

FINAL
PROBLEM DEFINITION
December 27, 2005

Introduction

Major transportation agencies in the Vancouver-Portland region have joined together to lead development of transportation improvements to the 5-mile segment of Interstate 5 (I-5) between State Route (SR) 500 in Vancouver and Columbia Boulevard in Portland, including the bridges across the Columbia River (the I-5 Bridge Influence Area). Improvements are expected to address highway, vehicular freight, transit, pedestrian, and bicycle needs.

Function and Role of the I-5 Bridge Influence Area

I-5 is the only continuous north/south interstate highway on the West Coast, providing a commerce link for the United States, Canada, and Mexico. In the Vancouver-Portland region, I-5 is one of two major highways that provide interstate connectivity and mobility. I-5 directly connects the central cities of Vancouver and Portland. Interstate 205 (I-205), a 37-mile long freeway that extends from its connection with I-5 at Salmon Creek to its terminus with I-5 near Tualatin, provides a more suburban and bypass function and serves travel demand between east Clark County, east Multnomah County, and Clackamas County.

Operation of the I-5 crossing over the Columbia River is directly influenced by the 5-mile segment of I-5 between SR 500 in Vancouver and Columbia Boulevard in Portland. Known as the I-5 Bridge Influence Area, this segment includes eight interchanges, including connections with four state highways (SR 14, SR 500, and SR 501 in Washington and OR 99E in Oregon) and with several major arterial roadways, that serve a variety of land uses, and provides access to downtown Vancouver, two international ports, industrial centers, residential neighborhoods, retail centers, and recreational areas.

The existing I-5 crossing of the Columbia River consists of two side-by-side bridges that have lift spans. They were built four decades apart and the cost of each was financed with bridge tolls. The eastern bridge (serving northbound traffic) was built in 1917 and the western bridge (serving southbound traffic) was built in 1958. The two-bridge crossing, which served 30,000

vehicles per day in the 1960s, now carries more than 125,000 automobiles, buses, and trucks each weekday. While many of these trips are regionally-oriented (average trip length is 16 miles), it is estimated that 70 to 80 percent of trips using the I-5 crossing actually enter and/or exit I-5 within the 5-mile long I-5 Bridge Influence Area.

A second interstate highway river crossing is located 6 miles east (upstream) of the I-5 crossing. The I-205 Glenn Jackson Bridge, which opened in 1982, carries about 140,000 vehicles per day and is reaching its peak-hour period carrying capacity. This bridge has a fixed span. No other river crossing options in the metropolitan area are available between the two states. The next closest bridges for automobile use are located at Longview, Washington, 46 miles to the west, and at Cascade Locks, Oregon, 40 miles east of the I-5 bridge crossing.

A rail bridge is located about a mile west (downstream) of the I-5 crossing. The Burlington Northern-Santa Fe (BNSF) rail bridge was built in 1908 and features a swinging span to accommodate river traffic. The I-5 crossing's lift spans were designed to align with the rail bridge's swing span.

The I-5 Bridge Influence Area serves several broad travel markets:

- Through travel. These users travel from outside the Vancouver-Portland region to destinations that are also outside the region—for example, a freight or tourist trip from Seattle, Washington to Eugene, Oregon. These users represent about 7 percent of the total vehicle-trips crossing the river during the peak periods.
- Regional travel. Most of these users travel between Clark County and the Portland metropolitan area (Multnomah, Washington and Clackamas counties), or vice-versa, without stopping in the I-5 Bridge Influence Area. These trips account for about 47 percent of the total vehicle-trips crossing the river during the peak periods.

Seven percent of the total trips crossing the river originate within the region and are destined outside of the region, or originate outside of the region and are destined within the region, for example, a trip from Salem, Oregon to Clark County.

- Local travel. Most of these users travel between the I-5 Bridge Influence Area and other locations within the Vancouver/Portland metropolitan area, or vice-versa. For example, a trip from a southeast Portland neighborhood to downtown Vancouver is considered a local trip. These trips account for about 32 percent of the vehicle-trips crossing the I-5 bridge during the peak periods.

Two percent of the total trips crossing the river originate outside the region and are destined to a location within the I-5 Bridge Influence Area, or originate within this area and are destined outside of the region, for example, a trip from Longview, Washington to Portland Meadows.

- Internal travel. These users stay entirely within the I-5 Bridge Influence Area—for example, from downtown Vancouver to Hayden Island. This constitutes about 5 percent of the trips crossing the I-5 bridge during the peak periods.

Definition of the Problem

Current Problems	Details/Background
1. Travel demand exceeds capacity in the I-5 Bridge Influence Area, causing heavy congestion and delay during peak travel periods for automobile, transit, and freight traffic. This limits mobility within the region and impedes access to major activity centers.	Heavy traffic congestion has resulted from growth in regional population and employment and in interstate commerce over the last two decades. The existing I-5 bridge crossing provides 3 lanes of capacity in each direction, with a directional capacity of about 5,500 vehicles per hour. Travel demand currently exceeds that capacity during peak periods. As a result, stop-and-go traffic conditions last 2 to 5 hours in the mornings and afternoons. These conditions are aggravated by vehicle merges, traffic accidents, and vehicle breakdowns. Due to excess travel demand in the I-5 Bridge Influence Area, many travelers take longer, alternative routes such as I-205, or circulate on local streets to less direct I-5 interchanges. In addition, spillover traffic from I-5 onto parallel arterial roadways increases local congestion. Although the lift span is used only in off-peak periods, it affects travel reliability across the river and creates extensive traffic delays. The span is opened 20 to 30 times a month, with the greatest number of lifts occurring during the winter when water levels are at their highest. Each lift takes approximately 10 minutes, creating traffic delays that can last up to an hour. During peak periods when the lifts are not allowed, river traffic must maneuver a tight S-curve route through the rail bridge opening and the highest fixed span of the I-5 crossing, creating hazardous navigation conditions.
2. Transit service between Vancouver and Portland is constrained by the limited capacity in the I-5 corridor and is subject to the same congestion as other vehicles, affecting transit reliability and operations.	The I-5 bridge is a critical bi-state transit link for transit patrons traveling between Vancouver and Portland. Bi-state transit service includes local fixed-route bus service between downtown Portland and downtown Vancouver (using the I-5 bridge), commuter-oriented peak period express routes from Clark County park-and-rides and transit centers to downtown Portland on both I-5 and I-205, and I-205 shuttle service between Fisher's Landing Transit Center and the Parkrose Transit Center. Current congestion in the I-5 Bridge Influence Area has an adverse impact on transit travel speed and service reliability. Between 1998 and 2005, local bus travel times between the Vancouver Transit Center and Hayden Island increased 50 percent during the peak period. Local buses crossing the I-5 bridge in the southbound direction currently take up to three times longer during parts of the morning

	peak period compared to off peak periods. On average, local bus travel times are between 10 percent and 60 percent longer when traveling in the peak period direction. Commuter buses also experience congestion and incident-related delays. Commuter buses traveling southbound during the morning peak period have travel times between 45 percent and 115 percent longer than commuter buses traveling during off-peak periods. Commuter buses traveling northbound during the afternoon peak period have the advantage of using the northbound High Occupancy Vehicle lane, however, these buses still experience travel times between 35 percent and 60 percent longer than commuter buses traveling during the off-peak periods.
3. The access of truck-hauled freight to nationally and regionally significant industrial and commercial districts, as well as connections to marine, rail, and air freight facilities, is impaired by congestion in the I-5 Bridge Influence Area.	I-5 is the primary supply-chain for goods moving into and out of the Vancouver-Portland region and the Pacific Northwest. Access to nationally and regionally significant industrial and commercial districts, including the Ports of Vancouver and Portland, and connections to marine, rail and air freight facilities, is adversely affected by congestion in the I-5 Bridge Influence Area. Congestion is increasingly spreading into the off-peak periods (including weekends) used by freight carriers. Declining freight carrier access slows delivery times and increases shipping costs, diminishing the attractiveness of I-5 and the uses served by I-5, and negatively affecting the region's economy. Recent forecasts indicate that truck traffic in the region will double, and the logistics requirements for freight delivery time will become increasingly "just-in-time" – placing even more pressure on travel time reliability.
4. The I-5 bridge crossing area and its approach sections experience crash rates over two times higher than statewide averages for comparable urban freeways in Washington and Oregon, largely due to outdated design. Incident evaluations attribute crashes to congestion, closely spaced interchanges, short weave and merge sections, vertical grade changes in the bridge span, and narrow shoulders.	Over 300 reported crashes occur annually in the I-5 Bridge Influence Area. Crashes have resulted in substantial property damage and injury; some have resulted in fatalities. The causes are: Close Interchange Spacing The 5-mile Bridge Influence Area contains eight closely spaced interchanges. These interchanges provide access to several east-west highways and arterial roadways that serve a mix of interstate, regional, and local trip purposes. The average distance between the interchanges is 1/2 mile, as compared with a recommended minimum spacing of 1 mile between interchanges located in urban areas. Short Weave and Merge Sections Short weave sections for vehicles entering and exiting the

In addition, the configuration of the existing I-5 bridges relative to the downstream BNSF rail bridge contributes to hazardous navigation conditions for commercial and recreational boat traffic.	freeway generate backups and delay due to difficulty in maneuvering, especially for large trucks. The proportion of trucks is high because this segment provides arterial street access to both ports. Outdated designs for entrance and exit ramps cause backups onto the mainline at exit ramps. Most of the entrance ramps do not provide enough space for vehicles to merge safely with through traffic. Vertical Grade Changes Vertical grade changes in the bridge span over the Columbia River create sight distance limitations that reduce speeds and create potential hazards to motorists. Narrow Highway Shoulder Width Several segments of the I-5 Bridge Influence Area, including the I-5 bridge, have narrow inside and outside shoulders in both travel directions. In several locations, shoulders are as little as 1-foot wide (10- to 12-foot wide shoulders are standard). The lack of shoulders positions many motorists undesirably close to physical barriers that border I-5. Many drivers respond with caution by slowing down to increase separation from vehicles ahead and behind. Increased vehicle spacing reduces vehicle throughput and contributes to freeway congestion. In addition, the lack of safe areas for incident response, disabled vehicle pullout, and driver recovery also impairs the ability to manage highway operations and recover from events that interrupt traffic flow. Hazards for River Navigation The I-5 crossing's lift span cannot be raised during peak traffic periods. This requires river traffic heading downstream on the Columbia River to navigate under the bridge's high fixed spans near the middle of the river, then quickly turn to line up with the narrow opening of the rail bridge on the north side of the river. This maneuver is especially difficult during high river levels and could result in a collision between a vessel and one of the bridges.
5. Bicycle and pedestrian facilities for crossing the Columbia River in the I-5 Bridge Influence Area are not designed to promote non-motorized access and connectivity across the river.	The width of the bicycle/pedestrian facility on the I-5 bridge is substandard (6 to 8 feet) and located extremely close to traffic. Separated multi-use paths should be at least 10 feet wide. Bicycle and pedestrian connections between North Marine Drive, Hayden Island, and Vancouver require out-of-direction travel. For example, no connection exists for

In addition, “low speed vehicles” are not allowed to use the I-5 bridge to cross the river.	pedestrians or bicyclists wanting to stay on the west side of the bridge between Hayden Island and North Marine Drive. In addition, many of the I-5 Bridge Influence Area’s features are not in compliance with Americans with Disabilities Act design guidelines. “Low speed vehicles” can be propelled via various means, including through the use of different fuels or electric power. These vehicles must have seatbelts, windshields, turn signals, headlights, brake lights and other safety equipment. According to the National Highway Traffic Safety Administration, “low speed vehicles” are capable of speeds of up to 25 miles per hour and can be operated on streets with posted speed limits of 35 miles per hour or less. Since I-5 is posted for freeway speeds and since the bridge’s multi-use pathway is narrow and permits only non-motorized vehicles, “low speed vehicles” are not allowed to use the I-5 bridge to cross the river.
6. The I-5 bridges across the Columbia River do not meet current seismic standards, leaving them vulnerable to failure in an earthquake.	Previous studies concluded that the existing structures could not be upgraded to fully meet seismic design standards without full bridge reconstruction.
7. The current configuration of I-5 within the I-5 Bridge Influence Area limits east-west connectivity across the highway for all users.	There are a limited number of overcrossings and undercrossings of I-5, particularly across I-5’s approaches to the Columbia River bridge crossing, i.e., between downtown Vancouver to the west of I-5 and the numerous land uses to the east of I-5 and between Jantzen Beach and Hayden Island. Users wishing to travel across I-5 often must take circuitous routes.
Future Problems	Details/Background
8. As the Vancouver/Portland metropolitan region grows, mobility and accessibility for automobile, freight, and transit will decline unless the disparity between demand and capacity in the I-5 Bridge Influence Area is addressed. The increasing disparity between demand and capacity will lead to longer delays, increased accident potential, and diminished	Regional Growth Consistent with regionally adopted comprehensive plans, the region’s growth forecasts indicate that population, employment, and commercial trade will continue to grow, increasing regional travel demand. • Between 2005 and 2030, the population of the four-county Vancouver-Portland region is projected to increase by 44 percent, from 1.96 million to 2.82 million. • Regional trade is expected to almost double over the next 25 years to over 520 million tons. While currently 64 percent of the region’s freight tonnage is hauled by truck, by 2030 it is projected that 73 percent will be

quality of life and economic opportunity.	carried by truck, many including container loads. Increased Travel Demand Daily traffic demand over the I-5 bridge is expected to increase by more than 40 percent in 20 years, from 125,000 vehicles in 2000 to 180,000 vehicles in 2020 (traffic is expected to further increase beyond 2020; new travel demand modeling is currently being conducted to predict 2030 levels). The projected increase in use of the bridge is constrained by the lack of capacity to accommodate more vehicles, resulting in an expansion of the peak period to accommodate the projected traffic increase. There will also be a potentially large and underserved transit market for trips between key regional locations traveling or connecting through the I-5 Bridge Influence Area. Deteriorating Traffic Conditions Unless improvements are made, traffic conditions in the I-5 Bridge Influence Area are predicted to worsen over the next 20 years: • Traffic congestion and delay will increase, with stop-and-go conditions occurring in both directions for 10 to 12 hours on weekdays. Increased delays on weekends will also result. • The current off-peak periods, which are generally uncongested and favored by freight carriers, will blend into adjacent peak period congestion, increasing freight delay throughout much of the day. • Vehicle-hours of delay during the evening commute period will increase nearly 80 percent, from 18,000 hours to 32,000 hours each day. Vehicle-hours of delay on truck routes will increase by more than 90 percent, from 13,400 hours to 25,800 hours each day. • Average travel times for buses traveling in general purpose lanes on I-5 between downtown Vancouver and downtown Portland are expected to almost double, from 27 minutes in 2000 to 55 minutes in 2020. • With an extension in the duration of congestion, there may be pressure to increase the bridge lift closure periods, further hampering river navigation and increasing the likelihood of accidents between vessels and the bridge. • As traffic demands increase, accident levels will likely rise within the Bridge Influence Area.
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	Diminished Mobility and Accessibility • Slower highway speeds will reduce access to jobs, shopping, and recreational uses. • Regional truck freight is projected to increase by about 130 percent in the next 25 years; however, increasing delays between I-5 and freight centers will adversely affect freight distribution and access to ports and terminals, thereby shrinking market areas served by the Vancouver-Portland region. The current Regional Transportation Council Metropolitan Transportation Plan and the Metro Regional Transportation Plan recognize the need for additional capacity to improve the flow of people and freight in the I-5 Bridge Influence Area. Both plans include the I-5 Transportation and Trade Partnership Strategic Plan recommendations to increase mobility and accessibility in the I-5 Bridge Influence Area.
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