall comply with 302.3.

EXCEPTION: Openings shall be permitted to be to be a size that does not permit passage of a ¾ inch (19 mm) sphere where openings that do not permit the passage of a ½ inch (6.4 mm) sphere cannot be provided due to the conditions in 1019.

1017.7 Slopes. The slopes of trails shall comply with 1017.7.

1017.7.1 Running Slope. No more than 30 percent of the total length of a trail shall have a running slope steeper than 1:12. The running slope of any segment of a trail shall not be steeper than 1:8. Where the running slope of a segment of a trail is steeper than 1:20, the maximum length of the segment shall be in accordance with Table 1017.7.1, and a resting interval complying with 1017.8 shall be provided at each end of the segment.

Table 1017.7.1 Running Slope and Resting Intervals

Running Slope of Trail Segment		Maximum Length of Segment
Steeper than	But not Steeper than	
1:20	1:12	200 feet (61 m)
1:12	1:10	30 feet (9 m)
1:10	1:8	10 feet (3050 mm)

Advisory 1017.7.1 Running Slope. Running slope can also be expressed as a percentage (grade).

1017.7.2 Cross Slope. The cross slope shall comply with 1017.6.2.

1017.7.2.1 Concrete, Asphalt, or Boards. Where the surface is concrete, asphalt, or boards, the cross slope shall not be steeper than 1:48.

1017.7.2.2 Other Surfaces. Where the surface is other than specified in 1017.7.2.1, the cross slope on other surfaces shall not be steeper than 1:20.

1017.8 Resting Intervals. Resting intervals shall comply with 1017.8.

1017.8.1 Length. The resting interval length shall be 60 inches (1525 mm) long minimum.

1017.8.2 Width. Where resting intervals are provided within the trail tread, resting intervals shall be at least as wide as the widest segment of the trail tread leading to the resting interval. Where resting intervals are provided adjacent to the trail tread, the resting interval clear width shall be 36 inches (915 mm) minimum.

1017.8.3 Slope. Resting intervals shall have a slope complying with 1017.8.3.

1017.8.3.1 Concrete, Asphalt, or Boards. Where the surface is concrete, asphalt, or boards, the slope shall not be steeper than 1:48 in any direction.

1017.8.3.2 Other Surfaces. Where the surface is other than specified in 1017.8.3.1, the slope on other surfaces shall not be steeper than 1:20 in any direction.

1017.8.4 Turning Space. Where resting intervals are provided adjacent to the trail tread, a turning space complying with 304.3.2 shall be provided. Vertical alignment between the trail tread, turning space, and resting interval shall be nominally planar.

1017.9 Protruding Objects. Constructed elements on trails and their related resting intervals and passing spaces shall comply with 307.

Advisory 1017.9 Protruding Objects. Protruding objects on trails and their related resting intervals and passing spaces can be hazardous for persons who are blind or have low vision. Signs and other post mounted objects are examples of constructed elements that can be protruding objects.

1017.10 Gates and Barriers. Where gates or barriers are constructed to control access to trails, gates and barriers shall comply with 1017.10.

1017.10.1 Clear Width. Gate openings and openings in barriers for hiker passage shall provide a clear width complying with 404.2.3.

1017.10.2 Gate Hardware. Gate hardware shall comply with 404.2.7.

1017.11 Trail Signs. Trail signs shall include the following information:

1. Length of the trail or trail segment;
2. Surface type;
3. Typical and minimum tread width;
4. Typical and maximum running slope; and
5. Typical and maximum cross slope.

Lake Crescent Segment A: Construction Details

Trail corridor would be cleared to a maximum width of 12 feet. Road base would be placed to a width of 8 to 10 feet. A 36 inch wide, asphalt paved trail with 5 foot wide asphalt paved passing spaces placed at regular intervals of approximately 1,000 feet at locations designed to minimize resource impact, as described above. An approximately 4-foot wide gravel shoulder would be retained upslope and immediately adjacent to the paved trail to provide access for stock users. An 8”-12” gravel shoulder would be retained on the downslope side of the paved trail to protect the edge of the asphalt.

Table 2.3, Alt 2 Segment A: Construction Requirements	**Quantities**
Length of trail segment	5,650 linear feet
Volume of excavation/cut required	1,645 cubic yards
Volume of fill required	250 cubic yards
Volume of base material placed	552 cubic yards
Volume of asphalt placed	107 cubic yards
Maximum number of trees removed (11” – 23” dbh)	21
Maximum number of trees removed (≥ 24” dbh)	1 (26” dbh)
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	30 days

Lake Crescent Segments B, C, and D

The existing Spruce Railroad trail segments would be cleared and maintained in accordance with a new Olympic National Park Multipurpose Nature Trail standard. This would amend the range of existing park trail standards to provide for a wider clear tread width than the existing Multipurpose Bicycle Trail standard. Segments B, C, and D would not be developed to achieve a universally accessible trail grade and would not be paved due to the barrier of the partially collapsed (short) railroad tunnel to the west and the steepness of the terrain from the east.

ONP TRAIL STANDARD	MULTIPURPOSE NATURE TRAIL
Tread width	60" maximum
Clearing and Brushing	8' lateral 10' vertical
Maintenance frequency	Annual +
Bridge width	6' decking maximum
Puncheon width	60" maximum
Turnpike width	60" maximum
Multipurpose Nature Trails — these trails are open to hikers, stock, and bicycles. These trails are gravel or natural surfaced, and are designed for large numbers of relatively inexperienced users. Multipurpose nature trails are maintained to a standard for higher use volumes.	

Lake Crescent Segments B, C, & D: Construction Details

Duff and debris would be to a width up to 8 feet using a small bulldozer or small tracked loader deployed from the west end of the project area for Segments B and C, and from the east end for Segment D. Equipment may be staged from a barge on the lake and moved onto the shore where needed, where it would better facilitate the work. Hand work would be extensively employed to remove branches and small limbs. Larger logs that block the trail would be sectioned using a chainsaw and rolled off the trail. Excavation would be minimized.

Where necessary, the trail surface would be improved through placement of compacted 1-1/4-inch minus gravel, or other minor improvements to provide an all-season tread. This gravel would be transported to the work site in a small tracked loader or wheeled tractor, spread by the loader and hand tools and wheel compacted using the loader or a dragged roller. Where necessary to control storm water and ground water flow, water bars and ditches would be placed in a manner consistent with current park trail standards. Historic railroad ditches would not be cleared of debris unless necessary to clear and maintain the proposed trail.

Table 2.4 Alternative 2, Segment B	
Construction Requirements	**Quantities**
Length of trail segment	8400 linear feet
Volume of excavation/cut required	25 cubic yards
Volume of fill required	N/A
Volume of base material placed	5 cubic yards
Volume of asphalt placed	N/A
Volume of rip rap placed	0
Maximum number of trees removed (11" – 23" dbh)	33
Maximum number of trees removed (≥ 24" dbh)	0
Work type	**Duration (approx.)**
Clearing and grubbing; excavation and placement of gravel where needed	8 days

Table 2.5 Alternative 2, Segment C	
Construction Requirements	**Quantities**
Length of trail segment	2475 linear feet
Volume of excavation/cut required	N/A
Volume of fill required	N/A
Volume of base material placed	5 cubic yards
Volume of asphalt placed	N/A
Volume of rip rap placed	0
Maximum number of trees removed (11" – 23" dbh)	2
Maximum number of trees removed (≥ 24" dbh)	0
Work type	**Duration (approx.)**
Clearing and grubbing; excavation and placement of gravel where needed	3 days

Table 2.6 Alternative 2, Segment D	
Construction Requirements	**Quantities**
Length of trail segment	3,250 linear feet
Volume of excavation/cut required	5 cubic yards
Volume of fill required	5 cubic yards
Volume of base material placed	10
Volume of asphalt placed	N/A
Volume of rip rap placed	N/A
Maximum number of trees removed (11" – 23" dbh)	4
Maximum number of trees removed (≥ 24" dbh)	3 (24" dbh)
Work type	**Duration (approx.)**

Clearing and grubbing; excavation and placement of gravel where needed	33 days

Railroad Tunnels & Bypass Trails

Under Alternative 2, both historic railroad tunnels would remain closed. Warning signs or preventative devices would be placed to limit or prevent access into the tunnels. The determination of the applicable level of protection necessary to preclude tunnel access would be made by a professional trained in tunnel safety.

Both tunnel bypass trails would be maintained to the park's current Multipurpose Bicycle Trail standard. No major improvements are proposed to the west (short) railroad tunnel bypass trail. The bridge located on the east (long) railroad tunnel bypass trail at the Devil's Punchbowl would be repaired or replaced to accommodate use by hikers, bicyclists, and people traveling with stock, consistent with park trail guidelines.

Lake Crescent Upslope Bank Failures

Under Alternative 2, upslope bank failures in trail segment A would be removed as described earlier for activities common to all NPS Action Alternatives. Excess materials would be removed using either a loader or excavator to place materials in a dump truck for disposal at a permitted location outside the Park.

Upslope bank failures within trail segments B and C would only be removed in areas where this would not affect slope stability. The materials moved within Segments B and C would be redistributed in areas adjacent to the trail that would not result in vegetation loss. Due to the existing condition of the trail, relatively little material movement within Segments B and C would be required. In areas where clearing would potentially destabilize upslope materials, the trail grade would be developed and maintained over the slide materials to avoid disturbing the toe of the slope.

Lake Crescent Downslope Bank Failures

Under Alternative 2, thirteen downslope bank failures occur in the construction limits of trail segments A and B. In areas where the downslope bank adjacent to Lake Crescent has collapsed and reduced the available width of the trail alignment, the park would adjust the alignment horizontally to avoid the bank failure. If a lateral realignment is not feasible, bank stabilization would be completed through the placement of rip rap.

Within Segment A, five downslope bank areas between the proposed trail bed and lake edge have failed. Four of these five sections contain historic log cribbing that was used during the original construction of the rail grade. The combined length of failed bank measured along the water edge is approximately 640 feet.

These five areas would be reconstructed through the placement of Class 3, 4 and 5 rip rap beginning at the lakeshore and extending upslope to the level of the trail. The lower 12 inches to

18 inches of the rip rap fill would be within the ordinary high water level of the lake. The rip rap would extend upwards along the bank to the level of the trail. As the rip rap is constructed, voids would be filled with graduated rock sized between three inches down to 1-1/4-minus road base.

Bank reconstruction would be completed in a manner that avoids or minimizes impacts to the lake and shoreline. Rip rap would be placed using the minimum design necessary to establish a structurally sound bank. Bank reconstruction would utilize a tracked excavator to place the rip rap and a dump truck to transport rip rap and backfill. Log cribbing present in several bank failure areas would remain in place unless the cribbing interferes with the placement of rip rap. If necessary, log cribbing would be removed and disposed of outside the Park. In all cases, the rip rap would cover any remaining log cribbing.

Within Segment B, nine downslope bank areas between the proposed trail bed and lake edge have failed. Two of these sections contain historic log cribbing that was used during the original construction of the rail grade. Historic dry laid masonry from the construction of the rail grade is also present. The combined length of failed bank measured along the water edge is approximately 550 feet. Approximately 85 feet of that length is intact dry laid masonry wall. Approximately 80 feet is failed dry laid masonry wall. These areas, including the dry laid masonry, would not be reconstructed. Instead, the desired width would be established through modifying the alignment to move the trail away from the bank failure.

Lake Crescent Trail Drainage

Under Alternative 2, two 36 inch plastic culverts and four low water crossings would be installed along trail segment A, up to four low water crossings would be developed in trail segment B, and up to ten low water crossings along trail segment C.

Spruce Railroad Trailhead Parking Lot: The existing parking lot would be expanded after the NPS-owned vacant property is removed (house, outbuilding, broken concrete slab, and dock) and disposed of at an approved site outside the park. Asbestos mitigation work would be completed prior to building removal.

A tracked or wheeled loader would be used to clear duff and vegetative overburden from the entire area of the road grade, extending down the slope to the extent of the former house footprint. No excavation would occur beyond the footprint of the removed building toward the lake or in any wetland areas.

Parking lot expansion would be limited to the footprint of the demolished building extended along the existing road. A minimum 30 foot wide buffer would be retained between the expanded parking lot and the adjacent private parcel. Development would not extend into any areas identified as wetlands.

A sub-grade of clean earthen fill would be placed to raise the grade of the lower area. This would be topped with 1-1/4 minus gravel placed twelve inches thick to match the grade of the road and

adjacent parking area. The existing parking area would also be graveled. The expanded parking area would provide parking for approximately 22 vehicles.
The lands between the expanded parking lot and Lake Crescent would be rehabilitated to natural conditions by removing any non-native plant species in the area and revegetating with native plants.

Table 2.7 Alternative 2, Parking lot at Lyre River (Spruce Railroad Trailhead)	
Construction Requirements	**Quantities**
Surface area of parking lot	17,800 square feet
Volume of excavation/cut required	35 cubic yards
Volume of fill required	1,750 cubic yards
Volume of base material placed	122 cubic yards
Volume of asphalt placed	N/A
Volume of rip rap placed	N/A
Number of trees removed (≥ 11" dbh)	N/A
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill and base	8 days

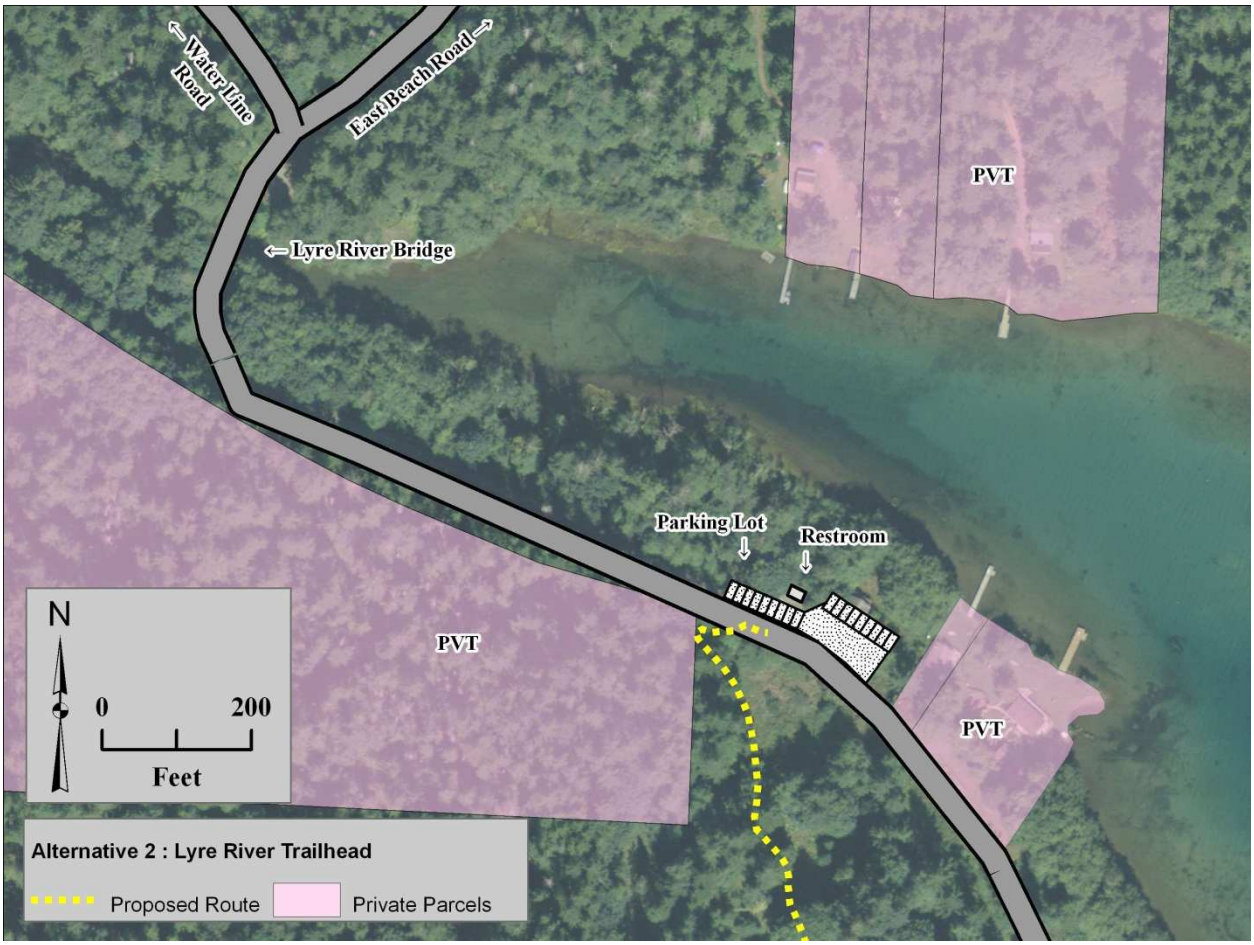


Figure 8. Spruce Railroad Trail parking lot improvements

Sol Duc Trail Development

Under Alternative 2 the park would construct approximately 2 miles of new trail in the Sol Duc area of the park. This would include 0.5 miles of new trail from the existing Sol Duc exhibit area and parking lot to the historic Spruce Railroad grade to the southwest of Highway 101, and 1.25 miles of new trail on the historic railroad grade within the park. This new trail segment would extend to the western park boundary to connect with trail proposed for construction outside of the park.

The trail would be constructed to meet federal outdoor accessibility guidelines for shared use paths. The finished trail would be five feet wide, compacted gravel surfaced, and open to hikers and bicycles.

No trail connection is proposed between the Sol Duc and Lake Crescent trail segments. No trail crossing of Highway 101 is proposed by the NPS. The Sol Duc trail segment would be managed as a separate recreational trail, unconnected to the Spruce Railroad Trail at Lake Crescent.

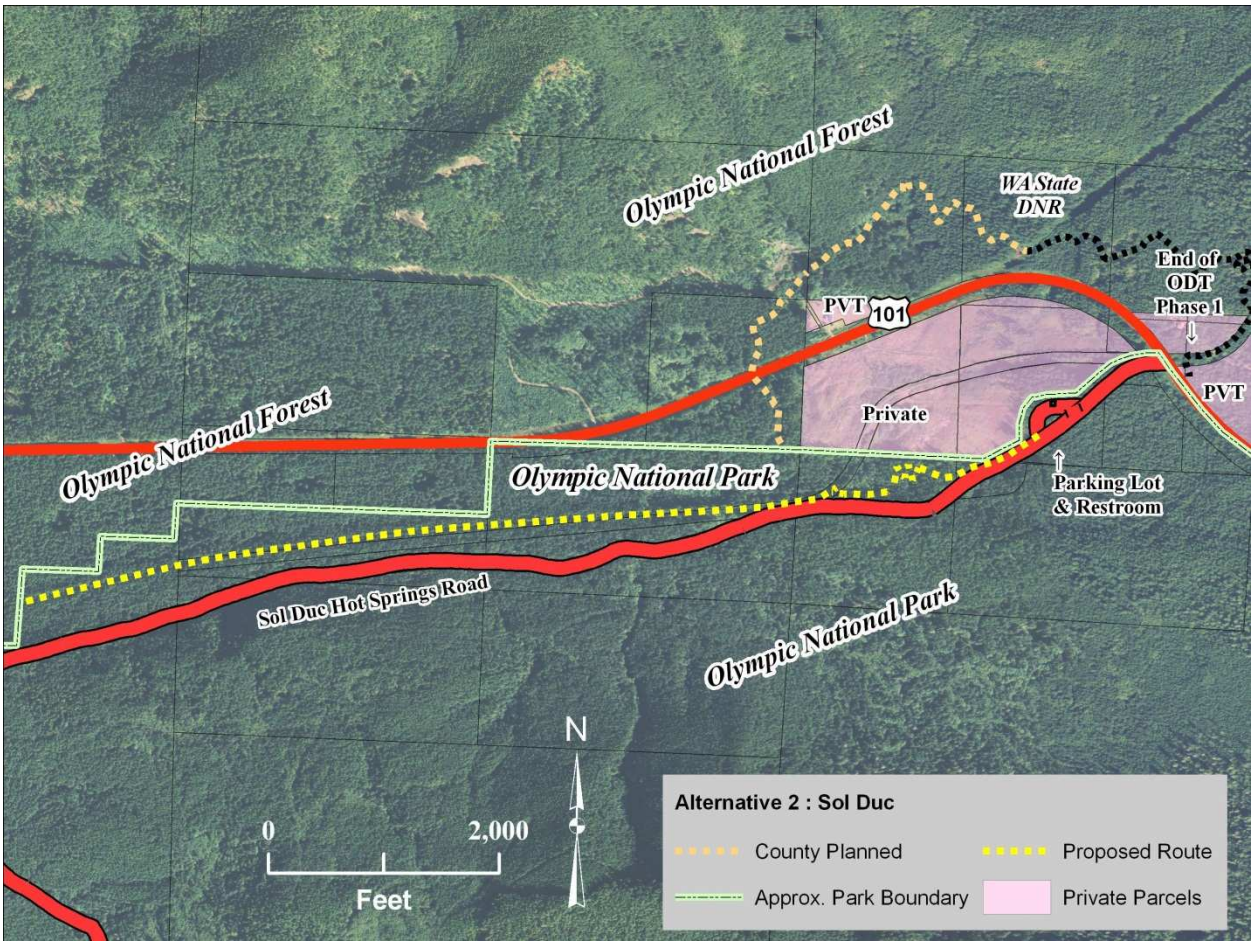


Figure 9. Proposed Sol Duc trail development in park under Alternative 2

Sol Duc Construction Details

Construction access and staging would occur from the existing Sol Duc road or small kiosk parking area. Construction on the Sol Duc trail would begin by marking the centerline of the trail from the existing Sol Duc parking area to the connection with the historic railroad grade. After the centerline is established, downed logs would be cut within a 12-foot wide corridor centered on the alignment. Rounds created by this process would be moved outside of the alignment by hand or small tracked loader or excavator.

After clearing the alignment of downed logs, the grade would be cleared of duff and vegetative overburden to a width of eight feet using a tracked loader. This material would be loaded onto trucks and disposed of at an approved site outside the park.

The trail surface would be improved through placement of compacted 1-1/4 inch minus gravel to provide an all-season tread. This gravel would be transported to the work site in a small tracked

loader or wheeled tractor, spread by the loader and hand tools, and wheel compacted using the loader or a dragged roller. Where necessary to control storm water and ground water flow, water bars and ditches would be placed in a manner consistent with current park trail standards. Historic railroad ditches would not be cleared of debris unless necessary to construct the proposed trail.

Sol Duc Upslope Bank Failures

In areas where an upslope cut bank is exposed, the bank would be excavated an additional 18 inches into the bank and rip rap would be placed to support the exposed bank while leaving the full width of trail.

Sol Duc Downslope Bank Failures

In areas along the grade, the downslope has slipped or eroded, resulting in a narrowed width insufficient to meet the requirements for trail width. Where possible, the trail in these areas would be moved away from the slip failure area. Where there is insufficient room to move the trail, a hand-placed log crib would be placed and soil compacted against the crib wall to establish sufficient trail width.

Sol Duc Trail Drainage

In the first segment of the trail, adjacent to the NPS interpretive pullout, the trail would cross a drainage area. A tracked excavator would be used to place a 20-foot-long, 60-inch diameter corrugated metal pipe culvert in the drainage immediately west of the Sol Duc kiosk parking lot. Six cubic yards of Class 3 and 4 rip rap would be placed around the inlet and outlet ends of the culvert to protect against erosion near the pipe. Clean earthen fill would be placed on top of the pipe and compacted in place, then topped with 1-1/4 inch minus road base, 12-inches thick, to form the trail grade. This would establish a surface 10 feet in width immediately above the culvert, with 1.5 to 1 side slopes. This top width would provide support to the proposed trail and provide additional shoulder for safety.

Where the new trail approaches the historic railroad grade, a tracked excavator would be used to place a 60-foot-long, 24-inch diameter corrugated metal pipe culvert in the drainage immediately below the railroad grade connection. Class 3 and 4 rip rap would be placed around the inlet and outlet ends of the culvert to protect against erosion near the pipe. Clean earthen fill would be placed on top of the pipe and compacted in place, then topped with 1-1/4 inch minus road base, 12-inches thick, to form a pathway five feet in width above the culvert, with side slopes joining directly into the adjoining hillside. This culvert would extend up the small valley at 12 percent, allowing a path for surface drainage from the side slopes into the contained drainage below, while providing a surface for the placement of the trail. This approach would be placed to prevent excavating into the side of the historic railroad grade.

Table 2.8 Alt 2, Sol Duc – Construction Requirements	Quantities
Length of trail segment	2,550 linear feet (from trailhead) 1.25 miles (on rail grade)
Volume of excavation/cut required	650 cubic yards (from trailhead) 1000 cubic yards (on rail grade)
Volume of fill required	950 cubic yards (from trailhead) 544 cubic yards (on rail grade)
Volume of base material placed	222 cubic yards (from trailhead) 560 cubic yards (on rail grade)
Maximum number of trees removed (11” – 23” dbh)	38 (from trailhead) 11 (on rail grade)
Maximum number of trees removed (≥ 24” dbh)	5 (from trailhead: 2 @ 24” dbh, 3 @ 26” dbh) 0 (on rail grade)
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill and base	30 days (new trail from trailhead) 38 days (new trail on rail grade)

Alternative 3 – NPS Preferred Alternative

Spruce Railroad Trail

Under Alternative 3, the NPS would make improvements to the Spruce Railroad Trail (SRRT) as described below. The trail alignment would remain in its current location with minor lateral adjustments, up to three feet from the current trail alignment on the railroad grade, to better accommodate site conditions. Both railroad tunnels would be re-opened to allow the existing trail to be widened and developed to meet accessibility standards along the general route of the historic Spruce Railroad grade and in all areas of new trail development in the Sol Duc area.

Once the two railroad tunnels are re-opened, the limitations and constraints posed by the existing outdoor environment would not preclude developing an accessible width beyond Segment C, but they would preclude developing an accessible grade on Segment D due to steepness of the terrain, the extent of disturbance to native soils and vegetation that would be required to achieve an accessible grade within current park boundaries, and due to the potential for construction related and operational impacts to adjacent private lands downslope of the trail. Implementation of the proposed trail improvements would occur over time, in phases.

Segments A, B and C: The existing Spruce Railroad Trail would be developed and maintained in accordance with the new ONP trail standard as described in the table below. This would amend the range of existing park trail standards.

ONP TRAIL STANDARD	SRRT - ACCESSIBLE
Firm & Stable Tread width	6’ maximum
Gravel or Natural Tread width	4’ maximum
Clearing and Brushing	14' lateral 12' vertical
Maintenance frequency	Annual +
Bridge width	8' decking maximum

SRRT Accessible — these trails are open to hikers, stock, and bicycles and are designed to meet federal outdoor accessibility guidelines for shared use paths to provide access for people with disabilities. These trails are a combination of accessible firm & stable (hardened) surface and gravel or natural tread surface, and are designed for large numbers of relatively inexperienced users. SRRT accessible trails are maintained to a standard for higher use volumes.

This new ONP trail standard would adopt guidance described in the proposed rulemaking for developing guidelines for federal shared use paths. These paths are designed for both transportation and recreation purposes and are used by pedestrians, bicyclists, skaters, equestrians, and other users. An advance notice of the proposed rulemaking was published in the Federal Register on March 28, 2011 (Access Board, 2011). These guidelines are proposed by the Architectural and Transportation Barriers Compliance Board (Access Board) to include technical provisions for making newly constructed and altered shared use paths covered by the Americans with Disabilities Act of 1990 (ADA) and the Architectural Barriers Act of 1968 (ABA) accessible to persons with disabilities. Excerpts from the proposed rulemaking are included below.

Draft Technical Provisions for Shared Use Paths (Access Board, 2011)

> The draft technical provisions establish criteria for the following components of a shared use path: surface; changes in level (vertical alignment and surface discontinuities); horizontal openings; width; grade and cross slope; protruding objects; gates and barriers; and intersections and curb ramps.
>
> **1. Surface**
>
> *Surface.* The surface of the shared use path shall be firm, stable, and slip resistant.
>
> A firm, stable, and slip resistant surface is necessary for persons with disabilities using wheeled mobility devices. Bicyclists with narrow-tired bicycles and in-line skaters also need a hard, durable surface. Shared use paths typically are comprised of asphalt or concrete and these surfaces are generally accessible for people with disabilities. These surfaces perform well in inclement weather and require minimal maintenance. Unpaved surfaces that are firm, stable, and slip resistant may be used; however, they may erode over time requiring regular maintenance.
>
> **2. Changes in Level**
>
> *Vertical Alignment.* Vertical alignment shall be planar within curb ramp runs, blended transitions, landings, and gutter areas within the shared use path. Grade breaks shall be flush.
>
> *Surface Discontinuities.* Surface discontinuities shall not exceed 0.50 inch (13 mm) maximum. Vertical discontinuities between 0.25 inch (6.4 mm) and 0.5 inch (13 mm) maximum shall be beveled at 1:2 maximum. The bevel shall be applied across the entire level change.
>
> In addition to firm, stable, and slip resistant surfaces, smooth surfaces are also necessary for the safe use of wheeled mobility devices, as well as bicycles and in-line skaters. The draft technical provisions allow vertical changes in level up to 1/4 inch without treatment and other vertical changes in level from 1/4 to 1/2 inch if they are beveled with a slope no greater than 1:2. Surfaces with individual units laid out of plane and those that are heavily textured, rough, or chamfered, will greatly increase rolling resistance and will subject pedestrians who use wheelchairs, scooters, and

rolling walkers to the stressful (and often painful) effects of vibration. Surface discontinuities are also dangerous for bicyclists and in-line skaters. It is highly desirable to minimize surface discontinuities. However, when discontinuities are unavoidable, they should be widely separated.

3. Horizontal Openings

Joints and Gratings. Openings shall not permit passage of a sphere more than 0.5 inch (13 mm) in diameter. Elongated openings shall be placed so that the long dimension is perpendicular to the dominant direction of travel.

Surface openings or gaps must be minimized in order to ensure a smooth surface on shared-use paths. Utility covers and drainage grates can be hazards and, for the safety of all users, must be treated.

The draft technical provisions for surface gaps in shared use paths are consistent with the draft provisions in the Pedestrian Access Route - Sidewalk Guidelines. In most cases, the guidelines will require surface gaps or openings on shared use paths to be no wider than 1/2 inch.

4. Width

Width. The clear width of shared use paths shall be 5 feet (1.5 m) minimum.

The Board is considering requiring accessible shared use paths to provide at least 5 feet minimum width to address those rare circumstances where the AASHTO Bicycle Facilities Guide is not applied so that sufficient space is provided for wheelchair turning and to allow wheelchair users and others to pass one another.

5. Grade and Cross Slope

Grade. The maximum grade of a shared use path shall be 5 percent.
Exception: Where the shared use path is contained within a street or highway border, its grade shall not exceed the general grade established for the adjacent street or highway.

Cross Slope. The maximum cross slope shall be 2 percent.

6. Protruding Objects

Protruding Objects. Protruding objects along or overhanging any portion of the shared use path shall not reduce the clear width of the shared use paths.

Protrusion Limits. Objects with leading edges more than 27 inches (685 mm) and not more than 80 inches (2 m) above the finish surface or ground shall not protrude more than 4 inches (100 mm) horizontally into shared use paths.

Post-Mounted Objects. Where objects are mounted on free-standing posts or pylons and the objects are 27 inches (685 mm) minimum and 80 inches (2030 mm)

maximum above the finish surface or ground, the objects shall not overhang shared use paths more than 4 inches (100 mm) beyond the post or pylon base measured 6 inches (150 mm) minimum above the finish surface or ground. Where a sign or other obstruction is mounted between posts or pylons and the clear distance between the posts or pylons is greater than 12 inches (305 mm) the lowest edge of sign or obstruction shall be 27 inches (685 mm) maximum or 80 inches (2 m) minimum above the finish surface or ground.

The draft technical provisions for protruding objects are derived from the Board's ADA and ABA Accessibility Guidelines and Pedestrian Access Route – Sidewalk Guidelines. The provisions addresses objects that may project into shared use paths in a manner hazardous to people with vision impairments. Any protrusion on a shared use path is considered hazardous for all users, including individuals with disabilities. These technical provisions would apply to the full width of the shared use path. Objects mounted on walls or posts with leading edges above the standard sweep of canes (27 inches) and below the standard head room clearance (80 inches) would be limited to a 4 inch protrusion.

7. Gates and Barriers

Clear Width. Where gates or other barriers are provided, openings in gates and barriers shall provide a clear width of 32 inches (815 mm) minimum.

The draft technical provisions for gates and barriers are based on the Board's ADA and ABA Accessibility Guidelines and Trails Guidelines. Gates or barriers often are wider than 32 inches to allow for the safe passage of bicycles and other authorized users of shared use paths. The Board is proposing to require a 32 inch minimum clearance to address the rare circumstance where gate or barrier openings are deliberately narrow and could restrict access by wheelchair users unless a minimum width applies. A 32 inch wide clear opening provides the minimum clearance necessary to allow passage of an occupied wheelchair or other mobility device. The operation and location provisions for gate hardware are necessary to ensure that individuals with disabilities can operate the hardware.

Lake Crescent Segments A, B, & C Construction Details

The trail corridor would be cleared to a width of 14 feet, with minimal additional cleared areas to accommodate construction access and turnaround areas. Road base would be placed to a width of 11 feet and depth of 10 inches to rehabilitate the feeling and appearance of the historic railroad profile and ditches. Asphalt would be placed to provide a 6-foot wide, universally accessible paved trail surface, consistent with the draft shared use path guidelines published by the Access Board as described above. A 4-foot wide gravel shoulder would be retained upslope and immediately adjacent to the paved trail to provide access for stock users. An 8”-12” gravel shoulder would be retained on the downslope side of the paved trail to protect the edge of the asphalt.

Historic railroad ditches would be cleared of debris and stabilized where appropriate to rehabilitate historic features. Historic railroad ditches would not be cleared outside of the

construction limits or in areas where this would create slope instability that would compromise the integrity of the trail, including surface drainage patterns.

East Approach to West (short) Tunnel – Missing Trestle Area

A short bridging structure is proposed to be installed on the east approach to the short tunnel where a short trestle formerly existed. A steel or concrete bridge structure with either concrete or heavy wooden decking would be installed at this location to bridge a small cove-like indentation in the shoreline. This location would be made passable for construction equipment and regular trail maintenance vehicle passage. It is likely that the bridge would be brought down the trail from the west side (Camp David Junior side) and placed by cranes located on both sides of the trail gap.

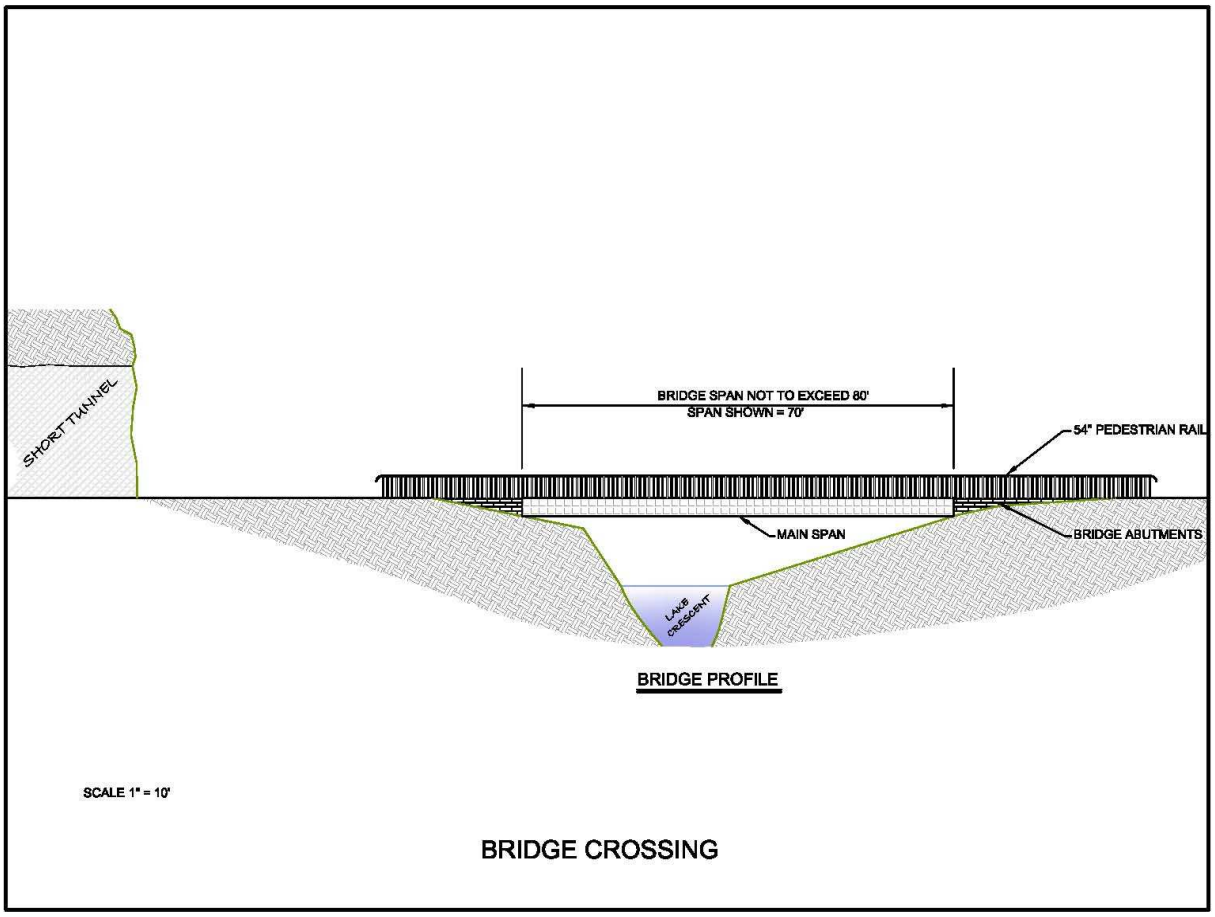


Table 2.9 Alternative 3, Segment A	
Construction Requirements	**Quantities**
Length of trail segment	5650 linear feet
Volume of excavation/cut required	5050 cubic yards
Volume of fill required	325 cubic yards
Volume of base material placed	1918 cubic yards
Volume of asphalt placed	209 cubic yards
Maximum number of trees removed (11” – 23” dbh)	26
Maximum number of trees removed (≥ 24” dbh)	2 (24” and 26” dbh)
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	35 days

Table 2.10 Alternative 3, Segment B	
Construction Requirements	**Quantities**
Length of trail segment	8400 linear feet
Volume of excavation/cut required	6550 cubic yards
Volume of fill required	1575 cubic yards
Volume of base material placed	2852 cubic yards
Volume of asphalt placed	311 cubic yards
Maximum number of trees removed (11” – 23” dbh)	69
Maximum number of trees removed (≥ 24” dbh)	2 (24” dbh)
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	48 days

Table 2.11 Alternative 3, Segment C	
Construction Requirements	**Quantities**
Length of trail segment	2475 linear feet
Volume of excavation/cut required	25 cubic yards
Volume of fill required	10 cubic yards
Volume of base material placed	840 cubic yards
Volume of asphalt placed	92 cubic yards
Maximum number of trees removed (≥ 11” dbh)	6
Maximum number of trees removed (≥ 24” dbh)	0
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and	9 days

asphalt	

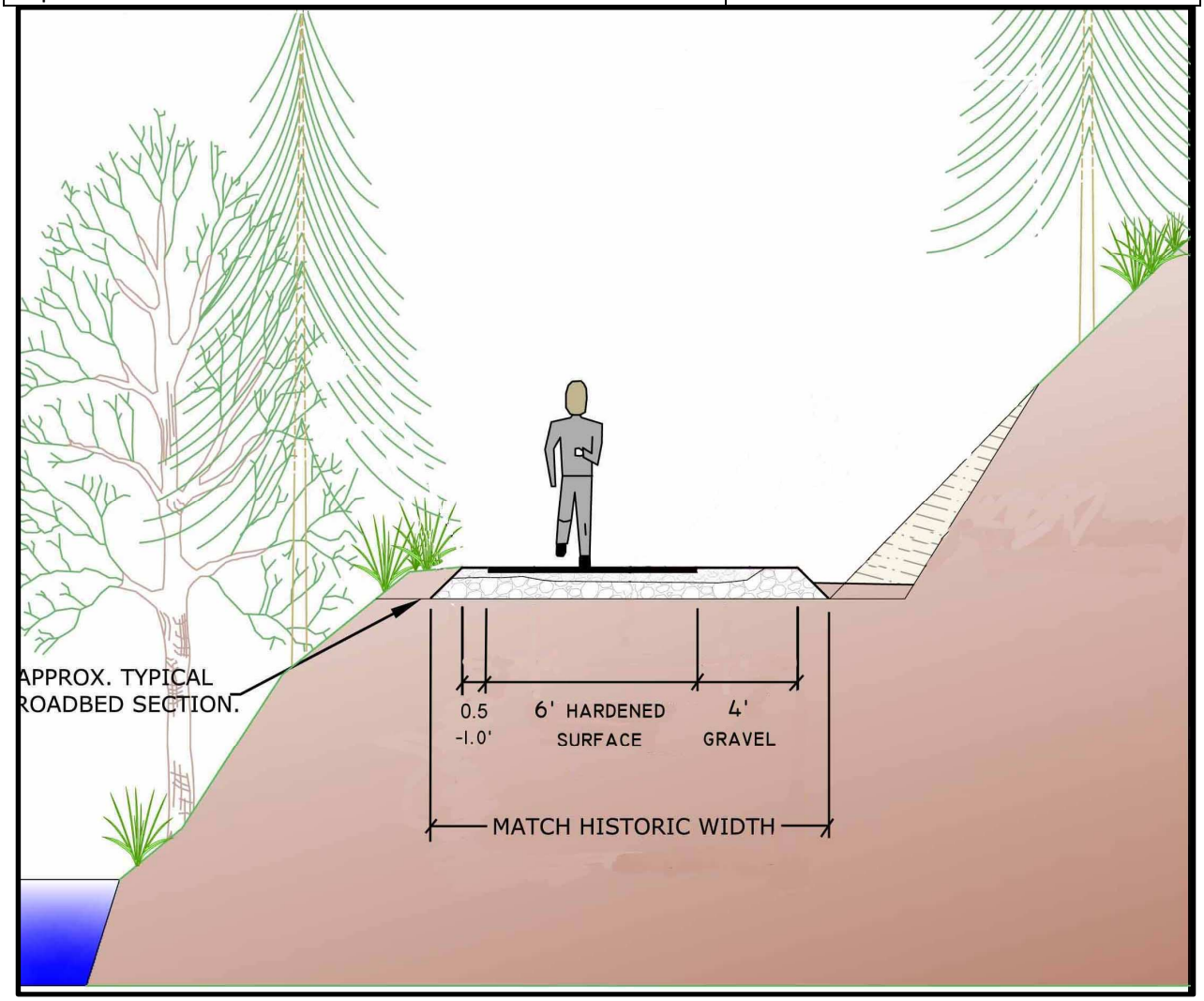


Figure 10. Trail profile (historic railroad segments) for Alternative 3

Railroad Tunnels & Bypass: The west railroad tunnel would be cleared of debris and developed to the same accessible SRRT accessible trail standard described for Segments A, B, & C. The bypass trail around the tunnel would be retained in its present condition with routine maintenance.

Re-opening of the short tunnel would commence after construction access is provided through Segment A through clearing and bank stabilization. The area near the west tunnel portal would be sufficiently cleared to allow for trucks and equipment to turn around. The tunnel would be scaled and any loose rock would be removed from the entire length of the tunnel and at portal locations.

All removed materials would be loaded onto a dump truck utilizing an excavator. Once access through the tunnel is established, work would continue on Segment B to clear the grade and

stabilize the downslope bank. The tunnel floor would be filled with 1-1/4-inch minus road base and sloped with a high spot at its center to provide flow of water from any point to the outside ends of the tunnel and out into the lake. A six foot wide asphalt trail would be paved through the tunnel to connect Segments A and B after other construction is complete. Once access to the East (long tunnel) is secure, work would proceed with clearing and opening the long tunnel. Once open, trail development would continue through the long tunnel to complete development of Segment C.

Table 2.12 West Railroad Tunnel Segment and bypass: Construction Requirements	
Construction Requirements	**Quantities**
Length of trail segment	200 linear feet
Volume of excavation/cut required	2000 cubic yards
Volume of fill required	N/A
Volume of base material placed	68 cubic yards
Volume of asphalt placed	7 cubic yards
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	5 days

Short Tunnel Rehabilitation Details

The stability of the tunnel portals and the large rock block failure that has occurred throughout the middle and northeast ends of the west tunnel in the tunnel crown and quarter arches would be addressed as recommended in the *Final Geotechnical Report Spruce Railroad Tunnel Evaluation* (PanGEO. 2011). A tunnel profile and cross-sections showing the details of these recommendations are included in Appendix B.

- Loose rock would be scaled throughout the entire length of the tunnel and at the portal locations. In particular, the large rock block in the tunnel crown above the northeast portal would be removed so that it does not pose a risk of falling and endangering pedestrians. All rock and timber debris would be removed from within the tunnel and the large pile of rock accumulation at the east portal that resulted from the attempt to close the tunnel via blasting.
- A minimum of four inches of fiber reinforced microsilica shotcrete (FRMS - steel or synthetic fiber) would be installed to the exposed bedrock in the crown and quarter arches from the middle of the tunnel to the east portal. FRMS creates a self-supporting lining in the tunnel. The fibers in the shotcrete act as reinforcement, instead of using traditional reinforcing bars. Adding FRMS to the interior of the tunnel would enhance the tunnel performance during seismic events and would inhibit further weathering and deterioration of the exposed rock surface, thereby preventing further rock fall.
- A minimum of four inches of FRMS would be applied to the exposed bedrock portals in the vicinity of the tunnel opening for the same reasons listed above. This would include the sidewalls, crown, and quarter arches.

- Rock bolts would also be installed to anchor potentially loose rock blocks within the tunnel and at portals. These rock bolts would be placed into the rock blocks as needed, and not in a pattern. An example plan sheet showing shotcrete lining and rock bolt details is included as Appendix B.
- Seepage along major joint sets that are producing water within the tunnel and at the portals would be controlled by installing strip drains on the rock prior to placing shotcrete. The drain strips would be extended down to the tunnel invert or bike path drainage so that any captured water flows to an acceptable location. Strip drains usually consist of a Geosynthetic drainage board, or dimple board, that can be cut into varying widths.
- At least one drainage ditch would be installed along one of the tunnel walls. The tunnel invert and drainage grade would be established so water within the tunnel naturally drains out of the tunnel and prevents any water from collecting within the tunnel. Drain pipes would not be placed in the ditches.
- When removing the large rock pile at the tunnel portal, care would be taken to grade the bike path away from the tunnel to facilitate drainage.

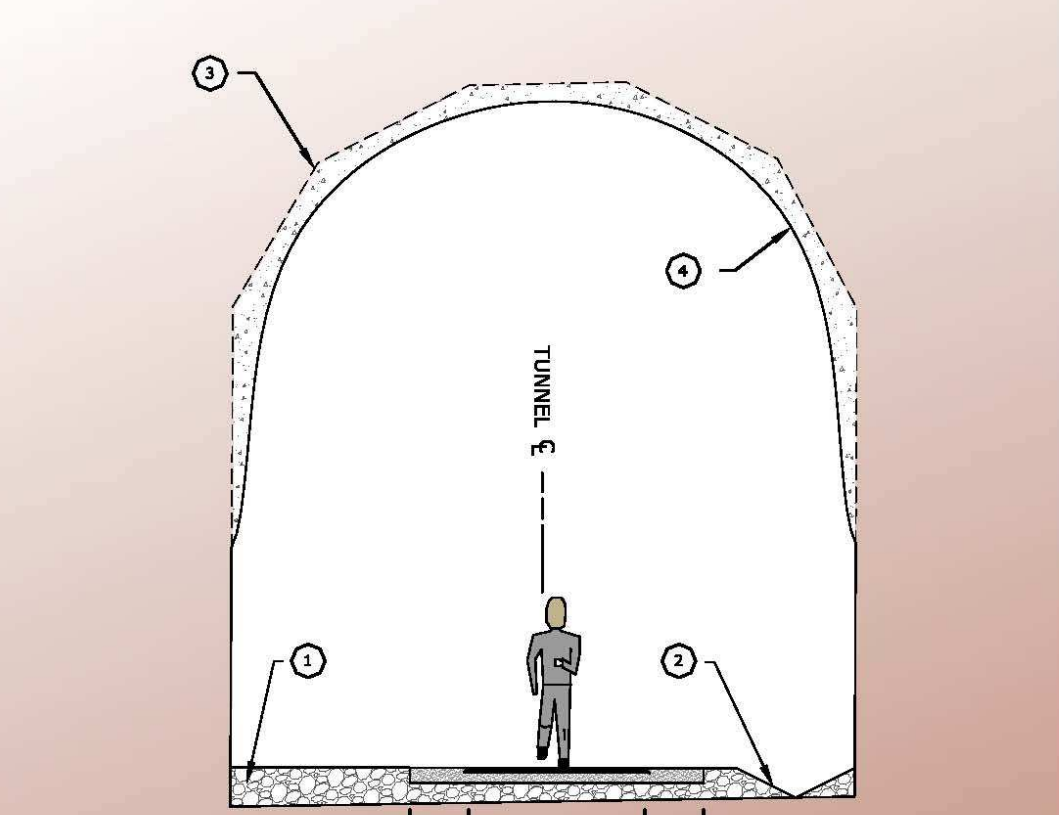


Figure 11. Railroad tunnel with trail

East Railroad Tunnel & Bypass: The east railroad tunnel would be cleared of debris and developed for trail use. The bypass trail would be retained, routine maintenance would continue.

The bridge at the Devil's Punchbowl would be replaced with a new structure of the same length, width and general design, constructed to support stock and pedestrians. The new bridge would be constructed off-site, staged on the lawn adjacent to the Storm King Ranger Station and flown into the site using a heavy lift helicopter. The flight would occur after September 15 and before April 1 to avoid potential noise disturbance to marbled murrelet during the breeding season.

Long Tunnel Rehabilitation Details

The long tunnel would be rehabilitated and maintained as recommended in the *Final Geotechnical Report Spruce Railroad Tunnel Evaluation* (PanGEO. 2011). A tunnel profile and cross-sections showing the details of these recommendations are included in Appendix B. Although the ground within the long tunnel is self-supporting on a large scale with only localized spalling and raveling, rehabilitation actions are needed to support opening the tunnel for use as a trail. The main areas requiring work are the tunnel portals. At a minimum, the following actions would be taken to allow for safe access.

- Loose rock would be scaled throughout the entire length of the tunnel and at the portal locations.
- All rock and timber debris would be removed from within the tunnel and the large piles of rock accumulation at the north and south portals that resulted from the attempt to close the tunnel via blasting.
- The two remaining timber sets that are standing in the tunnel would be removed to prevent them from becoming a hazard when they fall.
- A minimum of four inches of fiber reinforced microsilica shotcrete (FRMS - steel or synthetic fiber) would be installed to the exposed bedrock. Adding FRMS to the portal locations would enhance the tunnel performance during seismic events and would inhibit further weathering and deterioration of the exposed rock surface, thereby preventing further rock fall.
- Where seeps are encountered at the tunnel portals, water would be controlled by installing strip drains on the rock prior to placing shotcrete. The strip drains may be extended down to the tunnel invert or the bike path drainage so that any captured water flows to an appropriate location. Strip drains usually consist of a geosynthetic drainage board, or dimple board, that may be cut into varying widths.
- At least one drainage ditch would be installed along one of the tunnel walls. The tunnel invert and drainage grade would be established so water within the tunnel naturally drains out of the tunnel and prevents any water from collecting within the tunnel. Drain pipes would not be placed in the ditches.
- When removing the large rock pile at the tunnel portal, care would be taken to grade the bike path away from the tunnel.

Table 2.13 East Railroad Tunnel Segment and bypass: Construction Requirements

Construction Requirements	Quantities
Length of trail segment	500 linear feet
Volume of excavation/cut required	7,500 cubic yards
Volume of fill required	N/A

Volume of base material placed	170 cubic yards
Volume of asphalt placed	19 cubic yards
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	20 days

Segment D: The existing Spruce Railroad Trail would be developed and maintained in accordance with the new SRRT trail standard. This would amend the range of existing park trail standards.

ONP TRAIL STANDARD	SRRT
Firm & Stable Tread width	6’ maximum
Gravel or Natural Tread width	4’ maximum
Clearing and Brushing	14' lateral 10' vertical
Maintenance frequency	Annual +
Bridge width	8' decking maximum
SRRT — these trails are open to hikers, stock, and bicycles. These trails are a combination of firm & stable (hardened) surface and gravel or natural tread surface, and are designed for large numbers of relatively inexperienced users. SRRT trails are maintained to a standard for higher use volumes.	

Lake Crescent Trail Segment D Construction Details

Road base would be placed to a width of up to 11 feet. The existing Spruce Railroad Trail would be developed to provide a 6’ wide paved trail surface. The trail alignment would be slightly modified to avoid new construction on the corner of private property. A gravel shoulder up to 4’ wide would be retained upslope and immediately adjacent to the paved trail to provide access for stock users. This shoulder may be narrowed in some areas to avoid impacts to large trees or avoid other resource impacts. An 8”-12” gravel shoulder would be retained on the downslope side of the paved trail to protect the edge of the asphalt. Where necessary, a retaining structure would be placed to support the uphill bank. Segment D would not be developed to achieve a

universally accessible trail grade due to the steepness of the slope (18%) and extent of disturbance to park resources that would be required to achieve an accessible grade.

Table 2.14 Alternative 3, Segment D	
Construction Requirements	**Quantities**
Length of trail segment	3,250 linear feet
Volume of excavation/cut required	250 cubic yards
Volume of fill required	200 cubic yards
Volume of base material placed	389 cubic yards
Volume of asphalt placed	117 cubic yards
Length of retaining structure	200 feet
Maximum number of trees removed (11” – 23” dbh)	11
Maximum number of trees removed (≥ 24” dbh)	7 (24”, 26”, 30” dbh)
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	39 days

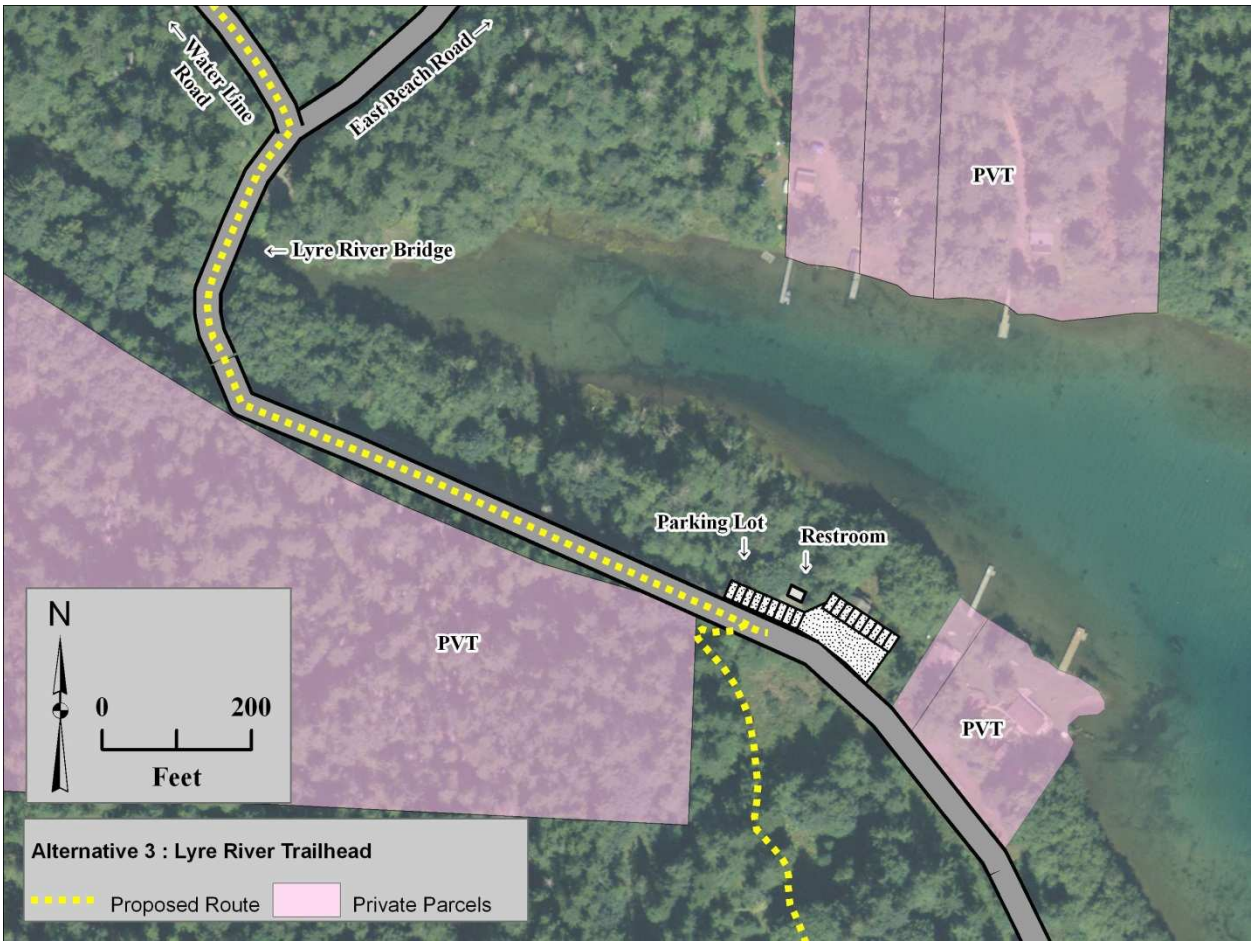


Figure 12. Proposed Segment D trail alignment under Alternative 3

Lake Crescent Upslope Bank Failures

Within Segments A, B, and C upslope bank failures have resulted in slide materials within the proposed construction limits at approximately eight locations. These materials would be removed as described in previous sections. Within Segment D, where slides from the upslope have deposited rock and debris across the construction limits, such material would be removed only as necessary to establish the construction limits over the top of the slide debris.

Lake Crescent Downslope Bank Failures

Within Segments A and B, fourteen areas between the proposed trail bed and lake edge have failed. Six of these sections contain historic log cribbing from the original construction of the rail grade. Historic dry laid masonry from the construction of the rail grade is also present. The combined length of failed bank measured along the water's edge is 1,409 linear feet.

In the six areas where historic log cribbing is present, the trail bed would be reconstructed. The trail bed would be excavated using a tracked excavator to an elevation slightly above the water level. Log cribbing would be removed to allow for new bank stabilization to be installed. This would be done in accordance with cultural resource guidelines to rehabilitate the historic appearance of the log cribbing. No work would occur below the ordinary high water mark.

In the area of historic dry laid masonry, all failed areas would be reconstructed in accordance with a treatment plan developed in consultation with cultural resource specialists. Bank stabilization would be designed to protect the remaining section of intact masonry wall. The lowest 12 inches to 18 inches of wall would be at or below the ordinary high water mark. Where the masonry wall is intact, it would remain. Concrete abutments would be placed into the bank and structural steel bridging with wood decking would be placed on top of the trail section to provide a driving platform for construction equipment, and a permanent trail surface.

Where masonry wall is not intact, initial work would entail the removal of the identified masonry elements along the bank down to the lake level. Material identified by cultural specialists as historic dry laid masonry wall would be treated in a manner consistent with NPS cultural resource guidelines. The excavated rock material would remain at the site and be used for reconstruction. A steel bridging structure would be placed on the trail grade as described above. New material matching the intact wall material would be transferred to the site using dump trucks. The material would be hand placed, beginning with the larger material at the bottom and extending up the wall. Rock would be placed to create a lock between adjoining pieces. As the wall is raised, previously excavated material would be replaced behind the wall and compacted into place.

The six areas that contain no log cribbing or dry laid masonry would be reconstructed through the placement of Class 3, 4, and 5 rip rap, placed beginning at the lakeshore and extending upslope to the level of the trail. The lower 12 to 18 inches of the rip rap fill would be below the ordinary high water level of the lake. As the rip rap is constructed, voids would be filled with graduated rock sized between three inches down to 1-1/4 minus road base.

Bank reconstruction would be completed in a manner that avoids or minimizes impacts to the lake and shoreline. Rip rap would be placed using the minimum design necessary to establish a structurally sound bank. Bank reconstruction would utilize a tracked excavator to place the rip rap and a dump truck to transport rip rap and backfill.

Lake Crescent Trail Drainage

Under Alternative 3, in Segments A & B, approximately 3 culverts and 8 low water crossings would be installed. Water flow across the trail within Segments C and D would be contained through the placement of low water crossings, boardwalk or trail bridges. Low water crossings would be placed at approximately 12 locations. The trail grade would be slightly depressed for 50 feet on each side of the crossing to match the trail grade. Concrete, rather than asphalt, would

be used to create a swale, providing a flow path for water. Where identified as necessary, the inlet and outlet sides of the low water crossing would be channelized through the placement of 3-inch minus rock to direct the water and maintain the channel alignment.

Four locations would require the placement of bridges in accordance with the NPS SRRT trail standards. Bridge lengths would vary from 16 to 26 feet. These bridges would span year-round stream channels. The bridges would be placed on concrete abutments excavated into the ground. The trail would be raised over a 100-foot length to match the elevation of the bridge. Bridge and low water crossing placement would utilize a tracked excavator and dump truck.

Spruce Railroad Trailhead Parking Lot, Lyre River Road and Water Line Road

The existing parking lot would be expanded after the NPS-owned vacant property is removed (house and dock) as described for Alternative 2. Parking lot expansion would be limited to the footprint of the demolished building extended laterally to the adjoining property line, leaving an undeveloped buffer adjacent to the adjoining property. The area has been surveyed for wetlands. No wetland areas would be developed. The lands between the expanded parking lot and Lake Crescent would be rehabilitated to natural conditions. The parking lot would be paved with 3" thick asphalt in the existing and expanded parking area. The paved lot would be striped to delineate 22 parking spaces and a large vehicle turnaround area. Two disabled access parking spaces would be designed and marked in accordance with ABA accessibility standards.

To provide a firm and stable surface the NPS would pave the road from the Lyre River Bridge to the expanded Spruce Railroad Trail parking lot, and would also pave the 0.2 mile long section of the existing Water Line Road within the park. A bike lane would be striped along the road.

Table 2.15 Alternative 3, Parking lot at Lyre River (Spruce Railroad Trailhead)	
Construction Requirements	**Quantities**
Surface area of parking lot	17,800 square feet
Volume of excavation/cut required	165 cubic yards
Volume of fill required	1750 cubic yards
Volume of base material placed	220 cubic yards
Volume of asphalt placed	165 cubic yards
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	6 days

Table 2.16 Alternative 3, Road from parking lot to the Lyre River Bridge	
Construction Requirements	**Quantities**
Length/width	950 feet long/ 22 feet wide
Volume of base material placed	258 cubic yards
Volume of asphalt placed	158 cubic yards
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	6 days

Table 2.17 Alternative 3, Water Line Road	
Construction Requirements	**Quantities**
Length/width	1050 feet long, 11 feet wide
Excavation	194 cubic yards
Volume of base material placed	143 cubic yards
Volume of asphalt placed	97 cubic yards
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	6 days

Sol Duc Trail Development

Under Alternative 3 the park would construct approximately two miles of new trail in the Sol Duc area of the park to the new SRRT Accessible Trail Standard. This would include 0.5 mile of new trail from the existing Sol Duc exhibit area and parking lot to the historic Spruce Railroad grade and 1.25 miles of new trail on the historic railroad grade within the Park. Additionally, a short spur trail, approximately 700 feet long would be constructed on NPS lands to connect with a trail that Clallam County is proposing to construct on USFS lands adjacent to the Park. Stock would be allowed on the 1.25 miles of new trail on the railroad grade and also on the spur trail connecting to USFS lands. The 0.5 mile trail access from the Sol Duc kiosk parking lot would be for pedestrian and bicycle use only.

These new trail segments would connect with a proposed interagency regional trail system. No trail connection is proposed between the Sol Duc and Lake Crescent trail segments on NPS lands, although the spur trail described above would connect to an at-grade trail crossing of Highway 101 that is proposed for development by Clallam County west of the park.

Sol Duc Construction Details – spur trail and railroad grade segments

New trail would be developed and maintained in accordance with the new SRRT accessible trail standard described for Lake Crescent trail segments A, B, & C under this alternative. Road base would be placed to a width of 11 feet. A 6-foot wide, universally accessible paved trail surface would be developed, consistent with the draft shared use path guidelines published by the Access Board.

A 4-foot wide gravel shoulder would be retained upslope and immediately adjacent to the paved trail to provide access for stock users. An 8”-12” gravel shoulder would be retained on the downslope side of the paved trail to protect the edge of the asphalt. Once asphalt is in place, additional gravel would be placed and compacted outside of the edges of the asphalt to raise the gravel elevation to the level with the asphalt grade. Historic railroad ditches would be cleared of debris where appropriate to rehabilitate historic features. Historic railroad ditches would not be cleared in areas outside of the construction limits or where this would create slope instability that would compromise the integrity of the trail, including surface drainage patterns.

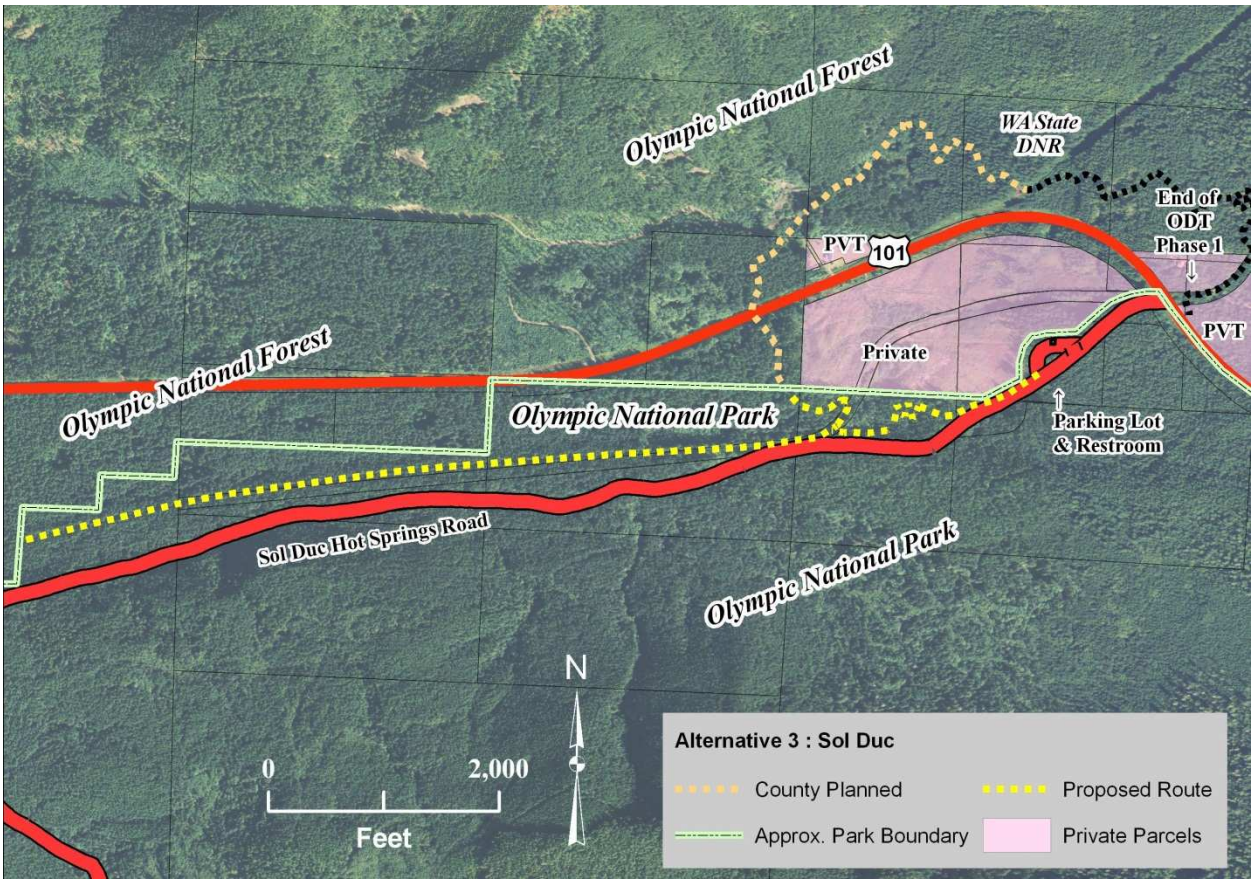


Figure 13. Proposed Sol Duc trail development under Alternative 3

Table 2.18 Alt 3, Sol Duc – spur trail and trail on railroad grade: Construction Requirements	Quantities
Length of trail segment	650 linear feet (spur) 1.4 miles (rail grade)
Volume of excavation/cut required	1,250 cubic yards (spur) 1,250 cubic yards (rail grade)
Volume of fill required	3500 cubic yards (spur) 3500 cubic yards (rail grade)
Volume of base material placed	221 cubic yards (spur) 2504cubic yards (rail grade)
Volume of asphalt placed	24 cubic yards (spur) 273 cubic yards (rail grade)
Maximum number of trees removed (11” – 23” dbh)	31 (spur) 36 (rail grade)
Maximum number of trees removed (≥ 24” dbh)	two, 24” dbh (spur) one, 24” dbh (rail grade)
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	35 days (spur) 39 days (new trail on rail grade)

Sol Duc Construction Details – trail between parking area and railroad grade

New trail would be developed along the same alignment described under Alternative 2. However, under Alternative 3 a 6-foot wide, accessible, asphalt paved trail surface would be developed. This trail segment would not be developed for stock access. Stock access would be provided on the spur trail segment described above.

Table 2.19 Alt 3, Sol Duc – Parking lot to intersection with railroad grade: Construction Requirements	Quantities
Length of trail segment	0.5 miles
Volume of excavation/cut required	650 cubic yards
Volume of fill required	950 cubic yards
Volume of base material placed	331 cubic yards
Volume of asphalt placed	142 cubic yards
Maximum number of trees removed (11” – 23” dbh)	57
Maximum number of trees removed (≥ 24” dbh)	12 (24” – 26” dbh)
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	39 days

Alternative 4 – Clallam County Proposal

Spruce Railroad Trail

Alternative 4 is proposed by Clallam County on lands within Olympic National Park. Under Alternative 4, Clallam County proposes to make improvements to the Spruce Railroad Trail as described below to closely replicate and restore the original railroad roadbed widths of 14-16 feet, raised tie ballast widths of 10-12 feet, uphill flat bottomed ditch line width of 3-4 feet and a paved trail width of 8 feet on top of the tie ballast to replicate the original wooden tie width of 8 feet. Both tunnels would be opened under Alternative 4 for trail use. Both tunnel bypass trails would be maintained and slightly improved. Construction would occur primarily along the existing Spruce Railroad Trail alignment for Segments A, B, and C.

A new trail alignment would be established for Segment D-ADA to establish a grade consistent with the Architectural Barriers Act (ABA) and Americans with Disabilities Act (ADA). This would require acquisition of access rights from a private land owner to accommodate the clearing and excavation that would be required on private lands to achieve an accessible grade. Coordination with other adjacent property owners would also be required due to the close proximity of proposed development to private lands near the existing Spruce Railroad Trail parking lot. Additional trail expansion is proposed to the east along East Beach Road and the Water Line Road to the park boundary and to the west of Fairholme Hill along the Sol Duc Railroad Grade alignment.

Segments A, B, C, & D-ADA: The existing Spruce Railroad Trail would be modified and developed in accordance with the AASHTO guidelines for bicycle facilities, as proposed by Clallam County. This would amend the range of existing park trail standards. In trail segments A, B, and C base rock would be placed to a width of 10-12 feet over the historic railroad tie ballast material (where present) prior to placing an off-centered 8-foot wide asphalt trail on top of the new ballast material. The 8 foot wide asphalt trail would replicate the width and dark shading appearance of the original eight foot wide historic wooden railroad ties. An area of roadbed would be restored by clearing on the uphill side of the tie ballast to reestablish a shallow 3 to 4 foot wide, flat bottomed ditch, which would also be utilized as the equestrian and hiker pathway. Between 6” – 12” inches of historic tie ballast material would be retained where present or gravel placed on downhill side of the paved trail to support the asphalt.

In segment D-ADA a new trail alignment would be developed to provide an 8-foot wide, universally accessible paved trail surface. Base rock would be placed 12-feet wide prior to asphalt paving. A 3.5 foot wide gravel shoulder would be retained on the upslope side for use by equestrians. Approximately 6”- 12” of gravel shoulder would be retained on the downslope side to support the 8-foot wide asphalt trail.

TRAIL STANDARD	CLALLAM COUNTY PROPOSAL
Firm & Stable Tread width	8’
Gravel or Natural Tread width	3’ minimum 4’ maximum
Clearing and Brushing (for maintenance)	14' lateral 10' vertical
Maintenance frequency	Annual +
Bridge width	8' decking maximum

Clallam County Trail Proposal — these trails are open to hikers, stock, and bicycles and are designed to meet the American Association of State Highway and Transportation Officials (AASHTO) guidelines for Bicycle Facilities. These trails are a combination of accessible, firm & stable (hardened) surface and gravel or natural tread surface, and are designed for large numbers of relatively inexperienced users. These trails are maintained to a standard for higher use volumes.

The American Association of State Highway and Transportation Officials (AASHTO) provide standards and guidelines that are used in the design, construction, maintenance, operation, and administration of highways, bridges, and other transportation facilities. AASHTO developed the "Guide for the Planning, Design, and Operation of Pedestrian Facilities" (July 2004) and the "Guide for the Development of Bicycle Facilities" (1999). Although compliance with these AASHTO documents is voluntary, many states adopt these AASHTO documents as standards.

In February 2010, AASHTO made available draft revisions to the 1999 "Guide for the Development of Bicycle Facilities." The February 2010 draft is named the "Guide for Planning, Design, and Operation of Bicycle Facilities." References in this notice to the AASHTO Bicycle Facilities Guide refer to the February 2010 draft of the "Guide for Planning, Design, and Operation of Bicycle Facilities."

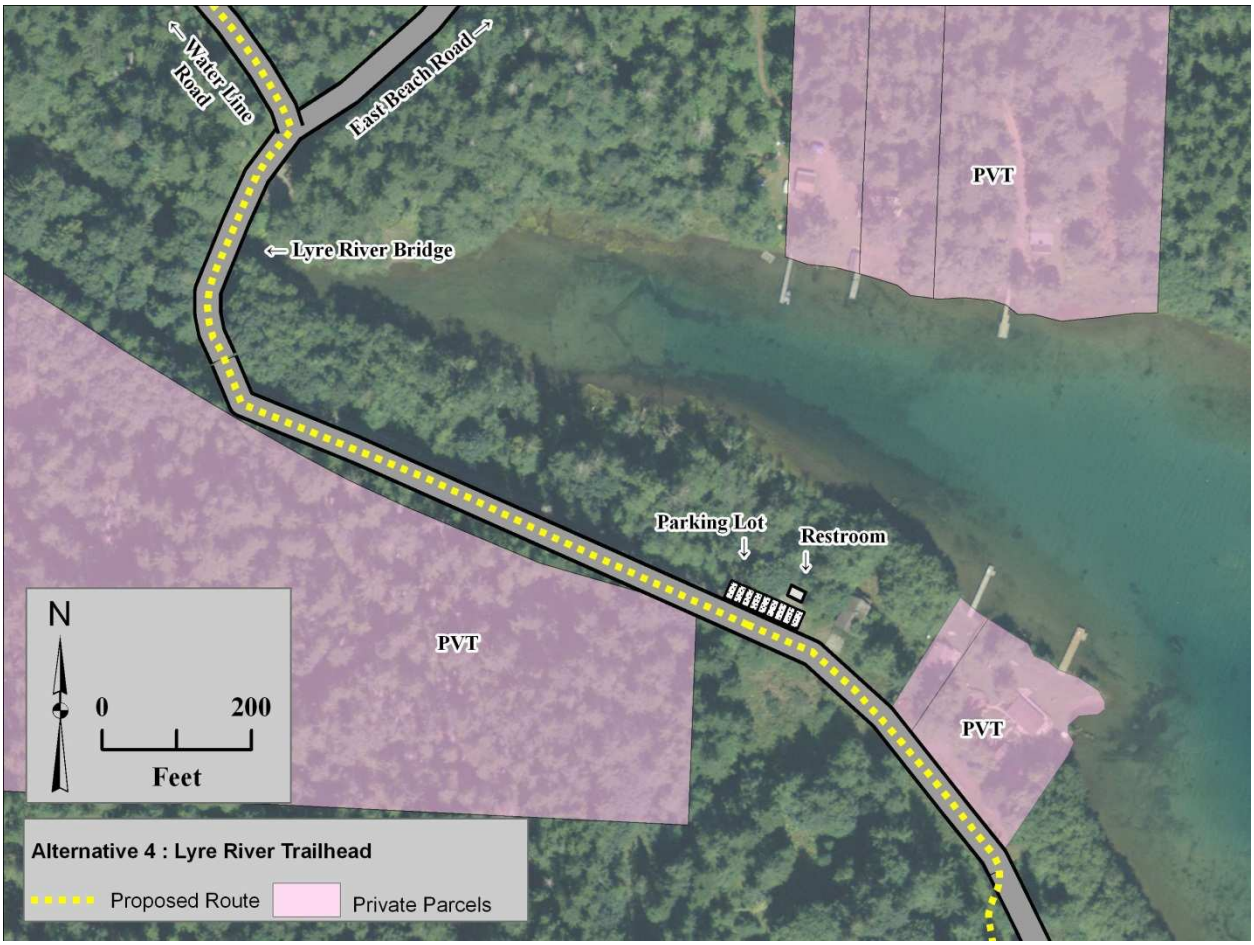


Figure 14. Trail Alignment proposed under Alternative 4

Lake Crescent Segment D-ADA: Construction Details

The County would initiate construction at the Lyre River Trailhead where the current trail on the west side of the trailhead would transition from the current alignment on the north side of the road to a trail located on the road, continuing west from the trailhead for approximately 700 feet. At the point on the road where the new alignment is west of the wetland and homestead property, the trail would continue uphill from the road on the newly proposed trail alignment. The trail on the road west of the current trailhead would be paved to a width of 8-10 feet.

As the first element of work on Segment D-ADA, the complete trail centerline and clearing limits would be staked. Clearing limits for new trail construction on a side hill slope include the top of trail width of 12-13 feet plus the uphill cut slope and the downhill fill slope which together could add between10 to 40 feet of width to the disturbed area in the cuts and fills on the 1200 foot descent to regain the railroad grade on the west end of the Segment D-ADA. Where necessary, the alignment would be adjusted to minimize resource impacts to the existing topography.

Clearing and grubbing would occur within the established construction clearing limits to establish a 12 foot wide finished trail alignment up the hillside at a 5% grade. Initial ground clearing would begin with tree cutting by chain saw. Trees would be moved to decking piles where they would be moved off-site by truck. Tree branches would be chipped and spread on exposed soil adjacent to the trail. Additional ground clearing would be accomplished using excavators and bulldozers and the vegetative material and topsoil would be hauled off-site to Clallam County's Joyce-Piedmont pit.

After ground clearing is complete, the centerline for horizontal alignment and vertical grade as established in the construction drawings would be located by providing construction stakes showing cuts and fills. The initial ground clearing would be followed by excavation and embankment in cut and fill areas using excavators, bulldozers, graders, and compaction equipment. Next, an initial shallow lift of base rock would be placed with dump trucks and spread with a bulldozer and grader and compacted in place with compaction equipment. The compacted base rock surface would serve as a running surface for the trail through the initial heavy construction phase of the project until additional screened rock materials recovered from the east entrance of the long tunnel could be utilized to supplement the base rock. Top rock and paving would be completed after major construction is complete.

The County's proposed trail alignment begins to climb uphill approximately 700 feet west from the current Lyre River parking lot elevation at an accessible 5% grade on Park lands above the private property and homes west of the trailhead. One switchback would be used to gain the elevation of the former road that is currently part of the Spruce Railroad Trail. The additional switchback would allow the continuation of the trail along the former roadbed in a westward direction. This new route is intended to avoid impacts to wetlands and water crossings while utilizing several areas that were formerly disturbed as skid roads.

Where the Alternative 4 trail alignment departs from the current East Beach Road, the trail would be constructed using a 12 foot wide cross section to allow width for a future construction phase. This would place asphalt 8 feet wide and 2 inches thick paving over crushed gravel to accommodate wheelchair users and road bicyclists. Gravel 0.5 feet wide would be used to hold the downhill pavement edge, and 3.5 feet of crushed gravel would be retained on the uphill side to accommodate hikers, mountain bikers, and equestrians until the railroad grade alignment is regained.

Once regaining the former road currently part of the SRRT, the County's proposed route would use and improve this former road route by adjusting the grade to meet an accessible 5% grade standard and reshaping the route to provide for a standard 12 foot wide trail cross section. Near the top of the old road grade, the County route would deviate downhill from the roadbed alignment to take advantage of a bench below the roadbed. The bench crests the highest elevation needed to reach the point where the trail can begin its downhill descent to regain the

elevation of the railroad grade west of the private property. This alignment would require an easement agreement for the right of use. The last 1,000 to 1,200 feet of new trail alignment would be constructed as an ADA compliant ground-based ramping trail section that consists of a series of 200 foot long 8% grades separated by 10 foot long flat resting areas to complete the trail down to the former railroad grade alignment.

Table 2.20 Alternative 4, Segment D-ADA	
Construction Requirements	**Quantities**
Length of trail segment	2800 linear feet
Volume of excavation/cut required	12100 CY - 987 CY on E. Beach Rd
Volume of fill required	3500 cubic yards
Volume of base material placed	2020 CY – 381CY on E. Beach Rd
Volume of asphalt placed	140 cubic yards-37 CY on E. Beach
Volume of rip rap placed	0
Number of trees removed (≥ 11" dbh)	152
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	87 days

Lake Crescent Segments B and C: Construction Details

Once developed, Segment D-ADA would be used as the construction access route to remove material from Segment C, the east (long) tunnel, and once the east tunnel is cleared Segment B.

As the first element of work on Segments B and C, the complete trail centerline would be staked for horizontal alignment and vertical grade as established in the construction drawings. Where necessary, the alignment would be adjusted to minimize resource impacts to the existing topography. This surveyed alignment would be field inspected and confirmed by NPS cultural staff and adjusted as necessary at their direction to conform to SRRT historic alignments and a final centerline established. Where the historic tie ballast can be identified in the field by NPS cultural staff and is relatively intact manifesting its original width of 10 to 12 feet, it is expected that the trail centerline would center on this 10 to 12 foot width of tie ballast.

In the County's proposal the original tie ballast width of 10 to 12 feet would be cleared of vegetation, duff and overburden down to the top of the tie ballast rock. Additional clearing of vegetation, duff, and slide materials beyond the north edge of the tie ballast material would take place at the same time to reestablish a 3-4 foot wide, flat bottomed, uphill ditch line that would provide a separated trail width for use by equestrians, hikers, and mountain bicyclists.

Under the County proposal, 4 inches of crushed surfacing top course or crusher fines would be placed over the tie ballast to match the original top of tie ballast width of 10 to 12 feet. This new crushed rock material, uncorrupted by organic material, would form a solid foundation for the slightly off-center paving of the trail to a width of 8 feet. This paving width would match the width of the original railroad ties.

Once the final centerline and outside boundaries of the clearing limits are marked and identified to the contractor, the area would be cleared of trees, duff, and overburden as discussed above. This activity would be completed using an excavator, a small bulldozer and/or grader. The intent would be to remove overburden only to a grade identified by a park archeologist as the top of the railroad ballast or higher with the remaining material consisting of clean, organically uncorrupted railroad tie ballast. NPS Cultural staff would be on-site to assist in identifying the vertical grade of the ballast. Removal of duff and overburden would not extend into the original roadbed layer located below the tie ballast. The overburden would be disposed of at a permitted disposal site outside the Park.

Where the historic tie ballast cannot be identified in the field by NPS cultural staff because it has been covered by slide debris or where the railroad grade has been eroded or partially collapsed towards the lake, the trail grade would be established by either excavating or filling to achieve the design grade. Where the original grade materials are not recoverable in place, the County would rebuild the raised portion of the railroad grade to replicate the tie ballast width in a standard 10-12 foot wide trail cross section with an additional 3-4 foot wide uphill, flat, natural tread ditch.

This clearing would continue 2,005 feet on the railroad grade to the vicinity of the east end of the long railroad tunnel. The constructed width would be marked using flagging or other accepted means to identify the constructed width to the contractor as the outer edges or boundary within which construction clearing or disturbance may occur and outside of which no disturbance would occur. Any areas of special concern or of varying width would be similarly identified and marked. Such areas would include pedestrian and stock passing zones, resting areas, failed side slopes or banks requiring additional excavation and overhanging trees requiring excavation or construction activities outside of the 10-12 foot wide tie ballast limits plus the additional 3-4 feet of uphill, flat, natural tread ditch line.

Throughout the length of Segments A, B, C, and D-ADA, Park staff would identify specific areas that may be used by the contractor as temporary widened truck and equipment staging or turning zones during construction. The priority would be to, wherever possible, utilize proposed permanent passing and resting areas as discussed above for these truck use areas. The constructed width of such areas would be marked and identified to the contractor. At the completion of construction, areas intended for use as permanent passing or resting areas would be developed as such. Temporary truck staging and turning areas not proposed for development

as permanent passing and resting areas would be restored through removal of any gravel surfacing, tilling of the surface, and seeding by a seed stock provided or approved by NPS staff. The width of restoration would be sufficient to extend across the entire disturbed area.

Once the east entrance of the long railroad tunnel is reached, an area for placement of a rock screener would be excavated near the entrance to the tunnel from the area currently occupied by tunnel blast debris. The 2,500 cubic yards of material at the east tunnel entrance would then begin to be screened, sorted, loaded, and placed back on Segment D-ADA to the trailhead area to augment the initial base rock placement or any areas needing fill material. Any remainder rock would be stockpiled for use on other segments. This base rock would be placed with dump trucks and the spreading of base rock accomplished with a bulldozer and grader, and compacting base rock with a compactor. The compacted base rock surface would serve as a surface for the trail through the heavy construction phase of the project on segment D-ADA.

Restoration of the Long Tunnel

With completion of a rocked and compacted construction access road to the east end of the long tunnel, work on the rehabilitation of this tunnel could begin. The major work to restore the tunnel consists of stabilizing the portal areas of the tunnel with steel fiber reinforced shotcrete, installation of rock bolts, and scaling of loose rock inside the tunnel and at the tunnel entrance faces. Opening the long tunnel would make it feasible to restore the 8,400 linear feet of trail between the two tunnels (Segment B) and placement of a bridge at the east entrance to the west tunnel. The bypass trail around the tunnel would be retained and improved to meet the ONP multipurpose bicycle trail standard.

Once the east tunnel is accessible, clearing and bank restoration would continue in Segment B. Work could simultaneously progress from the west, extending and developing Segment A to provide construction access from both directions.

Lake Crescent Segment A: Construction Details

Work on Segment A would begin by construction of a temporary construction access ramp connecting the east end of Camp David Junior Road to Segment A as described earlier in this chapter under Activities Common to all NPS Alternatives.

As in Segments B and C, the first element of work on Segment A would see the complete trail centerline staked for horizontal alignment and vertical grade as established in the construction drawings. There are areas where the historic alignment has been adjusted in the proposed design delivered to the Park to minimize resource impacts to the existing topography and there may be areas where the design may be further shifted to minimize impacts near the lake. This surveyed alignment would be field inspected and confirmed by ONP cultural staff and adjusted as necessary at their direction to conform to SRRT historic alignments and a final centerline

established. Where the historic tie ballast can be identified in the field by ONP cultural staff and is relatively intact manifesting its original width of 10 to 12 feet, it is expected that the trail centerline would center on this 10 to 12 foot width of tie ballast. In the County's proposal the original tie ballast width of 10 to 12 feet would be cleared of vegetation, duff, and overburden down to the top of the tie ballast rock. Additional clearing of vegetation, duff, and slide materials beyond the north edge of the tie ballast material down to the original roadbed would also take place at the same time to reestablish the original 3-4 foot wide, flat bottomed, uphill ditch line that would provide a grade separated, natural tread trail for use by equestrians, hikers, and mountain bicyclists. Under the County proposal, 4 inches of crushed surfacing top course or crusher fines would be placed over the tie ballast to match the original top of tie ballast width of 10 to 12 feet and to allow new crushed rock material, uncorrupted by organic material, to form a solid ballast rock support for the paving of the trail to a width of 8 feet, with this paving width replicating the width of the original wooden railroad ties.

The final trail centerline would be used to establish the constructed width of the trail located on top of the historic railroad tie ballast (where identifiable) with an additional 3-4 feet cleared on the uphill side, north of the tie ballast limit, down to the original roadbed elevation to re-establish the uphill ditch line. The constructed width would be marked using flagging or other accepted means to identify the constructed width to the contractor as the outer edges or boundary within which construction clearing or disturbance may occur and outside of which no disturbance would occur. Any areas of special concern or of varying width would be similarly identified and marked. Such areas would include pedestrian and stock passing zones, resting areas, failed side slopes or banks requiring additional excavation, and overhanging trees requiring excavation or construction activities outside of the area cleared for trail purposes.

Throughout the length of Segment A, NPS staff would identify specific areas which may be used by the contractor as temporary widened truck and equipment staging or turning zones during construction. The priority would be, wherever possible, to utilize proposed permanent passing and resting areas as discussed above for these truck use areas. The constructed width of such areas would be marked and identified to the contractor. At the completion of construction, areas intended for use as permanent passing or resting areas would be developed as such. Temporary truck staging and turning areas not proposed for development as permanent passing and resting areas would be restored through removal of any gravel surfacing, tilling of the surface and seeding by a seed stock provided or approved by NPS staff. The width of restoration would be sufficient to extend across the entire disturbed area.

Construction timing would require that clearing and bank restoration work on Segment A be completed, followed by clearing and opening the west tunnel as described below. Base placement and paving would continue simultaneously in both directions following the complete clearing and restoration of all segments and opening both tunnels.

Table 2.21 Alternative 4, Segment A	
Construction Requirements	**Quantities**
Length of trail segment	5650 linear feet
Volume of excavation/cut required	7315 cubic yards
Volume of fill required	460 cubic yards
Volume of base material placed	500 cubic yards
Volume of asphalt placed	283 cubic yards
Number of trees removed (≥ 11" dbh)	91
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	39 days

Table 2.22 Alternative 4, Segment B	
Construction Requirements	**Quantities**
Length of trail segment	8400 linear feet
Volume of excavation/cut required	9920 cubic yards
Volume of fill required	2564 cubic yards
Volume of base material placed	736 cubic yards
Volume of asphalt placed	421 cubic yards
Number of trees removed (≥ 11" dbh)	169
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	67 days

Table 2.23 Alternative 4, Segment C	
Construction Requirements	**Quantities**
Length of trail segment	2483 linear feet
Volume of excavation/cut required	3760 cubic yards
Volume of fill required	470 cubic yards
Volume of base material placed	320 cubic yards
Volume of asphalt placed	122 cubic yards
Number of trees removed (≥ 11" dbh)	49
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	18 days

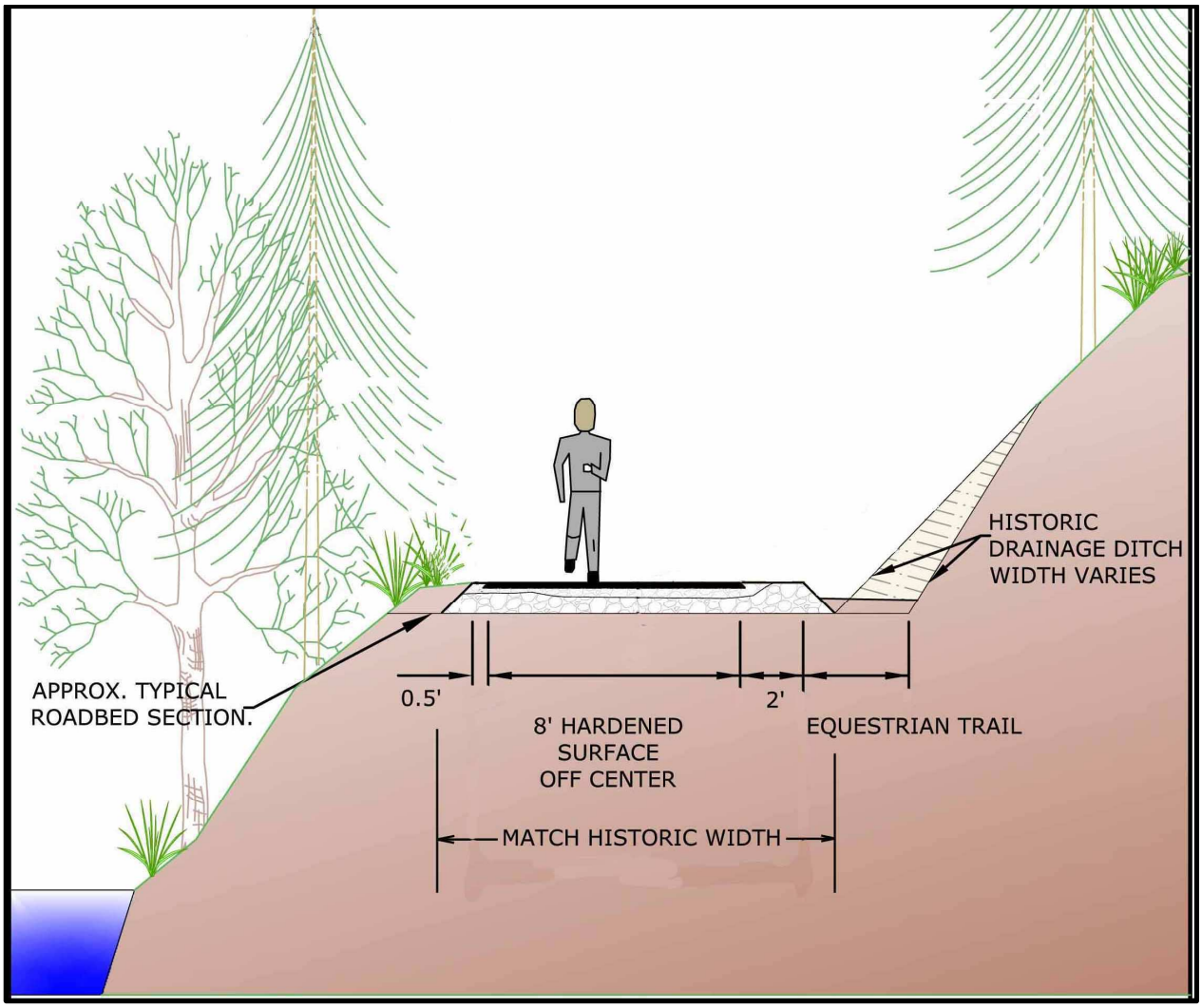


Figure 15. Trail profile (historic railroad sections) for Alternative 4

West Railroad Tunnel & Bypass: The west railroad tunnel would be cleared of debris and developed to provide trail access through the tunnel. Stabilization of the tunnel and portals would occur as described for Alternative 3. The bypass trail around the tunnel would be retained and improved to meet the ONP multipurpose bicycle trail standard.

Table 2.24 **West Railroad Tunnel Segment and bypass: Construction Requirements**	
Construction Requirements	**Quantities**
Length of trail segment	200 linear feet
Volume of excavation/cut required	1150 cubic yards
Volume of fill required	N/A
Volume of base material placed	18 cubic yards
Volume of asphalt placed	10 cubic yards

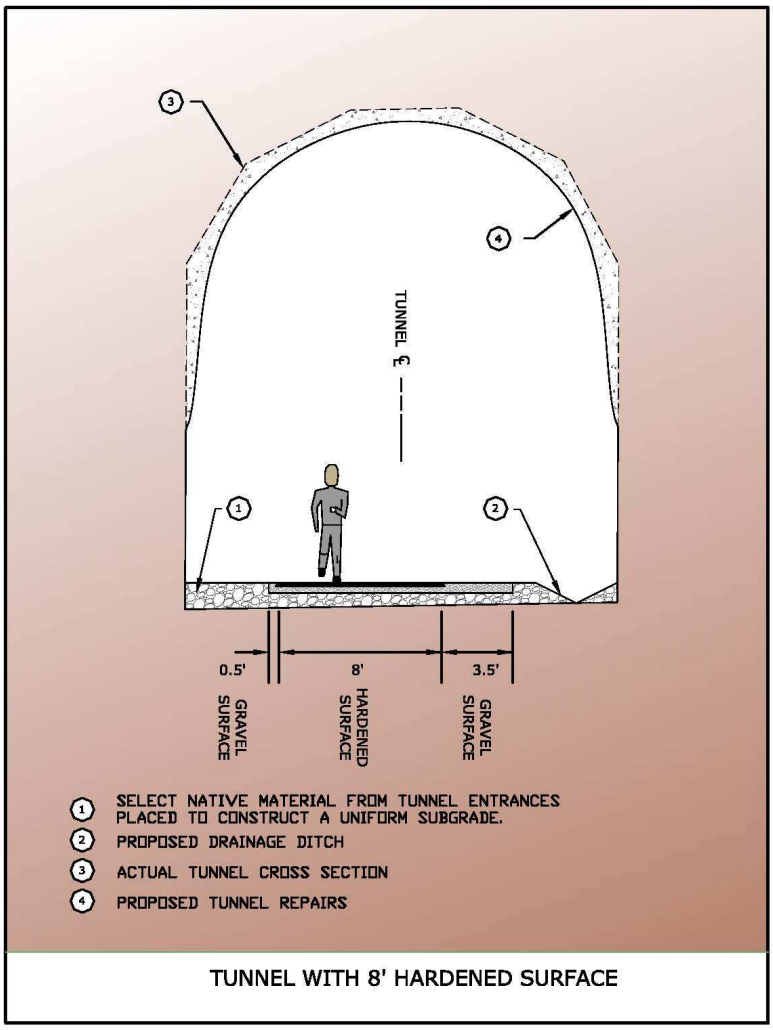


Figure 16. Railroad tunnel with 8' wide trail

Table 2.25 Alt 4, East Tunnel (long tunnel): Construction Requirements	Quantities
Length of trail segment	500 linear feet
Volume of excavation/cut required	7,500 (+626) cubic yards
Volume of fill required	95 cubic yards
Volume of base material placed	178 cubic yards
Volume of asphalt placed	37 cubic yards

Lake Crescent Upslope Bank Failures

Within Segments A, B, and C, at approximately 12 locations where slides or gradual release of rock through freeze/thaw erosion from the upslope have deposited rock and debris across the constructed width, slide material would be removed to the historic limits of excavation by loading onto a dump truck using either a loader or excavator and disposed of at a permitted

disposal site outside the Park. If such material is inspected by ONP staff and deemed acceptable for use in other areas of the SRRT, it could be transported to such areas and stockpiled for use. The material would be removed down to the grade of the ballast horizontally to the edge of the constructed width. No retaining structures would be installed.

Lake Crescent Downslope Bank Failures

Bank Stabilization

Where bank failures have occurred in Segments A, B, and C, the trail width would be established either through modifying the alignment to move the trail away from the bank failure or through the placement of bank stabilization. Approximately 14 areas of bank failure would be stabilized through the placement of Class 3, 4, and 5 rip rap beginning at the shore and extending up the slope to the level of the trail. It is anticipated that much of this rip rap would come from areas of upslope bank failures or upslope talus fall accumulation within the project limits.

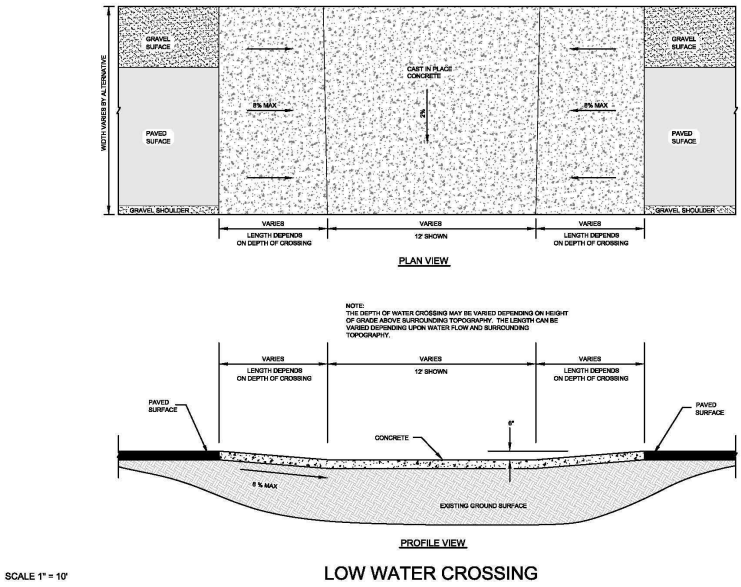
Historic log cribbing supports the railroad grade in a few locations. The log cribbing has failed at multiple locations due to deterioration of the original logs and subsequent erosion of the roadbed supported by the log cribbing. The cribbing would be replaced by rebuilding the cribbing areas with large rip rap sized rock generated at the project site if the need arose. All rock fill would be placed above the water line of the lake. Historic dry laid rock walls also support the trail in several locations. These rock walls have are failing and the proposed trail design would move the trail alignment away from these walls. Some repair in these areas would be accomplished by placing quarry spalls or rip rap in the depressed areas failing towards the lake to stabilize them from further erosion. Log cribbing in place at several of the bank failure areas would remain if cribbing does not interfere with the placement of rip rap, in which case it would be removed and disposed of outside the Park. The bank reconstruction would be completed to minimize impact to the lake bottom and shoreline. Rip rap would be placed using the highest solid shelf possible to establish a structurally sound bank, and extend upwards to the level of the trail. Bank reconstruction would utilize a tracked excavator and dump truck.

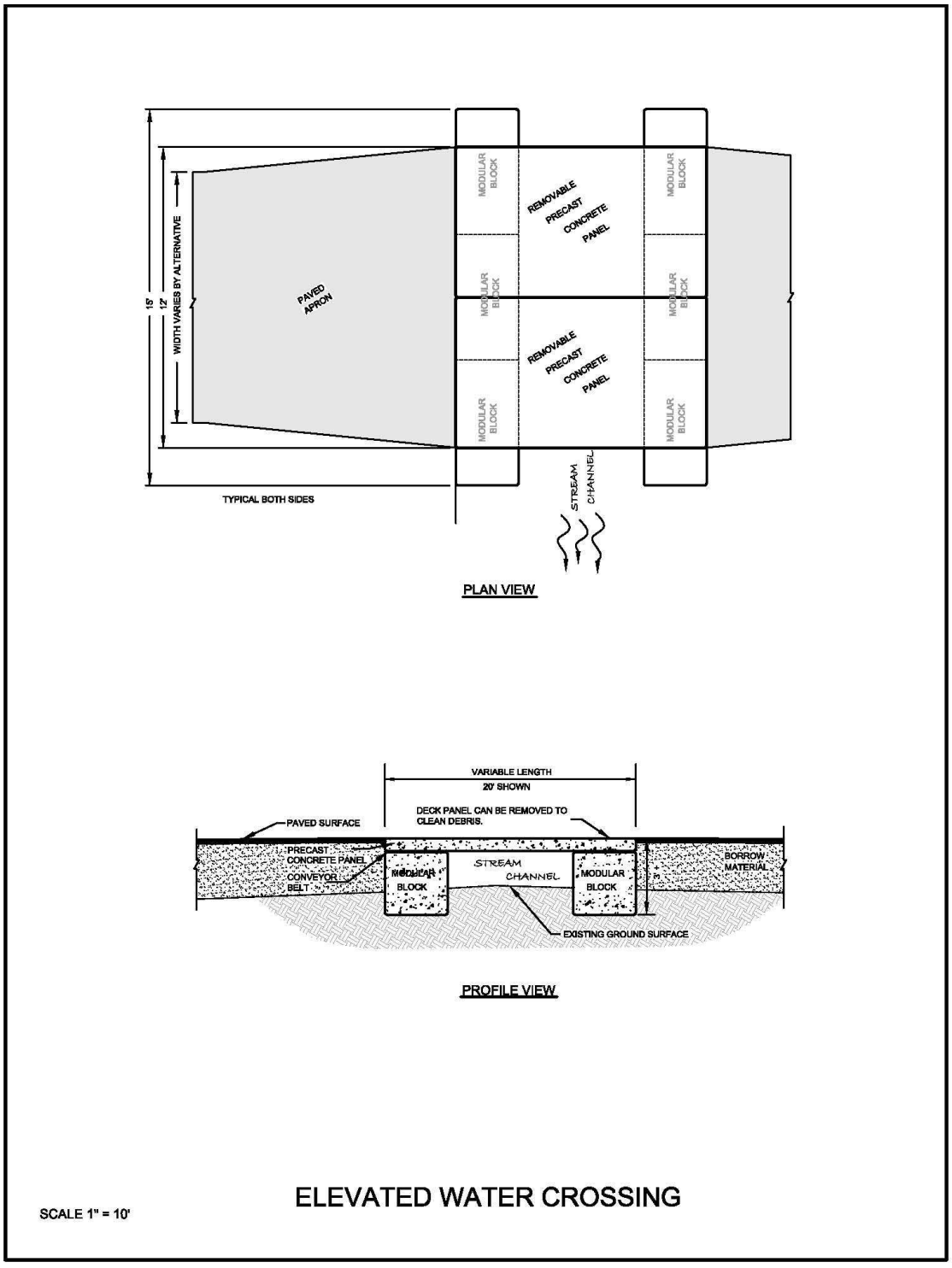
As many as ten widened resting areas would be placed along the length of Segments A, B, C and D-ADA. Widened resting areas would be placed at locations deemed to be most scenic and would be improved through the clearing and placement of compacted gravel as described for the trail. Resting areas would be graded to match the adjacent trail grade with compacted gravel placed to create a durable surface. Asphalt and benches for seating would be placed where identified. The modified constructed width of such areas would be identified and marked as above by NPS staff in advance of the work and identified to the contractor. Such areas would be cleared as described for the trail, below.

Lake Crescent Trail Drainage

Cross Drainage by Culvert, Low Water Crossings, and Concrete Panel Bridge

Water flow across the trail would be contained through the placement of buried plastic culverts, low water crossings or elevated crossings. Five cross drains have been identified and additional minor drains may be identified in the future and these cross drains would be contained through the placement of an appropriately sized plastic culvert at each location. Inlet and outlet ends of culverts would be protected from erosion through the placement of rip rap around the inlets and outlets. At approximately 2-3 cross drain locations water would be contained through the placement of concrete low water crossings. The trail grade would be slightly depressed for 50 feet on each side of the crossing to match the trail grade. The trail surfacing would utilize concrete in the depressed grade, providing a flow path for water and a cleanable surface for maintenance. Where identified as necessary, the inlet and outlet sides of the low water crossing would be channelized through the placement of 3-inch minus rock to direct the water and maintain the channel alignment while minimizing erosion. Three locations in Segment D-ADA would require large culverts. One location within Segment C would require the placement of an elevated water crossing consisting of a bridge structure approximately 16 feet in length and 12 feet in width. This bridge would span a year-round stream channel. The bridge would be placed on concrete abutments excavated into the ground. The trail would be raised over a 100-foot length to match the elevation of the bridge. Culverts, elevated water crossings, and low water crossing placement would utilize a tracked excavator, dump trucks, and compaction equipment.

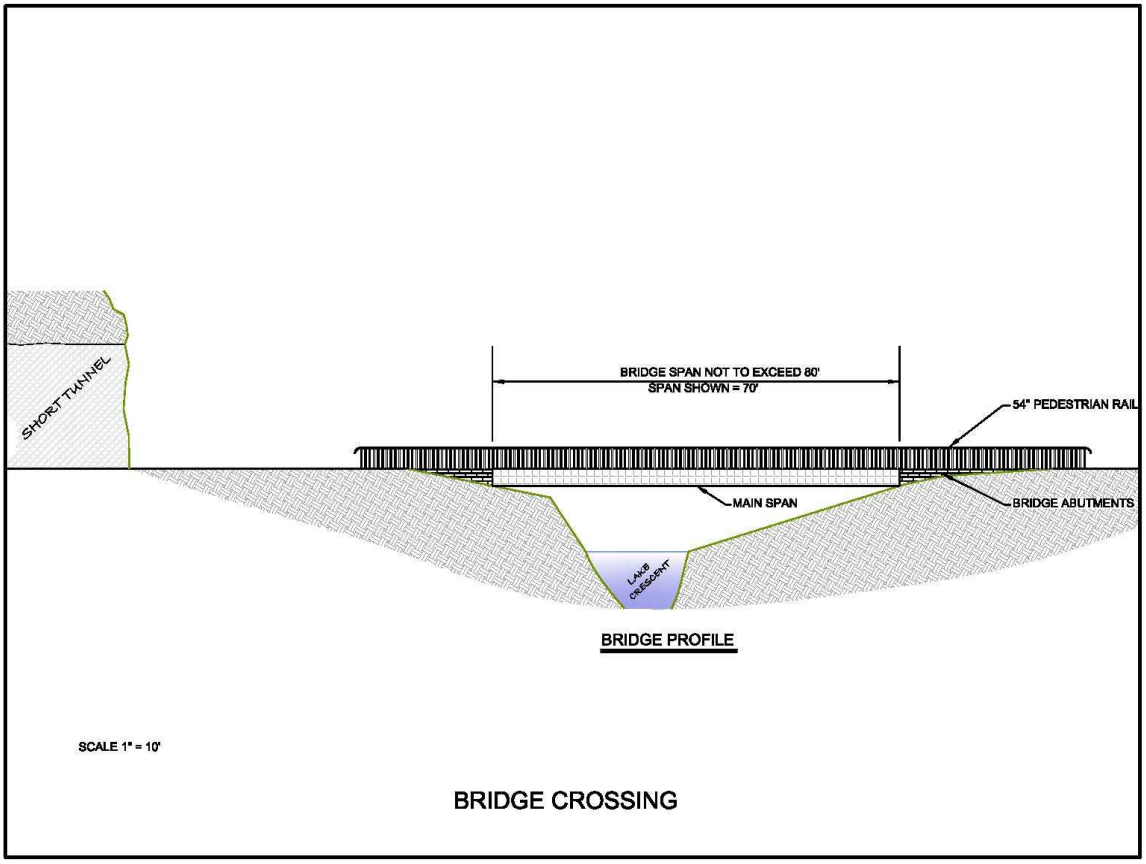




East Approach to West (short) Tunnel – Missing Trestle Area

A short bridging structure is proposed to be installed on the east approach to the short tunnel where a short trestle formerly existed. A steel or concrete bridge structure with either concrete or heavy wooden decking would be installed at this location to bridge a small cove-like

indentation in the shoreline. This location would be made passable for construction equipment and regular trail maintenance vehicle passage. It is likely that the bridge would be brought down the trail from the west side (Camp David Junior Road) and placed by cranes located on both sides of the trail gap.



Final Trail Paving Sequence

Compaction and Top Rock

Once the constructed width of Segments A, B, C, and D-ADA is cleared, and failed bank sections are reconstructed and the West and East tunnels are cleared, the contractor would compact the sub-base of the entire route using a mechanical compactor. Once compacted, 1-1/4 inch minus gravel road base or other suitable material would be placed to match the original tie ballast width of 10-12 feet in width, four inches thick, centered on the historic tie ballast width (where it can be identified). This would be completed using dump trucks to supply road base and bulldozers and graders to spread the material. Material would be compacted to at least 90 percent of a modified proctor using a mechanical compactor. The compacted base would be tested for compaction utilizing commonly accepted tools and methods.

Paving

Once road base is placed and compacted, the contractor would pave Segments A, B, C and D-ADA with hot mix asphalt using an asphalt mix design submitted in advance of the work by the contractor and approved by ONP. Asphalt would be placed eight feet wide and two inches thick. This would be completed using dump trucks to supply hot mix asphalt which would be placed using an approved paving machine and mechanically compacted. Material would be compacted per WSDOT 5.04, including testing for compaction.

The eight-foot-wide asphalt section would be set slightly off the center of the tie ballast material duplicating the width and color of the missing railroad ties. In addition to restoring the 4 inch depth of raised tie ballast, an additional 3-4 foot width of the original roadbed width would be cleared to restore the original, wide, flat bottomed ditch line beside the tie ballast which would serve to provide a grade separated, natural tread, cleared area for equestrian passage on the uphill side of the tie ballast paved trail.

Spruce Railroad Trailhead Parking Lot: No changes are proposed by Clallam County.

Lyre River Trailhead to Waterline Road Segment: Construction Details

Under Alternative 4, a 12 foot wide path with an 8 foot wide paved surface would be constructed beside East Beach Road from the Lyre River trailhead back to the Lyre River Bridge on the north side of the roadway. The trail would continue on the east side of the Lyre River Bridge and turn northeast onto Water Line Road where a 12 foot wide trail with an 8 foot wide paved surface would be built on top of the existing, low traffic volume Water Line Road.

The complete trail centerline would be staked for horizontal alignment and vertical grade as established in the construction drawings. Where necessary, the alignment would be adjusted to minimize resource impacts to the existing topography. Under the County proposal, the unsuitable material would be removed from the current ditch line on East Beach Road and small excavations made into the cut slope north of the road to widen the ditch line sufficiently to accommodate the new trail alignment beside the road. Base rock and 4 inches of crushed surfacing top course or crusher fines would be placed over the base rock ballast to support the trail with a trail width of 12 feet to allow a paved trail width of 8 feet and 3.5 feet of unpaved width to accommodate horses on the uphill side of the trail.

Table 2.26 Alternative 4, Lyre River Trailhead to Northeast Park Boundary end of Waterline Road	
Construction Requirements	**Quantities**
Length of trail segment	2215 linear feet
Volume of excavation/cut required	1047 cubic yards
Volume of fill required	3 cubic yards
Volume of base + top course material placed	921 cubic yards
Volume of asphalt placed	89 cubic yards
Number of trees removed (≥ 11" dbh)	4
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	39 days

Sol Duc Trail Development

Under Alternative 4, Clallam County would construct approximately 1.5 miles of new trail in the Sol Duc area of the park. This would include a short spur trail, approximately 680 feet long on NPS lands to connect with a trail that Clallam County is proposing to construct on USFS lands adjacent to the park in 2011, and 1.4 miles of new trail on the historic railroad grade within the park as described under Alternative 2 and 3. This new trail in the Sol Duc area would connect with a proposed interagency, regional trail system. No trail connection is proposed between the Sol Duc and Lake Crescent trail segments on park lands, although the spur trail described above would connect to an at-grade trail crossing of Highway 101 that is proposed for development by Clallam County.

Sol Duc Construction Details – spur trail and railroad grade segments

New trail would be developed and maintained in accordance with the AASHTO guidelines, as described for the Lake Crescent trail segments under this alternative.

Work on the Sol Duc trail segment would begin by completion of the 680 foot long trail connection from the Olympic Discovery Trail segment to be constructed on USFS lands in 2011, which crosses US 101 west of the top of Fairholme Hill and connects back to the existing 6.4 mile Phase I Segment of the Olympic Discovery Trail constructed within the park in 2009-2011. This spur trail climbs from US 101 to the top of the railroad grade within the park by means of a short series of three 8% grade ramps separated by 10 foot wide flat resting areas to meet minimum ADA standards.

As in Segments A, B, and C, the first element of work on the Sol Duc segment once the level of the railroad grade is achieved would see the complete trail centerline staked for horizontal alignment and vertical grade as established in the construction drawings. Where necessary, the alignment would be adjusted to minimize resource impacts to the existing topography. This

surveyed alignment would be field inspected and confirmed by ONP cultural staff and adjusted as necessary at their direction to conform to SRRT historic alignments and a final centerline established.

Where the historic tie ballast can be identified in the field by ONP cultural staff and is relatively intact manifesting its original width of 10 to 12 feet, it is expected that the trail centerline would center on this 10 to 12 foot width of tie ballast. In the County's proposal the original tie ballast width of 10 to 12 feet would be cleared of vegetation, duff, and overburden down to the top of the tie ballast rock. Additional clearing of vegetation, duff and slide materials beyond the south edge of the tie ballast material would also take place at the same time to reestablish the original 3-4 foot wide, flat bottomed, uphill ditch line that would provide a grade separated, natural tread trail width for use by equestrians, hikers, and mountain bicyclists.

Under the County proposal, 4 inches of crushed surfacing top course or crusher fines would be placed over the tie ballast to match the original top of tie ballast width of 10 to 12 feet and to allow new crushed rock material, uncorrupted by organic material, to form a solid ballast rock support for the paving of the trail to a width of 8 feet, with this paving width replicating the width of the original wooden railroad ties.

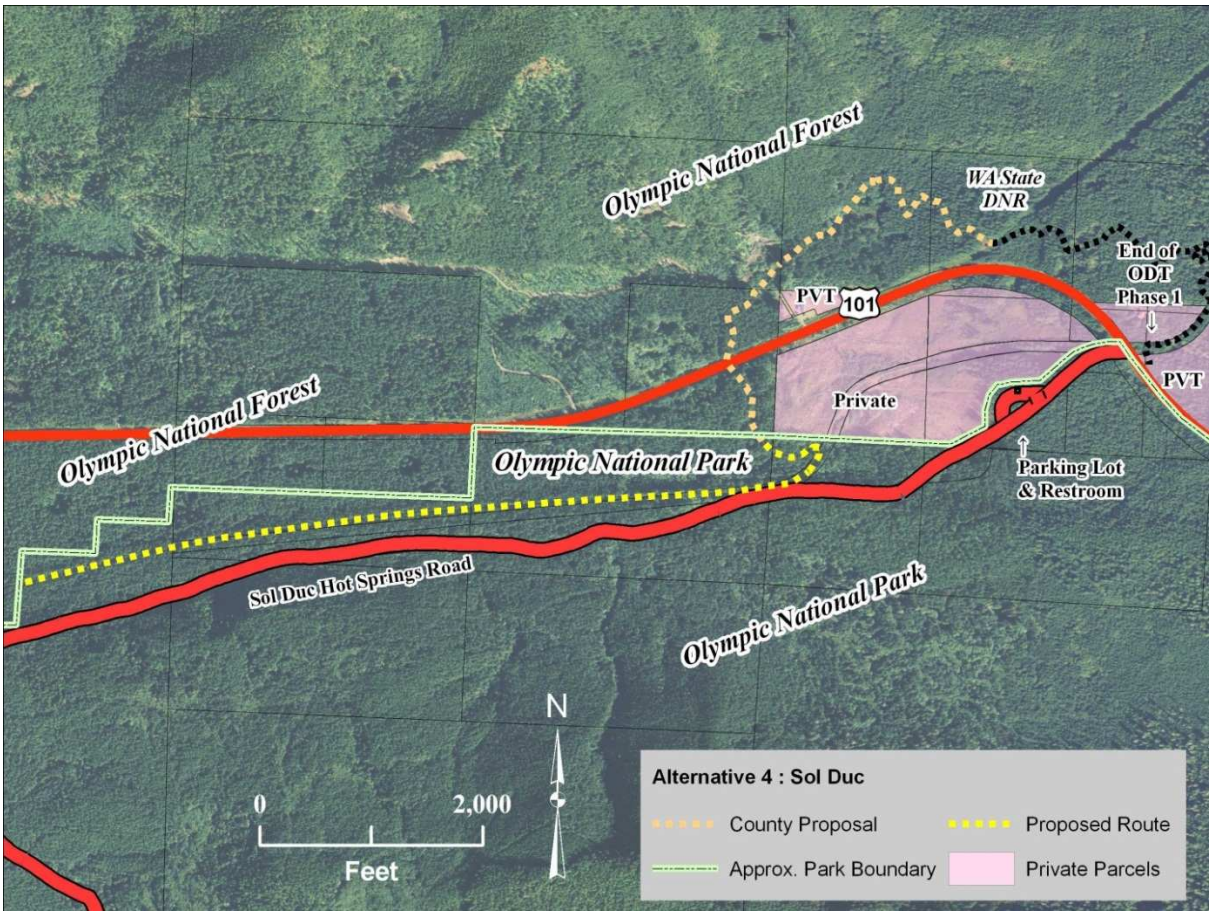


Figure 17. Proposed Sol Duc trail alignment Alternative 4

The final trail centerline would be used to establish the constructed width of the trail located on top of the historic railroad tie ballast (where identifiable) with an additional 3-4 feet cleared on the uphill side, south of the tie ballast limit, down to the original roadbed to re-establish the uphill ditch line. The constructed width would be marked using flagging or other accepted means to identify the constructed width to the contractor as the outer edges or boundary within which construction clearing or disturbance may occur and outside of which no disturbance would occur. Any areas of special concern or of varying width would be similarly identified and marked. Such areas would include pedestrian and stock passing zones, resting areas, failed side slopes or banks requiring additional excavation and overhanging trees requiring excavation or construction activities outside of the area cleared for trail purposes.

Throughout the length of the Sol Duc Segment, ONP staff would identify specific areas which could be used by the contractor as temporary widened truck and equipment staging or turning zones during construction. The priority would be to, wherever possible, utilize proposed permanent passing and resting areas as discussed above for these truck use areas. The constructed width of such areas would be marked and identified to the contractor. At the completion of construction, areas intended for use as permanent passing or resting areas would be developed as such. Temporary truck staging and turning areas not proposed for development as permanent passing and resting areas would be restored through removal of any gravel surfacing, tilling of the surface and seeding by a seed stock provided or approved by ONP staff. The width of restoration would be sufficient to extend across the entire disturbed area.

Due to funding, the Sol Duc Segment would likely be constructed at a date later than Segment A, B, C, and D-ADA. It is likely that this timing delay would allow the trail segments west of the park boundary in the Sol Duc area to be completed providing additional contractor access from the west end by way of the USFS 2918 Road. This additional trail construction of USFS lands west of the park would allow contractor construction access from both ends of the Sol Duc segment, facilitating trail construction and paving of this segment.

Railroad Grade Fill Failures

There are two to three significant fill failures on the 1.4 miles of trail on the railroad grade in the Sol Duc segment of trail. These would be repaired using the reinforced fill method. In this method 1-2 foot deep fill layers are reinforced by soil stabilization fabric between fill layers with the cloth spread parallel to the trail surface to cover the fill and hold it in place. This method would hold a 1:1 fill slope on the outer edge and is stable. Once the railroad grade is attained the regular trail cross section of 11-12 feet width of 4 inch thick ballast width representing the original tie ballast width and a 3-4 foot width of uphill, flat bottomed ditch line would be restored and an 8 foot width of paving would be placed, off centered on the 11-12 feet of raised ballast to replicate the 8 foot railroad tie width.

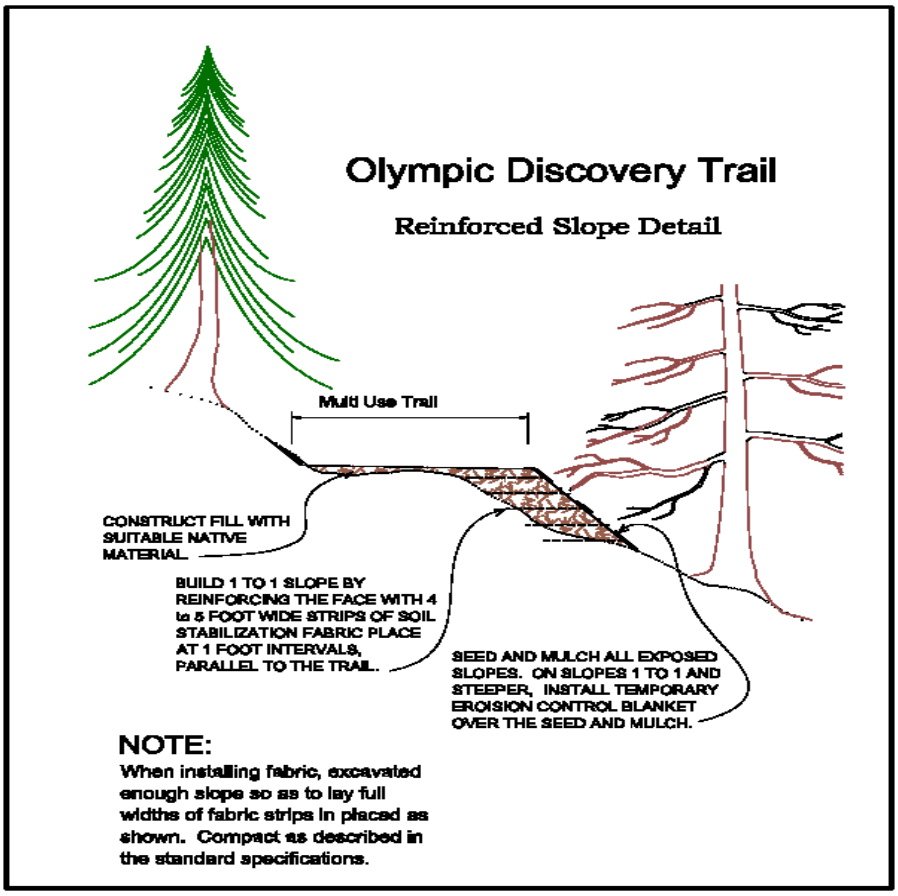


Figure 18. Railroad grade reinforced fill detail.

Railroad Grade Repair in Area Covered by Sol Duc Road Fill

There is a 200-300 foot long segment of the railroad grade that was covered by enbankment during construction of the Sol Duc Entrance Road. Due to the very steep and forested fill slope below the railroad grade in this section, the railroad grade is proposed for restoration by excavation of the toe of the road fill at the railroad grade and installation of a modular block wall, a rip rap wall or a soil nail wall on the uphill side of the trail

Sol Duc Trail Drainage

Cross Drainage by Culvert

Water flow across the trail would be contained through the placement of appropriately sized buried plastic culvert pipes.

Table 2.27 Alt 4, Sol Duc – spur trail and on railroad grade: Construction Requirements	Quantities
Length of trail segment	680 linear feet (spur) 1.4 miles (rail grade)
Volume of excavation/cut required	4300 cubic yards (spur) 1000 cubic yards (rail grade)
Volume of fill required	3320 cubic yards (spur) 544 cubic yards (rail grade)
Volume of base material placed	70 cubic yards (spur) 560 cubic yards (rail grade)
Volume of asphalt placed	51 cubic yards (spur) 410 cubic yards (rail grade)
Number of trees removed (≥ 11" dbh)	76 (spur) 108 (rail grade)
Work type	**Duration (approx.)**
Clearing and grubbing; excavation; placing fill, base and asphalt	35 days (spur) 39 days (rail grade)

Alternatives Considered but Dismissed

The preliminary range of alternatives considered included an alternative that would follow the alignment proposed by Clallam County, as described under Alternative 4, but built to the AASHTO design guidelines. This would include a 10' wide asphalt paved surface with an adjacent 2' wide downslope shoulder to retain the edge of the asphalt, and a 4' wide upslope shoulder to provide access for people traveling with stock. This alternative would have resulted in a universally accessible route throughout the entire project area to connect with new sections of the Olympic Discovery Trail that are proposed for future construction outside the park.

This alternative was dismissed because the extent of disturbance to natural and cultural resources that would be required to construct a trail to the standard AASHTO guidelines described above was determined unacceptable during the development of this environmental assessment.

Additionally, construction on private lands in the Lyre River area would be required to achieve a universally accessible grade upslope of the existing Spruce Railroad Trailhead parking lot. The NPS stated during public scoping that this planning process only applies to lands within Olympic National Park, and that no expansion would be proposed on private lands by Olympic National Park. Although some development on private lands is included in Alternative 4, this alternative is proposed by Clallam County. For these reasons, Alternative 5 was considered, but dismissed.

Management Actions Considered but Dismissed

The following management actions were identified during internal and public scoping for this plan, but are not included in any of the Action Alternatives being considered for adoption by the park. Actions are dismissed from full consideration when they do not achieve the purpose and need for taking action, when they are infeasible, or when the actions proposed are outside of the scope of the plan. The reasons for not pursuing each action are identified below.

Construct trail along historic railroad grade to the west of the existing Spruce Railroad Trail parking lot and to the immediate south of Highway 101 to avoid impacts to the surrounding areas in the park. Several comments were received during public scoping suggesting that the NPS consider a trail development alternative that was completely on the historic Spruce Railroad grade. Although the alternatives considered in this plan propose most trail development on the historic railroad grade, some sections are proposed on other park lands because segments of the railroad grade are privately owned or outside the boundary of Olympic National Park. This environmental assessment only considers actions that may be taken on NPS lands or under NPS jurisdiction, with the exception of a short section of trail proposed by Clallam County in Alternative 4, Segment D-ADA to achieve an accessible trail grade. For this reason, no alternative is considered that would be built entirely on the historic Spruce Railroad grade. If in the future the owners of these private lands become willing sellers and the park has the opportunity to purchase these lands, additional opportunities for trail development on the historic railroad grade may exist.

Construct trail using compacted gravel only – no asphalt. Several comments were received during public scoping suggesting that the NPS consider using compacted gravel to achieve a firm and stable trail surface to fulfill the objective of establishing a non-motorized, multiple-use, universally accessible trail. This was included among the range of preliminary alternatives considered, but was dismissed when it became clear that the use of stock on the shared gravel trail would result in an uneven surface not suited to use by people with mobility impairments, such as those requiring the use of a wheelchair. This would not meet the definition of a firm and stable surface as defined by the ABAAS/Outdoor Recreation Guidelines. For this reason, the park did not retain an alternative that would use compacted gravel along the entire trail corridor. The park did modify Alternative 2 to include both a paved, universally accessible trail section (Segment A) and a natural tread and compacted gravel trail section (Segments B, C, and D) and the new trail proposed in the Sol Duc area.

Construct trail to road standards to allow use by emergency vehicles in the event Highway 101 is closed. The park received comments suggesting that the proposed trail be developed to road standards so that it may be used as an alternate vehicular route if Highway 101 was unavailable. This was dismissed as being outside of the scope of this plan. The purpose of this project is to make improvements to the Spruce Railroad Trail and historic Spruce Railroad grade

to provide for enhanced non-motorized trail use. Trail development would accommodate vehicular use for trail maintenance and emergency response to the trail only.

Construct an underpass beneath Highway 101 to connect the proposed Lake Crescent and Sol Duc Trails while avoiding the at-grade crossing proposed by Clallam County. The park received numerous comments requesting an alternative to the at-grade trail crossing proposed by Clallam County on Highway 101. The at-grade trail crossing is proposed outside the boundary of Olympic National Park, and the NPS does not have jurisdiction related to this decision. The NPS would be willing to coordinate with the Washington State Department of Transportation and other adjacent property owners to evaluate the feasibility of a Highway 101 underpass should the opportunity become available in the future. However, this alternative is not feasible at this time due to the lack of NPS jurisdiction.

Relocate the Spruce Railroad Trail parking lot near the Lyre River to minimize impacts to adjacent property owners. The park conducted a survey of an alternate and overflow parking lot location near the eastern trailhead to the Spruce Railroad Trail. Unfortunately, development of a new parking lot would require extensive removal of intact forests and the altering of surface drainage patterns, including in wetlands and areas adjacent to highly sensitive fish and rare shoreline vegetation habitat. The NPS determined that this would result in unacceptable impacts to park resources. For this reason, this alternative was considered but dismissed.

The Environmentally Preferred Alternative

In accordance with DO-12, the NPS is required to identify the "environmentally preferred alternative" in all environmental documents, including EAs. According to Council on Environmental Quality (CEQ) guidelines, the environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in Section 101 of NEPA, which considers:

1. Fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations;

2. Assuring for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;

3. Attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;

4. Preserving important historic, cultural, and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice;

5. Achieving a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and

6. Enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources (NEPA, section 101).

Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources. The following paragraphs compare how well each of the alternatives considered meet criteria 1- 5 described above. The alternatives considered in this document do not measurably vary in how well they meet criteria 6.

1) **Fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations:**
   - Alternative 1 reflects implementation of National Park Service legal and policy guidance related to the protection of the environment for future generations. There would be no new impacts to natural or cultural resources, although there would be some continued deterioration of some elements of the historic Spruce Railroad Grade (wood culverts, wood tunnel support beams, historic timber half-bridges/cribbing, and dry laid rock wall due to a lack of preservation maintenance or rehabilitation).
   - Alternatives 2, 3, and 4 all would require construction related impacts to the environment within the project area, but these impacts would be mitigated to ensure that the integrity of the environment is not impaired over the long term for future generations. Of these alternatives, Alternative 2 would result in the least construction related impacts, to natural resources. Alternative 3 would result in greater disturbance to natural resources because the trail corridor would be wider and longer than what is proposed under Alternative 2. Alternative 4 would result in the greatest disturbance to natural resources because although the trail is slightly shorter than what is proposed under Alternative 3, the proposed trail corridor is wider and new trail is proposed that would require additional disturbance in the Lyre River area of the project.
   - Under Alternative 2 the historic Spruce Railroad would be adversely affected by the removal or burial of historic log cribbing and dry laid retaining wall on the north shore of Lake Crescent. Additionally, the deterioration of wood culverts and timber tunnel supports would continue. Alternative 3 would rehabilitate the historic railroad grade, wood cribbing, and railroad tunnels. The dry laid retaining wall would be retained. Wood culverts would remain in place, but would continue to deteriorate. Alternative 4 would rehabilitate the historic railroad grade and tunnels, but not the wood cribbing or dry laid retaining wall. Wood culverts would remain in place, but would continue to deteriorate.

2) **Assuring for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings:**

- The NPS would manage the trail to provide safe and healthful surroundings under all alternatives.
- Alternative 1 would continue to provide the existing level of esthetically and culturally pleasing surroundings. This alternative would create no new visual disturbance, but the culturally significant features of the historic Spruce Railroad would continue to deteriorate.
- Alternative 2 would maintain esthetically and culturally pleasing surroundings, providing the least visual disturbance of the action alternatives. However, the culturally significant features of the historic Spruce Railroad would continue to deteriorate.
- Alternative 3 would result in short-term esthetic impacts during construction but would maintain esthetically pleasing surroundings in the long term. Alternative 3 is the most effective at maintaining and improving culturally pleasing surroundings related to the rehabilitation of the historic Spruce Railroad.
- Alternative 4 would result in the most extensive short-term esthetic impacts during construction and additional long-term impacts near the Lyre River. Alternative 4 would result in culturally pleasing surroundings related to the rehabilitation of the historic Spruce Railroad, although not to the extent that Alternative 3 proposes, particularly related to treatment of the historic log cribbing and dry laid retaining walls on the north shore of Lake Crescent.

3) Attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences:

- Alternative 1 would maintain the existing range of beneficial uses of the environment, without any new degradation, risk of health or safety, or other undesirable and unintended consequences.
- Alternative 2 would modestly increase the range of beneficial uses of the environment by providing an additional mile of universally accessible trail in the Lake Crescent area while avoiding most construction related impacts and minimizing the potential for undesirable and unintended consequences. The primary area with potential for undesirable or unintended consequences would be the new 1.9 miles of accessible trail developed in the Sol Duc area. Alternative 2 is also most effective at expanding the range of possible visitor uses with the least displacement of current visitor uses by providing the widest range of trail types and surfaces, including both the paved trail on Phase 1 and in Segment A of the SRRT and the remaining gravel and natural tread surfaces on the other segments of the SRRT and on the new Sol Duc Trail.
- Alternative 3 would provide increased visitor opportunities, but with additional impacts to the natural environment. An additional 6 miles of universally accessible trail would be developed (nearly 3.8 miles on the SRRT and two miles in the Sol Duc). There would be some potential for undesirable and unintended consequences related to the widening of the existing SRRT and development of new trail in the Sol Duc area. Some current users of the SRRT may be displaced because the trail experience will be modified from a narrow unpaved trail to a wider asphalt paved trail with a gravel shoulder for visitors who prefer not to travel on asphalt (equestrians, trail runners, mountain bicyclists).

- Alternative 4 would provide the greatest increase in accessible visitor opportunities, but would also result in the greatest construction related impacts. An additional 6 miles of accessible trail would be developed (nearly 4 miles on the SRRT and 1.5 miles in the Sol Duc). There would be some potential for undesirable and unintended consequences associated with the widening of the existing SRRT and development of new trail in Segment D-ADA and the Sol Duc area.

4) Preserving important historic, cultural, and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice:

- Alternative 1 reflects the current management of the SRRT and Sol Duc area by the NPS. Important aspects of our historic, cultural, and natural heritage are protected, but elements of the historic Spruce Railroad are deteriorating and may eventually be lost. This is particularly true of the remaining log cribbing and rock walls along Lake Crescent, and also the areas of the railroad grade in areas where the bank is eroding. Alternative 1 does support diversity and variety of individual choice related to recreation by providing 6 miles of accessible trail constructed in 2009 by Clallam County above Camp David Jr. Road (CDJR). Alternative 1 would result in no new impacts to natural resources or construction related impacts to cultural resources. The existing SRRT is not accessible, but is used year-round by hikers, equestrians, and bicyclists (although the trail surface is not designed to provide a road-like surface).
- Alternative 2 would continue to preserve important aspects of our natural heritage, but would not address the deterioration of the historic Spruce Railroad as described for Alternative 1. Alternative 2 would result in the least amount of new disturbance to natural resources compared to Alternatives 3 and 4. Alternative 3 would provide an additional 2.9 miles of accessible trail and would maintain the existing uses of the SRRT.
- Alternative 3 would preserve and rehabilitate important historic, cultural, and natural resources. Alternative 3 would require greater disturbance to natural resources related to trail construction, but would result in fewer construction-related impacts than Alternative 4. Alternative 3 would substantially increase the extent of accessible trails in the park but would also displace some current users of the trail who prefer a less-developed trail experience.
- Alternative 4 would result in the greatest construction related disturbance to natural resources, although mitigation measures would be implemented to avoid or reduce impact in accordance with Olympic National Park standard mitigation measures. The two historic railroad tunnels would be re-opened, and 1.5 miles of new accessible trail would be developed in the Sol Duc and along the entire SRRT. These alternatives would also meet the desired conditions of Clallam County regarding the design and consistency with other planned sections of the regional Olympic Discovery Trail. This level of development would attract new user groups to the SRRT, but would also displace some current trail users.

5) **Achieving a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.**
   - Alternative 1 would continue to provide the existing balance between population and resource use in a way that permits a high standard of living and a wide sharing of life's amenities. Phase 1 of the ODT would provide six miles of accessible trail in the Lake Crescent area and the existing SRRT would continue to provide recreational opportunities for the current range of visitors. People would be able to access regional trail to the west from Phase 1 of the ODT and to the northeast on the Adventure Trail that is accessed via the Water Line Road.
   - Alternative 2 would provide a balance between population and resource use in a way that permits a high standard of living and a wide sharing of life's amenities. Alternative 2 would also provide an additional 2.9 miles of accessible trail and would provide connections to regional trails as described for Alternative 1 above and also to the west of the proposed trail in the Sol Duc area.
   - Alternative 3 would achieve a balance between population and resource use that would permit a high standard of living and a wide sharing of life's amenities, however there would be an increased construction-related impact to resources as compared to Alternative 2 to achieve increased accessibility. People would have greater access to regional trails due to an additional proposed connection in the Sol Duc area to link to trail planned by Clallam County on U.S. Forest Service lands.
   - Alternative 4 would achieve a balance between population and resource use that permits a high standard of living and wide sharing of life's amenities; however this alternative would require the greatest degree of construction-related impacts to natural resources as compared to all other alternatives. Alternative 4 would provide the greatest degree of accessibility across the project area and would provide accessible trail access that connects to regional trails, including the proposed Olympic Discovery Trail (ODT) in a manner most consistent with the ODT's conceptual design standards.

The alternative that causes the least damage to the biological and physical environment is Alternative 1, the No Action Alternative. The alternative that best protects, preserves, and enhances cultural and historic resources is Alternative 3, followed by Alternative 4. Alternative 2 would result in the greatest impact to cultural resources. The alternative that best protects, preserves and enhances natural resources is Alternative 1, although both Alternative 2 and 3 would enhance natural resources at the Lyre River by removing an abandoned building and restoring the adjacent shoreline.

All alternatives meet the criteria listed above to varying degrees, but Alternative 1 is the Environmentally Preferred Alternative because the existing conditions are consistent with the national environmental policy as expressed in Section 101 of NEPA as described above, and Alternative 1 would require the least impact to natural and cultural resources, although deterioration of some elements of the historic Spruce Railroad would continue as described above.

Spruce Railroad Trail EA Alternatives Summary				
Factor	**Alt 1: No Action**	**Alt 2: Recreation Trail**	**Alt 3: NPS Preferred**	**Alt 4: County Proposal**
Railroad Tunnels				
open/remain closed	remain closed	remain closed	open	open
SRRT: Segment A (1.1 miles)				
accessible (yes/no)	no	yes	yes	yes
total trail width (top surface w/shoulders)	~36"	8 - 10 feet	10.5 - 11 feet	12.5 feet (varies)
surface	natural tread	3 - 5 feet asphalt and 4 feet gravel shoulder	6 feet asphalt and 4 feet gravel shoulder	8 feet asphalt, gravel shoulders/ wide ditch
clearing limits (width)	n/a	12 feet	14 feet	varies
SRRT: Segment B (1.6 miles)				
accessible (yes/no)	no	no	yes	yes
trail width	~36"	5 feet	10.5 - 11 feet	12.5 feet (varies)
surface	natural tread	natural tread/gravel	6 feet asphalt and 4 feet gravel shoulder	8 feet asphalt, gravel shoulders/ wide ditch
clearing limits (width)	n/a	8 feet	14 feet	varies
SRRT: Segment C (0.5 miles)				
accessible (yes/no)	no	no	yes	yes
trail width	~36"	5 feet	10.5 - 11 feet	12.5 feet (varies)
surface	natural tread	natural tread/gravel	6 feet asphalt and 4 feet gravel shoulder	8 feet asphalt, gravel shoulders/ wide ditch
clearing limits (width)	n/a	8 feet	14 feet	varies
SRRT: Segment D (0.5 miles, varies slightly by alternative)				
accessible (yes/no)	no	no	no	yes
trail width	~36"	5 feet	9 - 10.5 feet	12 feet
surface	natural tread	natural tread/gravel	6 feet asphalt and up to 4 feet gravel shoulder	8 feet asphalt, gravel shoulders
clearing limits (width)	n/a	8 feet	12 feet	varies
SRRT: Parking Lot to Lyre River Bridge				

accessible (yes/no)	n/a	n/a	yes	yes
trail width	n/a	n/a	striped bike lane	12 feet
surface	gravel road	gravel road	asphalt paved road	8 feet asphalt, gravel shoulders
clearing limits (width)	n/a	n/a	n/a	varies
SRRT: Water Line Road (in park, 10 - 11 feet wide)				
surface	gravel road	gravel road	paved road	paved road
Lyre River Trailhead				
vehicle turnaround	no	yes	yes	no
surface	gravel	gravel	asphalt	gravel
# parking spaces	8	16 - 22	16 - 22	8
North Shore Picnic Area parking lot				
surface	gravel	gravel	asphalt	gravel
CDJR trail access				
Accessible trail	no	yes	yes	no
Accessible parking	0	2 spaces	2 spaces	0
Sol Duc: Trail from kiosk parking to RR grade (0.5 miles)				
accessible (yes/no)	n/a	yes	yes	n/a
trail width	n/a	5 feet	6 feet	n/a
surface	n/a	compacted gravel	asphalt	n/a
clearing limits (width)	n/a	8 feet	10 feet	n/a
Sol Duc: Trail on RR grade (1.4 miles)				
accessible (yes/no)	n/a	yes	yes	yes
trail width	n/a	5 feet	10.5 - 11 feet	12.5 feet (varies)
surface	n/a	compacted gravel	6 feet asphalt and 4 feet gravel shoulder	8 feet asphalt, gravel shoulders/ wide ditch
clearing limits (width)	n/a	8 feet	14 feet	varies
Sol Duc: Spur Trail from USFS lands (0.1 miles)				
accessible (yes/no)	n/a	n/a	yes	yes
trail width	n/a	n/a	10.5 - 11 feet	12 feet
surface	n/a	n/a	6 feet asphalt and 4 feet gravel shoulder	8 feet asphalt, gravel shoulders
clearing limits (width)	n/a	n/a	14 feet	varies

Impact Summary

	Current Actions (Alt 1)	Alt 2: Recreation Trail	Alt 3: NPS Preferred	Alt 4: County Proposal
Mitigation Measures identified in Appendix A would be implemented to avoid or minimize impacts to the greatest extent possible				
Geologic Features and Soils				
length of trail (miles)	3.7	5.7	6.4	6.1
volume of excavation/cut (CY)	0	3515	25039	45539
volume of fill required (CY)	0	5024	13335	18694
volume of base material placed (CY)	0	1671	10109	3814
volume of asphalt placed (CY)	0	142	1649	1727
total paved surface area (acres)	0	0.5	5	5.9
total disturbed area (construction)	0	6.6	11	14.4
Hydrology and Water Quality				
linear extent of new bank armoring	0	0.12 miles	0.28 miles	0.28 miles
volume of rip rap placed (CY)	0	1450	6195	6195
volume of rip rap below OHW (CY)	0	145	764	764
Air Quality	no change	short-term during construction from use of motorized vehicles and equipment	short-term during construction from use of motorized vehicles and equipment	short-term during construction from use of motorized vehicles and equipment

Vegetation	no change	Removal of vegetation to construct new trail in the Sol Duc and to widen Segment A of SRRT (up to 118 trees between 11" - 30" dbh)	Removal of vegetation to construct new trail in the Sol Duc and to widen the SRRT (up to 258 trees between 11" - 30" dbh)	Removal of vegetation to construct new trail in the Sol Duc and Lyre River area, and to widen segments A, B, and C of the SRRT (up to 632 trees between 11" - 40" dbh)
Wetlands	no change	Wetlands would be delineated and avoided. If trail must cross wetland areas it would be crossed via bridge or boardwalk, or routed to avoid wetlands. Possible wetland area near SRRT parking lot would be avoided and rehabilitated below parking lot towards the lake.	Wetlands would be delineated and avoided. If trail must cross wetland areas it would be crossed via bridge or boardwalk, or routed to avoid wetlands. Possible wetland area near SRRT parking lot would be avoided and rehabilitated below parking lot towards the lake.	Wetlands would be delineated and avoided.
Wildlife and Wildlife Habitat	no change	Wildlife habitat would be converted to trail in the Sol Duc area. Some habitat would be lost due to the widening of Segment A of the SRRT and the expansion of the parking lot. Short term noise disturbance would occur during construction. Long-term disturbance would occur due to ongoing use and maintenance of the expanded trail system.	Wildlife habitat would be converted to trail in the Sol Duc area. Some habitat would be lost due to the widening of the SRRT and the expansion of the parking lot. Short term noise disturbance would occur during construction. Long-term disturbance would occur due to ongoing use and maintenance of the expanded trail system.	Wildlife habitat would be converted to trail in the Sol Duc and Lyre River areas. Some habitat would be lost due to the widening segments A, B, and C of the SRRT. Short term noise disturbance would occur during construction. Long-term disturbance would occur due to ongoing use and maintenance of the expanded trail system.

Unique or Important Fish or Fish Habitat	no change	Fish habitat would be affected by the expansion of bank armoring along 0.12 miles of shoreline. Fish would be disturbed during widening of Segment A of the SRRT and expansion of the parking lot.	Fish habitat would be affected by the expansion of bank armoring along 0.28 miles of shoreline. Fish would be disturbed during widening of the SRRT and expansion of the parking lot. Paving the parking lots, Water Line Road and the road between the Lyre River Bridge and parking lot would reduce the amount of sediment delivered to Lake Crescent.	Fish habitat would be affected by the expansion of bank armoring along 0.28 miles of shoreline. Fish would be disturbed during widening of the SRRT and expansion of the parking lot. Paving the Water Line Road would reduce the amount of sediment delivered to Lake Crescent.
Threatened and Endangered Species	no change	There would be the potential for short-term disturbance to T & E species due to construction noise. No habitat trees would be removed. Work would be timed to avoid impacts to the greatest extent possible.	There would be the potential for short-term disturbance to T & E species due to construction noise. No habitat trees would be removed. Work would be timed to avoid impacts to the greatest extent possible.	There would be the potential for short-term disturbance to T & E species due to construction noise. No habitat trees would be removed.
Cultural Resources	no change	Archeological monitoring and implementation of an inadvertent discovery plan would avoid or minimize the potential for impacts to prehistoric and historic archeological resources. Interpretation of cultural resources would be improved.	Archeological monitoring and implementation of an inadvertent discovery plan would avoid or minimize the potential for impacts to prehistoric and historic archeological resources. Interpretation of cultural resources would be improved.	Archeological monitoring and implementation of an inadvertent discovery plan would avoid or minimize the potential for impacts to prehistoric and historic archeological resources.

Historic Spruce Railroad	no change	Historic railroad grade would be adaptively reused and rehabilitated in the Sol Duc area. The existing SRRT would be rehabilitated in Segment A. There would be an adverse effect to the remaining log cribbing and rock wall in Segment A. The remaining wood culverts and tunnel supports would continue to deteriorate.	Historic railroad grade would be adaptively reused and rehabilitated in the Sol Duc area. The existing SRRT would be rehabilitated. The remaining historic log cribbing and rock wall would be rehabilitated in accordance with a historic treatment plan. The remaining wood culverts would continue to deteriorate. The tunnel supports would be removed during the re-opening and stabilization of the two historic railroad tunnels	Historic railroad grade would be adaptively reused and rehabilitated in the Sol Duc area. The existing SRRT would be rehabilitated. The tunnel supports would be removed during the re-opening and stabilization of the two historic railroad tunnels
Visitor Use and Experience	no change	New accessible trail would be built in the Sol Duc area. Segment A of the SRRT would be made accessible. This would provide a total of 3 new miles of accessible trail.	New accessible trail would be built in the Sol Duc area. Segment A, B and C of the SRRT would be made accessible. This would provide a total of 5.7 new miles of accessible trail.	New accessible trail would be built in the Sol Duc area. The SRRT would be made accessible. This would provide a total of 6.1 new miles of accessible trail.
*** SRRT user groups**	hikers, equestrians, bicyclists	hikers, equestrians, bicyclists	hikers, equestrians, bicyclists	hikers, equestrians, bicyclists
*** Sol Duc user groups**	n/a	hikers, bicyclists	hikers, equestrians, bicyclists	hikers, equestrians, bicyclists
Soundscapes	no change	short-term during construction from use of motorized vehicles and equipment	short-term during construction from use of motorized vehicles and equipment	short-term during construction from use of motorized vehicles and equipment

Scenery and Visual Resources	no change	short-term construction related impacts, long-term visual impacts from increased visibility of bank stabilization in Segment A of SRRT	short-term construction related impacts, long-term visual impacts from increased visibility of bank stabilization in Segment A and B of SRRT	short-term construction related impacts, long-term visual impacts from increased visibility of bank stabilization in Segment A and B of SRRT and removal of wide corridor of vegetation to construct accessible trail grade on segment D-ADA
Park Operations and Safety	NPS would manage in accordance with all laws and policy that apply to visitor and employee safety within Olympic National Park	NPS would manage in accordance with all laws and policy that apply to visitor and employee safety within Olympic National Park	NPS would manage in accordance with all laws and policy that apply to visitor and employee safety within Olympic National Park	NPS would manage in accordance with all laws and policy that apply to visitor and employee safety within Olympic National Park
	no change in park operations	increased infrastructure and visitor use would affect extent of park operations	increased infrastructure (including rehabilitated railroad tunnels) would increase operational and maintenance requirements for the park	increased infrastructure (including rehabilitated railroad tunnels) would increase operational and maintenance requirements for the park
Land Use	no change	The current Lyre River parking lot would be expanded. A buffer would be retained between the expanded parking lot and adjoining private lands.	The current Lyre River parking lot would be expanded. A buffer would be retained between the expanded parking lot and adjoining private lands. SRRT would be realigned to avoid private property where it currently crosses a corner of a private parcel	SRRT is proposed for construction on lands with ONP and on a small section of private land. This would require prior approval by the land owner. The SRRT would be realigned to be closer to private lands near the Lyre River parking lot.
Socioeconomics	no change	short term impacts to socioeconomic values due to closures and delays during construction. Long term benefits	short term impacts to socioeconomic values due to closures and delays during construction. Long term benefits	short term impacts to socioeconomic values due to closures and delays during construction. Long term benefits

		due to expanded recreational opportunities.	due to expanded recreational opportunities.	due to expanded recreational opportunities.
	no change	Estimated cost to construct trail is $632,000.	Estimated cost to construct trail is $4.5 million	Estimated cost to construct trail is $4.1 million