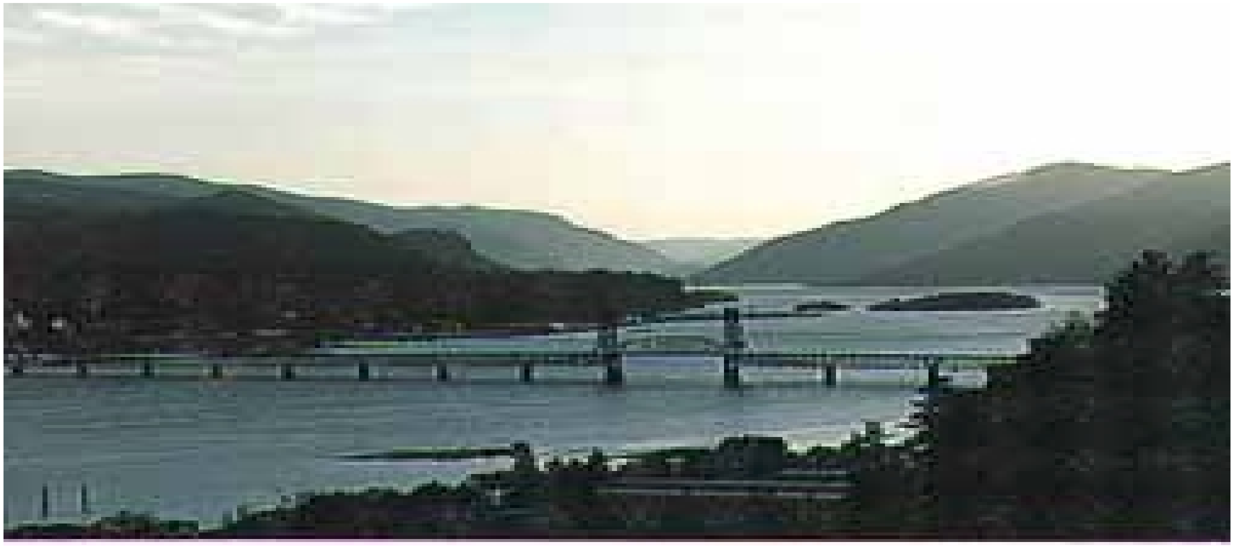

BASELINE CONDITIONS REPORT

Working Draft

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Prepared for:
Southwest Washington Regional Transportation Council
Washington State Department of Transportation
Oregon Department of Transportation

Prepared By:
Parsons Brinckerhoff
With
Entranco
Cogan-Owens-Cogan
Eco Northwest
Ogden Beeman and Associates

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BASELINE CONDITIONS REPORT

EXECUTIVE SUMMARY

Introduction

TEA-21 programmed funding for a feasibility study to replace or improve the Columbia River Crossing along a proposed SR 35 corridor linking Oregon and Washington near Bingen, Wash., and Hood River, Ore. A Purpose and Need Statement was developed and adopted by the RTC in 1999. RTC has begun conducting a feasibility study of a new or improved crossing.

With multiple agencies having jurisdiction or providing services in the study area, there is a wealth of information that needs to be centralized and made available for further use in this study. Collecting and developing a database of information is just part of the need; it is also critical to present the data in a fashion that is useful to the agencies and understandable to the public.

Purpose

This Baseline Conditions Report will summarize and evaluate existing data necessary to understand existing physical and operational features within the study area associated with the existing river crossing, including bottlenecks such as intersections with the bridge and I-84 and SR14, toll booths, connecting arterial roadways, rail and marine transportation. This data will form the baseline for comparison with the future "no-build" conditions and subsequent strategies, refinement, screening and evaluation.

This Baseline and Existing Conditions Inventory has been prepared to assist those involved with this study in understanding the current and future needs associated with the current Hood River Bridge crossing. This inventory is a summary of existing conditions of the built and natural environment, transportation facilities and conditions, current and future deficiencies in level-of-service, and identified substandard design conditions. This report describes the existing and 20-year No-Build conditions to be used for evaluating improvement alternatives in the corridor.

This report includes a review of the engineering information associated with the Hood River Bridge, existing transportation facilities, their respective deficiencies and funding sources, environmental issues that may impact or constrain crossing improvements, and economic conditions.

Report Format

This report has been developed so that major study areas, such as transportation and environmental, are included as separate chapters. The report is organized as follows:

Chapter 1, "Engineering," contains information regarding existing physical and operational features within the study limits associated with the existing river crossing. River navigation is included in Chapter 2. Included will be a compilation of structural condition information for the bridge and connecting roadways, as-built bridge and roadway information. Under development is a mapping database using existing mapping data in the study area.

This data will form the baseline for comparison with the future “no-build” conditions and subsequent strategies, refinement, screening and evaluation. The data developed will be tailored to the tiered evaluation framework.

Chapter 2, “Navigation”, identifies the types, frequency, size and operational characteristics of vessels transiting the Columbia River at the existing Bridge vicinity as well as other crossing corridors. Also included are recommended bridge design clearances to accommodate river navigation.

Chapter 3, “Environmental”, summarizes existing environmental data through contacts with federal, state, and local agencies, collection of available documents, and windshield reconnaissance of the project area. Applicable information is summarized in this chapter along with maps suitable for use in the development of alternatives and impact evaluations.

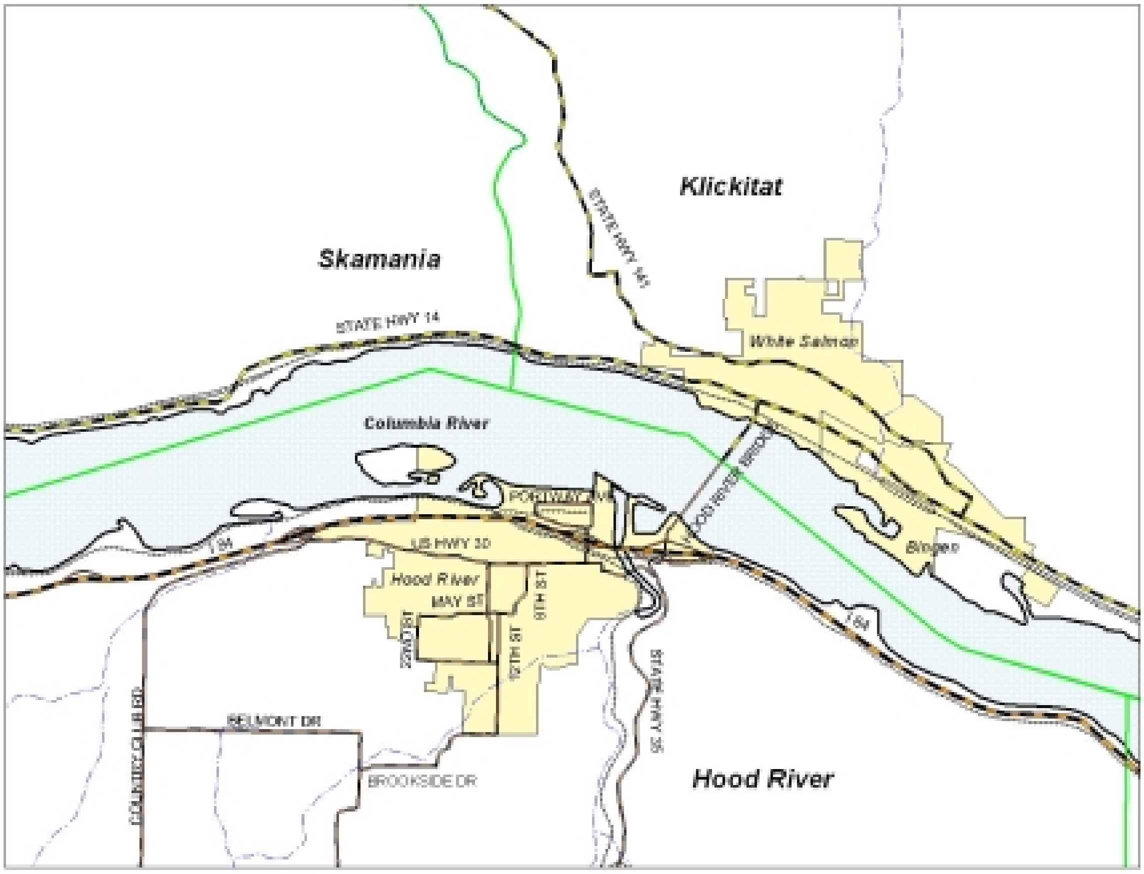
Information in this chapter includes land use and development plans for cities, counties, and ports; wetlands and stream crossing data; Gorge Management Act information; air quality and noise information; in-lieu tribal fishing sites and tribal, cultural, archaeological, historical data; as well as recreational use information.

Chapter 4, “Economics”, assembles existing and available economic and trade data to identify and describe the region and its industries. This includes an assessment of the role of interstate and regional trade in the regional economy and the importance of crossing as a commuter route to support the local economy.

The interstate and regional significance of the study region’s trade economy and the role of a Columbia River Crossing within the study region will be identified and described in the context of the proposed Tier 1 alternatives. General commodity flows will be described to provide an overview of local economy with respect to volumes of goods movement. Specific local industries or economic sectors involved in or affected by goods movement, including interstate trade, will be identified and the potential impacts of alternative crossings will be assessed to the extent relevant and necessary in the Tier 1 alternatives screening.

Chapter 5, “Transportation”, summarizes existing data necessary to understand existing physical and operational features within the study limits associated with the existing river crossing, including bottlenecks such as intersections with the bridge and I-84 and SR14, toll booths, connecting arterial roadways, rail and marine transportation. This data will form the baseline for comparison with the future “no-build” conditions and subsequent strategies, refinement, screening and evaluation. Data is included from traffic counts, studies such as the SR-14 Corridor Plan, and the Hood River Transportation System Plan.

Project Vicinity



Summary of Findings

The following is a brief summary of the key findings from the Baseline Conditions inventory.

Engineering

- No engineering analysis has been conducted that addresses the cost or problems associated with adding a sidewalk to the Hood River Bridge.
- A sidewalk study would need to examine such issues as wheelchair accessibility, bridge load strengthening, and modifications to the lift mechanisms to accommodate the additional load.
- The previous bridge inspections appear to be adequate. PB bridge engineers would suggest a more aggressive inspection schedule and process if they were responsible for the inspection on this bridge.
- Further communications with the Port of Hood River are ongoing regarding Bridge Inspection reports and maintenance repairs conducted to date to compile a more comprehensive understanding of the Bridge.

Navigation Issues

- The Hood River Bridge has a vertical clearance of 67 feet, which is an adequate height to allow most tugs to pass under without lifting the span.
- The horizontal clearance on the navigation channel is less than the 300 feet, which is recommended by the Corps of Engineers and the towboat operators.
- During high water, the passage of large vessels such as the stern-wheelers or cruise ship may require the bridge to be opened.
- The Hood River Bridge typically opens only once or twice a month.

Environmental Issues

- There are a number of threatened or endangered anadromous fish stocks that migrate through the bridge relocation study area. The National Marine Fisheries Service has designated all of the Columbia River shoreline within 300 feet of the water as Critical Habitat for these species.
- There are two designated access areas for Native American Fisheries in the bridge relocation area.
- Water quality in the area is generally good, but there are specific water quality issues in the Columbia, Hood and White Salmon Rivers.
- There are wetlands that would be directly impacted by proposed bridges in all of the corridors.
- There are a number of sensitive plants in the study area. They are primarily located at or near Stanley Rock or near the West Hood River Interchange.

Economic Issues

- The majority of the population and employment in the study is located on the Oregon side of the bridge.
- The Hood River Bridge carries a substantial amount of truck freight and it is used by a large number of consumers who are seeking retail options in Oregon.

Transportation Issues

- Most of the road system in the area of the Hood River Bridge has adequate capacity. However there are several identified highway capacity problems near the south end of the bridge.
- Identified current or near-term congestion locations include the Hood River Bridge access road at SR-14 (northbound-to-westbound left turn), the area between the toll booth and the four-way stop at the Port of Hood River and retail complex access road; and the left turns from each of the I-84 ramps.
- Two existing public transit systems provide basic local transit service to the area.
- The total number of bridge crossing on the Hood River Bridge was relatively stable from 1993 to 1998. This number increased somewhat in 1999.

Chapter 1 - Engineering and Bridge Inspections

Objective:

Obtain, review and comment on the following documents regarding the Hood River Bridge:

- October 1998 Underwater Inspection Report
- October 1997 Mechanical and Electrical Inspection Report
- July 1995 Load Rating
- April 1993 Routine and Fracture Critical Member Bridge Inspection Report (Including the Routine Inspection, Fracture Critical Inspection, and Underwater Inspection)
- HNTB conversation memos on other inspection materials.

Bridge Inspections:

The majority and a summary of the repair/maintenance recommendations are included in the April 1993 Inspection report. The recommendations made in the reports appear to be adequate and reasonable assuming that the field data was collected accurately, however there does not seem to be an aggressive approach to prolonging the service life of the structure. The recommendations are outlined in the Executive Summary portion of the reports, and are more specifically addressed in the Routine Bridge Inspection formwork, the Fracture Critical Inspection formwork and the underwater inspection formwork.

1. The 1998 and 1993 underwater inspection reports did not note or mention any issues with the bridge. These reports do document some localized scour effects but nothing that would be considered necessary for immediate repair, but should be monitored and a retrofit measure implemented if the problem persists.

2. The October 1997 Mechanical and Electrical Inspection Report does document and outline a programs for maintenance. No report documentation from the Port of Hood Rover documents if these repairs have been carried out, but conversation with HNTB engineering staff that prepared the reports indicated that all measures outlined for maintenance repair have been completed.

3. The July 1995 and 1993 Load Rating does document members in the bridge, which fall below a load-rating factor of 1 (below 1 is deficient). In 1996, the Port did contract with HNTB to prepare plans to repair the defective members and that work was subsequently completed in 1996. HNTB later in 1996 followed up with a supplemental load rating documenting that no bridge members have a Rating Factor below 1. This information was obtained in conversation with HNTB. Copies of these records have been requested from the Port of Hood River.

4. The April 1993 Routine and Fracture Critical Member Bridge Inspection Report (Including the Routine Inspection, Fracture Critical Inspection, and Underwater Inspection).

Fracture Critical Inspection Results (1993): The fracture critical inspection did document some stringers (load carrying bridge members, specifically stringers in spans 43, 54, S10, and S12) as have significant fatigue prone details, followed with the statement, “failure of stingers in spans 53, 54, S10, and S12 would allow the ends of these strings to drop down and carry the roadway with them which would undoubtedly cause a catastrophic hazard to the traveling public”. A recommendation was made by HNTB to install bracket supports at these stringers to support the stringers in the event of a stringer end connection failure. To our knowledge and HNTB’s no repair has been carried out to fix this situation. HNTB did note that the Port of Hood River has contacted them to begin plan preparation for replacement of the deck and that retrofits of the affected stringers would be included in that work. . Replacement of the deck should be completed within two years (winter of 2002).

Routine Inspections. The documentation obtained from the Port of Hood River only produced 1 routine inspection report. Follow up conversation with HNTB engineers have yielded routine inspection reports dating back to 1978. HNTB has indicated that they have carried out routine inspections since 1978 and specifically in the following years: 1978, 1979, 1980, 1981, 1982, 1984, 1985, 1987, 1989, 1991, and 1993. The inspection reports completed are at varies levels and some completed before there were established State and National inspection requirements and format. The latest inspection (1993) is by far the most comprehensive inspection done to date.

Summary Comments:

Although the report seems complete and thorough regarding the deficiencies noted during the inspection, typical inspection programs required by the Federal Highway Administration (FHWA) on State owned bridges or bridges requesting federal funds are as follows:

- Routine – every two years
- In-Depth - as required and determined by the owner, but most do it at a minimum of every four or five years
- Fracture Critical – every one to two years, depending on condition and local requirements
- Underwater - five years
- Mechanical/Electrical every two years
- Load rating – follows with In-Depth Inspections

The FHWA recommends these and the States are required to follow the guidelines to insure Federal funding. For typical highway structures the states typically have a Biennial Inspection program that is an in-depth inspection including hands on all fracture critical members every two years.

The inspection program for the Hood River Bridge is current in some aspects, underwater and mechanical & electrical, but out of date or sequence for routine, and fracture critical; which are the most common two for this type of bridge. The inspection reports do document and recommend maintenance repair of items found during those inspection, but it appears there is a lack of complete record keeping to track all inspections and or repair performed to the bridge.

The inspection requirements outlined above are National Bridge Inspection Standard recommendations that apply to State owned structures applying for Federal funding of bridgework. Many bridges that are owned and operated by Toll Authorities do not fully comply with the Federal recommendations and perform the minimum of inspections required to meet insurance or bond holder requirements, and as far as PB can tell there is no Federal Law requiring them to do more. State Law may require more thorough inspections on a State-by-State basis.

Regardless of legal requirements though, if there were to be an incident on a bridge that could have been avoided by inspections or by implementing repairs recommended as part of an inspection the owner would be in jeopardy since it is such common and widely used practice to perform Biennial Inspections. PB always makes it standard practice to include as part of our limited scope annual inspections for private bridge owners recommendations for more frequent inspections to be in compliance with FHWA standards as this is the national standard for the majority of bridges in the Untied States.

The Port of Hood River in general has hired a competent engineering company to assist them with the inspecting and recommending maintenance repairs to the bridge. The last detailed inspection and recommendation are now approaching 7 years of age, which by Federal and State standards is inadequate. PB would suggest that it is time for a full in-depth inspection to be carried out, setting up a baseline condition on which to institute a more consistent and proactive inspection, maintenance, and documentation process for the Hood River Bridge. This process will definitely be needed if some outcomes of this study are using Federal funds to finance short or long-term solution to the existing bridge.

Pedestrian Walkway Feasibility

Objective: Obtain and review all relevant studies the Port of Hood River produced regarding structural modification to the Hood River Bridge for adding pedestrian walkways.

Documents Obtained: Two documents were reviewed related to the addition of pedestrian walkways to the Hood River Bridge. They are:

1. Non-Structural Alternatives for Bicycle and Pedestrian Use of the Hood River Toll Bridge, HNTB May 10th, 1999. (Attached)
2. And 1-page fax cost proposal from HNTB's Tom Cassette to Port of Hood River, 1996. (Attached)

The first document is a concept planning alternative report, and does not meet the objective to review the structural aspects of adding a sidewalk to the bridge. Therefore no review was conducted.

The second document, (1 page fax cost proposal from HNTB) the following actions were taken:

1 Conversation between Doren Fix of the Port of Hood River and Larry Conrad of PBQD

Subject: SR35 HNTB Structural Design Report for adding a Pedestrian walkway to the Hood River Bridge

Doren indicated that back in June of 1996 the Port of Hood River had requested HNTB to prepare an estimate to add a pedestrian walkway to the upstream side of the Hood River Bridge. HNTB at the time was preparing widening plans for the north approach and sent a memo, which outlined an estimated conceptual cost for design and construction of the walkway. This is the only structural study done, and shortly afterwards the funding mechanism was lost and no further action was taken. Therefore the only item available for review and verification is the one page memo.

2 Conversation between Tom Cossette, HNTB and Mike Traffalis PBQD.

Subject: SR35 HNTB Structural Design Report for adding a Pedestrian walkway to the Hood River Bridge

Tom is the engineer who produced the memo Doren Fix had faxed to Larry Conrad, and he indicated that the construction cost is only based on square foot dollar amount for similar types of works and doesn't assess the need for strengthening or rehabilitating the existing bridge.

Conclusions:

There has not been a structural study for adding a walkway to the Hood River Bridge. If a study were to be carried out, not only will the study have to examine width, which side, ADA, uses, but also determine whether the existing bridge can be strengthened to support such a modification.

Chapter 2 - Navigation

Introduction

In the Columbia River Gorge National Scenic Area, three bridges span the Columbia River to connect Oregon and Washington:

- The Bridge of the Gods at Cascade Locks (RM 148);
- The Hood River - White Salmon (SR 35) Bridge at Hood River (RM 169.8); and
- The Dalles California Highway (I-197) Bridge at The Dalles (RM 191.4)

The small communities along the banks of the Columbia River in the Bonneville pool rely on the bridges as a vital transportation route. A local grassroots effort identified concerns regarding safety, bridge operation and maintenance issues on the Hood River Bridge, and the Southwest Washington Regional Transportation Council is conducting a feasibility study to address these concerns.

Any modification, upgrading or replacement of the bridge must consider existing and potential vessel traffic to ensure navigation is not impeded or safety compromised. The navigation baseline report addresses navigation issues by

- Describing the existing Hood River Bridge and navigation channel condition;
- Identifying vessel characteristics, traffic, and any problems transiting through the existing bridge; and
- Estimating the potential future vessel requirements.

Current authorizations

SR 35 Hood River Bridge

Built in 1924, the Hood River Bridge connects the communities of Hood River in Oregon with Bingen and White Salmon in Washington. Operated as a toll bridge by the Port of Hood River, the steel bridge is 4,418 feet long with 20 piers used to span the Columbia River.

In 1937, following construction of Bonneville Dam, a vertical lift span was added to the bridge to accommodate the increased vessel traffic allowed by the creation of the Bonneville pool. The bridge’s lift span is located between piers 8 and 9, near the center of the bridge. The horizontal clearance at the lift span is 246 feet, which is narrower than the navigation channel. The bridge has vertical clearances of 148 feet in the fully open position and 67 feet when closed, relative to the normal Bonneville pool elevation of 73.0 feet Mean Sea Level (MSL).

Navigation Channel

The Congressionally authorized navigation channel on the Columbia River above Vancouver is designed to accommodate shallow draft vessels and facilitate barge shipments on the Columbia-Snake River system. The 84.5-mile segment of the channel between Vancouver, Washington and The Dalles Dam (RM 191.4) was first authorized in 1937, spurred by navigation opportunities provided by the Bonneville pool. Channel dimensions are authorized to provide a 300-foot wide by 27-foot deep channel. The U.S. Army Corps of Engineers currently maintains the channel to a depth of 17 feet.

Vessel traffic

Commercial Vessels

Commercial traffic through the Vancouver-The Dalles reach includes tugs and barges for commodity movements in addition to cruise ships. Cargo shipments are generally down bound movements of agricultural products to Lower Columbia River deep draft ports for export and up bound movements of petroleum, fertilizers and chemicals for consumption in the hinterland. Three to four tons of cargo move downstream for each cargo ton moved upstream.

Several barge lines, including Foss Maritime, Shaver Transportation, Bernert Barge Lines and Tidewater Barge Lines, operate tugs and barges on the Columbia-Snake system and pass the Hood River Bridge. Barge lines typically use one tug to move multiple barges with the combination of vessels termed a barge configuration. Columbia-Snake River configurations are somewhat restrained by the size of the dam locks on the system although a new lock at Bonneville Dam removed the largest system constraint in 1993. System locks are 86 feet wide and range between 650 feet and 675 feet in length. U.S. statistics for 1999 show that the average tow size through all the locks on the Columbia River is three barges.[1]

Cruise and tourist vessel traffic through Hood River includes sternwheelers and cruise ships, and is more seasonal than barge traffic. During the fall and spring, small cruise ships from Alaska work the Columbia-Snake system with daily bridge crossings varying between one and three. In addition, two large sternwheelers, the *Queen of the West* and the *Columbia Queen,* travel the reach on a year-round basis, currently combining for four bridge crossings weekly.

Origin-Destination Patterns

Upriver Cargo Movements

Generally loaded in the Portland-Vancouver area, up bound cargoes are primarily petroleum products with other cargoes including chemicals, empty containers, manufactured equipment and goods, waste and scrap material, and radioactive materials. Petroleum products move upriver to Umatilla, Pasco and Lewiston. In addition, the U.S. Navy typically moves four to eight barges of radioactive material annually from Bremerton to Hanford.

Up bound cargo tonnage moving through the Vancouver-The Dalles reach is summarized below.

Up bound Cargo Tonnage (million tons): 1980 - 1998[2]

[1] U.S. Army Corps of Engineers, Water Resources Support Center, Alexandria, VA, 5/31/00

[2] U.S. Army Corps of Engineers, Waterborne Commerce Statistics, Part 4

	1980	1985	1990	1995	1998
Total Tons:	3.5	2.1	2.1	3.3	2.4

Downriver Cargo Movements

Barge cargo moving downriver to Lower Columbia River ports is predominantly grain. Additional commodities include wood chips, chemicals, pulp and paper products, aggregate and manufactured equipment and goods. Grain is loaded from elevators located between The Dalles and Lewiston. Wood chips move out of shallow draft facilities at Boardman and Lewiston. Empty petroleum barges move downstream after unloading at Umatilla, Pasco and Lewiston while full containers return to the Portland Harbor from Boardman, Umatilla, Pasco and Lewiston. Gravel and aggregate barges are loaded at The Dalles, Umatilla and Wishram.

Down bound tonnage moving through the Vancouver-The Dalles reach is summarized below.

Down bound Cargo Tonnage (million tons): 1980 - 1998[3]

	1980	1985	1990	1995	1998
Total Tons:	7.2	6.2	7.6	8.3	7.5

Clearance Requirements

Columbia-Snake system barge widths typically measure 42 feet with doublewides at 84 feet. Individual barge lengths vary between 150 feet and 300 feet. However, lock sizes limit tow configurations to a total length of 650 feet if the dam is to be transited without breaking the tow. Fully loaded barges on the Columbia River system generally draw 13.5 feet, compared to nine-foot drafts on the Mississippi and Ohio River systems.

A tow's vertical clearance is usually dictated by the tug size rather than barge size. Today's "tower" tugs extend +55 feet above the waterline although tug heights can usually be reduced to below 50 feet by lowering the masts. The railroad bridge that crosses the Snake River just downstream of Tucannon River (Snake River Mile 61.5) has a limiting vertical clearance of 52 feet with no lift capacity. In comparison, the Hood River Bridge has 67 feet of vertical clearance when closed which has not been a problem for existing barge traffic.

During high water events, the larger cruise ships, such as the *Queen of the West* and the *Columbia Queen*, may require the bridge to open. With the stacks and masts up, the air draft of the *Queen of the West* is 61 feet with the *Columbia Queen* reaching 70 feet. To avoid opening the bridge, both vessels can lay back their stacks and masts when the water is high in order to clear the Hood River Bridge when only 55 feet of vertical clearance is available. However, one drawback to the cruise ships laying back stacks and masts is that the mast-mounted radar becomes inoperable. During fog or inclement weather, the loss of radar creates a hazard for a vessel.

[3] U.S. Army Corps of Engineers, Waterborne Commerce Statistics, Part 4

Trip Frequency

Statistics on commercial traffic on U.S. waterways are compiled annually by the U.S. Army Corps of Engineers in conjunction with the Department of Commerce. Historic data are available for the Vancouver-The Dalles reach and are summarized below.

Vessel Trips through Vancouver-The Dalles Reach[4]

	1980	1985	1990	1995	1998
Up bound:	7,498	5,754	5,234	2,555	1,920
Down bound:	7,307	5,754	5,174	2,556	1,814
Avg. Daily:	41	32	28	14	10

The above numbers reflect motorized commercial vessels only and do not include barges. However, Commerce Statistics and previously referenced sources confirm that tows through the reach average three barges to one tugboat.

Statistics indicate that there has been a decrease in the number of vessel trips through the reach in the 1990s. Cargo tonnage has increased, however, during the same period. Vessel trip decline may be due to changes in reporting methods or opening of the new lock at Bonneville. When the cause of the decline is identified, this report will be revised as necessary.

Recreational Vessels

Recreational traffic in the vicinity of the Hood River Bridge includes a wide variety of interests such as windsurfers, kite boarders, fishing, sailing, and recreational cruising.

Origin-Destination Patterns

Fishing vessels, windsurfers and kite boarders typically launch on the Oregon side at the Port Marine Sailpark at River Mile 169, just downstream of the Hood River Bridge. Windsurfers tend to stay in the vicinity of the marina and do not roam up or downriver. Fishing vessels have a wider range, moving both upstream and downstream of the marina. A new sport, kite boarding, is expected to have a similar or wider range than that of windsurfing.

Recreational launch facilities on the Washington side are located at Bingen (mile 172) and Drano Lake (mile 162), both of which are several miles from the bridge.

Clearance Requirements

Most sailboats have masts extending 40 to 45 feet above the water's surface. However, larger sailboats and racing boats may have masts between 65 feet and 100 feet. These vessels currently require lifting of the bridge to traverse under SR 35.

Trip Frequency

In December 1999, the Oregon State Marine Board released its triennial report summarizing boating statistics for the state. The closest specified launch site to the Hood River Bridge is the Port of Cascade Locks, which recorded an average of 259

[4] U.S. Army Corps of Engineers, Waterborne Commerce Statistics, Part 4

vessel trips from October 1997 to September 1998. An additional 246 vessel trips were reported in Hood River County for the Columbia River with a launch site not specified. Activities reported to the Marine Board indicated that the vessels launched from the Port of Cascade Locks were predominantly sailing while the generic Hood River County launches were strongly oriented towards fishing.

Bridge Openings

Based on discussions with Port of Hood River personnel, the bridge only opens once or twice a month. The general barge traffic and cruise lines do not typically require the bridge to open. Examples of conditions that require opening of the lift span include high water in the Bonneville pool, barges carrying cranes or heavy equipment, and high-masted sailboats. Since the bridge crosses a navigation channel, the U.S. Coast Guard requires the bridge to be raised monthly as a maintenance check.

Most of the bridge lifts are not concentrated in a specific season but rather relate to the level of the Bonneville pool. One exception involves barges transporting cranes and heavy equipment for in-water work moving around the in-water fishery work window of November to February. During high water periods, the Port of Hood River raises the bridge for vessels that typically do not require the service. High water events on the Bonneville pool can reach 86.7 MSL, which reduces the bridge's vertical clearance to 54 feet (closed) and 135 feet (fully open).[5]

Navigation difficulties

Commercial Vessels

Tow configurations currently experience problems with the existing Hood River Bridge and navigation channel. The navigation channel and bridge opening are not lined up with the westerly winds, forcing the barges to tack through the bridge. The westerly winds in the area of the bridge blow at an angle from the Oregon bank to the center of the bridges lift span. To compensate for the westerlies blowing empty barges sideways, the barges set a course at an angle to the Oregon bank and tack to the navigation channel at the bridge. Compounding the problem is the bridge opening, at 246 feet wide, being narrower than the navigation channel (300 feet). Over the past seven years, the Port of Hood River recalled two or three barges that have scraped through the bridge opening but not caused any significant damage.

Commercial vessels did not report any problems regarding time delays or traffic congestion since the reaches upstream and downstream of the bridge are straight and allow vessels to safely pass.

Recreational Vessels

Recreational vessel traffic did not report any navigation difficulties with the bridge. The possibility of conflicts between the recreational and commercial vessel traffic was mentioned as barges currently dodge windsurfers and small recreational vessels that are in the navigation channel.

[5] Datum for the channel is the Bonneville Pool Elevation, 70.0 feet above Mean Sea Level (MSL).

Future vessel trends

Commercial Vessels

Expansion of the Bonneville Lock in 1993 occurred after an extensive study and authorization process. The new lock accommodates the standard Columbia River double tow width of 84 feet. It is unlikely that tug and/or barge sizes will increase in the near to medium term as any increase in width would require a substantial capital investment to retrofit system locks. There does not appear to be a market trend toward larger vessels or increased capacity. Additionally, the Endangered Species listings in Pacific Northwest waterways have made any commercial activity suspect. Commercial operators would like to increase the number of barge trips in the future but realistically foresee the volume of vessel trips as stable.

The expectation among operators and tourism elements is that the number of cruise ships through the reach will be increasing over the next few years. As American West Steamboat Company is currently operating at 100% capacity; they are bringing a new large (360 foot LOA) vessel into service in 2001. In addition, a contributing factor to the expansion of cruise ships is the upcoming two-year bicentennial celebration of the Lewis & Clark Expedition. Demand is anticipated to increase as people have shown interest in retracing the expedition's route.

Recreational Vessels

No changes to recreational vessel size are anticipated that would affect bridge navigability. There could be a decrease in recreational vessel trips if fishing restrictions are increased. The larger recreational issue is the conflict between commercial traffic and sailboarders, windsurfers and kite boarders. The prevalence of these activities on the river almost year-around is a reason to minimize other potential navigational conflicts associated with the Hood River Bridge.

Design Guidance

The U.S. Army Corps of Engineers provides design guidance for shallow draft navigation channels.[6] Guidance varies depending on whether the channel is in a straight reach, one with bends, through a bridge or abutment, and whether traffic is two way or one-way. The existing Hood River Bridge is located in a straight stretch of the river. The Corps recommends the following minimum widths for various tow configurations in straight reaches.

[6] U.S. Army Corps of Engineers, *Layout and Design of Shallow Draft Waterways,* 1982

	Channel Width, Feet	
Tow Width, Feet	Two-Way Traffic	One-Way Traffic
105	300	185
70	230	150
50	190	130

Corps guidance further states that the minimum channel width should provide for the width occupied by the tow, clearance between the tow and channel limits, and clearance between tows for two-way traffic. It suggests that reasonable limits for two-way traffic in straight river stretches is 20 feet between tow and channel limits, and at least 50 feet between tows when passing. However, Corps guidance also indicates that navigation channels through bridges should be somewhat larger than the designed width of the channel, depending on variables such as bridge approach, winds and currents. Applying the Corps' "reasonable limits" formula results in a 258 feet horizontal clearance as shown below:

20' clearance + 84' tow + 50' between tows + 84' tow + 20' clearance = 258'

However, applying Corps guidance for under bridge clearances would result in a minimum horizontal clearance of 300 feet, matching the navigation channel width.

Vertical clearances at the Hood River Bridge have not impaired navigation in any meaningful way. Bridge openings occur approximately twice a month, either during high water periods or for maintenance checks mandated by the U.S. Coast Guard. Through discussions with the U.S. Coast Guard, a new fixed bridge across the Columbia River would need to provide a vertical clearance on the order of 80 feet.

Summary

Historic commercial traffic through the Hood River Bridge has not encountered safety hazards resulting in loss of life or severe damage. However, modification or replacement of the bridge presents opportunities to improve conditions affecting navigation and thereby prepare for future growth in commercial and recreational traffic on the system. Three design elements are primary:

- The navigation channel under the bridge should have horizontal clearance equal to or greater than the navigation channel (300 feet).
- Channel alignment should allow tugs and barges to be aligned with the westerly winds that now hit on the diagonal and cause control problems, especially for tows with empty barges.
- Existing vertical clearances enjoy the flexibility of a lift span. A new or modified fixed bridge will have to conform to the vertical clearance requirements of the U.S. Coast Guard.

Design proposals should be reviewed by commercial river users to ensure that their navigability issues are addressed. These discussions should be preliminary to the U.S. Coast Guard permitting process.

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Chapter 3 - Hydraulic and Hydrologic Conditions

Introduction

The Columbia River near the SR-35 Bridge, Columbia River Mile 169.6, is heavily regulated by federal dams upstream and downstream. The dams upstream of the project modify the flow in the river; decreasing the natural flow during flood events by holding back water and increasing the natural flow during drought events by releasing additional water. The dam downstream of the project site, Bonneville Dam at River Mile 145.1, modifies the stage of river at the SR-35 Bridge by controlling the volume of water released through the dam and subsequently controlling the elevation of the river upstream of the dam.

The forebay or pool elevation of Bonneville Dam is the level of water upstream or behind the dam. The forebay can fluctuate from the minimum operating pool elevation of 70.0 feet, NGVD to the maximum operation pool elevation of 82.5 feet, NGVD. The normal pool elevation is 73.0 feet, NGVD and the full pool elevation is 77.0 feet, NGVD.

Floodplain Information

The floodplain of the Columbia River near the SR-35 Bridge is designated as Zone A (approximate). The 100-year floodplain is identified, but base flood elevations and flood hazard factors are not determined. Unofficial flood profile elevations and flows were obtained, however, from the Floodplain Management Section of the Portland District, U.S. Army Corps of Engineers, and are given in Table 1.

Table 1. Flood Levels and Discharges

SR-35 Bridge, Columbia River Mile 169.6

Recurrence Interval (years)	**Discharge (cfs)**	**Water Surface Elevation (feet, NGVD)**
2	360,000	81
10	515,000	85
50	635,000	88
100	680,000	89
500	800,000	92

Note: Water surface elevations based on Bonneville Dam full pool elevation of 77.0 feet, NGVD

If work is performed within the 100-year floodplain, potential flood rise issues must be evaluated. A floodway is not designated on the Columbia River near the SR-35 Bridge therefore a "no-rise" certification will not be necessary. According to FEMA Region X, FEMA does not have specific guidelines in the Code of Federal Regulations limiting flood rise in floodplains designated as Zone A. FEMA does have an agreement with

Federal Highways Administration that any new structure within the floodplain must cause less than one foot of rise in the base flood elevation.

The flood rise caused by the proposed structure could be calculated by creating an existing condition model, defining the base flood elevation and creating a proposed condition model, incorporating the new structure and predicting the new base flood elevation. The models would be used to verify that the new structure would not produce more than a one-foot rise in the base flood elevation. The two models should be adequate to satisfy all federal criteria concerning flood rise. Based on our professional judgment, it is not anticipated that a proposed bridge would cause a one-foot rise in the base flood elevation, assuming similar quantity and size of pilings, footings, etc. compared to the existing structure.

Bridge Scour

An existing, one-dimensional hydraulic model was obtained from the U.S. Army Corps of Engineers. Preliminary model runs estimate the average cross sectional velocity for the 100 and 500 year events to be approximately four and five feet per second, respectively.

In October 1998, underwater divers evaluated the condition of the piers of the existing SR-35 Bridge. The divers report stated that the underwater condition of the structure was good, with the exception of piers 13 and 14. Recent scour has occurred at piers 13 and 14, located just north of the navigation channel piers. It appears that pier 13 is in the deepest part of the river, approximately 60 feet deep.

Piers 13 and 14 are on the northern portion of the river, which is on the outside of a large bend in the river. At this location it is likely that the velocity of the northern portion of the cross section is greater than the velocity of the southern portion of the cross section, due to momentum caused by the bend in the river. Proposed piers near this location may be prone to greater scour than piers on the south side of the river, requiring additional armor or modified designs. The river is a dynamic system and over time the deepest part of the channel may migrate from one side of the river to the other.

Hydrographic surveys of the Columbia River near the project site were obtained from in-house files and the U.S. Army Corps of Engineers. Surveys were obtained from May 3, 1978, April 26, 1983, and August 30, 1990. The surveys show an overall trend of scour in the reach of Columbia River near the SR-35 Bridge downstream to River Mile 169.

Average depth was computed in three portions of the river; the navigation channel, south of the channel, and north of the channel from approximately River Mile 169 to 169.6, the SR-35 Bridge. The computed average depth values and average scour values between surveys are provided in Table 2.

Table 2. Columbia River: Computed Average Depth

River Mile 169 to 169.6

Date	**South of Channel**	**Navigation Channel**	**North of Channel**
	Average Depth (feet below 70 feet, NGVD)		
May 1978	32.9	38.7	41.9
April 1983	33.8	41.5	45.9
August 1990	34.9	42.3	47.3
	Average Scour (feet)		
1978 to 1983	0.9	2.8	4.0
1983 to 1990	1.1	0.8	1.4
1978 to 1990	2.0	3.5	5.4

Conclusion

The SR-35 Bridge is located at Columbia River Mile 169.6, within the backwater of Bonneville Dam. The unofficial 500-year flow and water surface elevation are 800,000 cfs and 92 feet, NGVD respectively. The 500-year average cross section velocity is approximately 5 feet per second.

An underwater divers report from October 1998 revealed that the two piers north of the navigation channel were actively scouring. Hydrographic surveys from 1978, 1983, and 1990 showed an overall trend of scour in the Columbia River from the project site at River Mile 169.6 to River Mile 169.0.

Based on the data gathered to date it appears that a hydraulic analysis will be necessary to evaluate flood rise and potential scour. A detailed hydraulic model will be necessary to quantify if there would be a rise in the base flood elevations and if there is, to ensure that rise is less than one foot. A potential scour analysis will also be necessary to quantify the maximum theoretical scour required to design the bridge piers.

The information presented in this letter is based on existing regulation of the Columbia River system's dams and reservoirs. If the regulation policies and practices of the reservoirs affecting the project site are significantly modified, it may effect the conclusions in this letter and warrant additional investigation. For example, lower reservoir levels for potential fish enhancement could increase velocities significantly and consequently increase potential scour.

Chapter 4 –Environmental Conditions

Environmental Memorandum

FISH

A. Listed Fish Species

The Middle Columbia River in the vicinity of the Hood River Bridge relocation area is used by anadromous salmon, steelhead, and sea-run cutthroat trout primarily as a migratory route between spawning areas and the Pacific Ocean.

Based on a review of NMFS Evolutionarily Significant Unit[7] (ESU) coverage maps, the following listed species are anticipated to be present:

- Lower Columbia River (LCR) steelhead (T);
- Middle Columbia steelhead (T);
- LCR/Southwest Washington Coho (C);
- LCR Chinook (T);
- Upper Columbia River (UCR) spring Chinook (E);
- UCR steelhead (E);
- Snake River Fall-run Chinook (T);
- Snake River Spring/Summer run Chinook (T); and
- Snake River Basin steelhead (T).

The National Marine Fisheries Service has designated all of the Columbia River shoreline as Critical Habitat (CH) for these species from the normal high water elevation to 300 feet landward. In addition, the following Middle Columbia River fish species have been listed by USFWS pursuant to the ESA:

- Bull trout; and
- Columbia River cutthroat trout.

A brief synopsis of the listed species that are relevant to the proposed project alignments is provided below:

Lower Columbia River Steelhead
LCR steelhead (*Oncorhyncus mykiss*) was listed as threatened under the Endangered Species Act on March 19, 1998 (63 FR 13347) (NMFS, 1998c). Protected fish include all naturally spawned populations of steelhead (and their progeny) residing below naturally occurring and man-made impassable barriers. To date, NMFS has listed only anadromous forms of the species. The Lower Columbia River ESU is composed of both winter-run and summer-run steelhead.

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[7] To be considered an ESU, a population must satisfy two criteria: 1) it must be reproductively isolated from other population units of the same species; and 2) it must represent an important component in the evolutionary legacy of the biological species (NMFS, 1998c).

The LCR river steelhead occupies tributaries to the Columbia River between the Cowlitz and Wind Rivers in Washington (inclusive), and the Willamette and Hood Rivers in Oregon (inclusive) (NMFS, 1998c). This area would include the West Hood River Interchange alignment, the low corridor crossing alignment, and the high corridor crossing alignment on the Oregon side and none of the crossing options on the Washington side.

Critical habitat is designated to include all river reaches accessible to Lower Columbia River steelhead within the range of the ESU, except for reaches on Indian Reservations (NMFS, 1999a). Where designated, critical habitat consists of the water, substrate, and adjacent riparian zone. NMFS defines the adjacent riparian zone as those "areas that provide the following functions: shade, sediment transport, nutrient or chemical regulation, stream bank stability, and input of large woody debris or organic matter" (NMFS, 2000).

Middle Columbia Steelhead

Middle Columbia River steelhead (*Oncorhyncus mykiss*) was listed as threatened under the Endangered Species Act on March 25, 1999 (64 FR 14517) (NMFS, 1999c). The ESU includes all naturally spawned populations of steelhead in streams above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington. This area would include the high corridor and the Stanley Rock possible crossing sites on the Oregon side and all the possible crossing sites on the Washington side.

Critical habitat is designated to include all river reaches accessible to listed steelhead within the range of the ESU, between Mosier Creek in Oregon and the Yakima River in Washington (inclusive), except for reaches on Indian Reservations (NMFS, 1999a). Where designated, critical habitat consists of the water, substrate, and adjacent riparian zone. NMFS defines the adjacent riparian zone as those "areas that provide the following functions: shade, sediment transport, nutrient or chemical regulation, stream bank stability, and input of large woody debris or organic matter" (NMFS, 2000).

Lower Columbia/Southwest Washington Coho

The Columbia River Coho salmon (*Oncorhynchus kisutch*) is a candidate species for future listing as threatened or endangered. NMFS added the Lower Columbia River ESU Coho salmon to the Candidate Species List on July 14, 1997 (62 FR 37562) (NMFS, 1997). The addition of Lower Columbia River Coho salmon to the list serves to notify the public that NMFS has concerns regarding the species and population that may warrant listing in the future. The ESU includes all naturally spawned populations of Coho salmon from Columbia River tributaries below the Klickitat River on the Washington side and below the Deschutes River on the Oregon side. This area would encompass all project crossing sites on both sides of the Columbia River.

Lower Columbia River Chinook

LCR Chinook salmon (*Oncorhyncus tshawytscha*) were listed as threatened under the Endangered Species Act on March 24, 1999 (64 FR 14308) (NMFS, 1999c). The Lower Columbia ESU includes all native populations from the mouth of the Columbia River to the crest of the Cascade Range. In the Columbia River, this ESU is bounded on the east by Celilo Falls, which may have historically presented a migrational barrier to Chinook salmon during certain times of the year. "Tule" fall Chinook salmon in the Wind and Little White Salmon Rivers are included in this ESU, but not introduced "upriver bright" fall-Chinook salmon populations in the Wind, White Salmon, and Klickitat Rivers.

The fall-run is predominant in the Lower Columbia River region (Myers et al., 1998). Fall-run fish in this region are often called "tules" and are distinguished by their dark skin color and advanced state of maturation upon entering freshwater. Tule fall-run Chinook salmon may have historically spawned in the Lower Columbia River ESU from the mouth of the Columbia River to the Klickitat River (RKm 290). This area would encompass all proposed project-crossing sites on both sides of the Columbia River.

Critical habitat for Lower Columbia River Chinook salmon is designated to include "all river reaches accessible to Chinook salmon in Columbia River tributaries between the Grays and White Salmon Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive" (NMFS, 1998a). Furthermore, critical habitat consists of the water, substrate, and adjacent riparian zone. NMFS defines the adjacent riparian zone as those "areas that provide the following functions: shade, sediment transport, nutrient or chemical regulation, stream bank stability, and input of large woody debris or organic matter" (NMFS, 2000).

Upper Columbia River spring-run Chinook

UCR Chinook was listed as an endangered species on March 24, 1999 (64 FR 14308) (NMFS, 1999c). The ESU includes all naturally spawned populations of Chinook salmon in all river reaches accessible to Chinook in Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington.

Critical habitat includes the areas mentioned above including adjacent riparian zones, as well as reaches and estuarine areas from a straight line connecting the west end of the Clatsop jetty (Oregon side) and the west end of the Peacock jetty (Washington side) upstream to Chief Joseph Dam. Excluded are tribal lands and areas above specific dams or above longstanding, natural barriers (i.e., natural waterfalls in existence for at least several hundred years). All of Hood River, Skamania, and Klickitat Counties lie within these designated areas.

Upper Columbia River steelhead

UCR steelhead was listed as an endangered species on August 18, 1997 (62 FR 43937) (NMFS 1997). The ESU includes all naturally spawned populations of steelhead (and their progeny) in streams of the Columbia River Basin upstream from the Yakima River, Washington, to the U.S. – Canada border.

Critical habitat includes all river reaches accessible to listed steelhead in the Columbia River tributaries upstream of the Yakima River, Washington, and downstream of Chief Joseph Dam in Washington. Also included are adjacent riparian zones, as well as reaches and estuarine areas from a straight line connecting the west end of the Clatsop jetty (Oregon side) and the west end of the Peacock jetty (Washington side) upstream to Chief Joseph Dam. Excluded are tribal lands and areas above specific dams or above longstanding, natural barriers (i.e., natural waterfalls in existence for at least several hundred years). All of Hood River, Skamania, and Klickitat Counties lie within these designated areas.

Snake River Fall-run Chinook

Snake River Fall-run Chinook were listed as a threatened species on April 22, 1992 (57 FR 14653) (NMFS 1992). The ESU includes all natural populations of fall-run Chinook in the mainstem Snake River and selected sub basins.

Critical habitat is designated to include the Snake River and selected river reaches accessible to listed Chinook in the Snake River. Also included are river reaches and estuarine areas accessible from a straight line connecting the west end of the Clatsop jetty (Oregon side) to the west end of the Peacock jetty (Washington side) upstream including all river reaches to the confluence of the Columbia and Snake Rivers. All of Hood River, Skamania, and Klickitat Counties lie within these designated areas.

Snake River Spring/Summer- run Chinook

Snake River Spring/Summer Chinook were listed as a threatened species on April 22, 1992 (57 FR 14653) (NMFS 1992). The ESU includes all natural populations spring/summer run Chinook in the mainstem Snake River and selected sub basins.

Critical Habitat is designated to include the Snake River and selected river reaches accessible to listed Chinook in the Snake River. Also included are accessible river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (Oregon side) to the west end of the Peacock jetty (Washington side) upstream to the confluence of the Columbia and Snake Rivers. All of Hood River, Skamania, and Klickitat Counties lie within these designated areas.

Snake River Basin steelhead

Snake River Basin steelhead were listed as threatened on August 18, 1997 (62 FR 43937) (NMFS 1997). The ESU includes all naturally spawned populations (and their progeny) in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho.

Critical Habitat is designated to include all river reaches accessible to listed steelhead in the Snake River and its tributaries in Oregon, Washington, and Idaho. Also included are adjacent riparian zones, river reaches, and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (Oregon side) to the west end of the Peacock jetty (Washington side) upstream to the confluence of the Columbia and Snake Rivers. Hood River, Skamania, and Klickitat Counties lie within these designated areas.

Cutthroat

Southwestern Washington/Columbia River coastal cutthroat trout (*Oncorhynchus clarki clarki*) were proposed for listing as threatened under the Endangered Species Act on April 5, 1999 (64 FR 16397) (NMFS, 1999d). This ESU includes all life history forms (non-migratory, freshwater migratory, and saltwater migratory) exhibited by coastal cutthroat trout (NMFS, 1999). The Southwestern Washington/Columbia River ESU includes coastal cutthroat trout in the Columbia River and its tributaries downstream from the Klickitat River in Washington and Fifteenmile Creek in Oregon (inclusive). This area would encompass all proposed project-crossing sites on both sides of the Columbia River.

Bull Trout

Bull trout (*Salvelinus confluentus*) were conterminously listed as threatened under the Endangered Species Act on November 11, 1999 (64 FR 58909) (USFW, 1999).

Bull trout are resident fishes that may occur near the project site on the Columbia including the White Salmon and Hood River; therefore, this area would encompass all proposed project-crossing sites on both sides of the Columbia River.

1. West Hood River Interchange Alignment Alternative

The following listed species either have ESU's that are located within the West Hood River Interchange alignment or pass through the alignment option at some point during their life cycle.

Oregon Side:

- Lower Columbia River (LCR) steelhead (T);
- LCR/Southwest Washington Coho (C);
- LCR Chinook (T);
- Upper Columbia River (UCL) spring Chinook (E);
- UCL steelhead (E);
- Snake River Fall-run Chinook (T);
- Snake River Spring/Summer run Chinook (T);
- Snake River Basin steelhead (T);
- Bull trout; and
- Columbia River cutthroat trout.

Washington Side:

- Middle Columbia steelhead (T);
- LCR/Southwest Washington Coho (C);
- LCR Chinook (T);
- Upper Columbia River (UCL) spring Chinook (E);
- UCL steelhead (E);
- Snake River Fall-run Chinook (T);
- Snake River Spring/Summer run Chinook (T);
- Snake River Basin steelhead (T);
- Bull trout; and
- Columbia River cutthroat trout.

2. Low Corridor Alignment Alternative

The following listed species either have ESU's that are located within the low corridor alignment alternative or pass through the alignment option at some point during their life cycle.

Oregon Side:

- Middle Columbia steelhead (T);
- LCR/Southwest Washington Coho (C);
- LCR Chinook (T);
- Upper Columbia River (UCL) spring Chinook (E);
- UCL steelhead (E);
- Snake River Fall-run Chinook (T);
- Snake River Spring/Summer run Chinook (T);
- Snake River Basin steelhead (T);
- Bull trout; and
- Columbia River cutthroat trout.

Washington Side:

- Middle Columbia steelhead (T);
- LCR/Southwest Washington Coho (C);
- LCR Chinook (T);
- Upper Columbia River (UCL) spring Chinook (E);
- UCL steelhead (E);
- Snake River Fall-run Chinook (T);
- Snake River Spring/Summer run Chinook (T);
- Snake River Basin steelhead (T);
- Bull trout; and
- Columbia River cutthroat trout.

3. High Corridor Alignment Alternative

The following listed species either have ESU's that are located within the high corridor alignment alternative or pass through the alignment option at some point during their life cycle.

Oregon Side:

- Lower Columbia River (LCR) steelhead (T);
- Middle Columbia steelhead (T);
- LCR/Southwest Washington Coho (C);
- LCR Chinook (T);
- Upper Columbia River (UCL) spring Chinook (E);
- UCL steelhead (E);
- Snake River Fall-run Chinook (T);
- Snake River Spring/Summer run Chinook (T);
- Snake River Basin steelhead (T);
- Bull trout; and
- Columbia River cutthroat trout.

Washington Side:

- Middle Columbia steelhead (T);
- LCR/Southwest Washington Coho (C);

- LCR Chinook (T);
- Upper Columbia River (UCL) spring Chinook (E);
- UCL steelhead (E);
- Snake River Fall-run Chinook (T);
- Snake River Spring/Summer run Chinook (T);
- Snake River Basin steelhead (T);
- Bull trout; and
- Columbia River cutthroat trout.

4. Stanley Rock Alignment Alternative

The following listed species either have ESU's that are located within the Stanley Rock alignment alternative or pass through the alignment option at some point during their life cycle.

Oregon Side:

- Middle Columbia steelhead (T);
- LCR/Southwest Washington Coho (C);
- LCR Chinook (T);
- Upper Columbia River (UCL) spring Chinook (E);
- UCL steelhead (E);
- Snake River Fall-run Chinook (T);
- Snake River Spring/Summer run Chinook (T);
- Snake River Basin steelhead (T);
- Bull trout; and
- Columbia River cutthroat trout.

Washington Side:

- Middle Columbia steelhead (T);
- LCR/Southwest Washington Coho (C);
- LCR Chinook (T);
- Upper Columbia River (UCL) spring Chinook (E);
- UCL steelhead (E);
- Snake River Fall-run Chinook (T);
- Snake River Spring/Summer run Chinook (T);
- Snake River Basin steelhead (T);
- Bull trout; and
- Columbia River cutthroat trout.

B. Non-Listed Fish Species

Other resident fish that may occur in the Columbia River (including the White Salmon and Hood River) within the project area include:

- Trout's and whitefishes (*Salmonidae* spp);
- Minnows (*Cyprinidae* spp.);
- Suckers (*Catostomidae* spp);

- Sunfishes (*Centrarchidae* spp);
- Sculpins (*Cottidae* spp); and
- Catfishes (*Ictaluridae* spp).

Resident fish that may occur within the project area but are limited to the main stem Columbia include:

- White sturgeon (*Acipenseridae transmontanus*);
- Northern pike (*Esox lucius*); and
- Perches (*Percidae* spp).

C. Native American Fisheries

Two designated access areas for Native American Fisheries exist within the proposed project area. On the eastern side of Stanley Rock (Oregon side) the U.S. Government, Department of the Interior, has an area that is fenced and clearly marked as tribal fishing land. On the Washington side, near the low corridor crossing option, is an area that is not fenced, but marked as a designated area by the U.S. Army Corps of Engineers.

D. Fish Hatcheries

Spring Creek National Fish Hatchery, established in 1901, is located 4 miles west of the Hood River/White Salmon Bridge on State Highway 14. This is in the vicinity of the

West Hood River Interchange option site. The hatchery raises more than 15 million tule fall Chinook salmon annually with the adults returning to the hatchery, via the Columbia River, in September. The returning adults are spawned in mid- to late September.

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WILDLIFE

The project vicinity encompasses five sites on each side of the Columbia River near Hood River, Oregon and White Salmon, Washington. Approximately four miles separate the easternmost and westernmost potential sites. Several different wildlife habitats are present in this area and several species of concern may be found in the vicinity.

Entranco has contacted the Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, National Marine Fisheries Service, Oregon Natural Heritage Program (ONHP), and the U.S. Fish and Wildlife Service in order to obtain information on species presence. At this time, NMFS has replied with a statement that the agency does not provide individual responses to species presence requests. Information on anadromous fish species of concern was gathered from other sources, including the NMFS web site. Information of sensitive plant and wildlife species was obtained from ONHP; this data is included in the appropriate sections for each alignment alternative. No other agencies have responded to species requests. Information for other species was obtained through published material, GIS coverage maps produced by WDFW and the State of Oregon, and knowledge of the vicinity by Entranco personnel. No species surveys were conducted, although an inventory of habitats within the study area was completed. Suspected presence or absence of wildlife species is based on this information.

The project vicinity is located between River Mile 167 and 171 on the eastern extent of the Columbia Gorge. It is considered to be on the edge of both the Columbia Gorge and Columbia Plateau ecotypes. As such, it is likely to contain species associated with both types.

Several wildlife habitats are present in the vicinity. Entranco utilized existing mapping at 1:100,000 scale from wildlife-habitat mapping (NWHI, 1999a) along with field review within the area. Habitats identified by NWHI on the Oregon side of the Columbia River include

- Westside lowland conifer-hardwood forest
- Agriculture, pasture, and mixed environs
- Urban and mixed environs
- Westside oak and dry Douglas-fir forest and wetlands,
- Ponderosa pine and eastside white oak forest,
- Eastside (interior) grasslands,
- And eastside (interior) mixed conifer forest.

Habitats identified by NWHI (1999b) within the area on the Washington side of the Columbia River include:

- Westside lowland conifer hardwood forest
- Eastside (interior) mixed conifer forest
- Ponderosa pine and eastside white oak forest
- Montane coniferous wetlands

- Lakes, rivers, and ponds, and
- Urban and mixed environs.

Field review of the area found similar habitat types; however the montane coniferous wetlands identified on the Washington side should be reclassified as herbaceous wetlands because this area is joined to the Columbia River and does not contain conifer trees. This wetland area does contain a large amount of herbaceous vegetation and is likely seasonally inundated.

The five crossing site options also contain a variety of habitat types capable of supporting a number of wildlife species.

A. West Hood River Alignment Alternative

The West Hood River Interchange crossing site is proposed to connect the area near the West Hood River Interchange (exit #62 on Interstate 84) with the Washington side east of the Spring Creek fish hatchery operated by the USFWS.

Oregon Side:
The topography on the Oregon side consists of relatively flat land within a quarter mile south of the Columbia River, changing to very steep slopes and cliffs approximately 250 to 300 feet (76 to 91 meters) in height closer to the river, and then flatter slopes adjacent to the river. Habitat on the Oregon side consists of mixed hardwood-conifer on the flatter upland portions of the site, with white oak, Douglas fir, and ponderosa pine as co-dominants in the area. A wetland with standing water is located approximately 1000 feet (304m) east of the interchange. Cottonwood and willow trees are the dominant over story, and herbaceous species are the dominant under story. Dominant vegetation in this area consists of scattered Douglas-fir trees on the steep slopes and cliffs.

The Oregon side of this site provides suitable habitat for several wildlife species. Within the mixed hardwood-conifer habitat are likely to be several types of perching birds, woodpeckers, and western screech or other small owls. Mammals in this habitat would include black-tailed deer, deer mice, and Douglas' squirrels. Reptiles and amphibians would likely include common garter snake, ringneck snake, a variety of salamanders, and Pacific chorus frogs. The wetland area provides suitable habitat for several waterfowl species including mallard and cinnamon teal. A bullfrog was detected during the field review in this area. This is an invasive, non-native species that is implicated in the decline of native wildlife (Csuti et al., 1997; Marshall, 1992).

The steep slopes and cliffs would provide habitat for several cliff-nesting birds such as cliff and barn swallows. The wetlands adjacent to the river provide habitat for great blue herons, osprey, American coots, Canada geese, and several other waterfowl species (Csuti et al., 1997; Marshall, 1992).

Washington Side:
The Washington side of this site consists of oak woodland and Douglas fir as dominant species in the over story with Himalayan blackberry, fescue, and other species present in the under story. Several depressional wetlands are also present closer to the

Columbia River. North of SR-14 the habitat changes to blocks of Douglas fir on steep slopes and white oak on outcroppings.

These habitat types may support several species of birds, including woodpeckers, perching birds, northern pygmy owls, and great horned owls, among others. An osprey-nesting platform is present near the intersection of SR-14 with the hatchery access road. This platform did not appear to have any nesting material on it at the time of the field review. Mammals in the area would likely include squirrels, black-tailed deer, coyote, and raccoon (Palsa, 1997; Csuti et al., 1997).

B. Low Corridor Alignment Alternative

This site to the west of the existing bridge is comparable to the Port Park option on the Oregon side.

Oregon Side:
The topography of this area is generally flat. Land use is mainly a marina and boat store with associated parking lots. In addition, short, mown grass fields and park-like areas are present.

Wildlife observed during the field review included herring and ring-billed gulls and European starlings. Other wildlife potentially using this habitat would include rock doves (pigeons), American crows, and common ravens (Csuti et al., 1997).

Washington Side:
On the Washington side of the Columbia River, the topography is generally flat although a 100-foot (30m) high slope is present approximately 200 feet (61m) north of the water's edge. Habitat in this area is generally mixed conifer-hardwood. Tall grasses are present immediately west of the current bridge. This entire site seems to have moister soil conditions than other sites further upslope. Recent clearing of trees 250 feet (76m) to the west of the current bridge has occurred in preparation for a tribal fishing area.

Wildlife in this area would likely include woodpeckers, black-capped chickadees, dark-eyed juncos, and other perching birds.

C. High Corridor Alignment Alternative

This option would connect two high points in the same general area of the existing bridge. The Oregon side would be connected on the slope above the current SR 35 and I-84 interchange approximately 130 feet (40m) above the Columbia River. The Washington side would connect to SR-141 in the city of White Salmon approximately 500 feet (152m) above the Columbia River.

Oregon Side:
The topography on the Oregon side of the river is relatively steep. A major land use in this area is an active gravel pit and a restaurant. The upland areas of the high corridor option are dominated by pine trees and weedy vegetation.

Wetlands located within or near the site are present at the base of the hillside located between I-84 and the cliff. These wetlands are highly disturbed with vegetation that consists of alders, cottonwoods, blackberries, reed canary grass, willows, and cattails. Wetlands associated with the Hood River riparian zone occur on the west side of the hill and more than likely would not be encompassed in the option area that is being considered.

Wildlife associated within the upland habitat could include several species of native perching birds and European starlings. The wetlands habitat nearer the Columbia River could provide habitat for several species of waterfowl and shorebirds. In addition, native frogs and the non-native bullfrog may utilize this area. Mammals in this area might include muskrat, shrews, and non-native nutria (Csuti et al., 1997).

Washington Side:

The Washington side of the crossing option is generally flat near the city of White Salmon, but is very steep for a long distance between the city and SR-14 nearer the Columbia River. Upland areas located within the proposed project crossing site mostly lack vegetation due to the presence of houses, roads, and driveways. Of the areas that are vegetated, lawns, ornamental landscaping and small and scattered stands of oak, fir, and maple trees are the dominant features. The steep slope is dominated by stands of oak, maple, and fir trees.

Wildlife in this area could include nesting and foraging habitat for perching birds, woodpeckers, and others. The south-facing slope would likely be good habitat for several snake species. Mammals in this area could include Douglas' squirrels, deer mice, and wood rats (Csuti et al., 1997).

D. Stanley Rock Alignment Alternative

This crossing option would connect the area near the Stanley Rock rest area on the Oregon side to the town of Bingen, Washington.

Oregon Side:

The topography on the Oregon side is generally flat except for the large mound of rock approximately 100 feet (30m) high, which is the feature known as Stanley Rock. Land use in this area is an abandoned quarry abutting a rest area with a paved parking lot and a tribal fishing area with adjacent campground. To the west of Stanley Rock is a relatively small state park. Vegetation in the rest area and tribal fishing area consists of scattered ash and cottonwood trees with grass as a ground covering. Vegetation in the state park to the west of Stanley Rock consists of large wetland areas dominated by horsetail, cottonwoods, ash, willows, and emergent wetland grasses and shrubs. In the upland areas of the park are cottonwoods, willows, Scot's broom, other shrubs, and grasses.

Wildlife in these habitats would include European starlings, northern flickers, downy woodpeckers, and black-capped chickadees in the rest area and fishing area. Bird species present in the state park could include northern flickers, western scrub jay, black-capped chickadees, and others. Other wildlife species could include gopher snake, northwestern and common garter snake, coyote, deer mouse, and bushy-tailed wood rat. A bald eagle nest is present approximately one mile east of this site, and is the only active site of any state or federally listed threatened or endangered wildlife species present near the analysis areas. Failures in nesting or breeding at this site occurred in 1997, 1998, and 1999 (ONHP, 2000). Details on the breeding success in 2000 are not available.

Washington Side:
The topography on the Washington side is generally flat between the Columbia River and the town of Bingen. Land use in this area consists of the town center of Bingen, a large lumber yard operation immediately south of the town, and a managed wetland area to the east of the lumber yard. Vegetation is not present to a large extent within the town or lumberyard. The wetland area was drained at the time of the field review. Vegetation in this area consisted of a rushes, sedges, horsetail, cattail, unidentified grasses, and reed canary grass.

This site may be inundated during the winter and spring months which would provide for use by a variety of wintering and migrating waterfowl and shorebirds. Other bird species, such as great blue heron, red-winged blackbird, European starlings, and others, may use this area during other times of the year (Csuti et al., 1997).

References

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Water Quality

The project vicinity encompasses five sites on each side of the Columbia River with over four miles between the easternmost and westernmost sites. The major water systems within this area include the Columbia River, the Hood River in Oregon, and the White Salmon River in Washington. Smaller tributaries to the Columbia River are also present, including Jewett Creek on the Washington side, and Flume Creek and an unnamed stream on the Oregon side. This area is located in the Middle Columbia-Hood watershed (HUC 17070105). Overall, this watershed is considered to have less serious water quality problems and low vulnerability to stressors (EPA, 2000).

Although, water quality in the watershed is generally good, water quality in specific streams in this area has been of concern. According to the Oregon Department of Environmental Quality (DEQ) and Washington Department of Ecology (Ecology), the Columbia River in this area is listed as not meeting water quality standards under Section 303(d) of the Clean Water Act for several characteristics. The Columbia in this area is water quality limited for total dissolved gases year-round and for temperature in the summer.

The Hood River is monitored for water quality by DEQ at the footbridge north of Interstate 84. Portions of the Hood River are listed under 303(d) by DEQ for not meeting water quality standards for pH and temperature (DEQ, 1998). In addition, DEQ has concerns about other water quality parameters such as sediment, turbidity, water flow, low dissolved oxygen, and pesticides. During heavy precipitation and high flows, water quality is impacted by high levels of biochemical oxygen demand, fecal coliform, and total phosphates. At other times, the Hood River is affected by natural glacial runoff that contributes to the sedimentation and turbidity problem, although other activities such as road building, agricultural and urban development, and timber harvest activities contribute to sedimentation and turbidity problems. During the summer low flow periods, moderately high temperatures, and high levels of total phosphates, biochemical oxygen demand, and total solids have been detected. Water temperatures and water flow are affected by the large amount of water withdrawn from the river for consumptive and non-consumptive uses. Flow is critically low in the East Fork Hood River and in the mainstem during high irrigation withdrawals. High pesticide concentrations are likely the result of agricultural runoff in the valley. The Hood River has had two recorded chemical spills the resulted in fish kills in 1977 and 1987. Despite these water quality concerns, average Oregon Water Quality Index scores for the Hood River are good in the summer and fair during the fall, winter, and spring (Cude, 2000).

The White Salmon is the other large system present in the vicinity. The Washington Department of Ecology lists part of the White Salmon as limited for fecal coliform counts under 303(d). The White Salmon River is not currently listed as a stream in the process of having Total Maximum Daily Loads (TMDLs) being enacted (Ecology, 1998).

The other streams are not listed as water quality limited by either state agency.

The proposed alignments for the SR 35 Columbia River Crossing directly affect the Columbia River and its shoreline, including wetland and other riparian areas.

The Hood River may be affected by the proposed alignment for the high option along the existing bridge corridor due to runoff from the site. In addition, existing wetlands near this site may be affected.

The White Salmon River may be affected by the option for the Stanley Rock alignment, depending on the routing of traffic on the Washington side. A large wetland area on the Washington side may be affected by the proposed Stanley Rock alignment, depending on the routing of the alignment south of the town of Bingen. In addition, smaller wetlands may be impacted on the Oregon side with the same alignment.

Other streams in the area are not expected to be directly impacted by the proposed actions at the sites.

References

Cude, Curtis. 2000. Oregon Water Quality Index Report for Deschutes and Hood Basins Water Years 1986-1995. Oregon Department of Environmental Quality Laboratory Division, Water Quality Monitoring web site accessed September 28, 2000 at http://www.deq.state.or.us/lab/ WQM/WQI/deshood/deshood3.htm#Hood.

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WETLANDS

Existing documentation, data, and mapping were examined to determine the potential presence of wetland resources within the respective proposed alternative alignments. The information reviewed included: National Wetland Inventory (NWI) mapping; previously prepared Environmental Assessments; wetland delineations; local jurisdiction environmental compliance documentation; and USGS Soil Survey mapping. Subsequent to reviewing existing documentation, a field review was conducted to verify the accuracy of the information gathered and identify potential wetland areas not identified by these existing resources.

Table 1 summarizes the findings generated from the review of existing documentation and field visits. Given the preliminary nature of the alternative alignment locations, all wetland areas within the general vicinity of the alignment were identified. However, wetland areas located on the periphery of the alignment are indicated to be “less likely” to fall within the ultimate alignment.

Table 1 - Wetlands found within/near the proposed project sites

Wetland Type*	West Hood River Option		Low Corridor		High Corridor		Stanley Rock	
	Wa Side	OR Side	Wa Side	OR Side	Wa Side	OR Side	Wa Side	OR Side
PSS1C						Possible Direct		Possible Direct
POWHh								Possible Direct
POWHx	Possible Direct					Possible Direct	Possible Direct	Possible Direct
L2USCh						Indirect (runoff)		
L2RSCh	Possible Direct		Less Likely				Possible Direct	
PEM1Fx								
L2UBFh								
PSS/FO1C						Possible Direct		
PFO1Ch			Possible Direct					Possible Direct
PFO1C		Less Likely						Possible Direct
PSS1Ch								Possible Direct
L1OWHh		Less Likely						
PFO/SS1C								Possible Direct
PEM1Ch		Less Likely						
L2AB4Hh							Possible Direct	
PEM1C							Possible Direct	

Description of wetland types:

- PSS1C - Palustrine, Scrub Shrub, Broad-leaved Deciduous, Seasonally flooded
- POWHh - Palustrine, Open Water (unknown bottom), Permanently Flooded, Dike Impounded
- POWHx - Palustrine, Open Water (unknown bottom), Permanently Flooded, Excavated
- L2USCh - Lacustrine, Littoral, Unconsolidated Shore, Seasonally Flooded, Dike Impounded
- L2RSCh - Lacustrine, Littoral, Rocky Shore, Seasonally Flooded, Dike Impounded
- PEM1Fx - Palustrine, Emergent, Persistent, semi-permanently Flooded, Excavated
- L2UBFh - Lacustrine, Littoral, Unconsolidated Bottom, semi-permanently Flooded, Dike Impounded

- PSS/FO1C - Palustrine, Scrub Shrub/Forested, Broad-leaved Deciduous, Seasonally flooded
- L1OWHh - Lacustrine, Limnetic, Open Water (unknown bottom), Permanently Flooded, Dike Impounded
- PFO1Ch - Palustrine, Forested, Broad-leaved Deciduous, Seasonally flooded, Dike Impounded
- PFO1C - Palustrine, Forested, Broad-leaved Deciduous, Seasonally flooded
- PSS1Ch - Palustrine, Scrub Shrub/Forested, Broad-leaved Deciduous, Seasonally flooded, Dike Impounded
- PFO/SS1C - Palustrine, Forested/ Scrub Shrub, Broad-leaved Deciduous, Seasonally flooded
- PEM1Ch - Palustrine, Emergent, Persistent, Seasonally flooded, Dike Impounded
- L2AB4Hh - Lacustrine, Littoral, Aquatic Bed, Floating Vascular, Permanently Flooded, Dike Impounded
- PEM1C - Palustrine, Emergent, Persistent, Seasonally flooded

References

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VEGETATION

To facilitate identification of sensitive plant species potentially found within the proposed alignment alternatives the U.S. Fish and Wildlife Service, Oregon Natural Heritage Program ONHP), and Washington Natural Heritage Program (WNHP) were contacted. At this time, only ONHP has replied with a list of sensitive plant species potentially occurring within the project vicinity (Table 2).

In addition, to identifying sensitive species within the alignments, general vegetative information was gathered for the alignment locations. Site visits to the prospective alignments determined that the proposed project crossing alignments encompass both the Columbia Gorge and Columbia Plateau ecotypes. As such, the general project area, as well as many of the individual alignments themselves, contains a mixture of vegetation associated with both types. Vegetation types identified as occurring within the project area include:

- Westside lowland conifer-hardwood forest;
- Agriculture and pasture lands;
- Urban and mixed environs;
- Westside oak and dry Douglas-fir forest and wetlands;
- Ponderosa pine and eastside white oak forest;
- Eastside (interior) grasslands;
- Eastside (interior) mixed conifer forest; and
- Montane coniferous wetlands

Specific vegetation information for the respective alignment options is provided below.

A. West Hood River Interchange Alignment Alternative

Oregon Side:
A mixture of big-leaf maple, Douglas firs, Oregon oak, and ponderosa pine dominate the upland areas. Under story vegetation varies depending on the level of disturbance and how much sunlight and moisture is reaching the ground, with Himalayan blackberry (*Rubus discolor*) and Scot's broom (*Cytisus scoparius*) dominating the more disturbed locations.

Both forested and emergent wetlands occur within the very general location of the proposed project-crossing site. Vegetation associated with the forested wetland areas includes cottonwoods, Oregon ash (*Fraxinus latifolia*), big-leaf maple, red alder (*Alnus rubra*), ferns, cattails, willows, and unidentified wetland shrubs and grasses. Vegetation occurring in the emergent wetlands includes rushes, sedges, Reed canary grass, common velvet grass, and cattails.

Washington Side:
Upland areas located within the proposed project-crossing site are dominated by Oregon oaks (*Quercus garryana*), Douglas firs (*Pseudotsuga menziesii*), black cottonwoods (*Populus balsamifera* sp. *trichocarpa*), ponderosa pine (*Pinus ponderosa*), and scattered willow (*Salix* sp.) trees. Under story species vary depending on the level of disturbance and the amount of sunlight and moisture reaching the ground, but typical species include orchard grass (*Dactylis glomerata*), English plantain (Plantago lanceolata), Himalayan blackberry (*Rubus discolor*), and Scot's broom (*Cytisus scoparius*).

Vegetation within the wetland areas includes cottonwoods (Populus balsamifera), snowberry (Symphoricarpos albus), Oregon Grape (*Berberis aquifolium*), Pacific willows (Salix lasiandra), rushes (Juncus sp.), oa sp.), horsetail (Equisetum sp.), and Reed canary grass (Phalaris arundinacea).

B. Low Corridor Alignment Alternative

Oregon Side:
This option area contains very little vegetation, no wetlands, and is dominated by a marina, Yamaha dealership, restaurants, hotel, parking lots, and a sandy beach.

Washington Side:
Upland areas located within the proposed project-crossing site are dominated by Oregon oaks, big-leaf maple (*Acer macrophyllum*), and ponderosa pine. Under story vegetation generally consists of Scot's broom, Himalayan blackberry, and unidentified grasses depending on the level of disturbance and how much sunlight and moisture reaches the ground.

Wetlands found in this area are primarily forested, broad-leaved deciduous. Dominant species include black cottonwoods, willows, rushes, horsetail, cattail (*Typha latifolia*), Reed canarygrass, and unidentified grasses.

C. High Corridor Alignment Alternative

Oregon Side:
The upland areas of the high corridor option is dominated by pine trees and low-grade vegetation (weeds).

Although there are no wetland areas associated with the hill upon which the high corridor alignment is located, there are wetlands within the Hood River riparian zone and disturbed wetlands at the base of the hill adjacent to the railroad tracks. These wetlands could potentially be impacted due to changes in drainage or erosion associated with construction of the alignment. Vegetation within these wetlands includes alders, cottonwoods, blackberries, Reed canarygrass, willows, and cattails.

Washington Side:
Upland areas located within the proposed project crossing site mostly lack vegetation due to the presence of houses, roads, and driveways. Of the areas that are vegetated, lawns, ornamental landscaping and small and scattered stands of oak, fir, and maple trees are the dominant features.

No wetlands were found within this portion of the high corridor alignment.

D. Stanley Rock Alignment Alternative

Oregon Side:
Cottonwood and ash trees, as well as a rest area containing a manicured lawn, dominate the upland vegetation located within or near the proposed alignment. The eastern portion of the site is a tribal fishing site, which is fenced off to the public.

Wetland areas are dominated by mostly horsetail, cottonwoods, ash, willows, emergent wetland grasses and shrubs.

Washington Side:
Upland areas located within the proposed site are dominated by industrial activity, hence, only small, widely scattered stands of cottonwoods can be found.

Rushes, sedges, horsetail, cattail, unidentified grasses, and Reed canarygrass dominate wetland areas, in particular a large area east of a log yard which may be inundated during the winter and spring months.

Table 2. Sensitive Plant Species Listed for SR 35 (OR Side) Identified by ONHP.

Common Name	Sci. Name	Federal Status	State Status	Approx. Location	Comments
Oregon Daisy	***Erigeron oreganus***	***Species of Concern***	***Candidate***	***1.5 miles east of Stanley Rock***	
Hood River Milk-Vetch	***Astragalus hoodianus***	***Currently Not Listed***	***Currently Not Listed***	***1.5 miles south of H.R. Fill***	ONHP considers sensitive.
White Meconella	***Meconella oregana***	***Species of Concern***	***Candidate***	***Stanley Rock***	
Barrett's Penstemon	***Penstemon barrettiae***	***Species of Concern***	***Candidate***	***1.5 miles east of Stanley Rock and 1.5 miles west of W.H.R. Int.***	
Violet Suksdorfia	***Suksdorfia violacea***	***Currently Not Listed***	***Currently Not Listed***	***West of existing alignment***	***ONHP considers sensitive. Last observed in area 1880.***

References

Hitchcock, C.L., and A. Cronquist. 1973. *Flora of the Pacific Northwest.* University of Washington Press, Seattle, Washington, 729pp.Imlay, Marc J. 1995. Memorandum For MAJ Weaver, 13 Feb 95.

ONHP. 2000. Data system search for rare, threatened and endangered species in the SR 35 Columbia River Crossing analysis area, September 25, 2000.

SOILS

A. West Hood River Interchange Alignment Alternative

Oregon Side:

The *soil survey of Hood River County*, Oregon has mapped four different soil series as potentially occurring within the western proposed project crossing site; Wyeth very gravelly loam, 45 to 75 percent slopes, Rock outcrop-Bodell-Bald complex, 0 to 30 percent slopes, Wind River fine sandy loam, 0 to 8 percent slopes, and Rockford very stony loam, 0 to 30 percent slopes.

- *Wyeth very gravelly loam, 45 to 75 percent slopes* – The wyeth series consists of well drained upland soils formed in loess, volcanic ash, and colluvium weathered from basalt. Runoff is rapid for this particular Wyeth soil and the hazard of erosion is high.

- *Rock outcrop-Bodell-Bald complex, 0 to 30 percent slopes* – The Rock outcrop series in the Hood River Area is composed of mostly basalt. This particular mapping unit occurs only along the Columbia River and currently can be found as terraces above the river, however, were at one time part of the river channel. Runoff is slow for this mapping unit and erosion hazard is slight.
- *Wind River fine sandy loam, 0 to 8 percent slopes* - The Wind River series consists of well-drained soils that are found on uplands and terraces. This particular mapping unit has slow runoff with the hazard of erosion slight.
- *Rockford very stony loam, 0 to 30 percent slopes* – The Rockford series consists of well-drained soils found on uplands. These series of soils were formed in very stony, medium textured and moderately fine textured glacial outwash from basalt and andesite. Runoff of this particular mapping unit is medium and the hazard of erosion is moderate.

Washington Side:
The *soil survey of Skamania County*, Washington has mapped Rock outcrop-Xerorthents complex, 50 to 90 percent slopes, as potentially occurring within the western-most option of the project site. Rock outcrop-Xerorthents are well drained soils found on the back slopes and escarpments of mountains. Approximately 25 percent of this unit is composed of Xerorthents and 65 percent Rock outcrop. Permeability is moderately rapid, available water capacity is low, runoff is medium to rapid, and the hazard of water erosion is moderate to severe.

A soil survey for Klickitat County, Washington is not available. This would include the Port of Hood River fill site option, the low and high corridor options, and the Stanley Rock site.

B. Low Corridor Alignment Alternative

Oregon Side:
The low corridor option is mapped as having Xerofluvents, nearly level, as the predominant soil type. Xerofluvents are well drained to moderately well drained soils dissected by numerous small drainage channels. These soils formed in recently deposited alluvium from ashy and sandy outwash containing a large number of basalt cobbles and pebbles. The surface layer, subsoil, and substratum are very cobbly sand, cobbly loamy sand, gravelly loamy sand, loamy sand, or sand. Runoff for this particular mapping unit is slow with the erosion hazard slight.

Washington Side:
Soil survey mapping for Klickitat County is currently unavailable.

C. High Corridor Alignment Alternative

Oregon Side:
Bald cobbly loam, 5 to 45 percent slopes, is mapped as occurring within this proposed project-crossing site. The Bald series consists of well-drained soils on uplands. These

soils formed in mixed loess, volcanic ash, and colluvium weathered from basalt. Runoff for this mapping unit is slow to rapid, and the hazard of erosion is slight to high.

Washington Side:
Soil survey mapping for Klickitat County is currently unavailable.

D. Stanley Rock Alignment Alternative

Oregon Side:
The *soil survey of Hood River County*, Oregon has mapped Rock outcrop as the soil type in or near the option site. A definition for this soil type is listed above in the West Hood River Interchange option.

Washington Side:
Soil survey mapping for Klickitat County is currently unavailable.

References

Soil Conservation Service (now Natural Resource Conservation Service (NRCS)). 1981. *Soil Survey of Hood River County, Oregon.* U.S. Department of Agriculture.

Chapter 5 – Geologic and Geotechnic Conditions

General

The Columbia River flows 75 miles through a spectacular gorge, known not only for its rare natural beauty, but also for the unique window it provides into the underlying geologic history of the area. Between The Dalles, Oregon and Washougal, Washington the Columbia River Gorge rises on the order of 900 feet above the level of the river, and bisects the axis of the Cascade Range. Mount Hood in Oregon and Mount St. Helens and Mount Adams in Washington overshadow the canyon as it passes through the Cascade Range. Over its lifetime, the Columbia River Gorge was repeatedly filled with lava or blocked by landslides, and each time the river eroded a channel through the obstacle to restore its pathway to the Pacific Ocean.

Beginning nearly 16 million years ago the Columbia River Gorge acted as a conduit for massive outpourings of basalt lava, making it possible for the lavas, erupted near the Oregon-Idaho border, to reach the Pacific coast. A succession of lava flows poured into the gorge, hardened and blocked the flow of water temporarily. The mighty Columbia River would not be defeated, however, and after each lava blockage the river cut a new channel along its northern bank. After numerous such events, the river gradually migrated northward to its present position leaving a succession of lava filled channels along its south bank.

Smaller local lava flows also entered the Columbia River Gorge along Wind River, Little White Salmon and White Salmon Rivers as well as lava flows from Underwood Mountain, Mount Defiance and other smaller eruptive centers. Some of these lavas also created temporary dams and lakes in the Columbia River gorge.

Landslides have also affected flow of the river through the gorge. The Bonneville landslide was the largest. Breaking away from Greenleaf Peak on the Washington side of the river, the landslide temporarily dammed the Columbia River in the area now covered by Bonneville Dam and reservoir, and probably gave rise to the Indian legend of a “Bridge of the Gods.” The river’s course was diverted southward around the toe of the landslide, and the debris that remained in the river channel produced the rapids known as the “Cascades of the Columbia.”

Regional Geology

Huntting and others (1961) and Walsh and others (1987) have published regional compilation geologic mapping of southwest Washington. Wells and Peck (1961) and Walker and MacLeod (1991) have published Similar mapping in Oregon. Regional structural trends were compiled for The Dalles 1^0 by 2^0 quadrangle (which covers both Washington and Oregon) by Bela (1982). Waters (1973) published a discussion of the general geology of the Columbia River Gorge, and Beaulieu (1977) published geologic mapping and a discussion of geologic hazards for northern Hood River County.

The general stratigraphic sequence of formations is relatively simple, but the development of structural features and the stratigraphic details of the basalt flow units are very complex. The base of the stratigraphic section, i.e. the oldest rocks exposed, in the Columbia River Gorge belong to the Ohanapecosh Formation. The late Eocene Ohanapecosh Formation is composed of lava and volcaniclastic rocks chiefly of andesitic composition. The formation is extensively altered by zeolitization and argillation which has effectively sealed all cavities in the rock, making the formation almost totally impermeable to ground water. The Ohanapecosh is exposed extensively in Skamania County between Rock Creek and Little White Salmon River, but it is masked by overlying formations south of the Columbia River. Total thickness of the Ohanapecosh may exceed 10,000 feet.

The Ohanapecosh Formation is overlain by the lower Miocene Eagle Creek Formation. The Eagle Creek Formation is composed chiefly of volcaniclastic silts, sandstones, and conglomerates. Up to 1,000 feet or more of the unit is exposed in the head scarp of the Bonneville landslide (west of Stevenson in Skamania County). The formation apparently thins southward, because no more than about 250 feet of the formation is exposed along McCord Creek on the south side of the Columbia River.

The Ohanapecosh and Eagle Creek Formations are exposed west of the axis of the Cascade Range. They are not present at the ground surface in the vicinity of White Salmon/Bingen/Hood River. In this area, the older formations are covered by flow rocks of the middle Miocene Columbia River Basalt and younger volcanic and sedimentary units.

The middle Miocene age Columbia River Basalt Group (CRBG) consists of five formations and many members and individual flow units. The group consists of subaerial basalt flows and flow breccia and related subaqueous pillow-palagonite complexes, bedded palagonite tuff and breccia. In places, tuffaceous sedimentary deposits are present between successive flows. The CRBG overlies the Eagle Creek Formation. The basalts in the western part of the gorge have a uniform southward dip of a few degrees. As a result, erosion removed the basalt from wide areas on the Washington side of the river, exposing the underlying Eagle Creek and Ohanapecosh Formations. On the Oregon side, the Columbia River has undermined the basalt along its base creating great bluffs of basalt that rise steeply above narrow accumulations of talus, landslide, and stream deposits that line the south bank of the Columbia River.

The CRBG is locally overlain by Pliocene to Holocene basalt and andesite flows and associated mudflow and volcaniclastic deposits. Nearby examples include basaltic flows underlying Strawberry Mountain in White Salmon and similar flows from the vents of Underwood Mountain west of White Salmon River.

Near the end of the last great glacial period of the Pleistocene epoch, a series of catastrophic breakout floods occurred from an ice-impounded lake on the Clark Fork River in western Montana. The resulting floods, numbering 40 or more, scoured the Columbia Plateau and the Columbia River gorge. As the floods receded, silt, sand and gravel were deposited in extensive bar deposits along the Columbia River.

Recent alluvial processes along the Columbia River and its tributaries have eroded and redeposited the late Pleistocene deposits, and deposited younger sand and silt layers within the modern flood plain. The modern Columbia River sediment load is primarily sand, but a thick gravel section, deposited by the catastrophic floods, remains within the river channel.

Local Geology--Soils

A few site-specific geotechnical studies have been located near the existing Columbia River Bridge. Dames & Moore (1965) and Shannon & Wilson (1988) conducted geotechnical investigations for the Hood River Village Motel located immediately upstream of the south bridge approach, and the Port of Hood River commissioned a geotechnical investigation for widening of the north bridge approach (Geoengineers, 1996). In addition, the US Army Corps of Engineers (USCOE) conducted subsurface investigations for proposed tribal parks/fishing access sites at White Salmon (Fujitani Hilts, 1999), about 700 feet downstream from the north end of the bridge, and at Stanley Rock (USCOE, 1998), about 7,000 feet upstream from the south end of the bridge.

In general, the north side of the river is underlain by relatively fresh, hard basalt rock that is mantled discontinuously by an alluvial cover consisting of very loose to medium dense silty fine- to medium-grained sand with some gravel. Rock exposures are present locally above river level downstream from the bridge. Gravel layers were encountered beneath a sand cover and just above the basalt rock at some locations. About one foot of gravel was noted in one boring at the tribal park site (Fujitani Hilts, 1999), and up to 12 feet of fine to coarse gravel was penetrated in one boring beneath the north bridge approach (Geoengineers, 1996).

Similar conditions were found off shore at the White Salmon tribal park site where the Corps of Engineers drilled 3 borings in the river (Fujitani Hilts, 1999). Two borings penetrated silty fine sand before encountering basalt rock. The sand layer thickened with distance from shore, being about 5 feet thick at 30 feet from shore and 23 feet thick at 200 feet from shore. The third boring, also at about 200 feet from the shoreline, penetrated 13 feet of silty sand and 13 feet of medium dense gravel. It was bottomed at a total depth of 26 feet without encountering rock.

The south bank of the river is also composed of alluvial and fill materials overlying basalt rock. Based on interviews with old time residents, Dames & Moore (1965) reported that there were two outcroppings of rock in the area. One is still visible in the river just upstream of the existing bridge. The other was present on shore within the existing motel/restaurant complex. The latter outcrop was apparently fairly sizable, since the bridge gate keeper's residence was built on it. The area near the south end of the bridge was a pear orchard from about 1919 until the Bonneville pool was raised. Then the area became a swamp, and remained in that condition until it was raised with dredged sand fill during the late 1950s. A rock-fill dike was constructed initially to retain the fill, and then the area landward of the dike was hydraulically filled with sand pumped from the Columbia River.

Dames & Moore (1965) drilled five subsurface borings on the motel site immediately upstream of the south bridge approach. Shannon & Wilson (1988) drilled three additional borings. These borings confirm the presence of up to 18 feet of fill. Near the bridge approach and locally elsewhere the fill consists of silty sand and gravel with some cobbles. At most locations, however, the fill consists of loose to medium dense, fine- to medium-grained dredged sand fill.

Beneath the fill, native soils consist of silty fine sand. Shannon & Wilson (1988) described these soils as being relatively weak and possessing moderate to high compressibility. Basalt rock was encountered in three of the borings. Native alluvial soils varied from about 6 to 21 feet in thickness where rock was encountered. One boring, however, penetrated 26 feet of alluvial soil and was bottomed at a total depth of 38 feet without encountering rock. No rock cores were drilled as a part of these studies, but the rock was interpreted to be relatively hard, fractured basalt with physical characteristics similar to the rock exposed on the island north of the motel restaurant.

At Stanley Rock, approximately 7,000 feet upstream from the south end of the bridge, the Corps of Engineers drilled a water well for a Tribal fishing site. This water well was located south of the Stanley Rock outcrop and north of Interstate 84. The well penetrated 108 feet of silt and clay before encountering basalt rock. The basalt surface apparently has a great deal of topography as a result of erosion by the Columbia River. There is a change in elevation on the order of 230 feet from the top of Stanley Rock to the rock first encountered in the well.

Such extremes in the rock surface may be rare, but the basalt surface is undoubtedly very irregular along the river. Catastrophic flooding during the Pleistocene epoch produced many erosion features. Even where rock prominences are not obvious, deep eroded rock canyons running parallel to the river should be anticipated in the subsurface. Deep cavities, particularly if isolated from the main channel of the river, would accumulate fine-grained material, such as at Stanley Rock, while coarse gravel deposits are commonly found in the lee of rock highs.

No local exploratory data is available in the main channel of the Columbia River. However, based on in-water borings completed by the Corps of Engineers near Bonneville, White Salmon and Maryhill, it is our opinion that sediments within the main channel are very likely to be predominantly fine to coarse gravel and cobbles to depths of several tens of feet.

Geologic Hazards

Geologic hazards are geologic processes or geologic conditions that form threats to the activities of man. Geologic hazards fall into two main categories: degradational and tectonic. Degradational hazards are the products of slow but persistent weathering and erosion of the land surface. Tectonic hazards are produced by volcanism and earthquakes and usually occur over very short periods of time. Tectonic events may also trigger degradational events; for example, a summit eruption of the Mount Hood volcano could cause rapid melting of glacier ice, resulting in mudflows and stream flooding many miles down Hood River to the Columbia River. Likewise, the ground shaking that occurs during an earthquake could also trigger landslides. Potential geologic hazards in the vicinity of the existing Columbia River Bridge include landslides, weak soils, high ground water levels, stream flooding, and earthquakes. In addition, volcanic eruptions of the Mount Hood or Mount Adams volcanoes could induce flooding in the Hood River or White Salmon River Valleys that could potentially reach the Columbia River. Each of these hazards is discussed in the following paragraphs.

Landslides. Landslide hazards are greatest on the Washington shore where steep slopes in talus and basalt rock rise up to about 400 feet in elevation above State Route-14 (SR-14).

Talus is defined as rock fragments of any size or shape (although usually coarse and angular) derived from, and lying at the base of, a cliff or very steep, rock slope. Hence, a *talus slope* is a steep, concave slope formed by an accumulation of loose rock fragments at the base of a cliff or very steep, rock slope. Talus slopes have a constant *angle of repose*, i.e., the maximum angle of slope (measured from a horizontal plane) at which loose, granular material will come to rest on a pile of similar material. The angle of repose commonly ranges between 33^0 and 37^0 on natural slopes, and is rarely less than 30^0 or more than 39^0.

Talus slopes directly north of the existing bridge approach are present at angles between 37^0 and 39^0 above horizontal (Fujitani Hilts & Associates, 1999). Because talus debris accumulates at the maximum stable angle, any change in the geometry of the slope that increases the angle, by making cuts or placing fills, for example, could induce sliding. Potentially, catastrophic failure of the slope could also be induced by ground shaking during a large earthquake. Run-out of slide debris beyond the existing toe of the slope could block SR-14 and the bridge approach roadway and damage approach structures. A new relocated bridge would be most at risk west of the existing bridge location because the bluff line is closer to the river and bridge approach structure would be shorter. The bluff line is farther from the bank of the river east of the existing bridge. Progressively longer approach structures would be necessary eastward of the existing bridge. Although landslide potential and impacts to SR-14 and bridge approach roadways are the same, the potential for damage to bridge structures would diminish with distance from the slope.

Steep to near-vertical rock exposures are also susceptible to rock fall hazards. Steep rock slopes are present high on the gorge walls on the Washington side of the river. On the Oregon shore, rock slopes begin to rise adjacent to the south bank of the river about 8,000 feet west of the existing bridge and at Stanley Rock, about 7,000 feet upstream from the bridge.

Weak Soils. Loose unconsolidated granular soils and other soils that contain a high percentage of organic matter are potentially susceptible to excessive and uneven settlement when subjected to foundation loads. Shannon & Wilson (1988) found the dredged sand fill present along the Oregon shoreline in Hood River to have a low relative density. They also described the native soils which underlie the fill as having a "moderately high compressibility." GeoEngineers (1996) and Fujitani Hilts & Associates

(1999) described native soils along the Washington side of the river as being very loose to medium dense silty fine sand.

Stream Flooding

Flooding often results in increased erosion of stream banks and increased sedimentation, both in-channel and on the floodplain by over-bank floodwaters. When streams overflow their banks, damage to roads, bridges, and structures may result. Major floods occurred on the Columbia River in 1894 and 1948. The construction of hydroelectric dams on the Columbia River, however, has greatly minimized the potential of damaging floods. The flood of 1964, for example, which was the worst in history in many northwest drainage basins had little effect on the Columbia River because of the large size of the drainage basin, seasonal low flows, and upstream dam regulation (Beaulieu, 1977). The potential for damaging floods on the Columbia River is therefore relatively small.

High Ground Water

Within the fill and alluvial soils along the river, ground water will occur at about the level of the Columbia River. Particularly where bedrock lies deep beneath a thick soil cover such as near the south end of the existing bridge, in the area south of Stanley Rock, and beneath the flood plains in Bingen, groundwater will affect foundation conditions. Saturated soils will tend to be weaker, and deep excavations for construction may require dewatering. Saturated sandy soils may also be subject to liquefaction, which will be discussed below.

Volcanic Eruptions

Volcanic hazards within the Columbia River Gorge are limited. Mudflows and flooding associated with eruptions at Mount Hood could potentially reach the Columbia River via Hood River. Such flooding could potentially result in the construction of a delta at the mouth of the Hood River and excessive sedimentation in the Columbia River. Similar mudflows and flooding could also occur down the White Salmon River as a result of volcanic activity on Mount Adams. An event capable of reaching the Columbia River, however, would be larger than any event that has occurred during the last 10,000 years (Scott and others, 1995). Again, excessive sedimentation would be the major impact to the Columbia River. Volcanic hazards within the Columbia River Gorge are, therefore, relatively low.

Earthquakes

One or more of the following phenomena resulting from earthquakes could potentially cause damage to existing and proposed new construction:

- Liquefaction of water-saturated sand
- Amplification of ground shaking by a soft soil column
- Landslides triggered by the shaking of an earthquake

- Fault rupture of the ground surface

Liquefaction is a phenomenon in which loose, granular soils and some silty soils, located below the ground water surface, develop high pore water pressure and loose strength due to ground vibrations induced by earthquakes. Soil liquefaction can result in lateral flow of material into river channels, loss of bearing strength, ground settlements and increased lateral and uplift pressures on underground structures. Soils located above the ground water surface cannot liquefy, but granular soils located above the ground water surface may settle during earthquake shaking.

Relatively shallow ground water is present within dredged sand fill and the underlying native soils along the south side of the Columbia River in the vicinity of the existing Columbia River Bridge. Based upon the description of these soils by Dames and Moore (1965) and Shannon & Wilson (1988), and upon recent earthquake hazard studies by Madin and Wang (1999), it appears that there is a moderate to high probability for liquefaction to occur in these soils during earthquake shaking. Similar conditions are probably also present in the low-lying areas along the Columbia River in Bingen.

Ground shaking amplification *can occur when earthquake waves pass from bedrock into softer overlying materials such as recent alluvial soils. Amplification can result in stronger surface shaking and a slower swaying motion (longer period) that can be more damaging than the higher frequency motions that are more typical of those on rock or rock overlain by shallow, stiff soil layers.*

Again, based upon the soil descriptions earthquake hazard studies described above for the Hood River area and on interpretation of soil conditions along the Washington shoreline, it appears that potential ground amplification hazards in the Hood River and Bingen water front areas are low to moderate.

Landslides can be triggered by earthquake shaking. No ancient or presently active landslides are known to be present along the Columbia River shoreline at least within a distance of 7,000 feet or so of the existing bridge. However, the high talus slopes on the Washington side of the river are particularly at risk to earthquake-induced landsliding as discussed above. Rock and talus slopes and embankment fills along the Oregon shoreline also have a moderate to high potential for earthquake induced slides as indicated in the earthquake hazard studies by Madin and Wang (1999).

Fault Rupture or fracture of the earth's surface along the trace of a fault is a potential hazard. Although faults have been identified and mapped in the White Salmon/Bingen/Hood River area (Waters, 1973; Beaulieu, 1977; Bela, 1982), the hazard that any specific fault represents is unknown. The magnitude range of 5.5 to 6.5 is the threshold at which fault rupture generally begins to be apparent. Since the range of 6.0 to 6.8 is the likely maximum magnitude for any crustal earthquakes in the area (Geomatrix, 1995), fault rupture is likely to be absent altogether or will be of very limited extent.

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Chapter 6 – Economic Conditions

SR 35 Crossing Economic Overview

This report documents the existing local economic conditions and impact area that provide the backdrop for the SR 35 Columbia River Bridge Crossing. The crossing is currently served by an aging drawbridge with two 9.5 feet wide lanes and no pedestrian facilities. The toll bridge was completed in 1924 and is currently operated by the Port of Hood River. It connects the south central Washington State communities of Bingen and White Salmon with Hood River on the north central Oregon side of the Columbia River. This Economic Overview is one component of the overall SR 35 Columbia River Crossing Feasibility Study, which itself is the result of a local grass roots effort by a wide range of individuals who are interested in the near and distant future of the White Salmon, Bingen and Hood River region. The vision statement for the project is:

Preserve the natural beauty of the Columbia River Gorge with a new or improved bridge that supports the region's diverse economy and provides safe travel capacity for automobiles, trucks, recreation vehicles, river traffic, pedestrians and bicycles.

Defining the Economic Study Area

The issue of a Columbia River crossing in the Hood River-White Salmon area potentially affects any business or person who uses or would use a crossing at that location. These entities could be from anywhere in Washington and Oregon, though most regular users would be concentrated from areas within the four counties that surround the crossing location — Skamania and Klickitat Counties in Washington and Hood River and Wasco Counties in Oregon. Because there are existing bridge crossings less than 30 miles to both the west and east of SR 35 (one at Cascade Locks between Skamania County and Multnomah County, Oregon and another at The Dalles crossing into Washington within Klickitat County), we have defined a relatively compact study area that includes the portions of Klickitat and Hood River Counties adjacent to SR 35.

Though it might be reasonable to include all of Hood River County in such a study area, Klickitat County is very large, extending roughly 80 miles east of White Salmon, and includes two other Columbia river crossings. Moreover, White Salmon and Bingen account for a relatively small share of the county's its economic activity, especially when compared to the city of Goldendale. Because of this, county data on Klickitat County does not relate closely to the connection provided by the SR 35 bridge crossing. We therefore used US Census block groups on both sides of the river to isolate an appropriate study area that includes the towns of Hood River, White Salmon, and Bingen, and immediately adjacent populated areas.[8] Census data can be obtained at this sub-county level, though much important economic data is available only at the County level. Additionally, in some cases the Census population data can be used to apportion County data to the study area.

[8] In Washington, this area includes Block Groups 4-6 from Census Tract 9503. In Oregon, it includes Block Groups 1-6 from Census Tract 9503, Block Groups 1-4 from Census Tract 9502, and Block Group 5 from Census Tract 9504.

Economic Conditions

Economic statistics on Hood River County and Klickitat County are presented in Table 1 below. Employment and income statistics for the project study area have been estimated by scaling them to the population of this area. While this provides reasonable estimates, there is more potential for variation in Klickitat county portion of the study area, since it represents a relatively small share (14.6%) of the Klickitat County population.

Table 1. Economic Characteristics of the SR 35 Study Area

Economic Characteristic	*SR-35 Crossing Study Area*	*Hood River County, OR*	*Klickitat County, WA*
Population			
1990 Population	10,715	16,903	16,616
2000 Population (est.)	12,302	20,280	19,880
Study Area Population Share of County	—	46.4%	14.6%
Employment[1]			
Civilian Labor Force	6,500	11,160	9,070
Employment	5,880	10,090	8,240
Unemployment Rate	9.5%	9.6%	9.2%
Personal Income & Earnings[2]			
Personal Income (millions)	$248.3 M	$416.6 M	$378.2 M
Personal Income per Capita	$20,750	$21,300	$19,720
Wage & Salary Earnings per Employee	$21,550	$20,330	$25,510
Wage & Salary Earnings per Capita	$10,590	$10,490	$10,960

Sources: Parsons Brinckerhoff, US Census Bureau, US Bureau of Economic Analysis, Washington State Employment Security Department, & Oregon Employment Department

[1] 1999 data for Klickitat County, WA & 1998 data for Hood River County, OR [2] 1998 data

Population Trends

Population today within the defined project study area is estimated at 12,300 persons, and has grown by 14.8% since 1990, or an average of about 1.4% per year. Overall, 76.5% of the study area population lives on the Oregon side of the river within greater Hood River area, leaving 23.5% residing on the Washington side in Bingen, White Salmon, or its surrounding area.

Growth on the Washington side of the river has been almost non-existent, with population increasing a mere 0.2% per year within the Bingen/White Salmon area over the past decade. This rate of growth is well below the Klickitat County average annual population growth rate of 1.8%, and is likely indicative of stagnant economy. Conversely, study area population growth on the Oregon side, at 1.65% per year, is only slightly below the Hood River County average growth rate of 1.8%.

On the Washington side, the study area represents only 14.6% of the Klickitat County population, down from 16.8% in 1990. The Oregon portions of the study area comprise a much larger share of Hood River County, which at 46.4% has remained nearly unchanged over the past decade.

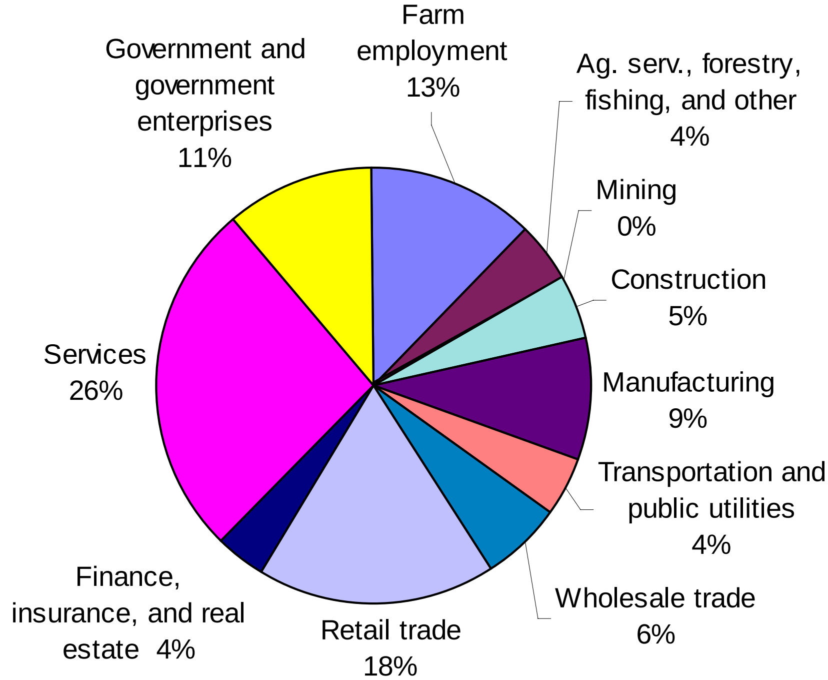
Employment Trends

Table 1 provides information about the civilian labor force, employment, and unemployment rates. Within the study area, the unemployment rate is 9.5%, which is comparable to other rural areas within Washington and Oregon, but relatively high compared with the two states' urban areas.

Figure 1 and Figure 2 below show the distribution of employment by industry sector for Hood River County and Klickitat County, respectively. Because the majority of the study area population is located within Hood River County and because the Oregon portion of the study area is a relatively large share of Hood River County, the employment distribution by industry for Hood River County is probably a better indicator for the study area than is the Klickitat County distribution. Services and retail trade are the largest industry sectors in terms of employment within Hood River County. This is likely due to the relatively recent rise in recreational development and its contribution to economic activity. The Hood River area of the Columbia River Gorge has become a major windsurfing capital, and many other outdoor recreation opportunities abound, creating an attraction for tourism. Retail trade's importance may also be explained by the lack of sales tax in Oregon, which effectively creates a 7% discount for nearby Washington residents, many of whom cross the river to shop in Hood River. Hood River County also has significant activity in the farming, manufacturing, and government sectors.

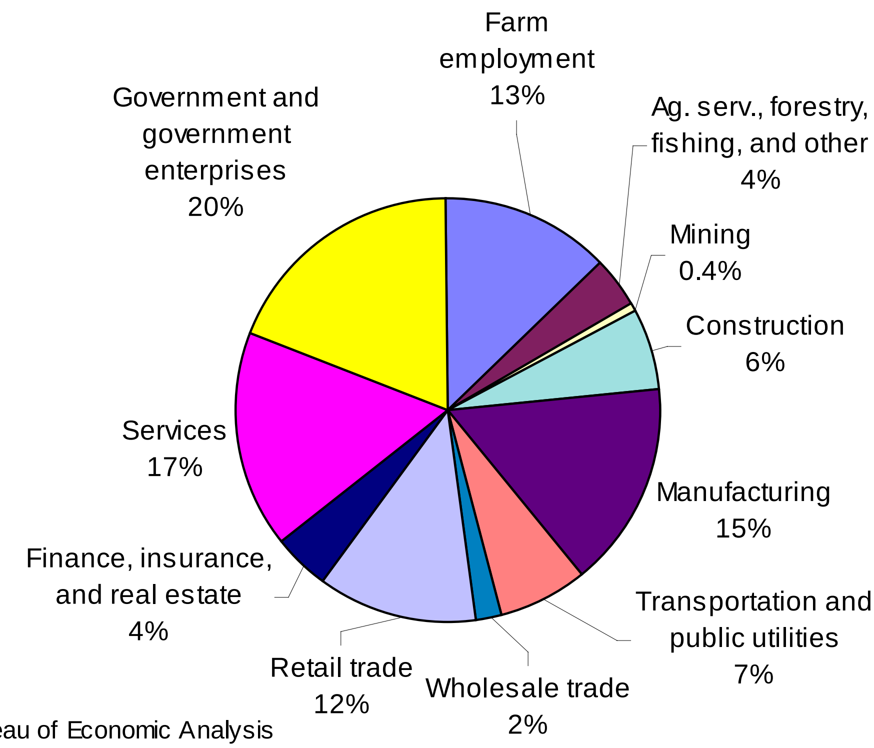
Although Klickitat County has the same top four industry sectors by employment, manufacturing and government employment play a bigger role than in Hood River County. Not surprisingly, farm employment makes up a larger share of employment in Klickitat County than in Washington as a whole.

Figure 1. Employment Distribution by Industry — Hood River County (1998)



Source: Bureau of Economic Analysis

Figure 2. Employment Distribution by Industry — Klickitat County (1998)



Source: Bureau of Economic Analysis

Large Employers

In the White Salmon/Bingen area, employers of more than 100 people include SDS Lumber (300+), Underwood Fruit and Wholesalers (about 240), White Salmon School District (186), and Skyline Hospital (125).[9] In the Hood River area, employers of more than 100 people include Luhr Jensen &Son (a manufacturer of fishing lures), Sprint, Diamond Fruit Growers, Hood River Memorial Hospital, and the Columbia Gorge Hotel. Hanel Lumber in Hood River has typically employed over 100 people, but it has just announced layoffs and possible closure.[10]

Personal Income and Earnings

Table 1 also presents information on personal income and average job wage and salary earnings. Personal income for the entire study area — which includes wage and salary earnings, investment income, and transfer payments — was about $248 million in 1998, the last year for which data was available. This amounts to $20,750 per capita. The average wage and salary earnings per job within the study area is $21,550, which equates to wage and salary earnings per capita of $10,590. This would suggest that nearly half of personal income within this region is generated from non-wage/salary sources.

Role of Regional and Interstate Trade

Comparative Advantages and Disadvantages of Region

Advantages

The study area has several advantages for regional and interstate trade. One is its easy access to I-84, which follows the Columbia River and is an important route connecting I-5 and Portland to points east. Another advantage is the presence of railroads, specifically the Burlington Northern Santa Fe (BNSF) line on the Washington side of the river and the Union Pacific (UP) line on the Oregon side. Additionally, the high share of primary sector industries like agriculture and manufacturing is a factor supporting export-oriented trade.

The rise of the Hood River area as a tourist and recreation destination suggests that the region is also capitalizing on its comparative advantage in providing a range of outdoor opportunities.

Disadvantages

From a trade standpoint, the study area's disadvantages include the fact that it is not located on the I-5 north-south corridor, and it is an hour's drive from Portland International Airport. At the same time, given its proximity to the Columbia River and rail lines, the region is too close to the I-5 corridor to effectively serve as a multimodal center for freight movement. Another disadvantage, or result from its other

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[9] Source: Tom Seifert, Klickitat County Economic Development.

[10] Source: local Chambers of Commerce, newspaper clippings.

disadvantages, is the small population of the area, which supports a relatively small labor force and economic base compared with larger metropolitan areas.

Current Trade Statistics

There are three main components to trade relevant to this study: the flow of goods, the flow of labor, and the flow of customers. Goods are the products that are supplied and have to be physically transported to customers, labor is a key input to the production of the goods that are supplied, and customers are the demand that comes to the supply when the supply is not transported to the customer. The current flows of goods, labor, and customers will each be discussed in turn.

Flow of Goods

River Traffic

While a great deal of barge traffic passes through the study area along the Columbia River, very little is generated or received in the study area. Neither the Port of Hood River nor the Port of Klickitat have loading and unloading facilities in the area, and the same is true at the Port of Skamania and the Port of Cascade Locks to the west. The SDS lumber mill has a log-loading facility at Bingen, and further along in The Dalles there are two-grain elevators and a wood chip loading facility. By and large, however, the capital and operating costs associated with loading/unloading barges for traffic that is typically going to Portland are too high to support much river-based trade in the study area.[11]

Railroad Traffic

Again, a great deal of railroad traffic passes through the study area, but little is generated or received in the study area. At Bingen, the BNSF rail line has two industry tracks for SDS Lumber and one for Underwood Fruit, as well as two spur tracks that are primarily used by the railroad itself for car storage. According to BNSF staff, the lumber company sends off finished lumber, and the fruit company sends packed fruit in refrigerated cars. Estimated traffic from these industries is about six cars per day, mostly heading to the east. The nearest BNSF yard is 30 miles east of White Salmon, at Wishram, with a larger yard further east at Pasco.[12] The nearest UP yard is 25 miles east of Hood River, at the eastern end of The Dalles.[13]

Truck Traffic

Ever since the Columbia River Highway was completed in 1915 as the first paved highway in the Northwest, the Hood River region has been a noteworthy milepost for east-west motor freight moving through the gorge. The completion of the SR 35 Hood River Bridge in 1924 enhanced the connection and solidified the interaction of the local economies on both sides of the river. Today, trucks carry the bulk of the regional and interstate trade within and through the study area. Much of this truck traffic is interstate traffic that using the existing Hood River bridge. The average daily traffic volume on this

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[11] Source: local Port authorities

[12] Source: Burlington Northern Santa Fe office at Wishram, Washington.

[13] Source: local Port authorities

bridge for vehicles with more than two axles was 171 for the fiscal year ending June 2000. Traffic counts for these vehicles peaked during the summer months of June through September, and were lowest in December through March, as shown in Table 3. This is consistent with and at least partly due to the seasonal nature of agricultural activity as well as truck traffic associated with services supporting tourism and recreation.

Businesses on the Washington side of the river generate a great deal of interstate traffic using the bridge because of the fast, efficient transport of I-84 located on the Oregon side of the river. Even if the destination of the goods is Washington or other points north, crossing over to I-84 in Oregon often saves time over using SR-14 on the Washington side.

There is also a significant amount of interstate truck traffic that does not use I-84, but links the Hood River economy with the western Klickitat County economy. Logging trucks link the wood-related industries on either side of the river, and fruit haulers cross over from the growers in the Hood River Valley to the facilities in Underwood just west of Bingen. Delivery trucks from a variety of companies are common. Concrete mixers, dump trucks, and chip trucks are also frequent participants in the interstate flow of goods across the river.[14]

Flow of Labor

The 1990 Census indicates that, at that time, 208 workers from the Washington part of the study area worked outside their state of residence, presumably in Oregon. These 208 workers amount to nearly one-quarter of the Washington-based employment in the study area. It is likely that nearly all of these persons were working in the Hood River area rather than The Dalles or Portland, and probably used the Hood River Bridge crossing in any case. The 1990 Census also shows that 141 workers from the Oregon part of our study area worked outside their state of residence, presumably in Washington. Unless they worked in Goldendale, Stevenson, or Vancouver, they probably worked in White Salmon or Bingen and used the Hood River crossing.

Anecdotal reports from the Mt. Adams Chamber of Commerce, which represents western Klickitat County, are that many employers in Hood River, including Diamond Fruit and Sprint, attract labor from western Klickitat County. The lower property taxes in Washington are a possible explanation for these workers not living on the Oregon side. At the same time, employers like SDS Lumber and Skyline Hospital in western Klickitat County attract some labor from the Hood River area.

The flow of labor is reflected in the traffic on the existing Hood River Bridge crossing. The annual average daily traffic volume for automobiles and other two-axle vehicles including those with small trailers is about 7,600 per day.

[14] Source: Port of Hood River and local trucking firms.

Flow of Customers

Residents of western Klickitat County often cross over to Hood River for shopping, dining, and entertainment, because the Hood River area offers a wider range of such options than do White Salmon and Bingen. For example, there is no movie theatre in the White Salmon/Bingen area. The Wal-Mart in Hood River is also a draw for Washington shoppers. The fact that Oregon has no sales tax, combined with a 7% sales tax in the Washington part of the study area and Washington's lower property taxes, supports this relationship of Washington residents shopping in Oregon.

The annual average daily traffic of 7,600 cars and two-axle trucks using the Hood River Bridge reflects in part this significant flow of customers. Moreover, the seasonal peaking to over 9,000 vehicles per day in the summer months is in part attributable to recreational travel, including that associated with windsurfing. Windsurfers staying in, residing in, or renting equipment in Hood River use the bridge to access launch sites on the Washington side, including the Bingen Marina, Doug's Beach and the Hatchery Creek State Park.

Retail Trade Activity

Annual retail sales volume data and number of retail establishments by county and city were obtained for 1997 to gauge retail economic activity within the study area. Table 2 below presents these estimates by area. The data support the notion that the City of Hood River is the economic center not only for the study area, but for much of Klickitat, Skamania and Hood River Counties. Retail sales data for the City of Hood River is nearly three times that for all of Klickitat County, and on a per capita basis, is over three times that of Bingen and White Salmon combined. This is consistent with the incentives created by the Washington sales tax for businesses to locate, and consumers to shop, on the Oregon side of the river.

Table 2. Annual Retail Sales and Retail Establishments by Area (1997)

Geographic Area	*Number of Retail Establishments*	*Retail Sales Volume (1997)*
Klickitat County, WA	69	$47,399,000
Bingen*	8	$5,405,000
White Salmon*	14	$9,942,000
Hood River County, OR	129	$170,254,000
Hood River	86	$135,547,000
Incorporated Cities within the Study Area	**108**	**$150,894,000**

Sources: U.S. Census Bureau 1997 Economic Census & Wash. State Department of Revenue

* Estimate based upon county sales tax distribution

Importance of a Bridge Crossing

The SR 35 Bridge crossing at Hood River is key to the flow of goods, the flow of labor, and the flow of customers in this region. As described above, interstate truck transport dominates rail and river traffic in terms of transporting goods to and from the study area. Similarly, interstate labor flow within the region — and all person movement, for that matter — occurs almost exclusively by motor vehicle via the bridge crossing, as opposed to air, water, or rail.

Table 3 below summarizes the monthly average daily traffic volumes on the bridge by vehicle type for fiscal year 2000 — July 1, 1999 through June 30, 2000.

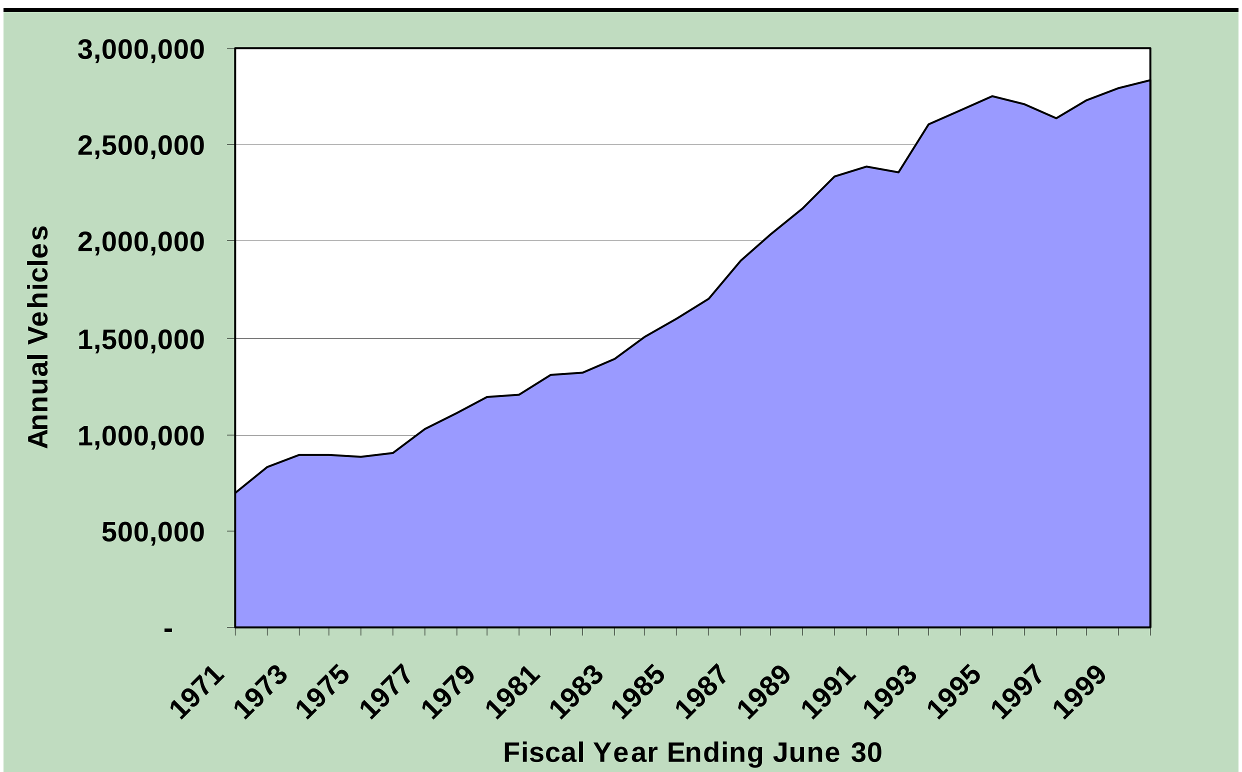
Figure 3 illustrates the growth in annual traffic volumes over the past 30 years. Note the increase in the growth rate during the latter half of the 1980s. This may be partly attributable to the advent of windsurfing in the Columbia River Gorge and the increased draw of the area for recreation and tourism.

Table 3. Monthly Average Daily Traffic Volumes on the Hood River Bridge

Time Period	*2 Axle Vehicles*	*3+ Axle Vehicles*	*Bicycles/ Motorcycles/ Pedestrians*	*Total Average Daily Crossing Volume*
July 1999	9,321	247	15	9,583
August	9,056	238	14	9,308
September	8,407	265	7	8,679
October	7,556	200	18	7,775
November	6,394	153	4	6,550
December	6,264	113	2	6,379
January 2000	5,772	124	0	5,897
February	6,764	84	2	6,849
March	6,844	106	11	6,961
April	7,358	122	22	7,503
May	8,190	167	27	8,384
June	8,916	223	11	9,149
Annual Average	**7,575**	**171**	**11**	**7,756**

Source: Port of Hood River

Figure 3. Annual Traffic Volumes 1971 – 2000



The importance of the existing bridge at Hood River is a function of the adequacy of available alternatives. In fact, for local travel, there are no attractive alternatives, as the nearest Columbia River crossings are at Cascade Locks, 24 miles to the west, and at The Dalles, 22 miles to the east. Businesses and commuters traveling or transporting goods between White Salmon or Bingen and Hood River would face about a one-hour addition to their travel time if the Hood River bridge crossing did not exist. Goods and people traveling from the White Salmon area to points farther east and west than Hood River would also face an increase in travel time due to the longer distance before I-84 could be accessed.

Potential Impact of Alternatives

Of the four alternatives that are being considered for a new river crossing, three of them are distinguished mostly by their location along the river from east to west. All three of them are close enough to Hood River that there would be little additional travel time for any of the alternatives compared to any other, especially when compared to the time costs involved with using the crossings at The Dalles or Cascade Locks. The westernmost alignment would add travel time to traffic that goes from east of Hood River to east of White Salmon, and the easternmost alignment would add travel time to traffic that goes from west of Hood River to west of White Salmon.

The “bluff-to-bluff” alternative is different, however. While it offers the benefits to the Hood River Valley firms of getting and sending labor and goods to and from south-central Washington, it would provide less direct access to I-84 and to the industrial firms in the Bingen area, and may not be popular with local businesses that would be potentially bypassed.

Chapter 7. Transportation System

BASELINE CONDITIONS MEMORANDUM

Objectives

The objectives are to: 1) describe the transportation system as it exists today using the most recent data that is available and 2) provide the baseline for comparison with the future "no-build" conditions and subsequent strategies, refinement, screening, and evaluation.

Existing Transportation System

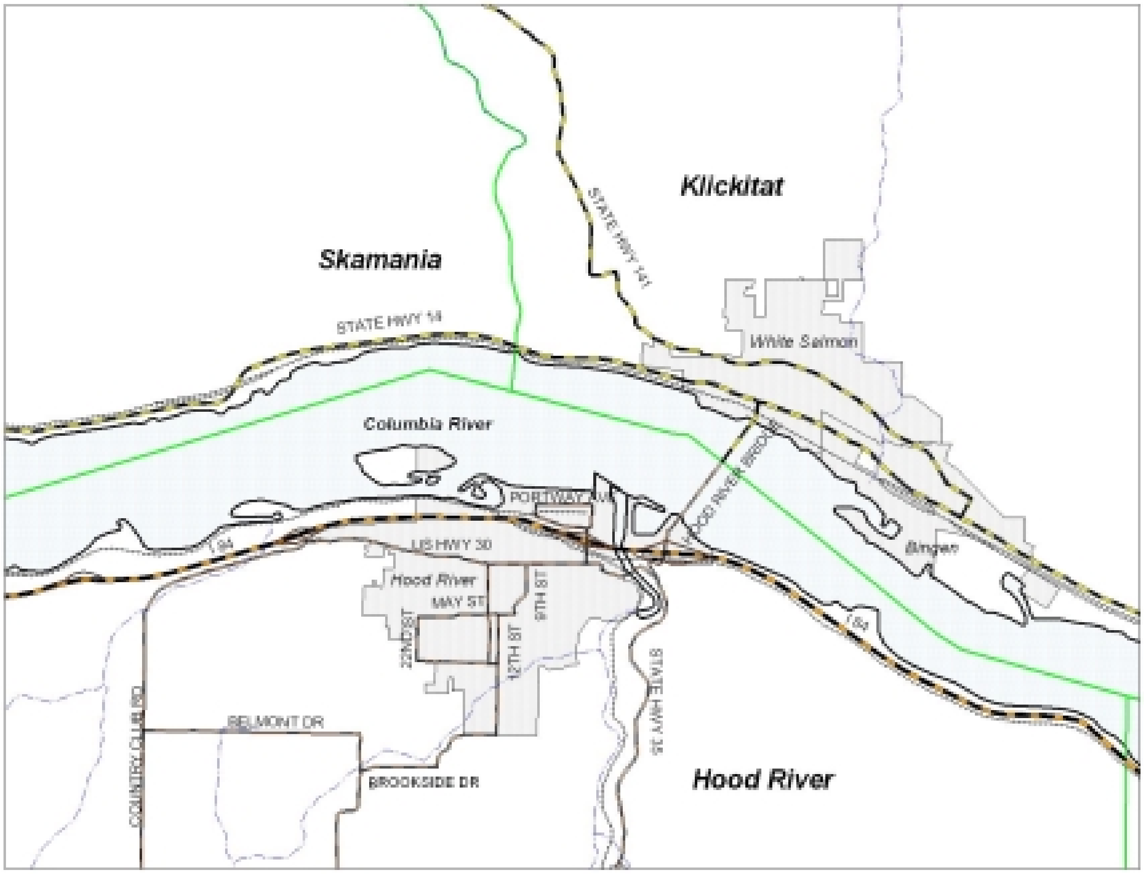
The Hood River Bridge is one of nine bridges on the Columbia River along the Oregon/ Washington border that provides north/south highway connections between two major east/west highway systems – Interstate Highway 84 (I-84) and Washington State Route 14 (SR-14). In addition, the Bridge is the northern terminus of Oregon State Highway 35 (OR-35), which provides north/south access between the Columbia Gorge and Mt Hood. The Hood River Bridge is one of three bridges located in the Columbia Gorge National Scenic Area (CGNSA) and acts as an important crossing point for recreational travel within the CGNSA.

The nearest available alternative river crossings are located 24 miles west of Hood River in Cascade Locks or 22 miles east of Hood River in The Dalles. The Dalles Bridge is the only one of these three bridges, which has separate pedestrian and bicycle facilities on the bridge. Much of the regional significance of the Hood River Bridge is derived from its connection between these two highway systems and between White Salmon/Bingen, Washington and Hood River, Oregon, as well as connecting the Ports of Hood River and Klickitat.

I-84 is the major east/west highway in Oregon and provides trucks and automobiles with access to the east from the valleys of western Oregon and Washington without the need for climbing the Cascade Mountains. I-84 is part of the Interstate Highway System and part of the National Highway System (NHS) and is also part of State Highway Freight System. The Oregon Highway Plan adopted by the Oregon Highway Commission in 1999, sets out a series of policy objectives that affect I-84 and it connecting roadways and bridges. Any proposed changes to the Hood River Bridge should be consider in light of the policies established by Oregon Highway Plan.

SR-14 is a historic 2 lane State highway that provides the primary highway connections to the communities along the north shore of the Columbia River. SR-14 is classified as a minor arterial in the Washington Highway System, and as a rural principal arterial and part of the National Highway System. SR-14 is the primary east/west highway on the north shore of the Columbia River and an important transportation corridor within the CGNSA. SR-14 is also a freight route and is classified as a T-3 Highway (300K to 5,000K tons of freight annually and 24 to 4000 trucks daily) under Washington's Freight and Goods Transportation System. In the area of the Hood River Bridge, SR-14 was recently improved to include turn lanes and shoulders.

Vicinity Map



Private vehicles are the predominant travel mode in the Columbia Gorge. Pedestrian and bicycle travel are an increasingly important component of recreational travel in the CGNSA. The Hood River Bridge in its current configuration does not effectively support non-vehicular travel between the two east/west on highway corridors. In fact, bicycle and pedestrian travel are discouraged on the Hood River Bridge.

Public transit service in the area of the Hood River Bridge is minimal but it does exist on both sides of the Columbia River. This is a typical situation for rural counties with small population bases. Columbia Area Transit (CAT) provides public transit in Hood River County in the form of a demand-responsive van system. CAT has eight twenty-passenger vans and one thirty-passenger bus. It is planning to construct a multi-modal transit center on the Hood River waterfront, which could serve as a base for any transit-based operations over the bridge. At this time, CAT does not provide regular transit service across the Hood River Bridge. Mt Adams Transit provides similar demand-responsive van service in the areas north of the Columbia River, and on an infrequent basis, Mt. Adams Transit vehicles cross the bridge to provide access to Hood River.

The concept of using a Hood River to Bingen shuttle van as a non-structural method of providing pedestrian and bicycle across the Hood River Bridge was discussed in an analysis prepared for the Port of Hood River. This option has not been implemented but it has promise as a short-term solution for increasing public transit access and pedestrian and bicycle mobility in the Hood River–Bingen-White Salmon area. This is especially true during those times of the year when recreational travel by bicycle is common.

There is one park and ride lot in close proximity to the Hood River Bridge. This lost is located at the north end of the bridge and is used by an average of 20 vehicles a day. The majority of the users are believed to be people who are traveling from Washington to Oregon by car pool.

Hood River Bridge

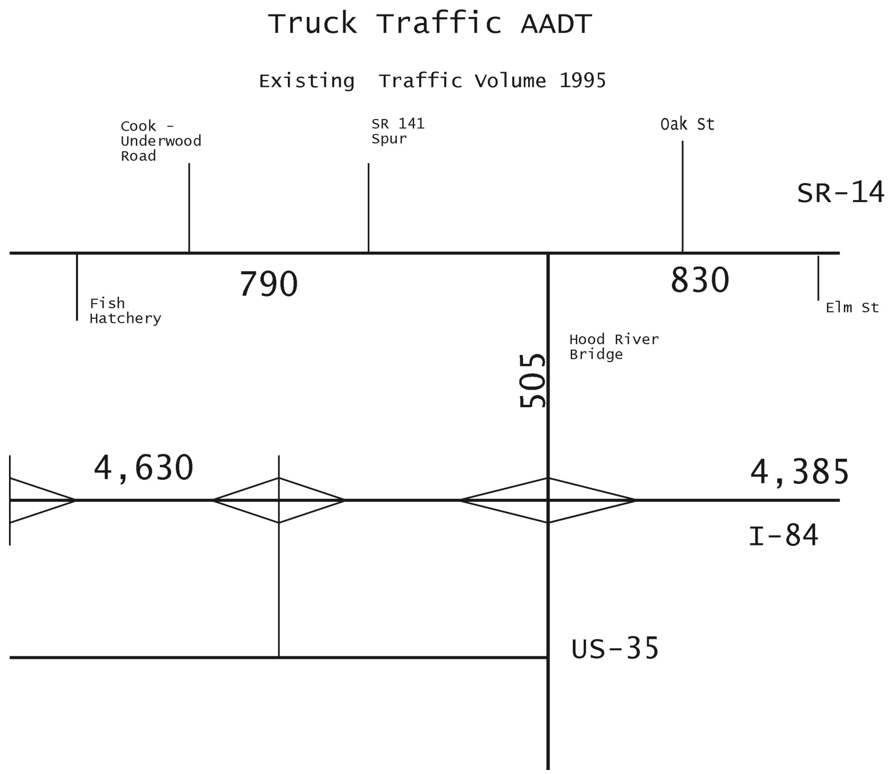
The Hood River Bridge was constructed in 1924 and opened to traffic in December of 1924. Congress authorized the Oregon Washington Bridge Company to construct the toll bridge at this location in 1923. The bridge is a steel structure that has a twenty feet wide steel deck travel surface. The Hood River Bridge roadway deck has a width of 18 feet 9 inches, which is wide enough for two 9 feet wide travel lanes. There are no separate pedestrian or bicycle facilities on the bridge.

The first major revision to the bridge structure occurred in 1938 when the bridge was partially rebuilt to move it vertically. The vertical was a response to the newly created pool behind the Bonneville Dam, which changed the water elevation at the Hood River Bridge. During this rebuild, a lift span was added to the bridge.

The Hood River Bridge was purchased, by the Port of Hood River, in 1950 following the approval of legislation by the Oregon State Legislature. The Port of Hood River has operated and maintained the bridge since that time. The vertical clearance between is lift span and normal water level is adequate to allow most river traffic to pass beneath the bridge without the lift span being raised. Under normal circumstances, the Bridge lifts one or two times per month.

Other Transportation Modes

The study area contains a wealth of transportation modes, mainly for freight. Truck traffic accounted for eight percent of all vehicles using the bridge on a daily basis in 1990. A more recent analysis used in the SR-14 Corridor Plan showed the following average annual daily traffic (AADT) for truck on the bridge, SR-14 and I-84. East/west truck movements dominate truck movements in the vicinity of the bridge.



There is a significant amount of river traffic in the vicinity of the bridge. This traffic consists mainly of barges, which travel through the area, although a small component has destinations within the study area (see the Economic chapter of this report).

Union Pacific owns and operates a railroad mainline on the southern side of the Columbia River. On the north side, Burlington Northern Santa Fe Railroad owns and operates a mainline that parallels SR-14. Both railroads provide connections to the west (Portland and Vancouver) and the east (Spokane and Boise). A cross-river connection exists at Wishram, located east of Hood River.

Amtrak operates the Empire Builder intercity passenger service along the railroad tracks on the north side of the River. This service formerly was daily and has been scaled back in recent years. It provides service between Portland/Vancouver, Boise, Denver, and Chicago. There is a passenger station in Bingen.

Amtrak formerly operated the Pioneer along the Union Pacific Railroad on the south side of the River. This service was discontinued in 1997-1998 along with other service cutbacks. There was formerly a passenger stop in Hood River. Oregon and Idaho have been in discussions with Amtrak regarding re-initiating a “New Pioneer” passenger service between Portland and Boise, but to date no final decisions have been made on initiating this service.

A short line railroad known as the Mount Hood Railroad operates excursion service out of Hood River, running south toward Mount Hood. This service operates mainly in the summer.

Columbia River Historic Highway

The Columbia River Historic Highway (US-30) parallels I-84 through most of the Columbia Gorge. In the SR 35 study area, it intersects I-84 at the West Hood River exit, and then travels through downtown Hood River along Oak Street. It intersects OR-35 south of I-84 on a bluff overlooking the Hood River Bridge, approximately 1/3 mile south of I-84. US-30 then runs along the south side of I-84, closely paralleling the highway, to the east end of the study area.

Through legislation adopted by the State of Oregon, the Columbia River Historic Highway is to be maintained in its historic alignment and configuration. These protections restrict any improvements to the Highway.

Additionally, the downtown portion of US-30 has been listed as a National Historic District. This designation requires that the roadway between the existing curbs be kept in its historic condition. Therefore, it is difficult, if not unlikely, that any widening of the Columbia River Historic Highway will be possible.

Area Traffic

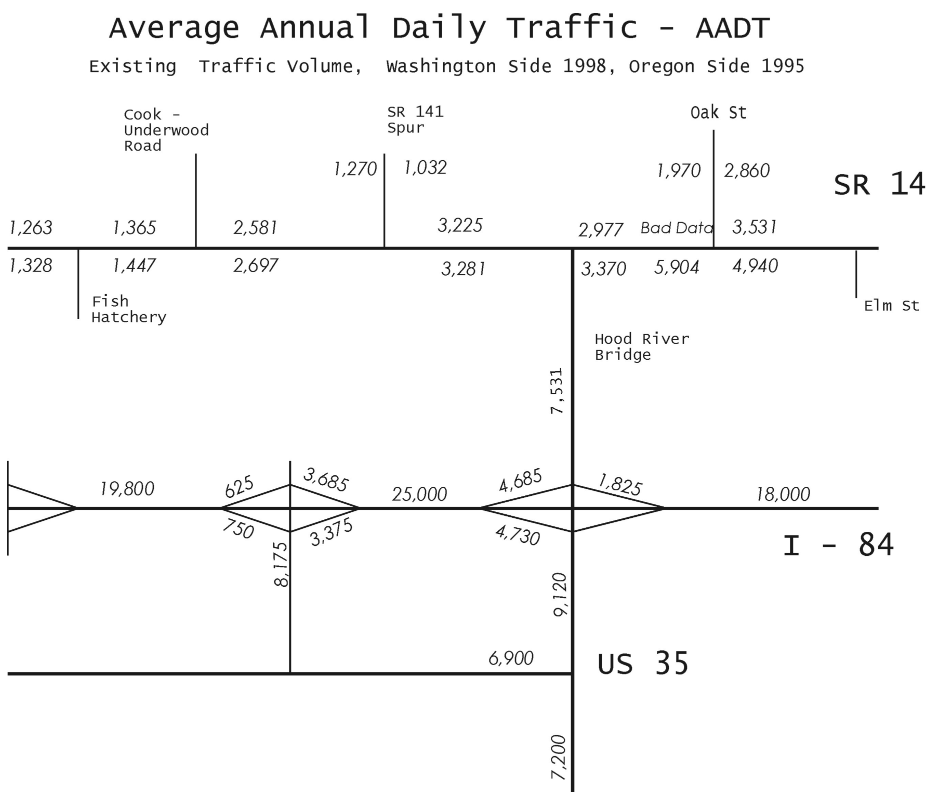
Traffic patterns in the area around the Hood River Bridge are influenced by three factors: the limited number of roads connecting with the bridge; the location of a majority of the jobs in the region on the south side of the Columbia River; and the differences in the tax structure between Oregon and Washington. The Washington sales tax provides an added incentive for Washington residents to do their major shopping south of the river where there is no sales tax. The location of Wal-Mart in Hood River is a clear case of a major retailer siting a facility in such a manner as to take advantage of this difference. Other economic issues are discussed in the economic memorandum that is part of this report. The location of the jobs in the region and the affect of that factor on commuting patterns is clearly visible in the Origin Destination Survey, which is discussed in a later section.

The local road network in the vicinity of the Hood River Bridge is relatively limited. On the north side of the river, there are no alternative approaches to the Bridge. SR-14 provides this access and it is receives traffic from a limited number of local roads and the city streets in Bingen and White Salmon. On the south access to the bridge is from either I-84 or OR-35.

While there are a number of substandard local roads and streets in the vicinity of the Hood River Bridge the congestion level on local roads are relatively low. SR-14 is generally rated as having a B or a C level of service. This means that traffic flow on SR-14 usually travels at the posted speed limit, and that side-street traffic experiences less than 40 seconds of delay entering SR-14.

The Hood River to Mt Hood, OR-35 Corridor Plan notes that while the traffic volumes in the Corridor have been growing there are few congestion problems. The highest level of congestion in the Hood River area occurs at the East Hood River Interchange where OR 35/Hood River Bridge access roadway intersects with two off ramps. These intersections both have a moderate level of congestion (LOS D/E) with left turn movement delays of over 40 seconds. The other high volume intersection, Button Junction – State Street and OR-35 operates at a C level of service most of the year. However, seasonal recreation traffic (especially in the winter when conditions on US-26/Mount Hood Corridor serves to divert traffic to OR-35/I-84) can push it to an F level of service. While there are a few other intersections in Hood River that have congestion problems, the majority of the local road system has adequate capacity.

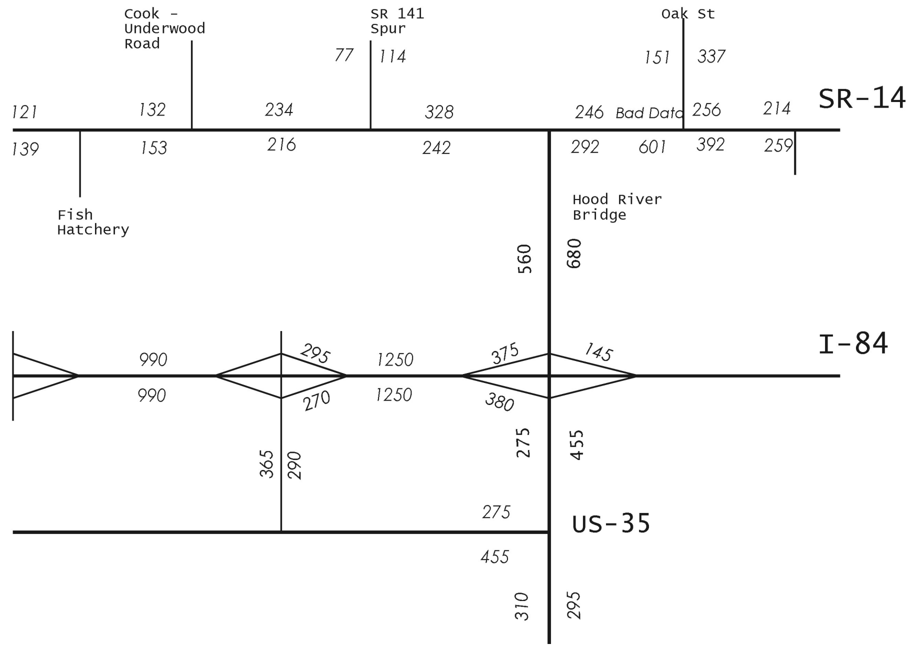
The diagram shown below was created using the Average Annual Daily Traffic estimates for the SR-14 Corridor Plan (1998) and the Hood River Transportation System Plan (1995) and bridge crossing counts from the Port of Hood River. Additionally, the consultant team recently conducted AM peak hour counts (October 2000).



The PM Peak hour traffic counts shown below are taken from the same sources as the AADT counts in the previous diagram.

PM Peak Hour Traffic

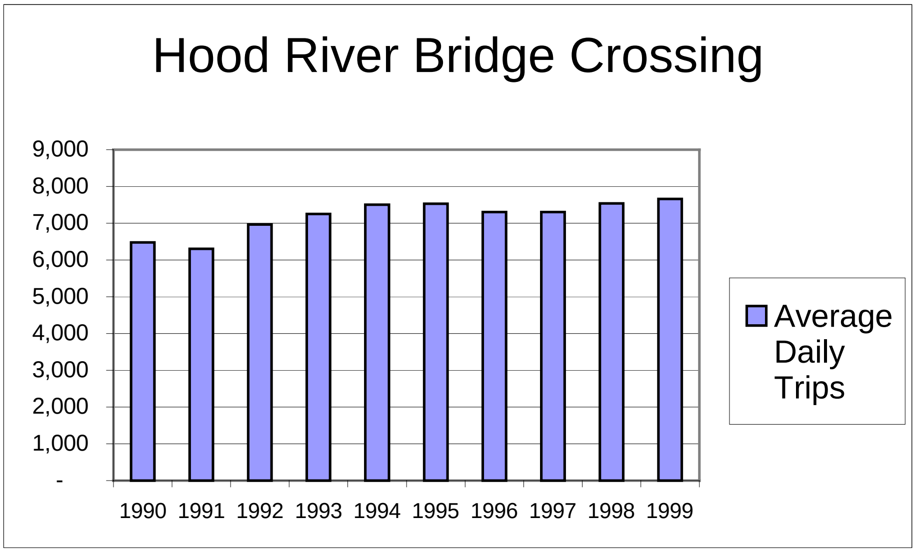
Existing Traffic Volume Washington Side 1998, Oregon Side 1995



The Port of Hood River maintains a monthly traffic count of all vehicles traveling both ways on the Hood River Bridge, which is shown in the table below. Traffic counts on the bridge increased substantially in 1992 when the Wal-Mart open in Hood River. During the next six years, traffic counts on the bridge varied between 7,300 and 7,500. Last year traffic counts on the bridge exceeded 7,600 vehicles per day. This traffic data is shown in the following table and chart

Bridge Crossing

Year	Annual Crossing	Annual Change	Annual Average Daily Crossings	Annual Change
1990	2,365,120		6,480	
1991	2,301,839	(63,281)	6,306	(173)
1992	2,548,467	246,628	6,963	657
1993	2,648,353	99,886	7,256	293
1994	2,738,927	90,574	7,504	248
1995	2,748,929	10,002	7,531	27
1996	2,671,882	(77,047)	7,300	(231)
1997	2,664,745	(7,137)	7,301	0
1998	2,751,761	87,016	7,539	238
1999	2,797,504	45,743	7,664	125
Change 90-98	432,384		1,185	1,185
Percent Change	18.28%		18.28%	



1990 Origin Destination Survey

In 1990 the Washington State Legislature authorized the Washington State Transportation Commission to conduct a traffic survey of the Hood River Bridge in conjunction with the local governments. The result of this decision was the 1990 Origin Destination Survey, which is the most recent survey of the users of this bridge.

The origin destination survey was conducted between Thursday September 27 and Saturday September 29. All vehicles crossing the bridge were provided a six-question survey form in the form a prepaid mailer. Since that time the there have been several changes in the area including the location of a Wal-Mart in Hood River. These changes suggest the need for an updated origin destination study that would provide a current picture of bridge traffic.

A total of 3,408 surveys were returned which is a 39% response rate. The vehicle characteristics of the respondents were as follows:

Vehicle Type

- Passenger Vehicle 98%
- Truck 8%

State of Origin

- Washington 58%
- Oregon 36%
- California 2%
- Other 4%

Average Vehicle Occupancy

- 1.63 passengers per vehicle

Each vehicle was asked two questions on regarding their trip origin and destination.

- Where did this one trip begin?
- Where did this one-way trip end?

This question produce distinctly different results for trips the end at home and trips that ended at other than home.

Location of Trip End	Home	Non Home
Hood River	13%	49%
Hood River / Wasco County	6%	7%
Other Oregon	7%	9%
White Salmon/ Bingen	40%	20%
Klickitat County	16%	7%
Skamania County	15%	6%
Other Washington	3%	2%
Total	**100%**	**100%**

Home trips – trips that end at home are more likely to end on the Washington side of the bridge. Non Home trips are more likely to end on the Oregon side of the bridge. This suggests that local Washington residents are the primary users of the Hood River Bridge.

Questions were also asked concerning the purpose of the trips across the bridge. This question produced the following results.

Trip Purpose

- Work 31%
- School 3%
- Outdoor Recreation 12%
- Personal Errand / Medical 19%
- Shopping/Eating/Social 35%

The two dominant trip purposes for those crossing the bridge are work and shopping

Another question looked at how often individuals used the bridge on a weekly basis and produced the following results.

Average Number of Trips per Week

- Less than 1 17%
- 1 to 2 13%
- 3 to 4 19%
- 5 to 7 14%
- 8 to 10 14%
- 11 or more 23%

More than half of the respondents use the bridge more than 5 times per week. At the other end of the scale the occasional user accounted for approximately one sixth of the total trips.

Updated Traffic Counts and Future Traffic Volumes

Current traffic counts have been collected for the Study Area. The final report on the study area will contain 2020 No-Build traffic volumes for major roadways. These volumes will be developed based on past 5-year trends and work on the Hood River Transportation System Plan and the current traffic counts.

Information Sources:

City of Hood River and David Evans and Associates, *City of Hood River Transportation System Plan*, Hood River, Oregon 1999

David Evans and Associates, *SR-14 Corridor Management Plan, Columbia River Gorge National Scenic Area*, Portland Oregon July 1997

HNTB*, Non-Structural Alternative for Bicycle and Pedestrian Use of the Hood River Toll Bridge*, Hood River Oregon 1999

Intergovernmental Resource Center, *Hood River Bridge Origin and Destination Survey*, Vancouver, Washington, 1990

Oregon Department of Transportation Plan, *Oregon Highway Plan*, Salem, Oregon 1999