

# Improving Pedestrian Safety & Trail Experience at the Bridge of the Gods

Pacific Crest Trail Association

In cooperation with the Port of Cascade Locks,  
City of Stevenson, and Friends of the Gorge

*Cascade Locks, OR – Stevenson, WA*  
December 31, 2015





## Contents

1	Executive Summary .....	1
2	Project Overview .....	2
	2.1 Project Location.....	2
	2.2 Project Background & Purpose .....	2
	2.3 Project Need.....	3
	2.4 Common Vision and Project Goals .....	5
	2.5 Outcomes Provided by this Study .....	6
	2.6 Related Studies & Reports .....	6
	2.7 Project Partners.....	7
3	Key Project Issues & Challenges .....	8
	3.1 Environmental .....	8
	3.2 Archeological & Cultural Resources.....	9
	3.3 Right-of-Way .....	9
	3.4 Railroad .....	9
	3.5 Stormwater .....	9
	3.6 Structural .....	10
	3.6.1 Main Cantilever Truss .....	10
	3.6.2 Oregon Approaches .....	10
	3.6.3 Washington Approaches .....	10
	3.6.4 Substructure & Foundations.....	11
4	Concept Alternative Descriptions .....	12
	4.1 Alternative 1 – New overhang structure outboard of the existing roadway.....	12
	4.2 Alternative 2 – New & independent pedestrian bridge.....	12
5	Planning-Level Estimates.....	14
	5.1 Cost Overlap with Active Bridge Rehabilitation Needs .....	14
	5.2 Funding the Project .....	15
	5.3 Cost Estimating Approach & Assumptions.....	16
6	Limitations .....	17
7	Appendices.....	17

## Appendices

- Appendix A – Project Aerial Map of Key Issues
- Appendix B – Proposed Project Schedule
- Appendix C – Funding Study Results
- Appendix D – Concept Project Improvements
- Appendix E – Concept Images
- Appendix F – Project Planning Level Cost Estimates





# 1 Executive Summary

This report describes the project needs, conceptual solutions, planning level cost, proposed schedule, and funding opportunities to improve pedestrian, bike, and equestrian safety and user experience on the Bridge of the Gods and surrounding bridge heads on the Oregon and Washington sides. The report specifically provides:

- Project purpose, need, and background;
- Description of two basic alternatives for improving pedestrian safety and experience;
- Planning-level cost estimates for the two alternatives, an overview of environmental process, project steps, and construction cost that can be used to secure funding;
- Images and graphics that conceptually depict the scope of issues and potential improvements;
- Potential funding sources and a preliminary funding strategy.

This study was commissioned by the Pacific Crest Trail Association, in collaboration with the Port of Cascade Locks, City of Stevenson, and Friends of the Gorge, all of who contributed in-kind staff time to plan and review drafts. Cash contributions were assembled from the Lewis and Clark Trail, the Port, members of PCTA and FOG, and hundreds of individuals who attended the Community Bridge Walk event in 2014. The following are the key conclusions of this study:

- It is believed to be feasible to add the weight of pedestrian pathway to the Bridge of the Gods, in its current condition while continuing to uphold existing vehicle loads. Additional funding, environmental process and approvals, and engineering design are required to advance the project to actual construction.
- A detailed structural analysis of the bridge and alternatives analysis is required to define specific structural impacts and refine the full cost estimated for adding a designated pedestrian crossing on the bridge. Some components of the bridge will need to be replaced which may include the bridge deck, railing, and select structural elements. Many of these components were already slated to be replaced, regardless of a pedestrian addition, in the Ports 10-Year Bridge Plan.
- The project is highly valuable to a number of stakeholders and should be funded.

## 2 Project Overview

Both the Pacific Crest Trail Association (PCTA) and the Port of Cascade Locks (POCL) understand the safety issues that occur at and around the Bridge of the Gods. The POCL owns, maintains, and has responsibility for the Bridge of the Gods condition. The PCTA, in partnership with the Forest Service, maintains and operates the Pacific Crest Trail. At and around the Bridge of the Gods are a number of safety issues and substandard conditions that result in a strong need to improve the safety of the trail system. Throughout this report any reference to pedestrians implies all users of the bridge including PCT trail users, local and regional trail users, cyclists, equestrian users, sight-seers, and all other forms of non-motorized traffic.



*The Bridge of the Gods is narrow and has no shoulder. Many long-distance hikers refer to it as the scariest part of the entire PCT.*

### 2.1 Project Location

The project is located approximately 40 miles east of Portland, Oregon and 4 miles upriver from the Bonneville Dam. The Bridge of the Gods is a toll bridge operated by the POCL. The bridge spans over and connects to US Route 30 (Cascade Locks Highway) on the south end, crossing over the Columbia River and connects to the Washington State Route 14 (Evergreen Hwy) on the north end at grade. The bridge crosses over the UPRR railroad on the Oregon side and BNSF railroad on the Washington side. On the Oregon side the bridge crosses over a parking lot utilized by locals, tourists, and Native American tribes as seasonal fish sales. The bridge connects to a westbound on-ramp and eastbound off-ramp from Interstate-84. The bridge has navigational vertical clearance of 135-feet and horizontal clearance of 656 feet from the normal pool elevation.

The natural beauty surrounding the bridge is recognized as nationally significant. Not only is the bridge part of the PCT, a National Scenic Trail, it's also located in the heart of the Columbia River Gorge National Scenic Area (CRGNSA). The views of the Columbia River, mountains, cities of Cascade Locks and Stevenson, and other gorge features from the bridge are breathtaking, but current conditions don't allow sightseers to enjoy the views safely. The bridge's national significance has several additional facets adding to its draw. It connects two National Scenic Byways; it is part of the Oregon National Historic Trail, the Lewis and Clark National Historic Trail, and the proposed Ice Age Floods National Geologic Trail.

### 2.2 Project Background & Purpose

The primary purpose of this report and project was to dig deeper into issues related to the structural feasibility of adding pedestrian facilities supported by the existing bridge and compare that to a new bridge crossing. Previous studies have been conducted by the POCL and City of Stevenson, but were not advanced due to lack of information at the time. Since the last report on feasibility of using the existing bridge, the Oregon Department of Transportation (ODOT) completed a thorough inspection, bridge load

rating, and structural analysis of the bridge. ODOT in coordination with the POCL completed an emergency repair project to mitigate deficiencies found in the inspection and load rating process. Results previously indicated that the bridge did not have the reserve structural capacity to carry additional loading without additional vehicular weight restrictions beyond that which are already restricted to Legal Load Limits. Now that the reserve structural capacity of the bridge is known, and some deficiencies were mitigated through structural rehabilitation, it is possible to further advance toward pedestrian improvements on and around the Bridge of the Gods.



*The Washington Bridge Head provides no clear pedestrian access to the bridge.*

## 2.3 Project Need

The Bridge of the Gods is a regionally and nationally significant structure and part of the Columbia River Gorge National Scenic Area. The bridge is an essential vehicular, freight, and pedestrian transportation link connecting the States of Oregon and Washington across the Columbia River. Local stakeholders and interest groups have expressed an interest in a more safe and dedicated pedestrian crossing for many years. This river crossing between Stevenson, Washington and Cascade Locks, Oregon is vital to the local and regional economic systems and the quality of life throughout the region encompassing both sides of the Columbia River.

The bridge is unsuitable for safe pedestrian traffic. The narrow 22-foot roadway lacks even minimal shoulders. Typically, during summer, over 10,000 cars and trucks per day cross the bridge—and this coincides with highest season for trail use and other non-motorized recreation. It's a perilous situation for hikers, cyclists, sightseers, and equestrians while crossing this narrow bridge, 1/3 mile long, with nothing to separate them from traffic, and the water visible under their feet, 140 feet below the steel grate. The potential for disaster is high when tractor-trailers must swerve to go around pedestrians, and other motorists are sometimes paying more attention to the scenic views than to the road. Pedestrian use is on the rise. In 2015 there was over 180% increase in pedestrian and bicycle crossings recorded at the bridge, as compared to 2014. Reasonable alternative pedestrian crossings of the Columbia River simply do not exist. Replacement of the existing bridge in its entirety is too costly and adequate funding is not available. The POCL must continue to operate and maintain the bridge for all users until a new bridge is constructed. The PCTA and POCL recognize interest from local, regional, and national stakeholders to have a safe and viable pedestrian crossing at the bridge.

There is a lack of alternate Columbia River crossing options in either direction. It is a 43-mile alternate detour route to the east across the Columbia River in Hood River and 72-mile alternate detour to the west at the I-205 Glenn Jackson Bridge between Portland and Vancouver. If the bridge is closed or weight limits reduced, the residents, businesses, and governments of cities and counties on both sides of the river will be severely impacted. For pedestrians, cyclists, and equestrians, this bridge is the only option. There is a strong need to improve passage for pedestrians, bicyclists, and equestrian at this bridge to benefit the local, regional, and tourist users. The existing

bridge is 90 years old and aging. A major rehabilitation has not been conducted in over 30 years.

The detailed needs that arise in the interaction of the users of Bridge of the Gods can be grouped into three physical areas: on the Bridge of the Gods, the Oregon Bridge Heads, and the Washington Bridge Heads.

**On the Bridge of the Gods** a number of concerns arise and define the need, including:

- A pedestrian crossing is fundamentally not provided on the Bridge of the Gods.
- The two-lane roadway is too narrow to provide a safe width for pedestrian, bike, and equestrian space, and combined with the overall length of the bridge make for a very unsafe pedestrian condition.
- The traffic and pedestrians are not separated, causing pedestrians to be very near to passing trucks and cars.
- The bridge surface is an open-grid steel deck system resulting in a number of real or perceived safety issues, including vertigo and trip hazard to pedestrians, slippery surface for bikers, discomfort for horses, and inability for pets to walk.
- The bridge railing is a traffic type system that is woefully inadequate for vehicles, and pedestrian level safety. The system does not meet current strength or user standards.
- The bridge is not American with Disabilities Act (ADA) compliant.

At the **Oregon Bridge Head** which includes the trail crossing under the Interstate 84, crossing over bridge approach loop ramp, connections to Cascade Locks, the Toll House Park area, and toll booth interactions additional concerns arise, including:

- Inadequate drainage, trail surface, and signage undercrossing of the interstate.
- No clearly marked or safe pedestrian crossing is provided across the loop ramp.
- No clearly marked or safe pedestrian crossing is provided for access to Cascade Locks.
- No way finding or adequate trail facilities provided in the Toll House Park through the toll booth area.
- Pedestrian traffic is not separated from vehicular traffic.
- Inadequate lighting is provided throughout the Oregon Bridge Head.
- Inadequate parking is provided at the Toll House Park.
- The two-lane loop ramp roadway is too narrow to provide a safe width for pedestrian, bike, and equestrian space.
- The facilities are not ADA compliant.



*The PCT crossing at the Bridge of the Gods includes rich Native American history.*



At the **Washington Bridge Head** which includes the trail crossing over Washington State Route 14 (SR14), connections to surrounding trail systems, and the gravel parking area additional concerns arise, including:

- Inadequate drainage, trail surface, and signage of the highway.
- No clearly marked or safe pedestrian crossing is provided across the 55 MPH speed SR14 highway.
- No clearly marked or safe pedestrian connections are provided for access to the City of Stevenson's non-motorized path system.
- Trail level way finding is inadequate.
- Pedestrian traffic is not separated from vehicular traffic.
- Inadequate lighting is provided throughout the Washington Bridge Head.
- Inadequate signage and parking is provided at the gravel parking area.
- The two-lane roadway is too narrow to provide a safe width for pedestrian, bike, and equestrian space.
- The facilities are not ADA compliant.

Figure 1 provides an aerial overlay of the three key project areas and some of the key issues that need to be resolved.

---

#### **Increasing Demands**

The need to improve safety is dramatically increasing due to growing potential conflicts between:

- PCT and other trail user traffic
  - Tourism and vehicular traffic
  - Freight and truck traffic
- 



*PCT trail improvements should include facilities at Toll House Park on the Oregon Bridge Head*

## 2.4 Common Vision and Project Goals

The PCTA, POCL, City of Stevenson, and the Friends of the Gorge have common goals and objectives for this project, which can be summarized as follows:

- Understand the scope of concept alternatives, impacts, and improvements to fix the safety and improve the user experience on and around the Bridge of the Gods.
- Understand the costs to the Port and costs to other partners for making the improvements.
- Assemble the data needed to know what funding to apply for and have the information needed for a successful funding application.
- Advance the project toward real, tangible construction improvements, stepping from the “idea” phase into a real planning, engineering, and construction.

---

#### **Primary Project Goal**

It is the goal of the project to **obtain adequate funding** to advance toward improved pedestrian, bike, and equestrian safety and user experience at and near the Bridge of the Gods over the Columbia River at Cascade Locks, Oregon.

---

## 2.5 Outcomes Provided by this Study

The outcomes provided by this report can be categorized into two areas: 1) details of the needed physical improvements and 2) detailed information needed to obtain funding and advance toward construction. This report includes a description of two basic solutions which could improve the trail experience across the Columbia River at Cascade Locks: either retrofitting of the existing Bridge of the Gods to carry the additional facilities or construct a new pedestrian bridge crossing of the Columbia River near the existing Bridge of the Gods

Summary of physical improvements provided by this study and report:

- Work required on the existing Bridge of the Gods to support the pedestrian path.
- Comparisons of using the existing bridge against an alternate new bridge crossing.
- Descriptions of the specific improvements at the Oregon Bridge Head and Washington Bridge Head

Summary of information included to obtain funding:

- Brief outline of the potential issues and processes needed to address the issues;
- Steps in the project and proposed schedule;
- Planning-level project cost estimates, including illustrations of how to maximize efficiency by packaging the improvements together with improvements the Port has already recommended in its 10-Year Bridge Plan.
- Real funding targets and recommendations for funding sources applications.

---

### **Outcomes of this Study**

This report provides:

- Feasibility of using the existing bridge to add safe pedestrian facilities
  - New bridge crossing concepts
  - Improvements needed at the bridge heads
  - Potential impacts and needed environmental process
  - Planning-level project costs
  - Proposed project schedule
  - Funding source recommendations
- 

## 2.6 Related Studies & Reports

No known comprehensive reports on pedestrian crossing feasibility exist for this bridge. This is due the missing structural detail plans, which were lost for decades. Without the plans it is very difficult to evaluate the structural feasibility. With recent plans recovered, detailed inspections, and technological advancements (e.g., 3D laser survey of the bridge geometry) ODOT completed a detailed structural analysis of the bridge to understand the load rating capacity. At the same time, regional priorities have focused over the past decade to other Columbia River crossings, such as on I-5 and other areas between Portland and Vancouver and between Hood River and White Salmon. With limited local funding and limited regional interest, this bridge has not been adequately studied. Funding for replacement is limited and not currently available. A previous report is available titled *Bridge of the Gods – Pedestrian crossing feasibility study, Bridging Byway Communities over the Bridge of the Gods* completed by the Port of Cascade Locks and City of Stevenson, dated December 31, 2012. This previous report was limited by the available information at the time.

## 2.7 Project Partners

The bridge and landside improvements on the Oregon Bridge Head and Washington Bridge Head will require close coordination with partners from the local, state, and federal, and other interest groups. Outreach and coordination will be a key part of the project. The project should be carefully designed and vetted with proper outreach process in order to comply, including an open house and other community outreach programs. In addition to the public outreach, the following groups have expressed an interest in the project and should be consulted when determining the final design of landside connections and features on or off the bridge:

- Pacific Crest Trail Association (CA/OR/WA)
- Port of Cascade Locks
- Friends of the Columbia Gorge (OR/WA)
- City of Stevenson, WA
- City of North Bonneville, WA
- Skamania County
- City of Cascade Locks, OR
- City of Hood River, OR
- Hood River County
- Multnomah County
- Hood River County Commission (OR)
- Skamania County Facilities & Recreation (WA)
- SW Washington Regional Transportation Council (WA)
- Back Country Horsemen of Washington (WA)
- Bicycle Alliance of Washington (WA)
- Bicycle Transportation Alliance (OR)
- Chinook Trail Association (OR/WA)
- Skamania County Senior Services (WA)
- US Forest Service Columbia River Gorge National Scenic Area Office (OR/WA)
- US Forest Service Pacific Crest National Scenic Trail Office (CA/OR/WA)
- Oregon Chapter of the Lewis and Clark Trail Heritage Foundation
- Department of the Interior, Lewis and Clark Trail Office
- Vancouver Bike Club
- Skamania County Economic Development Council
- Port of Skamania County

- Washington Trails Association
- Columbia River Gorge Visitors Association

## 3 Key Project Issues & Challenges

A map of key project issues and challenges is provided in Appendix A. The following sections overview some of the project key issues and challenges.

### 3.1 Environmental

Consultation with local, state, and federal agencies will be required to design and construct pedestrian improvements on and around the bridge. The following is a preliminary list of permits that will need to be considered:

- Section 404 joint Permit Application required by the U.S. Army Corp of Engineers & Oregon Department of State Lands (ODSL).
- Fish Passage Permit required by the Oregon Department of Fish & Wildlife
- Bridge Permit required by the U.S. Coast Guard
- DEQ Stormwater Management Plan required by the Oregon Dept. of Environmental Quality (ODEQ)
- HAZMAT Compliance required by the ODEQ
- NPDES 1200-C required by the ODEQ
- Bridge Easement over Waters of the State required by the ODEQ and ODSL
- Local Permits (Land use, Stormwater, Floodplains, Building, Development, Erosion Control, Grading, etc.) required by the cities, counties and other local jurisdictions.
- Other approvals required by the CRGNSA in consultation with Columbia River Gorge Commission
- Compliance with the National Environmental Policy Act (NEPA)
  - Section 4(f)
  - Noise and Vibration
  - Air Quality Assessment
  - Traffic Impacts
  - Environmental Justice

The following environmental constraints apply to the project:

- In water work period will restrict any work in the Columbia River, if necessary.
- Excavations are expected and this is included in Hazardous Materials or Archeological scope of the project.

- U.S. Coast Guard (USGS) navigational allowances must be maintained. Allowances include horizontal and vertical clearances and allowable durations of bridge closures and operational impacts. Permit avoidance is needed to maintain a PCE. Operations must fall within current permit and agreements with the County.
- An adverse effect on 4(f) historic properties must be avoided. Potential issues that could trigger an adverse effect include unacceptable modification to the barrier rail, sidewalk treatment, and lighting treatment. Potential issues that could also trigger an adverse effect include unacceptable impacts to the bridge or parks.

## 3.2 Archeological & Cultural Resources

The Bridge of the Gods is eligible for the National Register of Historic Places. It is regionally and locally significant and will require consultation with the State Historic Preservation Office (SHPO). Special consideration of aesthetics, architectural treatments, and visual impacts of any modification will be required. The bridge is eligible to be listed on the National Register of Historic Places due to its unique history and construction techniques. Additional funding sources for rehabilitation may be available if listed, but additional restrictions on modifications may also be required.

## 3.3 Right-of-Way

In order to design and construct a pedestrian pathway right-of-way (ROW) and temporary or permanent easements will be required. These requirements are not expected to influence feasibility but should be considered during the planning, scheduling, negotiations, and cost estimating phases of the project. At a minimum, temporary construction easements will be required when working over the BNSF and UPRR railroads on both sides of the river. Acquiring these easements and permits can often be a lengthy negotiation process.

## 3.4 Railroad

Given that the bridge spans over the UPRR and BNSF railroad properties a number of coordination needs arise and constraints result. Constraints specifically resulting from the UPRR and requirements include meeting the minimum required clearances at all times. Approval from the railroad is required and applicable design standards will be applied following the 'BNSF Railway – Union Pacific Railroad Guidelines for Railroad Grade Separation Projects', UPRR 'Public Projects – Plan Submittal Guidelines' (Oct 10th 2014).

## 3.5 Stormwater

In order to comply with local, state, and federal permits the installation of new impervious surfaces requires retention, treatment of stormwater to improve water quality. Direct runoff into streams, rivers, and storm drains is typically no longer allowed except in special situations. Further project development will require special consideration of selected surface treatments. Impervious surfaces added to the bridge, which are desirable for pedestrians, bicyclists and equestrian use, may require drainage to be

collected and drained off the bridge or may require special consultation to obtain environmental variance.

## 3.6 Structural

The following overviews the key structural issues related to pedestrian crossing feasibility, considering the bridge condition, probable rates of deterioration, and current bridge load rating status and potential weight restrictions. In general, a comprehensive engineering evaluation of the bridge is still required to fully comprehend the issues and associated costs.

### 3.6.1 Main Cantilever Truss

The steel truss of the three-span main cantilever segment is a significant roadblock that limits the pedestrian crossing alternatives for two reasons: the steel truss physically obstructs the path way location and replacement or strengthening of the main spans would be very costly. The pedestrian path must be either inside the truss or outboard of the truss and cannot be safely split by the truss. There are also conflicts with the overhead steel bracing when considering alternatives with a path inside the steel truss. The capacity of the main steel truss elements and the steel gusset plates on the main cantilever truss are unknown. At the time of this report ODOT completed the main span and gusset plates load rating. The reserve structural capacity to carry additional loading is known, but further engineering is required to better know the cost.

### 3.6.2 Oregon Approaches

Based on the load rating conducted by ODOT the Oregon approaches do not have adequate reserve structural capacity to resist the additional weight of a pedestrian facility. These limitations suggest that either a strengthening project would be necessary or replacement of these spans. A strengthening project may require deck replacement with a wider, lighter, more modern deck and bridge rail with structure added to support a pedestrian path. Full replacement of the approach spans with a modern structure would allow for both current vehicle weights and a pedestrian path. Full replacement of these spans can be accomplished with minimal impacts to the historic and aesthetic appeal of the bridge.

### 3.6.3 Washington Approaches

Based on the load rating conducted by ODOT the Washington approaches also do not have adequate reserve structural capacity to resist the additional weight of a pedestrian facility. ODOT required weight restrictions for the bridge until repairs were made. These limitations suggest that either a strengthening project would be necessary or replacement of these spans. A strengthening project may require deck replacement with a wider, lighter, more modern deck and bridge rail with structure added to support a pedestrian path. Full replacement of the approach spans with a modern structure would allow for both current vehicle weights and a pedestrian path. Full replacement of these spans can also be accomplished with minimal impacts to the historic and aesthetic appeal of the bridge.

### 3.6.4 Substructure & Foundations

There are large in-water concrete piers for this bridge. In order to provide pedestrian facilities on the bridge the existing substructure and foundation need careful evaluation. The piers of the bridge were designed in the 1920's and 1930's and are not expected to meet current design standards. Investigations into the quality and condition of the concrete would be necessary to understand the quality and rate of deterioration. Engineering calculations for loading conditions on the existing piers would be necessary to determine the load effects and feasibility of supporting additional load. Underwater inspections indicate no signs of deterioration. It is possible that retrofit would be required to support a pedestrian crossing; further investigation may be necessary.

## 4 Concept Alternative Descriptions

Given the myriad issues, and some concept ideas provided by the Port, HDR developed a basic configuration for adding pedestrian facilities to the existing bridge. A brief description and comparison of these concept alternatives is listed in Table 1. The overall project schedule proposed to progress forward either of these concepts is provided in Appendix B.

### 4.1 Alternative 1 – New overhang structure outboard of the existing roadway

This alternative is the most straight-forward solution and is depicted in Appendix D & E. This alternative simply involves a structural steel extension of the floorbeam to overhang the pedestrian facility outboard of the main cantilever truss and approach spans. Longitudinal steel stringers support the path spanning between the floorbeam extensions. This type of project has been successfully executed on steel trusses that have reserve structural capacity. Structures originally designed for railroad loading, but later converted to carry vehicular loads commonly have reserve structural capacity. Structures that were once used for vehicular loads have been successfully converted to exclusive pedestrian-only crossings. It is much less common to retrofit an old vehicular bridge with added weight without compensating for the additional weight. This alternative also requires an overhang pedestrian path on the approach spans, which is assumed to be accomplished through full replacement on the Oregon Approach Spans and re-decking on the Washington Approach Spans. As currently determined by ODOT, the approach spans cannot sustain additional loading and Washington Approach Spans require strengthening or deck replacement.

### 4.2 Alternative 2 – New & independent pedestrian bridge

This alternative is the most feasible, simple, and straightforward structural solution for getting pedestrians, bikes, and equestrian safely across the Columbia River at this location. However, the obvious downside is the cost of designing and constructing a new bridge. Ideally, if a new bridge is constructed, it would serve both pedestrians and vehicular traffic and be designed as a modern structure built to last for a minimum of 75 more years. However, given the known issues with the weight restriction on the Bridge of the Gods, this alternative should be considered moving forward.





**Table 1. Concept alternatives considered for pedestrian crossing**

Alt.	Description	Top Benefits	Key Issues
1	<p><b>New overhang structure outboard of the existing roadway</b> supported by the existing trusses &amp; approach superstructure</p>	<ul style="list-style-type: none"> <li>• Simplified construction</li> <li>• Less traffic disruptions</li> <li>• Improved experience &amp; safety via separated path</li> </ul>	<ul style="list-style-type: none"> <li>• Structural feasibility – bridge must be retrofit to support loads</li> <li>• Added overturning forces from load applied outboard of existing truss</li> <li>• Approach span structure replacement or retrofit</li> </ul>
2	<p><b>New &amp; independent pedestrian bridge</b> upstream or downstream of the existing bridge</p>	<ul style="list-style-type: none"> <li>• No dependency on existing bridge</li> <li>• Modern, low maintenance, crossing designed to current standards and longevity</li> <li>• Physically separated pedestrian facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Overall cost for long span independent pedestrian bridge</li> <li>• Visual impacts to existing bridge</li> <li>• New R.O.W. &amp; environmental impacts due to new landside connections</li> <li>• Lack of funding opportunities for other bridge improvements</li> </ul>

## 5 Planning-Level Estimates

More structural analysis data was made available by ODOT to determine the likely quantities or detailed cost estimates for the two basic alternatives. In order to arrive at a more accurate estimate of the cost associated with one or more alternatives further engineering evaluation is required to confirm or deny key assumptions. Based on experience with similar types of projects, bridges of this scale, and an understanding of the existing bridge condition, it is anticipated the range of cost for a structural solution of adding pedestrian facilities to the existing bridge is as shown in Table 2. These estimates could rise or fall with further investigation, and fluctuation in construction prices. Cost ranges are concept level only for planning purposes. Actual specific costs will depend on the scope of project selected and construction bidding environment at the time of construction. Estimates are for the work required for the structural pedestrian path and also include allowance on both bridge heads and retrofit of the structure required to maintain truck weight limits.

**Table 2. Concept level total cost ranges for alternatives (2015 dollars)**

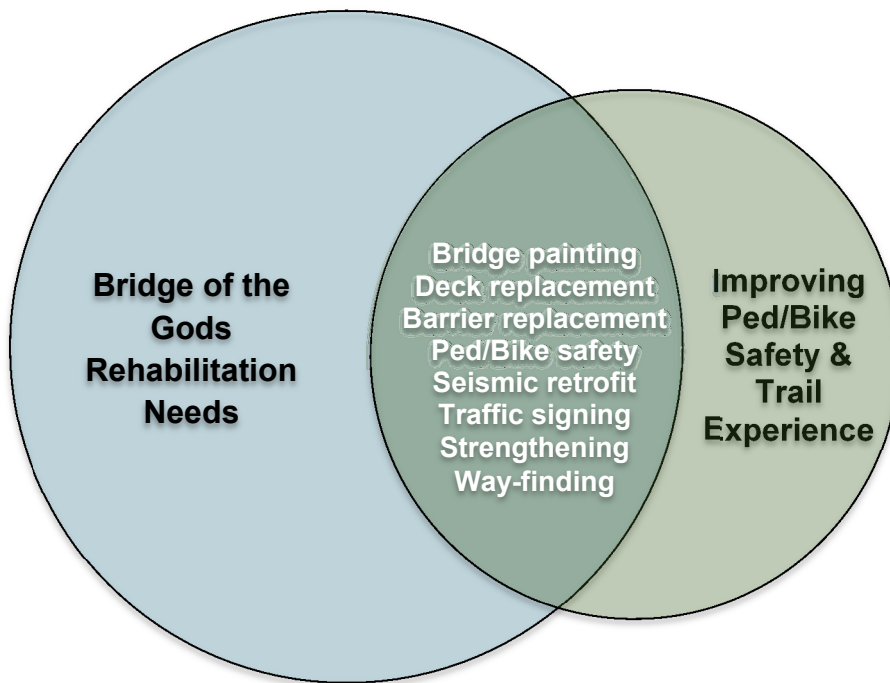
Alt.	Description	Planning Level Cost Range		Notes
		Low	High	
1	New overhang structure outboard of the existing roadway	\$8M	\$15M	Simple overhang structure supported entirely from the existing bridge. Cost of new bridge deck and rails included.
2	New & independent pedestrian bridge	\$20M	\$40M	Long main span matching navigational clearances increases cost significantly. Signature bridge costly.

### 5.1 Cost Overlap with Active Bridge Rehabilitation Needs

There are rehabilitation needs programmed for the bridge and approaches in the Ports 10-year Plan, which the Port updates on a regular interval. If a pedestrian crossing is pursued and funding is made available for adding a pedestrian crossing, many of the current rehabilitation needs would be resolved through the project of adding pedestrian facility on the existing bridge. This overlapping need is explained in part by Table 3. Conceptually, Figure 1 shows through a VIN diagram how the cost needs overlap. Based on early estimates, around \$3M in savings could be realized by combined bridge rehabilitation needs with the addition of improved pedestrian crossing. An itemized listing of project cost estimates is provided in Appendix F.

**Table 3. Bridge Rehabilitation Needs & Benefits to Adding Pedestrian Facility**

<b>Overlapping Bridge Rehabilitation Needs</b>	<b>Key Benefits to Adding Pedestrian Crossing Improvements</b>
<ul style="list-style-type: none"> <li>• Bridge paint rehabilitation</li> <li>• Bridge deck replacement</li> <li>• Bridge traffic rail replacement</li> <li>• Bridge structural strengthening for vehicles</li> <li>• Landside (bridgehead) pedestrian connections</li> <li>• Bridge seismic retrofit</li> <li>• Pedestrian safety, signage, and way-finding</li> </ul>	<ul style="list-style-type: none"> <li>• Additional funding made available for all work</li> <li>• Cost savings for combined planning, engineering, construction, tools, skills, and processes</li> <li>• Less public impact due to reduced ongoing rehabilitation project disruption, if combined</li> <li>• Combined environmental containment</li> <li>• Positive public outreach</li> <li>• Common bridge preservation, enhancement, and maintenance goals</li> <li>• Significantly improved pedestrian and vehicular safety by separating traffic</li> </ul>



**Figure 1. Overlapping needs for improving ped/bike safety at the bridge**

## 5.2 Funding the Project

A study was completed to develop potential funding sources and a preliminary funding strategy. The results of this study are provided in Appendix C.

## 5.3 Cost Estimating Approach & Assumptions

The planning level project cost estimates in this report rely heavily on similar projects and consider the complexity, type of the work, and the difficulties with working over a wide river crossing with environmental processes and design required. Full tabulation of construction bid items was not completed at this time as the design was at that level of detail. The next project step should include a more precise tabulation of work items based on concept design, bid prices, and further project scope definition. Costs will need to be refined as the project advances, as is typical with similar projects.

The cumulative cost shown in this report represents an accumulation of the project's design, permitting, and construction work, and is the *summation of all of the work*.

Based on information provided by the Port, it is assumed that the Port has a "Prior Rights" designation over all utility agencies impacted. As such, utility costs were assumed to be low and most costs associated with utility relocations were assumed to be financed by the utility owner. In the event that Port-owned or City-owned water, sewer, electrical, or other similar facilities are impacted or needed as part of the project, costs for the construction of these elements will be developed individually. Utility costs will be updated as the design progresses.

The following assumptions are applicable to this project. All of these assumptions are applied to develop the cost, and can be used as a guide moving forward:

- Costs shown were developed based on 2015 unit pricing.
- Costs were developed based on average historical prices for similar work elements in the region. If regional unit prices were not available, relevant bid items from similar projects outside of the local area were used. If pricing from similar projects was not available, engineering judgment was used.
- Planning: Planning the project includes costs for overseeing and executing the planning phase of the project, including all concept design, environmental process, agency coordination, funding oversight, and all local, state, and federal processes including coordinating with the public. These costs can be established as a percentage of construction costs. For this project, a factor of 15% can be applied to determine the cost for planning.
- Preliminary Engineering (PE): PE includes costs for overseeing and executing the design phase of the project, including all engineering design process required by local, state, and federal process, and coordinating with the public. These costs can be assumed as a percentage of construction costs. For this project, a factor of 15% can be applied to determine the cost for PE.
- Contingency: Contingency costs are intended to account for uncertainty in the constructed value buildup and miscellaneous items that are not typically quantified during early project phases. Contingency is based on a percentage of raw construction costs, accounting for escalation. For this project, the contingency can be set at 35% of the construction cost.
- Escalation: Escalation costs are intended to capture inflationary costs from the assumed unit pricing date of 2015. Escalation costs were based on a 3% per

year based on analysis of historical trends for bridge projects in Oregon between 2004 and 2015. This value is consistent with CPI forecasts for material pricing from Engineering News-Record (ENR). Escalation was projected from the 2015 pricing to the mid-point of construction (anticipated to be in the summer of 2019).

- Construction Engineering and Inspection (CEI): CEI costs include all project costs for overseeing the construction phase, including construction administration, engineering support, responding to contractor inquiries, construction inspection, and coordinating with the public. CEI costs were established as a percentage of construction costs inclusive of utilities, mobilization, temporary traffic control, contingency, and escalation. For this project, a factor of 16% can be applied to determine the cost of CEI.

## 6 Limitations

This report is only a step in the project development process. HDR did not perform an independent and comprehensive structural analysis on the entire bridge as part of these services and is relying on work by ODOT to draw conclusions, tempered by engineering experience and judgment. There are a number of structural elements of the bridge that need specific analysis to determine how to mitigate the weight of pedestrian facilities on the bridge. A conceptual design process and alternatives analysis is required. The POCL and its partners must weigh the benefits and costs and decide if further investment is warranted after each step. Additional services are required to respond to environmental process, coordinate with regulatory agencies, address permitting requirements, mitigate impacts, design the physical improvements to current codes and regulations, and better determine cost to each agency.

## 7 Appendices

Appendix A – Project Aerial Map of Key Issues

Appendix B – Proposed Project Schedule

Appendix C – Funding Study Results

Appendix D – Concept Project Improvements

Appendix E – Concept Images

Appendix F – Project Planning Level Cost Estimates

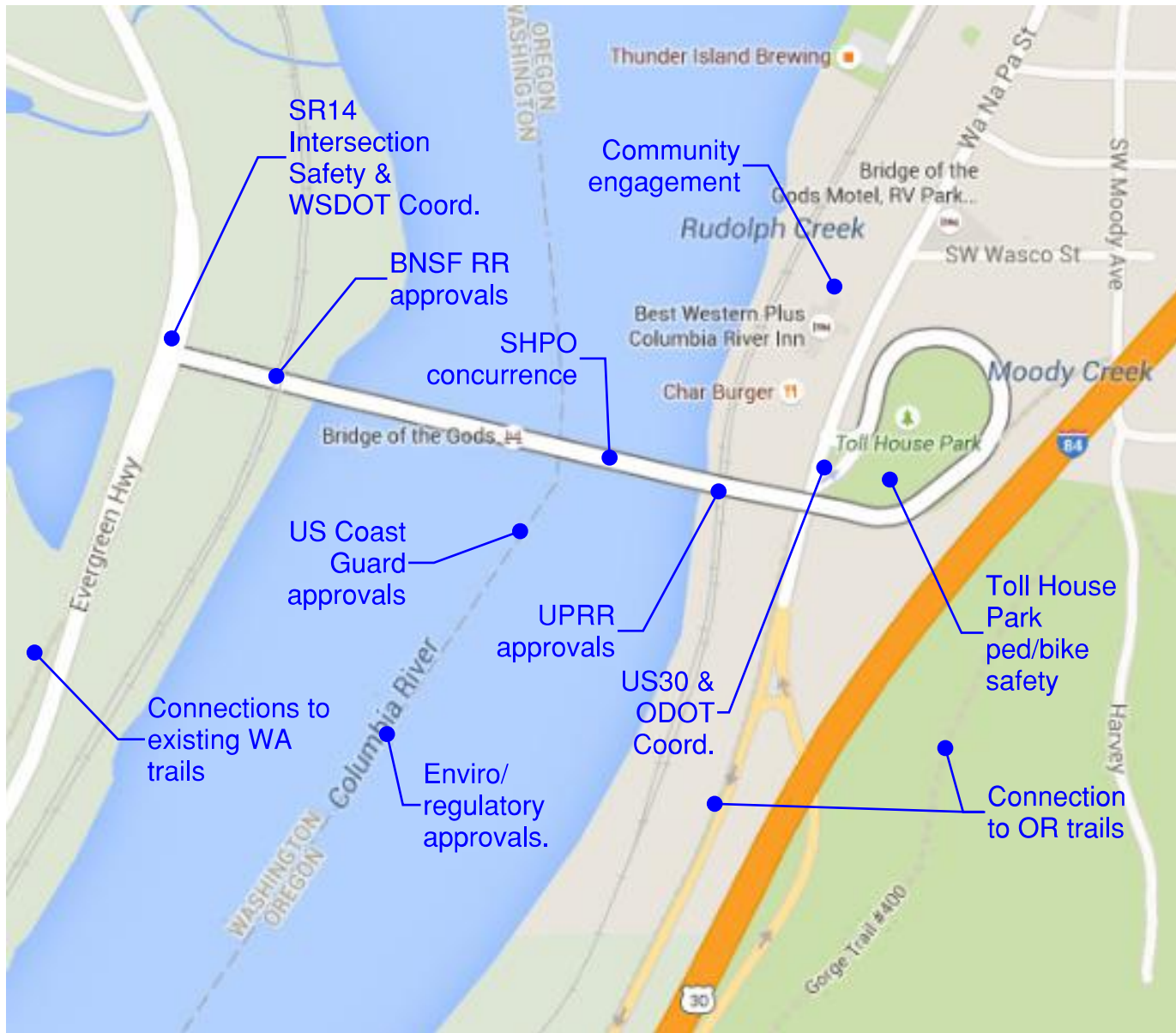


# Appendix A. Project Aerial Map of Key Issues





# APPENDIX A. Project Aerial Map of Key Issues





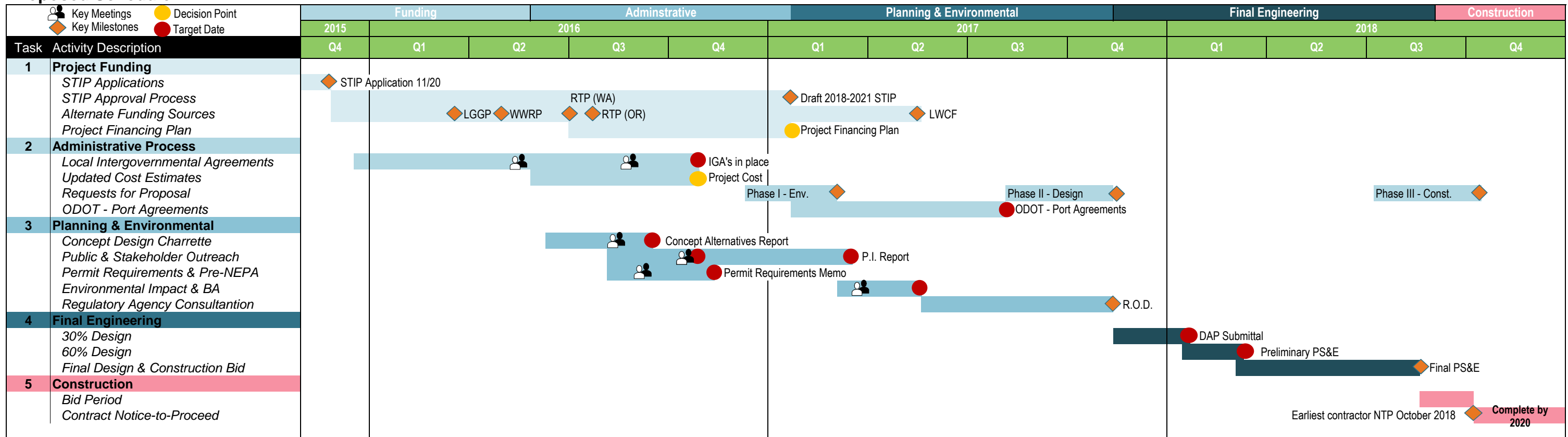


## Appendix B. Proposed Project Schedule



# Improving Pedestrian Safety & Trail Experience at the Bridge of the Gods

## Proposed Schedule





# Appendix C. Funding Study Results





## Pedestrian Crossing at the Bridge of the Gods

Funding Study - Potential Sources

6/16/2015

Priority (1 = high)	Grade	State	Source Agency	Funding Source Name	Type	Brief Description	Project Phase(s)	Highest Award	Next Date Application s due
1	A	OR	Oregon Department of Transportation (ODOT)	Transportation Alternative Program (TAP) (formerly Transportation Enhancement program)	Federal grant	The Transportation Alternatives Program (TAP) provides funding for programs and projects defined as transportation alternatives, including on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and improved mobility, community improvement activities, and environmental remediation; recreational trail program projects; and federally funded safe routes to school projects. <b>Funding &amp; project selection has been rolled into the multi-modal STIP-Enhance process.</b>	Planning, programming	\$ -	Need to contact for further information
2	A	WA	Washington State Dept. of Transportation (DOT)	Surface Transportation program (STP)	Grant	The Surface Transportation Program (STP) is the most flexible of all the highway programs and the one that provides the most financial support to local agencies. Projects eligible for STP funding includes highway and bridge construction and repair; transit capital projects; bicycle, pedestrian, and recreational trails; construction of ferry boats and terminals.	Planning, construction, programming	\$ -	Need to contact for further information
3	A	WA	Washington State Department of Transportation (DOT)	Transportation Alternatives Program (TAP)		The Transportation Alternatives Program (TAP) provides funding for programs and projects defined as transportation alternatives, including on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and improved mobility, community improvement activities, and environmental remediation; recreational trail program projects; and federally funded safe routes to school projects.	Planning, construction, programming	\$600,000	Contact RTPO program officer
4	A	WA	State of Washington Department of Commerce	General Purpose Grant	Grant	To assist Washington State small cities, towns and counties in carrying out significant community and economic development projects that principally benefit low- and moderate-income persons. The purpose of the state CDBG Program is to improve the economic, social and physical environment of eligible, non entitlement cities and counties to enhance the quality of life for low- and moderate-income residents, and as a result, benefit the entire community. Examples of eligible General Purpose Grant activities include: <ul style="list-style-type: none"> <li>- Public facilities such as water, wastewater and streets</li> <li>- Community facilities, such as community centers, fire stations, homeless shelters and child care facilities</li> <li>- Economic development, such as microenterprise assistance and public infrastructure</li> <li>- Affordable housing and housing rehabilitation</li> </ul>	Construction	\$750,00	06/01/15

## Pedestrian Crossing at the Bridge of the Gods

### Funding Study - Potential Sources

6/16/2015

Priority (1 = high)	Grade	State	Source Agency	Funding Source Name	Type	Brief Description	Project Phase(s)	Highest Award	Next Date Applications due
5	B	OR	Oregon Department of Transportation (ODOT)	Transportation & Growth Management (TGM) Program	Grant	Oregon's Transportation and Growth Management Program supports community efforts to expand transportation choices for people. By linking land use and transportation planning, TGM works in partnership with local governments to create vibrant, livable places in which people can walk, bike, take transit or drive where they want to go.	Planning, programming	\$ 200,000	06/12/15
6	A	OR	Oregon Department of Transportation (ODOT)	Statewide Transportation Improvement Program (STIP) Enhance	State Investment Program	The Statewide Transportation Improvement Program, known as the STIP, is Oregon's four year transportation capital improvement program. It is the document that identifies the funding for, and scheduling of, transportation projects and programs. It includes projects on the federal, state, city, and county transportation systems, multimodal projects (highway, passenger rail, freight, public transit, bicycle and pedestrian), and projects in the National Parks, National Forests, and Indian tribal lands.	Planning, programming	\$ -	08/03/15
7	A	OR	Oregon Parks and Recreation Dept.	Local Government Grants Program (LGGP)	Federal grant	To provide support for outdoor recreation projects. Eligible projects involved land acquisition, development, and major rehabilitation projects that are consistent with the outdoor recreation goals and objectives contained in the Statewide Comprehensive outdoor Recreation Plan (SCORP)	Planning, acquisition, development, construction,	\$ 750,000	03/21/16
8	A	WA	Washington State Recreation & Conservation Office	Washington Wildlife Recreation Program (WWRP)	Grant	Provides funding for a broad range of land protection and outdoor recreation, including park acquisition and development, habitat conservation, farmland preservation, and construction of outdoor recreation facilities.	construction, development	\$500,000	5/1/16
9	A	WA	Washington State Recreation & Conservation Office	Recreational Trails program (RTP)	Federal Grant	Provides funds to rehabilitate and maintain recreational trails and facilities that provide a backcountry experience. This grant program provides for trail-related facilities for both non-motorized and motorized trail uses. Under limited circumstances, new "linking" trails, relocations, and education proposals are also eligible. Typical projects include replacing bridges and drainage structures.	Construction	\$150,000	7/1/16

## Pedestrian Crossing at the Bridge of the Gods

Funding Study - Potential Sources

6/16/2015

Priority (1 = high)	Grade	State	Source Agency	Funding Source Name	Type	Brief Description	Project Phase(s)	Highest Award	Next Date Application s due
10	A	OR	Oregon Parks and Recreation Dept.	Recreation Trails Program (RTP) Grants	Federal grant	To support recreational trail-related projects, such as hiking, running, bicycling, off-road motorcycling, and all-terrain vehicle riding.	Construction	\$ 150,000	07/22/16
11	A	WA	Washington State Recreation & Conservation Office	Land & Water Conservation Fund (LWCF)	Grant	To preserve and develop outdoor recreation resources, including parks, trails, and wildlife lands. Typical projects include: renovating community parks, building new skate parks, tennis courts, swimming pools, and trails. Protecting wildlife habitats, building athletic fields.	Planning, acquisition, development, construction,	\$500,000	5/1/17





# Appendix D. Concept Project Improvements



# APPENDIX D. Concept Project Improvements



Improving Pedestrian Safety & Trail Experience at the Bridge of the Gods





# Appendix E. Concept Images



# APPENDIX E. Concept Images

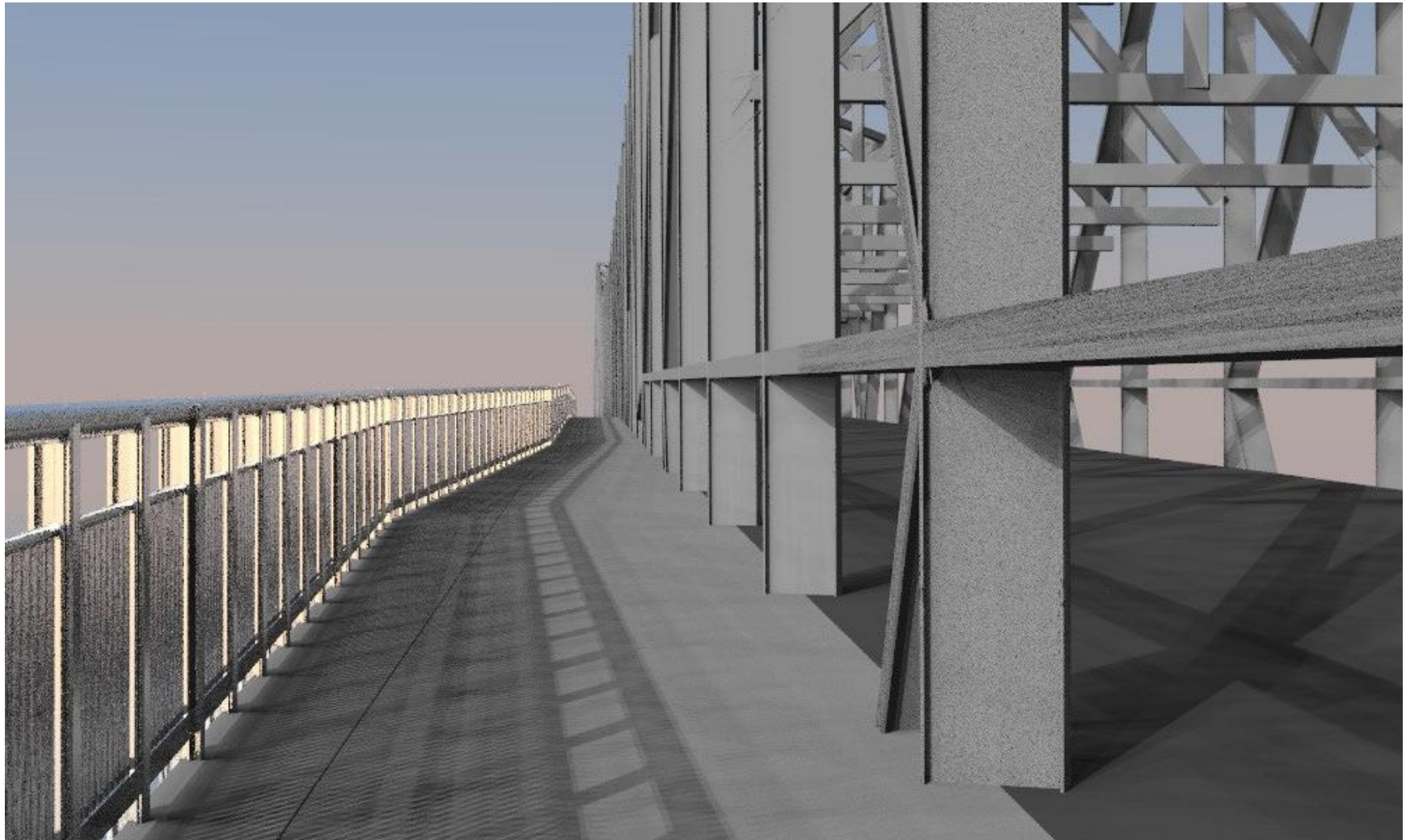


# APPENDIX E. Concept Images



# APPENDIX E. Concept Images













# Appendix F. Project Planning Level Cost Estimates



**Planning Level Cost Estimates**  
 Pacific Crest Trail Association & Port of Cascade Locks  
 Ped/Bike Path & Other Bridge Rehab (10-year Plan)

Phase	Cost Items	Year	Basis	Major BOG Rehab - Without Ped/Bike or Full Paint <sup>2</sup>	Ped/Bike Overhang Path Needs Only <sup>3</sup>	Combined Projects <sup>4</sup>	Savings Realized by Combining <sup>5</sup>
1	Admin., Planning, & Environmental <sup>1</sup>	2017-18	15% Cons.	\$ 1,770,000	\$ 1,420,000	\$ 2,800,000	\$ 380,000
2	Preliminary Engineering <sup>1</sup>	2018-19	15% Cons.	\$ 1,770,000	\$ 1,420,000	\$ 2,800,000	\$ 380,000
3	Construction <sup>1</sup>	2019-20	2015 Prices	\$ 11,768,300	\$ 9,405,700	\$ 18,650,800	\$ 2,523,200
	BOG Steel Deck System Retrofit/Replacement	2019-20	Prelim. Est.	\$ 1,791,000	\$ 2,230,400	\$ 2,230,400	\$ 1,791,000
	BOG New Ped/Bike Overhang System	2019-20	Prelim. Est.	\$ -	\$ 1,239,300	\$ 1,239,300	\$ -
	BOG Structural Rehab, Painting, & Misc.Repairs	2019-20	Prelim. Est.	\$ 1,314,000	\$ 1,445,000	\$ 2,759,000	\$ -
	OR Approach Bridge Rehab/Replacement	2019-20	Prelim. Est.	\$ 244,800	\$ 2,655,000	\$ 2,655,000	\$ 244,800
	WA Approach Bridge Rehab/Replacement	2019-20	Prelim. Est.	\$ 162,400	\$ 1,411,000	\$ 1,411,000	\$ 162,400
	OR Bridgehead PCT Ped/Bike Improvements	2019-20	Prelim. Est.	\$ -	\$ 212,500	\$ 50,000	\$ 162,500
	WA Bridgehead PCT Ped/Bike Improvements	2019-20	Prelim. Est.	\$ -	\$ 212,500	\$ 50,000	\$ 162,500
	Toll Systems, Booth, Infrastructure	2019-20	Prelim. Est.	\$ 1,094,000	\$ -	\$ 1,094,000	\$ -
	Bridge seismic retrofit	2019-20	Prelim. Est.	\$ 5,720,500	\$ -	\$ 5,720,500	\$ -
	Oregon Approach Roadway	2019-20	Prelim. Est.	\$ 1,154,300	\$ -	\$ 1,154,300	\$ -
Washington Approach Roadway	2019-20	Prelim. Est.	\$ 287,300	\$ -	\$ 287,300	\$ -	
<b>2 &amp; 3</b>	<b>Design Engineering &amp; Construction</b>			<b>\$ 13,600,000</b>	<b>\$ 10,900,000</b>	<b>\$ 21,500,000</b>	<b>\$ 3,000,000</b>
<b>Total</b>	<b>All Phases, All Costs</b>			<b>\$ 15,400,000</b>	<b>\$ 12,300,000</b>	<b>\$ 24,300,000</b>	<b>\$ 3,300,000</b>

Table Notes:

All costs are approximate and for planning purposes. Additional design and engineering required prior to construction.

- 1) Includes the owners costs and additional consultant fees for the improvements listed; % of construction.
- 2) Estimated baseline bridge rehabilitation needs over the next 10 years.
- 3) Estimated baseline improvements for only adding new ped/bike overhang.
- 4) Estimated costs if projects are combined into a single project.
- 5) Estimated savings realized by combining projects.