INTERSTATE 5 COLUMBIA RIVER CROSSING

Economics Technical Report

May 2008

Columbia River CROSSING

TO: Readers of the CRC Technical Reports

FROM: CRC Project Team

SUBJECT: Differences between CRC DEIS and Technical Reports

The I-5 Columbia River Crossing (CRC) Draft Environmental Impact Statement (DEIS) presents information summarized from numerous technical documents. Most of these documents are discipline-specific technical reports (e.g., archeology, noise and vibration, navigation, etc.). These reports include a detailed explanation of the data gathering and analytical methods used by each discipline team. The methodologies were reviewed by federal, state and local agencies before analysis began. The technical reports are longer and more detailed than the DEIS and should be referred to for information beyond that which is presented in the DEIS. For example, findings summarized in the DEIS are supported by analysis in the technical reports and their appendices.

The DEIS organizes the range of alternatives differently than the technical reports. Although the information contained in the DEIS was derived from the analyses documented in the technical reports, this information is organized differently in the DEIS than in the reports. The following explains these differences. The following details the significant differences between how alternatives are described, terminology, and how impacts are organized in the DEIS and in most technical reports so that readers of the DEIS can understand where to look for information in the technical reports. Some technical reports do not exhibit all these differences from the DEIS.

Difference #1: Description of Alternatives

The first difference readers of the technical reports are likely to discover is that the full alternatives are packaged differently than in the DEIS. The primary difference is that the DEIS includes all four transit terminus options (Kiggins Bowl, Lincoln, Clark College Minimum Operable Segment (MOS), and Mill Plain MOS) with each build alternative. In contrast, the alternatives in the technical reports assume a single transit terminus:

- Alternatives 2 and 3 both include the Kiggins Bowl terminus
- Alternatives 4 and 5 both include the Lincoln terminus

In the technical reports, the Clark College MOS and Mill Plain MOS are evaluated and discussed from the standpoint of how they would differ from the full-length Kiggins Bowl and Lincoln terminus options.

Difference #2: Terminology

Several elements of the project alternatives are described using different terms in the DEIS than in the technical reports. The following table shows the major differences in terminology.

DEIS terms	Technical report terms
Kiggins Bowl terminus	I-5 alignment
Lincoln terminus	Vancouver alignment
Efficient transit operations	Standard transit operations
Increased transit operations	Enhanced transit operations

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Difference #3: Analysis of Alternatives

The most significant difference between most of the technical reports and the DEIS is how each structures its discussion of impacts of the alternatives. Both the reports and the DEIS introduce long-term effects of the full alternatives first. However, the technical reports then discuss "segment-level options," "other project elements," and "system-level choices." The technical reports used segment-level analyses to focus on specific and consistent geographic regions. This enabled a robust analysis of the choices on Hayden Island, in downtown Vancouver, etc. The system-level analysis allowed for a comparative evaluation of major project components (replacement versus supplemental bridge, light rail versus bus rapid transit, etc). The key findings of these analyses are summarized in the DEIS; they are simply organized in only two general areas: impacts by each full alternative, and impacts of the individual "components" that comprise the alternatives (e.g. transit mode).

Difference #4: Updates

The draft technical reports were largely completed in late 2007. Some data in these reports have been updated since then and are reflected in the DEIS. However, not all changes have been incorporated into the technical reports. The DEIS reflects more recent public and agency input than is included in the technical reports. Some of the options and potential mitigation measures developed after the technical reports were drafted are included in the DEIS, but not in the technical reports. For example, Chapter 5 of the DEIS (Section 4(f) evaluation) includes a range of potential "minimization measures" that are being considered to reduce impacts to historic and public park and recreation resources. These are generally not included in the technical reports. Also, impacts related to the stacked transit/highway bridge (STHB) design for the replacement river crossing are not discussed in the individual technical reports, but are consolidated into a single technical memorandum.

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Interstate 5 Columbia River Crossing

Economics Technical Report:

Submitted By:

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ACRONYMS

Acronym	Description
ADA	Americans with Disabilities Act
AOM	C-TRAN Administration Operations and Maintenance
API	Area of Potential Impact
BNSF	Burlington Northern Santa Fe Railroad
BRT	Bus Rapid Transit
BTOD	Bus Transit Oriented Development
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CRC	Columbia River Crossing
DLCD	Department of Land Conservation and Development
DOT	Department of Transportation
DRG	Digital Raster Graphic
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FWG	Freight Working Group
GTEC	Growth and Transportation Efficiency Center
HCT	High-Capacity Transit
IAMP	Interchange Area Master Plan
ITS	Intelligent Transportation Projects
LOS	Level of Service
LRT	Light Rail Transit
Mph	Miles per hour
MSA	Portland-Vancouver Metropolitan Statistical Area
MTP	Metropolitan Transportation Plan
NEPA	National Environmental Policy Act
NRM	Natural Resources and Mining
OAR	Oregon Administrative Rule
ODOT	Oregon Department of Transportation
PDC	Portland Development Commission
PMSA	Portland-Vancouver Primary Metropolitan Statistical Area
RTOD	Rail Transit-Oriented Development
TAZ	Traffic Analysis Zone
TDM	Transportation Demand Management
TOD	Transit-Oriented Development
TRB	Transportation Research Board
TSM	Transportation System Management
TSP	Transportation System Plan
UPRR	Union Pacific Railroad
WSDOT	Washington State Department of Transportation

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1. Summary

1.1 Introduction

This report evaluates potential economic impacts that would result from the proposed Interstate 5 (I-5) Columbia River Crossing (CRC) project alternatives. These issues are summarized in this section, and addressed in more detail in the appropriate sections of the report.

This report addresses the following questions, based on available conceptual designs:

- What are the current and projected economic conditions in the project area?
- How will the construction and operation of the project impact local businesses (e.g., changes in access or turning radii, congestion, noise, traffic flows)?
- What will be the impact of construction-related spending on the regional economy?
- What mitigation measures or permits could be required?
- How will the different alternatives affect economic development?

The analysis is based on conceptual designs of a range of alternatives. The project sponsors will select a preferred alternative following the analysis and findings described in this and other technical reports, and input from project stakeholders and the public. Once the Preferred Alternative is selected, the project team will further refine the impact analysis and develop mitigation measures.

1.2 Description of the Alternatives

The alternatives being considered for the CRC project consist of a diverse range of highway, transit and other transportation choices. Some of these choices – such as the number of traffic lanes across the river – could affect transportation performance and impacts throughout the bridge influence area or beyond. These are referred to as "system-level choices." Other choices – such as whether to run high-capacity transit (HCT) on Washington Street or Washington and Broadway Streets – have little impact beyond the area immediately surrounding that proposed change and no measurable effect on regional impacts or performance. These are called "segment-level choices." This report discusses the impacts from both system- and segment-level choices, as well as "full alternatives." The full alternatives combine system-level and segment-level choices for highway, transit, pedestrian, and bicycle transportation. They are representative examples of how project elements may be combined. Other combinations of specific elements are possible. Analyzing the full alternatives allows us to understand the combined performance and impacts that would result from multimodal improvements spanning the bridge influence area.

Following are brief descriptions of the alternatives being evaluated in this report, which include:

- System-level choices,
- Segment-level choices, and
- Full alternatives.

1.2.1 System-Level Choices

System-level choices have potentially broad influence on the magnitude and type of benefits and impacts produced by this project. These options may influence physical or operational characteristics throughout the project area and can affect transportation and other elements outside the project corridor as well. The system-level choices include:

- River crossing type (replacement or supplemental)
- High-capacity transit mode (bus rapid transit or light rail transit)
- Tolling (no toll, I-5 only, I-5 and I-205, standard toll, higher toll)

This report compares replacement and supplemental river crossing options. A replacement river crossing would remove the existing highway bridge structures across the Columbia River and replace them with three new parallel structures – one for I-5 northbound traffic, another for I-5 southbound traffic, and a third for HCT, bicycles, and pedestrians. A supplemental river crossing would build a new bridge span downstream of the existing I-5 bridge. The new supplemental bridge would carry southbound I-5 traffic and HCT, while the existing I-5 bridge would carry northbound I-5 traffic, bicycles, and pedestrians. The replacement crossing would include three through-lanes and two auxiliary lanes for I-5 traffic in each direction. The supplemental crossing would include three through-lanes and one auxiliary lane in each direction.

Two types of HCT are being considered – bus rapid transit and light rail transit. Both would operate in an exclusive right-of-way through the project area, and are being evaluated for the same alignments and station locations. The HCT mode – LRT or BRT – is evaluated as a system-level choice. Alignment options and station locations are discussed as segment-level choices. BRT would use 60-foot or 80-foot long articulated buses in lanes separated from other traffic. LRT would use one- and two-car trains in an extension of the MAX line that currently ends at the Expo Center in Portland.

Under the Efficient operating scenario, LRT trains would run at approximately 7.5 minute headways during the peak periods. BRT would run at headways between 2.5 and 10 minutes depending on the location in the corridor. BRT would need to run at more frequent headways to match the passenger-carrying capacity of the LRT trains. This report also evaluates performance and impacts for an Increased operations scenario that would double the number of BRT vehicles or the number of LRT trains during the peak periods.

1.2.2 Segment-Level Choices

1.2.2.1 Transit Alignments

The transit alignment choices are organized into three corridor segments. Within each segment the alignment choices can be selected relatively independently of the choices in the other segments. These alignment variations generally do not affect overall system performance but could have important differences in the impacts and benefits that occur in each segment. The three segments are:

- Segment A1 – Delta Park to South Vancouver
- Segment A2 – South Vancouver to Mill Plain District
- Segment B – Mill Plain District to North Vancouver

In Segment A1 there are two general transit alignment options - offset from, or adjacent to, I-5. An offset HCT guideway would place HCT approximately 450 to 650 feet west of I-5 on Hayden Island. An adjacent HCT guideway across Hayden Island would locate HCT immediately west of I-5. The alignment of I-5, and thus the alignment of an adjacent HCT guideway, on Hayden Island would vary slightly depending upon the river crossing and highway alignment, whereas an offset HCT guideway would retain the same station location regardless of the I-5 bridge alignment.

HCT would touch down in downtown Vancouver at Sixth Street and Washington Street with a replacement river crossing. A supplemental crossing would push the touch down location north to Seventh Street. Once in downtown Vancouver, there are two alignment options for HCT – a two-way guideway on Washington Street or a couplet design that would place southbound HCT on Washington Street and northbound HCT on Broadway. Both options would have stations at Seventh Street, 12th Street, and at the Mill Plain transit center between 15th and 16th Streets.

From downtown Vancouver, HCT could either continue north on local streets or turn east and then north adjacent to I-5. Continuing north on local streets, HCT could either use a two-way guideway on Broadway or a couplet on Main Street and Broadway. At 29th Street, both of these options would merge to a two-way guideway on Main Street and end at the Lincoln Park and Ride located at the current WSDOT maintenance facility. Once out of downtown Vancouver, transit has two options if connecting to an I-5 alignment: head east on 16th Street and then through a new tunnel under I-5, or head east on McLoughlin Street and then through the existing underpass beneath I-5. With either option HCT would connect with the Clark College Park and Ride on the east side of I-5, then head north along I-5 to about SR 500 where it would cross back over I-5 to end at the Kiggins Bowl Park and Ride.

There is also an option, referred to as the minimum operable segments (MOS), which would end the HCT line at either the Mill Plain station or Clark College. The MOS options provide a lower cost, lower performance alternative in the event that the full length HCT lines could not be funded in a single phase of construction and financing.

1.2.2.2 Highway and Bridge Alignments

This analysis divides the highway and bridge options into two corridor segments, including:

- Segment A – Delta Park to Mill Plain District
- Segment B – Mill Plain District to North Vancouver

Segment A has several independent highway and bridge alignment options. Differences in highway alignment in Segment B are caused by transit alignment, and are not treated as independent options.

The replacement crossing would be located downstream of the existing I-5 bridge. At the SR 14 interchange there are two basic configurations being considered. A traditional configuration would use ramps looping around both sides of the mainline to provide direct connection between I-5 and SR 14. A less traditional design could reduce right-of-way requirements by using a "left loop" that would stack both ramps on the west side of the I-5 mainline.

1.2.3 Full Alternatives

Full alternatives represent combinations of system-level and segment-level options. These alternatives have been assembled to represent the range of possibilities and total impacts at the project and regional level. Packaging different configurations of highway, transit, river crossing, tolling and other improvements into full alternatives allows project staff to evaluate comprehensive traffic and transit performance, environmental impacts and costs.

Exhibit 1-1 summarizes how the options discussed above have been packaged into representative full alternatives.

Exhibit 1-1. Full Alternatives

	Packaged Options				
Full Alternative	River Crossing Type	HCT Mode	Northern Transit Alignment	TDM/TSM Type	Tolling Method[a]
1	Existing	None	N/A	Existing	None
2	Replacement	BRT	I-5	Aggressive	Standard Rate
3	Replacement	LRT	I-5	Aggressive	Two options[b]
4	Supplemental	BRT	Vancouver	Very Aggressive	Higher rate
5	Supplemental	LRT	Vancouver	Very Aggressive	Higher rate

[a] In addition to different tolling rates, this report evaluates options that would toll only the I-5 river crossing and options that would toll both the I-5 and the I-205 crossings.

[b] Alternative 3 is evaluated with two different tolling scenarios, tolling and non-tolling.

Modeling software used to assess alternatives' performance does not distinguish between smaller details, such as most segment-level transit alignments. However, the geographic difference between the Vancouver and I-5 transit alignments is significant enough to

warrant including this variable in the model. All alternatives include Transportation Demand Management (TDM) and Transportation System Management (TSM) measures designed to improve efficient use of the transportation network and encourage alternative transportation options to commuters such as carpools, flexible work hours, and telecommuting. Alternatives 4 and 5 assume higher funding levels for some of these measures.

Alternative 1: The National Environmental Policy Act (NEPA) requires the evaluation of a No-Build or "No Action" alternative for comparison with the build alternatives. The No-Build analysis includes the same 2030 population and employment projections and the same reasonably foreseeable projects assumed in the build alternatives. It does not include any of the I-5 CRC related improvements. It provides a baseline for comparing the build alternatives, and for understanding what will happen without construction of the I-5 CRC project.

Alternative 2: This alternative would replace the existing I-5 bridge with three new bridge structures downstream of the existing bridge. These new bridge structures would carry Interstate traffic, BRT, bicycles, and pedestrians. There would be three through-lanes and two auxiliary lanes for I-5 traffic in each direction. Transit would include a BRT system that would operate in an exclusive guideway from Kiggins Bowl in Vancouver to the Expo Center station in Portland. Express bus service and local and feeder bus service would increase to serve the added transit capacity. BRT buses would turn around at the existing Expo Station in Portland, where riders could transfer to the MAX Yellow Line.

Alternative 3: This is similar to Alternative 2 except that LRT would be used instead of BRT. This alternative is analyzed both with a toll collected from vehicles crossing the Columbia River on the new I-5 bridge, and with no toll. LRT would use the same transit alignment and station locations. Transit operations, such as headways, would differ, and LRT would connect with the existing MAX Yellow Line without requiring riders to transfer.

Alternative 4: This alternative would retain the existing I-5 bridge structures for northbound Interstate traffic, bicycles, and pedestrians. A new crossing would carry southbound Interstate traffic and BRT. The existing I-5 bridges would be re-striped to provide two lanes on each structure and allow for an outside safety shoulder for disabled vehicles. A new, wider bicycle and pedestrian facility would be cantilevered from the eastern side of the existing northbound (eastern) bridge. A new downstream supplemental bridge would carry four southbound I-5 lanes (three through-lanes and one auxiliary lane) and BRT. BRT buses would turn around at the existing Expo Station in Portland, where riders could transfer to the MAX Yellow Line. Compared to Alternative 2, Increased transit service would provide more frequent service. Express bus service and local and feeder bus service would increase to serve the added transit capacity.

Alternative 5: This is similar to Alternative 4 except that LRT would be used instead of BRT. LRT would have the same alignment options, and similar station locations and requirements. LRT service would be more frequent (approximately 3.5 minute headways

during the peak period) compared to 7.5 minutes with Alternative 3. LRT would connect with the existing MAX Yellow Line without requiring riders to transfer.

1.3 Long-Term Effects

1.3.1 Regional Effects

Each of the build alternatives would improve economic development conditions for businesses in both Oregon and Washington by: reducing congestion, improving access, improving safety, reducing overall travel times, and improving travel time reliability. The build alternatives would support this growth by reducing the roadway congestion experienced by freight, workers, and other vehicles going to and from the two cities. Additionally, the high-capacity transit (HCT) connections provided by the transit alternatives would improve travel time accessibility and reliability, and broaden the pool of labor available to firms within a given commute time.

1.3.2 Segment-level Effects

1.3.2.1 Segment A

The build alternatives in Segment A are expected to improve economic conditions by reducing congestion, improving safety, and improving access. They could encourage more economic development in this part of the region to take advantage of the new access. A summary of impacts associated with Segment A are listed in Exhibit 1-2 below.

The build alternatives in Segment A would acquire properties containing between 34 and 41 existing businesses, impacting between 470 and 565 employees and between $60 and $112 million in annual sales. Estimated property tax impacts to the City of Portland are between $205,000 and $220,000 (0.13 percent of the overall budgeted 2006 property tax revenues), and between $10,000 and $20,000 to the City of Vancouver (between 0.01 and 0.06 percent of the overall budgeted 2006 property tax revenues). Replacement alternatives in Segment A would displace five businesses in the vicinity of Marine Drive for the standard Marine Drive alignment, three businesses for the southern Marine Drive alignment, and more than two dozen businesses on Hayden Island. The supplemental alternatives would acquire slightly fewer businesses, impact fewer employees, and have less of an impact on annual sales revenues than the replacement alternatives. Typically, businesses displaced by a project such as this one prefer to move operations to another location and remain in business. Specific decisions are left to the business owner, but depend on availability of vacant land of similar size, zoning, and proximity to the local and regional transportation network. ODOT and WSDOT would provide relocation assistance to displaced businesses.

Access and circulation effects of the build alternatives would be substantial and positive for the businesses near Marine Drive, as the new interchange design is expected to reduce travel time and improve travel time reliability for commercial vehicles. This is true both for businesses in the direct vicinity of the interchange as well as businesses in the two established industrial districts (Rivergate and Airport) within the API (City of Portland 2004) who will take advantage of improvements along Marine Drive and along the highway.

Exhibit 1-2. Summary of Economic Effects (Segment A Highway and Bridge Alternatives)

	Alternative 1 No-Build	Alternative 2 (Replacement bridge with BRT)	Alternative 3 (Replacement bridge with LRT)	Alternative 4 (Supplemental Bridge with BRT)	Alternative 5 (Supplemental Bridge with LRT)
Number of Businesses Displaced					
Replacement	0	Up to 44	Same as Alternative 2	N/A	N/A
Supplemental	0	N/A	N/A	Up to 34	Same as Alternative 4
Number of Employees Impacted by Displacements					
Replacement	0	Up to 565	Same as Alternative 2	N/A	N/A
Supplemental	0	N/A	N/A	Up to 480	Same as Alternative 4
Annual Sales Impacts from Displacements					
Replacement	0	Up to $112 million	Same as Alternative 2	N/A	N/A
Supplemental	0	N/A	N/A	Up to $68 million	Same as Alternative 4
Property Tax Impacts					
Replacement	0	Up to $220,000 Portland Up to $20,000 Vancouver	Same as Alternative 2		
Supplemental	0			Up to $205,000 Portland Up to $10,000 Vancouver	Same as Alternative 4
Parking Impacts					
Replacement	0	40-80 spaces	Same as Alternative 2	N/A	N/A
Supplemental	0	N/A	N/A	40-80 spaces	Same as Alternative 4
Access/Circulation Impacts					
Replacement	Access and circulation same as existing.	Driveways for some businesses within Hayden Island and Marine Drive interchange areas closer than allowed under OAR 734-051.	Same as Alternate 2	N/A	N/A
Supplemental	Same as Replacement alignment	N/A	N/A	Driveways for some businesses within Hayden Island and Marine Drive interchange areas would be closer than allowed under OAR 734-051.	Same as Alternative 4

	Alternative 1 No-Build	Alternative 2 (Replacement bridge with BRT)	Alternative 3 (Replacement bridge with LRT)	Alternative 4 (Supplemental Bridge with BRT)	Alternative 5 (Supplemental Bridge with LRT)
Travel Patterns/Volumes Impacts					
				N/A	N/A
Replacement	Duration of congestion increases over current levels Travel time reliability similar or worse than current levels.	Travel time delay decreases and reliability increases for trucks and vehicles at Marine Drive and Hayden Island interchange areas.	Same as Alternative 2	N/A	N/A
Supplemental	Same as Replacement alignment	N/A	N/A	Travel time delay decreases and reliability increases for trucks and vehicles at Marine Drive interchange. Conditions at Hayden Island interchange area are not greatly improved.	Same as Alternative 4

Exhibit 1-3. Summary of Economic Effects (Segment B Highway and Bridge Alternatives)

	Alternative 1 No-Build	Alternative 2 (Replacement bridge with BRT)	Alternative 3 (Replacement bridge with LRT)	Alternative 4 (Supplemental Bridge with BRT)	Alternative 5 (Supplemental Bridge with LRT)
Number of Businesses Displaced	0	0	Same as Alternative 2	0	Same as Alternative 4
Number of Employees Impacted	0	0	Same as Alternative 2	0	Same as Alternative 4
Annual sales affected	0	0	Same as Alternative 2	0	Same as Alternative 4
Property Tax Revenue Impacts					
Replacement	0	Less than $1,000	Same as Alternative 2	N/A	N/A
Supplemental	0	N/A	N/A	Less than $1,000	Same as Alternative 4
Parking Impacts	0	0	Same as Alternative 2	0	Same as Alternative 4
Access/Circulation Impacts	Access and circulation same as existing.	Interchange improvements will improve circulation	Same as Alternative 2	Interchange improvements will improve circulation	Same as Alternative 4
Travel Patterns *Volumes Impacts*	Duration of congestion increases over current levels Travel time reliability similar or worse than current levels.	During the AM Peak period 20-30% of traffic on local streets would shift to I-5.	Same as Alternative 2	During the AM Peak period 20-30% of traffic on local streets would shift to I-5.	Same as Alternative 4

The replacement alternatives would provide slightly more benefit than the supplemental alternatives due to the additional capacity (three vs. one or two auxiliary lanes in each direction). Standard Marine Drive interchange improvements may affect the access for a sand and gravel business located directly north of the interchange area. Southern Marine Drive alignments would avoid impacting these accesses; however would displace three additional businesses.

The construction of any of the alternatives could substantially change the pattern of development on Hayden Island. Because residential development on the island is limited due to a Portland International Airport noise overlay zone, it can be expected that commercial development would continue to occur. Improved access to and from the highway, as well as planned investments in the local transportation network by the City and single ownership of large contiguous parcels is expected to be attractive to developers. The City of Portland is currently leading a master plan effort to facilitate and support potential redevelopment of certain sections of the island. Changes to access and circulation from the project would be considered by the City and by developers as redevelopment ensues. The location at the north edge of Oregon will remain attractive to Washington residents wishing to avoid paying state sales tax.

1.3.2.2 Segment B

The build alternatives in Segment B are expected to have positive benefits on economic development due to reduced travel times, improved safety, and improved travel time reliability.

The build alternatives would acquire no businesses in Segment B, with no employee or annual sales impacts. Property tax impacts from partial acquisitions are small, less than $1,000 for each alternative and comprising less than 0.01 percent of the budgeted 2006 Vancouver property tax revenues.

1.3.2.3 Transit - Segment A1

The transit options in Segment A1 are expected to improve economic development on Hayden Island and south downtown Vancouver. Few business displacements were uniquely associated with the transit alignments in Segment A1 (Exhibit 1-4). Parking and circulation impacts would be minor due to the elevated nature of the transit structure in this segment. The supplemental offset alignment would eliminate between 50 and 75 parking stalls from the Jantzen Beach Shopping Center.

Depending upon the recommendations from the Hayden Island Master Plan (Portland City Council adoption expected summer 2008), the potential for transit-oriented development (TOD) at the Hayden Island station could be moderate to high. Currently, most land within 0.25 mile of the proposed station is surface parking. Depending on the development climate, redevelopment could occur to bring stores closer to the station, with parking in the rear or in a structure. Current zoning is predominantly general commercial, which could be conducive to TOD.

The transit alignment and station on Hayden Island will be elevated and would create minimal to no disruptions to circulation within Hayden Island. However, if TOD

potential were realized access and congestion could remain critical issues. The City of Portland has imposed a moratorium on any development on Hayden Island that would increase automobile trips to and from the highway. An Interchange Area Management Plan (IAMP) currently underway will assess mobility, access, and circulation issues related to existing and planned transportation facilities and land development. Metro's 2040 Growth Plan and the City of Portland TSP both reference development of a potential container port terminal by the Port of Portland west of I-5. For these development plans to be realized, good access between this facility and the highway would be considered necessary.

1.3.2.4 Transit - Segment A2

Exhibit 1-5 summarizes impacts from Segment A2. HCT in Segment A2 has the potential to improve economic development in downtown Vancouver. Business displacements would be avoided or minor depending on the alignment, as the transit alignment largely fits within available City right-of-way. One existing business at the north end of downtown would be acquired under two of the Segment B alignments (Vancouver/two-way Broadway and I-5/McLoughlin Boulevard).

Negative effects associated with the HCT alignments in Segment A2 relate to parking and access. The two-way Washington Street light rail transit (LRT) and Bus Rapid Transit (BRT) alignments would remove all (100 percent) of the 106 on-street parking spaces along Washington Street between Sixth Street and 15th Street.

The Washington/Broadway couplet alignment would also impact on-street parking. Parking on both sides of Washington Street and much of Broadway would not be allowed, which amounts to removal of 230 spaces (94 percent of existing spaces on these corridors). Though parking would be available on side streets and parallel streets, this is expected to result in a large impact for businesses along both Washington and Broadway.

Under all options, one block between 15th and 16th and Washington and Main would be acquired, where the future Mill Plain transit station bisects the block. Currently this area is used as a paid surface parking lot with capacity for about 150 (unstriped) parking stalls. However, according to the City of Vancouver this usage is not allowed, and will be ending in the near future. Loss of this parking area from the project is therefore not considered an impact to employees or businesses in the vicinity of the new station.

Washington Street south of 15th Street is currently one-way southbound. Under the Two-Way Washington alignment, the street would be converted to two-directional travel between Fifth and 15th Streets. Because LRT and BRT operate in the median of the roadway, left turns would not be allowed at intersections from Washington Street in either direction for station blocks, and for non-station blocks between intersections. This means that vehicles trying to access parking in front of businesses on the left side of the street may need to turn off of Washington and go around the block to access the business. Businesses along Washington Street include restaurants, cafes, banks, office buildings, and surface parking areas. These businesses do not mainly rely on drive-by traffic. Access impacts associated with no left turns are offset by increased storefront exposure associated with adding the LRT or BRT line and changing circulation to allow two-way travel.

Exhibit 1-4. Summary of Economic Effects (Segment A1 Transit)

	No-Build Alternative 1	Alternative 2 (Replacement bridge with BRT)	Alternative 3 (Replacement bridge with LRT)	Alternative 4 (Supplemental Bridge with BRT)	Alternative 5 (Supplemental Bridge with LRT)
Number of Businesses Displaced					
Adjacent	0	Replacement up to 17	Same as Alternative 2	Up to 7	Same as Alternative 4
Offset	0	Replacement up to 5	Same as Alternative 2	Up to 5	Same as Alternative 4
Number of Employees Impacted by Displacements					
Adjacent	0	Replacement up to 215	Same as Alternative 2	Up to 165	Same as Alternative 4
Offset	0	Replacement up to 25	Same as Alternative 2	Up to 50	Same as Alternative 4
Annual Sales Affected by Displacements					
Adjacent	$0	Replacement up to $15 million	Same as Alternative 2	Up to $17 million	Same as Alternative 4
Offset	$0	Replacement up to $3 million	Same as Alternative 2	Up to $7 million	Same as Alternative 4
Property Tax Revenue Impacts					
Adjacent	$0	Replacement up to $15,000	Same as Alternative 2	Up to $65,000	Up to $65,000
Offset	$0	Replacement up to $140,000	Same as Alternative 2	Up to $135,000	Up to $130,000
Parking Impacts					
All alignments	0	Between 50 and 75 impacted on Hayden Island due to piers to support elevated structure Up to 25 off-street impacted elsewhere	Same as Alternative 2	Between 50 and 75 impacted on Hayden Island due to piers to support elevated structure	Same as Alternative 4
Access/Circulation Impacts					
All alignments	Access and circulation same as existing.	Due to the elevated HCT structure, access and circulation impacts are expected to be minor	Same as Alternative 2	Due to the elevated HCT structure, access and circulation impacts are expected to be minor	Same as Alternative 4
Travel Patterns/Volumes Impacts					
All alignments	Duration of congestion increases over current levels Travel time reliability similar or worse than current levels.	Travel patterns/volumes in Segment A1 associated with transit alignment are minor. Exhibit 1-2 summarizes impacts associated with highway improvements.	Same as Alternative 2	Travel patterns/volumes in Segment A1 associated with transit alignment are minor. Exhibit 1-2 summarizes impacts associated with highway improvements.	Same as Alternative 4

Exhibit 1-5. Summary of Economic Effects (Segment A2 Transit)

	No-Build Alternative 1	Alternative 2 (Replacement bridge with BRT)	Alternative 3 (Replacement bridge with LRT)	Alternative 4 (Supplemental Bridge with BRT)	Alternative 5 (Supplemental Bridge with LRT)
Number of Businesses Displaced					
2-way Washington Street	0	2-way Broadway up to 1 Broadway/Main 0 16th Street 0 McLoughlin up to 1	Same as Alternative 2	2-way Broadway up to 1 Broadway/Main 0 16th Street 0 McLoughlin up to 1	Same as Alternative 4
Washington/ Broadway Couplet	0	0 for all alignments	2-way Broadway up to 1 Broadway/Main 0 16th Street 0 McLoughlin up to 1	0 for all alignments	2-way Broadway up to 1 Broadway/Main 0 16th Street 0 McLoughlin up to 1
Number of Employees Impacted by Business Displacements					
2-way Washington Street	0	2-way Broadway up to 5 Broadway/Main 0 16th Street 0 McLoughlin up to 5	Same as Alternative 2	2-way Broadway up to 5 Broadway/Main 0 16th Street 0 McLoughlin up to 5	Same as Alternative 4
Washington/ Broadway Couplet	0	0 for all alignments	2-way Broadway up to 30 Broadway/Main 0 16th St 0 McLoughlin up to 30	0 for all alignments	2-way Broadway up to 30 Broadway/Main 0 16th Street 0 McLoughlin up to 30
Annual Sales Affected by Business Displacements					
2-way Washington Street	0	2-way Broadway less than $1 Million Broadway/Main $0 16th $0 McLoughlin less than $1 Million	Same as Alternative 2	2-way Broadway less than $1 Million Broadway/Main $0 16th $0 McLoughlin less than $1 Million	Same as Alternative 4
Washington/ Broadway Couplet	0	2-way Broadway less than $1 Million Broadway/Main $0 16th $0 McLoughlin less than $1 Million	Same as Alternative 2	2-way Broadway less than $1 Million Broadway/Main $0 16th $0 McLoughlin less than $1 Million	Same as Alternative 4

	No-Build Alternative 1	Alternative 2 (Replacement bridge with BRT)	Alternative 3 (Replacement bridge with LRT)	Alternative 4 (Supplemental Bridge with BRT)	Alternative 5 (Supplemental Bridge with LRT)
Property Tax Revenue Impacts					
2-way Washington Street	No Change	2-way Broadway up to $1,000 Broadway/Main up to $800	Same as Alternative 2	2-way Broadway up to $200	Same as Alternative 4
Washington/ Broadway	No Change	Up to $900	Same as Alternative 2	2-way Broadway up to $200	Same as Alternative 4
Parking Impacts					
2-Way Washington Street	0	Between 6th and 15th: 100% on-street parking removed North of 15th: Varies by Segment B alignment Vancouver: 45-55 on-street, 30 off-street I-5: 10-15 on-street, 0-30 off-street	Same as Alternative 2	N/A	N/A
Washington/ Broadway	0	Between 6th and 15th Streets: 100% on-street parking removed North of 15th Street: Varies by Segment B alignment Vancouver: 30-40 on-street, 30 off-street I-5: 20-30 on-street, 0 off-street	Same as Alternative 2	N/A	N/A
Access/Circulation Impacts					
2-Way Washington	Access and circulation same as existing.	Left turns restricted due to HCT alignment, vehicles may have to travel out of direction to access businesses. 97% of accesses removed. Loading zone impacts depend on Segment B alignment: Two-Way Broadway – all loading zones removed Broadway/Main – 60% loading zones removed	Same as Alternative 2.	Alternative 4 requires the closure of 6th at Street where the HCT structure would touch down. Remaining impacts identical to Alternative 1.	Same as Alternative 4

	No-Build Alternative 1	Alternative 2 (Replacement bridge with BRT)	Alternative 3 (Replacement bridge with LRT)	Alternative 4 (Supplemental Bridge with BRT)	Alternative 5 (Supplemental Bridge with LRT)
Washington/ Broadway	Access and circulation same as existing.	Broadway converted from two-way travel to one-way northbound. Access and loading zone impacts depend on Segment B alignment: Two-Way Broadway – 80% accesses, 65% loading zones removed. Broadway/Main – 75% accesses, 65% loading zones removed.	Same as Alternative 2.	Alternative 4 requires closure of 6th at Street where the HCT structure would touch down. Remaining impacts identical to Alternative 2.	Same as Alternative 4
Travel Patterns/Volumes Impacts					
All Alignments	Duration of congestion increases over current levels Travel time reliability similar or worse than current levels.	At PM peak, 15% northbound traffic diverts from local arterials to I-5. At AM peak, 15% traffic diverts to local streets. This could adversely impact morning deliveries to businesses.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.

Washington Street currently operates as a one-way street between Fifth and 15th Streets, in the southbound direction. Broadway is two-way north of Sixth Street. Under the Washington/Broadway couplet alignment, Broadway would be converted to one-way northbound, and HCT would operate in the same direction as vehicle travel. Washington Street would continue to operate as a one-way street in the southbound direction. LRT and BRT would operate along the east side of Washington Street and along the west side of Broadway. Left turns would continue to be allowed at intersections, at station and non-station blocks, and under both BRT and LRT designs. Therefore, no circulation impacts are associated with the HCT design on either Washington or Broadway Streets. The conversion of Broadway from a two-way street to a one way running northbound could reduce the exposure of storefronts. HCT could increase store visibility somewhat if potential customers change from driving to HCT, but the net effect of this change on businesses that rely on drive-by sales is expected to be somewhat negative.

Under the supplemental alternatives, Sixth Street would be closed at its intersection with Washington Street, and a retaining wall would be constructed between Fifth and Sixth Streets. This is because the touchdown point for the HCT structure on the north side of the Columbia River would be farther north for the supplemental bridge than it would be for the replacement. The location of this street closure could be of issue for the economic vitality of several businesses in downtown Vancouver.

Also of potential concern is the difficulty of the supplemental alternatives in accommodating a street connection between downtown Vancouver and the Columbia River waterfront. This connection was recommended in the Vancouver City Center Vision Plan and included in the list of projects in the No-Build Alternative. The vertical alignment of the HCT structure for the supplemental bridge would not allow this connection.

1.3.2.5 Segment B

Exhibit 1-6 summarizes impacts from Segment B. The Vancouver alignments would have more business displacements within Segment B than the I-5 alignment options. The Vancouver alignments (Two-Way Broadway or Main/Broadway couplet) would acquire between 17 and 24 businesses, impacting between 50 and 125 employees and between $7 and $15 million of annual sales. By contrast, the I-5 alignment would acquire between 2 and 10 businesses, impacting between 10 and 60 employees and annual sales between less than $1 million and $3 million. Ranges represent the difference between various alignment options. Business decisions to relocate depend on availability of vacant land of similar size, zoning, and proximity to the local and regional transportation network. WSDOT would provide relocation assistance to displaced businesses.

Impacts to on-street parking range from 43 to 131 total spaces, comprising between 54 and 100 percent of currently available on-street parking along the four corridors. The largest impacts to on-street parking would be along the Broadway/Main couplet option, (131 stalls impacted). The largest percentage impact to on-street parking removed would be 100 percent of stalls along McLoughlin Boulevard (82 stalls impacted). Many businesses along these corridors have additional customer and employee parking in off-

street lots, along alleys in back of the business, or along side streets off the main corridor. However, parking impacts would be a substantial economic impact in Segment B, albeit to varying degrees depending on business type and specific alignment. Some of this impact would be mitigated through the provision of HCT in the API, as some drivers could reasonably be expected to switch modes from driving to transit.

One of the Vancouver alignments, the Broadway/Main couplet, would change the direction of travel along both the Broadway and Main Street corridors from two-way to one-way directional travel. This could reduce storefront exposure of businesses along both Broadway and Main. This is considered important to the number of small businesses along Uptown Village.

1.3.3 Minimal Operable Segment

The Clark College minimum operable transit segment (MOS) would mimic the I-5 transit alignment between the Expo Center and either the 16th Street or McLoughlin Boulevard alignments. The MOS would then operate along either the McLoughlin Boulevard or 16th Street alignment to the east side of I-5 and end Clark College Park and Ride, just north of McLoughlin Boulevard. Selecting the Clark College MOS would effectually determine the overall transit alignment, selecting the I-5 over the Vancouver alignment.

The Mill Plain minimum operable segment (MOS) would follow the Clark College MOS alignment—transit would travel through downtown in an exclusive guideway to the Mill Plain MOS terminal station between 15th and 16th Streets. This transit alignment would end just north of downtown Vancouver, and is the shortest HCT guideway alternative.

Direct economic impacts of the MOS reflect the I-5 transit alignment. Although the full I-5 transit alignment would require multiple property acquisitions north of Clark College, the majority of these are to residences, not businesses, and therefore are not considered an economic impact. Compared to the full I-5 alignment, the MOS would acquire two fewer businesses from Segment B, affecting 40 employees and approximately $1 million in sales. The lessened impact results from avoiding acquisitions near the original alignment terminus at Kiggins Bowl.

The Clark College MOS is discussed in more detail as Section 5.4.1.

Exhibit 1-6. Summary of Economic Effects (Segment B Transit)

	No-Build Alternative 1	Alternative 2 (Replacement bridge with BRT)	Alternative 3 (Replacement bridge with LRT)	Alternative 4 (Supplemental Bridge with BRT)	Alternative 5 (Supplemental Bridge with LRT)
Number of Businesses Displaced					
Vancouver Alignment	0	2-Way Broadway: Between 18 and 24. Broadway/Main: Up to 17.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
I-5 Alignment	0	16th Street: Up to 2. McLoughlin: Up to 10.	Same as Alternative 2.		
Number of Employees Impacted by Displacements					
Vancouver Alignment	0	2-Way Broadway: Between 55 and 215. Broadway/Main: Up to 50.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
I-5 Alignment	0	16th Street: Up to 10. McLoughlin: Between 35 and 60.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Annual Sales Affected by Displacements					
Vancouver Alignment	0	2-Way Broadway: Between $8 and $15 Million. Broadway/Main: Up to $7 Million.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
I-5 Alignment	0	16th Street: Less than $1 Million. McLoughlin: Up to $5 Million.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Annual Property Tax Revenue Impacts due to Displacements					
Vancouver Alignment	0	2-Way Broadway: Up to $5,000. Broadway Main: Up to $7,000.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
I-5 Alignment	0	16th Street: Up to $1,000. McLoughlin: Up to $2,000.	Same as Alternative 2.	16th Street: Up to $1,000. McLoughlin: Between $2,000 and $8,000.	Same as Alternative 4.

	No-Build Alternative 1	Alternative 2 (Replacement bridge with BRT)	Alternative 3 (Replacement bridge with LRT)	Alternative 4 (Supplemental Bridge with BRT)	Alternative 5 (Supplemental Bridge with LRT)
Parking Impacts					
Vancouver Alignment	0	2-Way Broadway: Up to 55 on-street stalls (57% of total) removed. Broadway/Main: Up to 131 on-street stalls (78% of total) removed. Off Street: Up to 75 stalls removed.	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
I-5 Alignment	0	16th Street: Up to 43 on-street stalls (54% of total) removed. McLoughlin: Up to 82 on-street stalls (100% of total) removed.	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
Access/Circulation Impacts					
Vancouver Alignment	Access and circulation same as existing.	No loading zones removed Access impacts dependant on Segment B alignment: Two-Way Broadway – up to 30% accesses removed Broadway/Main – up to 35% accesses removed	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
I-5 Alignment	Access and circulation same as existing.	No loading zones removed Access impacts depend on Segment B alignment: 16th Street – up to 45% accesses removed McLoughlin – up to 80% accesses removed	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
Travel Patterns/Volumes Impacts					
All Alignments	Duration of congestion increases over current levels Travel time reliability similar or worse than current levels.	Shift in traffic volumes from local streets to highway during the AM peak hour. This shift reduces congestion in downtown street network during AM peak, increasing reliability and efficiency of AM deliveries. May impact businesses that rely on drive-by traffic.	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2

1.4 Temporary Effects

Construction activities associated with of any of the build alternatives have the potential to cause economic impacts by temporarily blocking visibility and access to businesses, causing traffic delays, and rerouting traffic on detours that increase travel times and make access to some locations difficult. Access restrictions or difficulties may divert customers and clients and hamper deliveries. Most traffic movements would remain open for either alternative throughout the construction stages. Those movements that would be closed are noted in the sections pertaining to that area.

Construction of any of the build alternatives could also result in increased employment and spending in the project area during construction. The extent of these effects depends on the source of project funding and the makeup of work crews used during construction. Funds from local or regional sources are transfers that could be spent by residents and businesses on other economic activities. Federal or state funds that are new to a region can have a measurable economic effect on employment and income gains resulting from project construction. The federal government and the states of Oregon and Washington would provide the funds for the CRC project resulting in some income and job benefits that would otherwise not occur.

Project construction is anticipated to take between 6 and 9 years. It is likely that firms located within the region and other areas of Oregon and Washington would provide the majority of workers and supplies. For aspects of project construction provided by firms located outside Portland and Vancouver, the beneficial effects to the region would be less than if those inputs were provided locally.

Traffic congestion is already a common occurrence within the corridor during peak hours and adjacent construction activities and temporary detours would extend the peak duration, negatively impacting businesses whose employees commute using the corridor. Likewise, freight, goods, and services travel would also be negatively affected. If construction activities make travel times more difficult to determine, many freight shippers and businesses that rely on just-in-time delivery would be negatively affected. Because most motorists during the peak are commuters, many of them would be able to adapt quickly to announced changes in travel routes or construction activities. Other motorists who travel the corridor infrequently or on a part-time basis, would have more difficulty adapting. Through effective communication strategies and advanced signing, motorists would be warned about delays and some may avoid the API entirely, which could negatively affect patronage of local businesses.

Major events proposed for Portland International Raceway, the Exposition Center, the Fort Vancouver Fireworks Show, and other community celebrations would require substantial communication such that the contract plans can reflect certain restrictions to work periods. Nonetheless, congestion and alignment changes could be discouraging enough to some potential patrons that they may avoid the event, depressing attendance. Restrictions to work periods may not be practical in all cases as weekend work may be necessary to keep the project on a tight timeline; however, knowledge of each other's

schedule and activities would keep parties informed to the extent they can devise individual strategies to lower the impacts.

Some likely effects to marine commerce are as follows:

- The duration of in-water construction is projected to be nearly six years for the replacement bridge alternative. The supplemental bridge should result in less in-water time than either of the other alternatives, perhaps as short as three years.
- The lift span channel would be closed for a two-month period under all alternatives. This channel is one of three channels available to marine commerce and during construction, efforts will be made to keep at least one channel open at all times.
- The 300-foot channel is expected to be closed for a three-month period; after this there could be room for selected river traffic, but it would be on a case by case basis and require coordination to maintain safe and effective working conditions. This channel is one of three channels available to marine commerce and during construction efforts will be made to keep at least one channel open at all times.
- Marine commerce may need an extra tow to help maneuvering during construction, which will carry an extra cost.
- Temporary river travel restrictions are anticipated in all alternatives as barges are used to ferry materials to and from work sites.

1.5 Mitigation

The following mitigation measures would be pursued for long-term effects of the build alternatives:

Right-of-way business displacements, losses in parking, and changes in access identified in this report are based on preliminary design for the build alternatives. More detailed design for any of the alternatives will seek to reduce the area of land needed for right-of-way and to avoid acquiring businesses where possible.

For those businesses acquired by the project, the Oregon Department of Transportation (ODOT) and the Washington State Department of Transportation (WSDOT) would provide a relocation assistance program. The federal "Uniform Relocation Assistance and Real Property Acquisition Polices Act of 1970" and the "Uniform Relocation Assistance Amendments of 1987" insure the fair and equitable relocation and reestablishment of persons, businesses, farms, and nonprofit organizations displaced as a result of federal or federally assisted programs. This is done so that displaced persons would not suffer disproportionate injuries as a result of projects designed for the benefit of the public as a whole.

Coordination would be conducted with the City of Portland Office of Transportation, the City of Portland Bureau of Planning, the Portland Development Commission (PDC), and business owners on Hayden Island through the development of the Hayden Island Master Plan, the development of the Hayden Island IAMP and other efforts to identify an

adequate local circulation system, access spacing, and land use policies to manage demand on the interchange. Coordination is expected to occur around provision of adequate businesses to serve household needs of residents on the island.

A downtown Vancouver parking utilization study would be conducted to identify whether on-street parking losses along Washington Street or along the Washington/Broadway couplet between Sixth and 15th Streets can be absorbed by existing on-street parking, off-street surface parking lots, or parking structures. Between 105 and 230 stalls are expected to be removed, depending on the specific downtown transit alignment. This could be a construction impact as well as a permanent impact. Impacts to parking would be offset partially through the provision of improved transit service, because some drivers would be likely to switch modes from driving to HCT.

If the supplemental bridge is selected, the project would work with Convention Center and downtown businesses to develop a circulation plan that would mitigate impacts of this alignment's closure of Sixth at Washington Street for the LRT touchdown point.

The following mitigation measures would be pursued for temporary (construction) effects of the build alternatives:

- Construction of any of the build alternatives would be carefully planned to phase construction of project components in a way that reduces or avoids complete closure of affected roadways and access points to nearby businesses.
- To the extent that detours are necessary, these detours would be carefully routed to reduce travel times and signed to reduce confusion.
- To the extent that construction occurs in front of business access points, construction would be planned to keep these access points open as much as possible and would provide signage to identify the location of these access points and the businesses served.
- Outreach to businesses affected by construction and assistance programs could help mitigate potential negative construction related effects. Programs to help affected businesses could include business planning assistance, low-interest loans, marketing and retail consulting, business-oriented workshops, and special promotions to generate patronage in construction areas. The City of Vancouver is planning to establish a Growth and Transportation Efficiency Center (GTEC), which is charged to improve transportation efficiency and could develop and administer a construction communication and mitigation plan. The plan could develop strategies to move both employees and customers around downtown Vancouver throughout construction.
- Efforts would be made to ensure that at least one of the three channels available to marine commerce would remain open during construction efforts.
- Coordination with the Port of Portland and businesses located in the Rivergate and Airport industrial areas would be conducted to identify ways to minimize delays for commercial freight vehicles during construction.

Signs would be posted to encourage commercial freight vehicles not serving the Portland-Vancouver region to shift from I-5 onto I-205 during construction.

2. Methods

2.1 Introduction

This section describes the methods used to collect data and evaluate economic impacts of the No-Build and build alternatives. The economics evaluation identified potential significant adverse impacts and beneficial effects on the local and regional economy. The local economy was defined as businesses located within the primary area of potential impact (API) while the regional economy is defined as the Portland-Vancouver Primary Metropolitan Statistical Area (PMSA), which includes the counties of Clackamas, Columbia, Multnomah, Washington, and Yamhill in Oregon, and Clark County in Washington. The impact analysis included a discussion of construction-related impacts, operational impacts, and cumulative and indirect impacts associated with the different alternatives. The analysis was developed to comply with the National Environmental Policy Act (NEPA), applicable state environmental policy legislation, and local and state planning policies.

2.2 Study Area

The economic impacts evaluation employed two study areas for environmental effects: the primary and secondary areas of potential impact (APIs). These are described below.

2.2.1 Primary API

The primary API, illustrated as Exhibit 2-1, addressed direct economic impacts associated with the No-Build and build alternatives, including business displacements as well as impacts to business access, parking, and visibility. The primary API was defined as a 0.25 mile buffer around the largest build alternative footprint, and extended approximately five miles from north to south. It starts north of the I-5/Main Street interchange in Washington, and runs south towards the I-5/Columbia Boulevard interchange in Oregon. North of the river, the API expands west into downtown Vancouver, and east near Clark College to include potential high-capacity transit alignments and park and ride locations. Around the actual river crossing, the eastern and western sides each extend 0.25 mile from the I-5 right-of-way.

The primary API is the area most likely to experience direct impacts from construction and operation of the project build alternatives. Most physical project changes were determined to occur in this area.

2.2.2 Secondary API

The secondary API, illustrated as Exhibit 2-2, represents the area where indirect impacts, including traffic and development changes, are expected to occur from the proposed project alternatives.

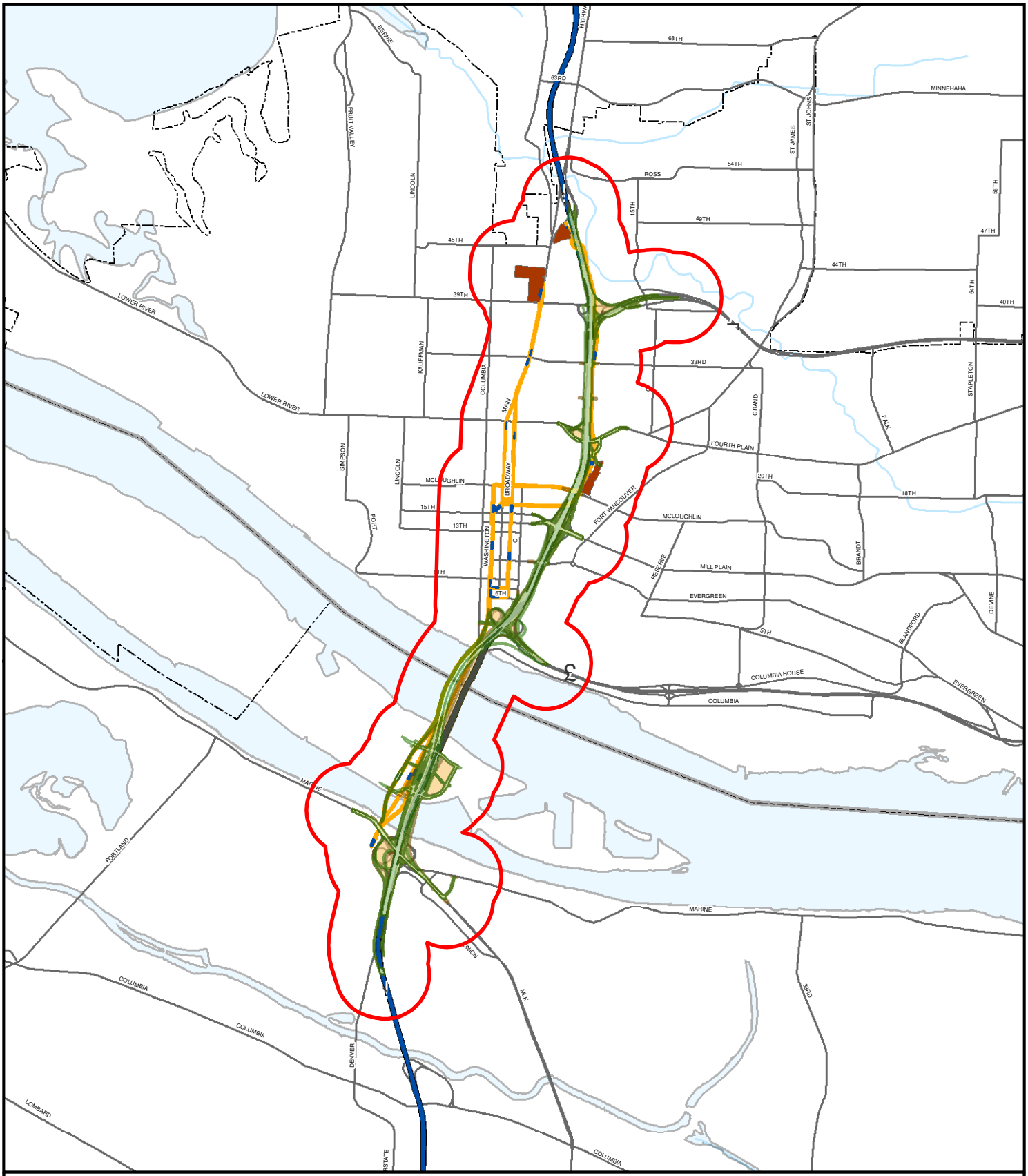
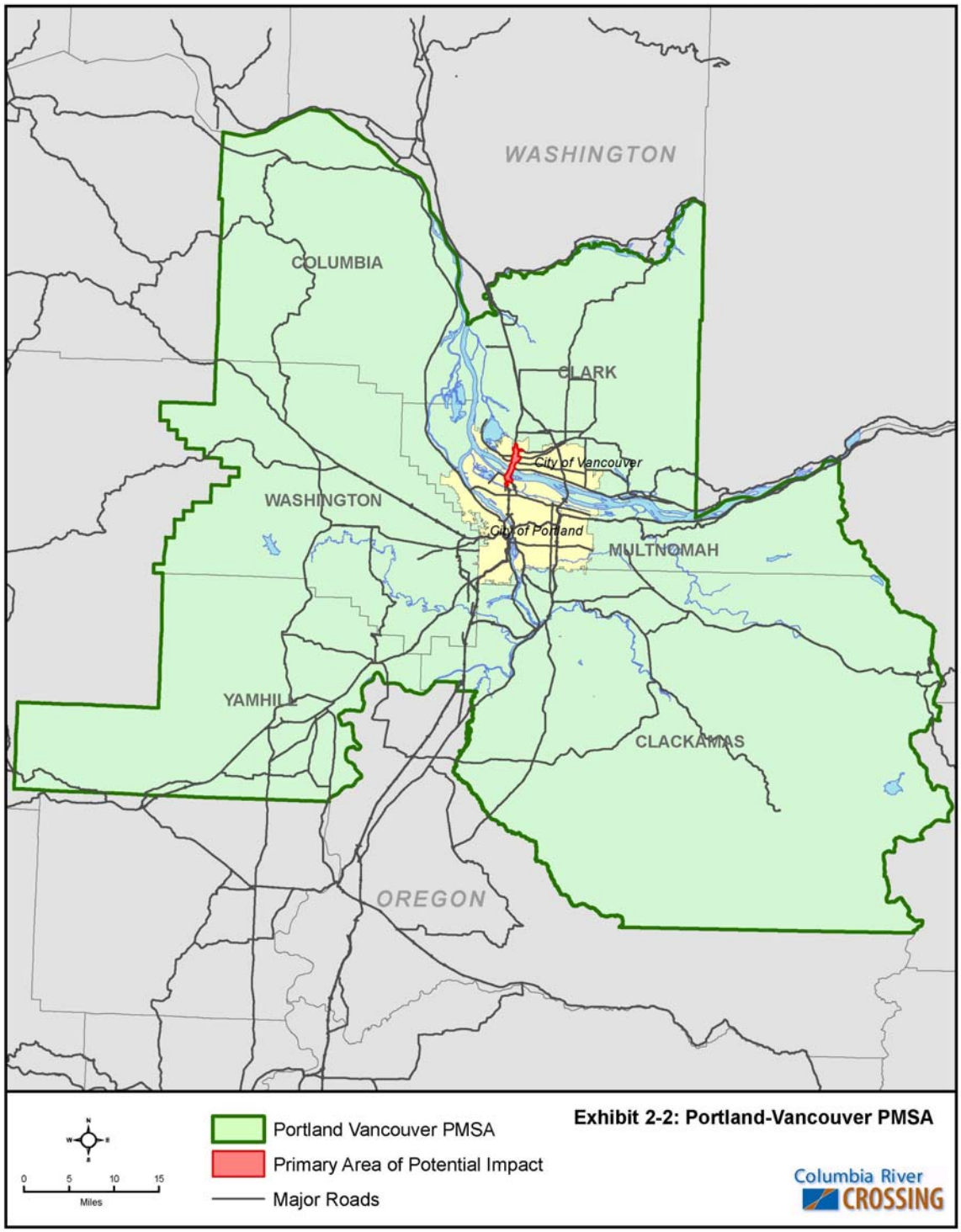

Primary Study Area
Downstream Alignment
Supplemental Alignment
Transit Lines
Park and Ride
Transit Stop
N
W
E
S
0 0.1 0.2 0.3 0.4
Miles
Exhibit 2-1: Primary Study Area
Columbia River CROSSING
Analysis by J. Koloszar; Analysis Date: Aug.-2007; Plot Date: Aug.-2007; File Name: StudyArea_TC077.mxd

Exhibit 2-2. Secondary API



The secondary API is comprised of the six-county Portland-Vancouver Primary Metropolitan Statistical Area (PMSA). This larger region was analyzed because the project is expected have far-reaching economic effects outside the immediate project area.

2.3 Effects Guidelines

Relevant laws and regulations include federal, state, and local plans and laws governing economic development, land use, and transportation planning adopted by jurisdictions within the Portland-Vancouver Metropolitan Area. Local policies and goals related to economic development depend on the implementation of certain transportation policies. For this reason, the major transportation plans of the region were reviewed.

2.3.1 Federal

- U.S. Department of Transportation (DOT), Federal Highway Administration (FHWA).

  FHWA's Guidance for Preparing and Processing Environmental and Section 4(f) Documents (USDOT FHWA 1987) was used to guide the economic analysis. According to FHWA, the analysis should discuss the following for each alternative commensurate with the level of impacts:

  - The economic impacts on the regional and local economy such as the effects of the project on development, tax revenues and public expenditures, employment opportunities, accessibility, and retail sales.
  - The impacts on the economic vitality of existing highway-related businesses (e.g., gasoline stations, motels, etc.) and the resultant impact, if any, on the local economy.
  - Impacts of the proposed action on established business districts, and any opportunities to minimize or reduce such impacts by the public or private sectors.

- U.S. Department of Transportation (DOT), Federal Transit Administration (FTA).

  FTA's Resource Information Section (USDOT FTA 2007) discusses social and economic externalities that should be addressed in environmental documents. For economic impacts, it states that: "Proposed transit projects may have economic impacts that should be included in environmental impact documents. In particular, projects may create direct and indirect taxation changes, cause substantial displacement of businesses and individuals, disrupt business activities, and influence regional construction costs. If a proposed project is small, contained on a single site, does not involve displacements, and is compatible with surrounding land uses, there will probably be few economic impacts and extensive analysis is not needed. If a project is costly, covers a wide area, and will cause extensive displacement of businesses and individuals, there is a greater chance that it will

cause economic impacts. In such cases, a detailed economic impact analysis should be included in environmental documentation."

2.3.2 State

- Oregon Department of Transportation (ODOT 2002). Draft Environmental Procedures Manual (Socioeconomics).

  ODOT has developed guidelines for conducting environmental analysis for highway projects. The guidelines for socioeconomics are consistent with the recommendations made by the FHWA, as discussed above.

- Department of Land Conservation and Development (DLCD 1996). Oregon Statewide Planning Goals.

  Goal 9 includes guidance for economic development. Goal 12 includes guidance for transportation.

- Washington State Department of Transportation (WSDOT 2005). Environmental Procedures Manual (Economics).

  WSDOT has developed guidelines for conducting environmental analysis for highway projects. Like the ODOT manual, the guidelines for economics follow closely the recommendations made by the FHWA.

2.3.3 Local

- Metropolitan Transportation Plan (MTP) for Clark County. December 2002.

  The Southwest Washington Regional Transportation Council (Clark County RTC 2002) developed the regional MTP to provide mobility and accessibility for personal travel and movement of goods within Clark County. The plan has a 20-year planning horizon; it identifies future needs, recommends policies and strategies, and identifies an implementation program to meet the region's needs. The plan provides two lists of projects: one that is considered to be reasonably funded, and the other (referred to as the strategic plan) that is not currently funded. The I-5 CRC project is listed in the strategic plan and is considered an important project for continuing economic success within the region.

- Clark County Comprehensive Plan, 2003-2023.

  The Clark County Comprehensive Plan (Clark County 2005) establishes policies and land uses in rural, agricultural and timber lands within the unincorporated portion of the county. Chapter 9 (Economic Development Element) of the plan discusses how economic vitality depends on land use policies, transportation planning, and capital facility investments. Goals and policies to encourage economic development in the county are presented.

- City of Vancouver Comprehensive Plan, Chapter 2: Economic Development. City of Vancouver. 2004.

The City of Vancouver's Comprehensive Plan (City of Vancouver 2004) includes higher density and transit-supportive development regulations for areas along the defined high-capacity transit corridors. These economic development policies aim to efficiently utilize land designated for employment through more intensive development and redevelopment. The plan also recognizes the importance of major transportation system investments that support freight mobility, job creation, and revenue growth.

- City Center Vision Plan. City of Vancouver. 2006.

  The City Center Vision Plan for Vancouver (City of Vancouver 2006) was developed to foster and guide development of a city center area. It provides a vision and guiding principles for six areas within downtown Vancouver. The revitalization and development plan relies on improved infrastructure; it attempts to ensure that I-5 improvements and the I-5 CRC project improve access to the downtown area and minimize potentially adverse impacts to the city.

- Columbia Gateway Master Plan. (Port of Vancouver, 2006).

  The Columbia Gateway, a piece of undeveloped property at the Port of Vancouver, includes nearly 1,100 acres of industrial-zoned land. The purpose of the proposed Columbia Gateway project is to develop a strategic master plan that meets the long-term economic, infrastructure, marine, and industrial land needs of the Port of Vancouver, City of Vancouver, Clark County, and the region.

- The Columbia River Economic Development Council Strategic Plan (Columbia River Economic Development Council Strategic Plan 2005).

These plans were reviewed for consistency with alternatives.

- City of Portland Comprehensive Plan, Goals and Policies. (City of Portland 2006a).

  The City of Portland's Comprehensive Plan provides a coordinated set of guidelines for decision-making to guide future growth and development in the City of Portland. Its goals and policies provide the context and guidance for future City programs, major capital projects, and other funding decisions. The plan also provides a map and a set of regulations for development, including a revised zoning code to carry out the policies, a guide for the major public investments required to implement the plan, and a process for plan review and amendment.

  The plan includes policies that generally pertain to and support the I-5 CRC project. These goals generally support multimodal transportation and mobility, economic development, and cost-effective, safe, and efficient freight movement. The plan also discusses inter-jurisdictional planning for improvements to the I-5 trade corridor.

- Metro Regional Transportation Plan (RTP).

  The RTP (Metro 2004) is a 20-year blueprint for the Portland metropolitan region's transportation system. The RTP establishes policies and priorities for all

forms of transportation and anticipates the region's current and future transportation needs. These policies focus on ensuring that the region's transportation system works in the most effective way, and recognizes the importance of the movement of goods and services for the regional economy.

- Metro Regional Framework Plan and 2040 Growth Concept (Metro 1995).

  The 2040 Growth Concept is the 50-year growth strategy for the Metro region. One of its stated goals is to "promote a transportation system that includes all types of travel." The plan seeks to focus transit and highway improvements around regional centers such as Multnomah County and Vancouver. Areas of future development also include Portland central city, industrial areas and freight terminals, station communities along the light rail system, and corridors. The Regional Framework Plan is the integrating and current document that includes both land use (Growth Concept) and overall transportation policies for the region. It serves as the guiding policy document for the RTP.

  Portland Transportation System Plan (Portland Department of Transportation 2007)
  The City of Portland Transportation System Plan (TSP) is the long-range plan to guide transportation investments in Portland. The TSP meets State and regional planning requirements and addresses local transportation needs for cost-effective street, transit, freight, bicycle, and pedestrian improvements. The objective of the TSP is to provide a balanced transportation system to support neighborhood livability and economic development.

- Other Portland/Vancouver Area Plans.

  Several plans were reviewed for consistency with alternatives and of those reviewed, the following were relevant for this technical report:

  - Albina Community Plan (City of Portland, Bureau of Planning 1993)
  - Interstate Corridor Urban Renewal Area (PDC 2001)
  - Freight Master Plan, (City of Portland 2006b)
  - The Historic Reserve Plan (Vancouver National Historic Reserve 2006)

2.4 Data Collection Methods

This section explains the general methodology and data sources used to describe the current conditions in the project area, and discusses the potential impacts associated with the construction and operation of the project.

2.4.1 General Methods

Data sources used for the economics analysis include a combination of secondary data, field surveys, and purchased information. Published studies evaluating the relationship between transportation investment and economic growth were reviewed and summarized. A literature search was conducted and the results summarized to gain insight into the relative effect that high-capacity transit stations may have on economic development

trends around station areas. Published reports on the impact of congestion in the project area and reports on the economy of the project area were reviewed, and relevant conclusions were summarized. Research into the effects of tolling and transportation investment on retail sales, property values, and public revenue sources was summarized, and a qualitative discussion of the potential for such impacts from this project is presented in the following sections.

Input/output analysis was conducted to estimate the impact of construction spending on the six-county regional economy. Data files were purchased from the Minnesota IMPLAN Group and the IMPLAN multipliers for the six-county area were used to estimate direct, indirect, and induced effects associated with construction spending.

The comprehensive plans of the cities of Portland and Vancouver and plans from local neighborhoods were reviewed to gauge the impact of construction and operation on economic development goals and objectives. In addition, interviews with staff from local agencies were conducted by the economics analysis team (Brooks 2007a, 2007b; Gillam 2007, McCaffrey 2007, Platman 2007, Strathman 2007, and Zehnder 2007).

Estimates of retail sales and employment of businesses displaced by the project and of the potential for employment and sales impacts to businesses districts that may be affected by the project were prepared. These estimates were based upon the best available information from the following sources:

- Marketing data purchased from a private vendor (INFO USA)
- Employee-per-square-foot ratios for business types using data from the results of a literature search of reported ratios
- Tax assessment information on the square footage of properties, tax rates, and past taxes paid
- Windshield surveys to cross-check business name, type, and addresses

Results of the transportation report and published economic and demographic data were used to estimate the economic effects of different alternatives on the trucking industry, the two states, and the ports.

Additional data were obtained from other technical reports being completed for this project. Information from the Acquisitions Technical Report was used to estimate impacts to property tax collections, and the number of businesses and employees impacted by the project. Information from the Traffic Report was used to compare the impact of congestion and mobility for each alternative. Coordination with the Land Use Technical Report ensured consistency between findings for indirect growth induced by the project.

2.5 Analysis Methods

There are few formal guidelines on measuring economic impacts from projects such as CRC. Some states, such as California, provide general guidelines but no specific thresholds. For example, the California Environmental Quality Act (CEQA Title 14.3.5) states that “Economic and social changes resulting from a project shall not be treated as

significant effects on the environment. Economic or social changes may be used, however, to determine that a physical change shall be regarded as a significant effect on the environment."

This analysis considered both context and intensity (who or what is affected and to what degree) when determining the type and importance of economic impacts. In terms of context, the project action was considered in several contexts, such as society as a whole, the affected region, the affected interests, and the locality, for both the short term and the long term. In terms of intensity, the project was analyzed to consider the degree to which the effects on the quality of the human environment (including population, housing, and employment) were likely to be highly controversial.

While recognizing that there does not appear to be any specific, relevant agency guidance regarding the determination of economic impacts, the economics team considered the following questions when assessing impacts:

1. Would the proposed action directly result in a substantial short-term loss of tax revenues for the local jurisdictions?

2. Would the proposed action change access that would adversely affect the profitability of a substantial number of businesses in a local business district, or the marketability of a substantial number of non-residential properties?

3. What are the economic development implications of the proposed action?

4. What indirect impacts might be associated with the proposed action?

2.6 Long-Term Operational Impacts

Long-term economic impacts include the acquisition of a business, a change in property taxes, or economic impacts that result from a change in access or mobility patterns.

Estimates of the net loss of taxable property due to project right-of-way acquisitions were prepared. Assessed property values reported by Multnomah County and Clark County tax assessors were used to estimate the assessed value of lost property. The portion of each property affected by the project and the average property tax levies for Multnomah and Clark counties were used to estimate the amount of property tax revenue that would be removed as a result of the project. Total parcel area and the estimated acquired area were obtained from the project right-of-way acquisition databases.

Localized effects on businesses were estimated by reviewing the design drawings for each alternative, site visits, and information about transportation effects from the Transportation Technical Report. The potential risk of lost retail sales and employment from businesses acquired by the project and business districts affected by the project were estimated using a variety of sources, discussed earlier in this section.

For broader regional effects, research into the links between transportation infrastructure improvements, mobility, congestion, and economic growth helped address how different alternatives may have different effects on the regional economy. Vehicle miles of travel

and average speeds for different travel modes from the Transportation Technical Report were used to estimate the direct user benefits to the trucking industry.

2.7 Short-Term Construction Impacts Approach

Short-term construction impacts that affect the economy may result from access changes to local businesses, parking changes, and short-term construction activities that contribute to noise, vibration, and visibility changes.

Construction-related traffic delays, increased noise and dust, restricted access, and reduced parking may impact gross revenues of firms located in the project area. For this report, analysis of these effects was based on a review of construction techniques, a review of aerial photos, site visits, and information about transportation effects from the Transportation report. Available information from the Transportation report was used to note potential impacts to transit riders from project construction.

One potential benefit from a highway or transit project is the potential for a temporary increase in jobs and income in the region resulting from construction spending. How much a highway project affects a region depends on the source of project funding. Funds from local or regional sources are transfers that could have been spent by residents and businesses on other economic activities. Typically, only "new money" (i.e., federal or potentially state funds) to a region has a measurable economic effect on employment and income gains resulting from project construction. Construction spending also generates local and state sales taxes and use taxes over the entire construction period. Only the portion of construction spending related to federal and state funds was included in the analysis. Information regarding the funding sources of the project was gathered through coordination with other project team members.

Expenditures during construction would result in demand for construction materials and jobs. These expenditures are considered direct effects. These direct effects lead to indirect effects as firms in other industries provide goods and services to the construction industry. Finally, wages paid to workers in construction trades or supporting industries are spent on other goods and services; these are referred to as induced effects. Input/output analysis was conducted to estimate the impact of construction spending on the six-county regional economy using 2006 data files purchased from the Minnesota IMPLAN Group. IMPLAN multipliers for the six-county area and 2007 project construction cost estimates were used to estimate direct, indirect, and induced effects.

3. Coordination

The economics analysis technical report was prepared under *Guidance for Preparing and Processing Environmental and Section 4(f) Documents*, Technical Advisory T6640.8A (U.S. Department of Transportation [USDOT], Federal Highway Administration [FHWA]) and consistent with guidance from the USDOT Federal Transit Administration (FTA), resource information section. Data collection and analyses were conducted in the manner outlined in Section 2 of this report.

The economics team coordinated with several other environment technical report teams. Right-of-way acquisition data were obtained and joined with Multnomah and Clark County tax assessor data to determine tax implications of the build alternatives. Right-of-way acquisition data were also joined with purchased market research data to determine the numbers of businesses, employees, and sales impacted by each of the build alternatives. Coordination occurred to ensure consistency between impacts reported in the Economics Technical Report and those reported in the Acquisitions Technical Report. Research on differing transit technologies and resultant economic development levels in station areas, as well as indirect impacts from major transportation improvements, was performed in coordination with the land use analysis team. Data from the transportation team informed the identification of impacts related to traffic flows, travel times, and shifts in travel patterns for the No-Build and each of the build alternatives.

External coordination occurred with the CRC's Freight Working Group (FWG), Metro, the Port of Portland, the Port of Vancouver, the City of Portland Office of Transportation, the City of Portland Bureau of Planning, the City of Vancouver, and Portland State University. This external coordination assisted the economics team in better understanding existing conditions, planned visions, and potential impacts of the Build and No-Build Alternatives. Draft findings were shared with ODOT, WSDOT, and local jurisdictions to obtain reviewer and stakeholder feedback prior to submittal of technical reports.

Economic impacts were analyzed in accordance to the Council on Environmental Quality (CEQ) regulations (40 CFR §§ 1500-1508), which provide guidance on determining scale of impacts as a function of *context* and *intensity*. To determine significance, the severity of the impacts was examined in terms of the type, quality, and sensitivity of the resource involved; the location of the proposed project; the duration of the effect (short or long term) and other considerations of context.

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4. Affected Environment

4.1 Introduction

This section describes the current conditions of the economics analysis API. For this analysis, the API consists of both local and regional areas. The local API includes a 0.25 mile buffer on all sides of the combined build alternatives footprint. This area, which generally extends from the Columbia Slough to the south to 54th Street to the north, includes all of downtown Vancouver and extends beyond 15th Street on the east, as illustrated in Section 2 in Exhibit 2-1. The regional API, referred to in this section as the Portland-Vancouver region, is the Portland-Vancouver OR-WA Primary Metropolitan Statistical Area (PMSA). The U.S. Census Bureau defines the Portland-Vancouver OR-WA PMSA as consisting of six counties, including Multnomah, Washington, Clackamas, Yamhill, and Columbia counties in Oregon and Clark County, Washington, as illustrated in Exhibit 2-2. Some information not published for the Portland-Vancouver OR-WA PMSA was available for the 7-county Portland – Vancouver Metropolitan Statistical Area (MSA), which includes the six PMSA counties and Skamania County in Washington. In such instances, data from the MSA was used.

4.2 Regional Conditions

The Portland-Vancouver region is located at the confluence of two navigable rivers, the Columbia and the Willamette, and is served by the Burlington Northern Santa Fe (BNSF) and Union Pacific intercontinental rail lines (UPRR), Portland International Airport, and marine terminals at the Ports of Portland and Vancouver. The region's competitiveness is largely dependant on its role as a gateway and distribution center for domestic and international markets. Because most of the region's industries depend on the movement of freight, transportation access must be maintained in order for the region to stay competitive locally and internationally.

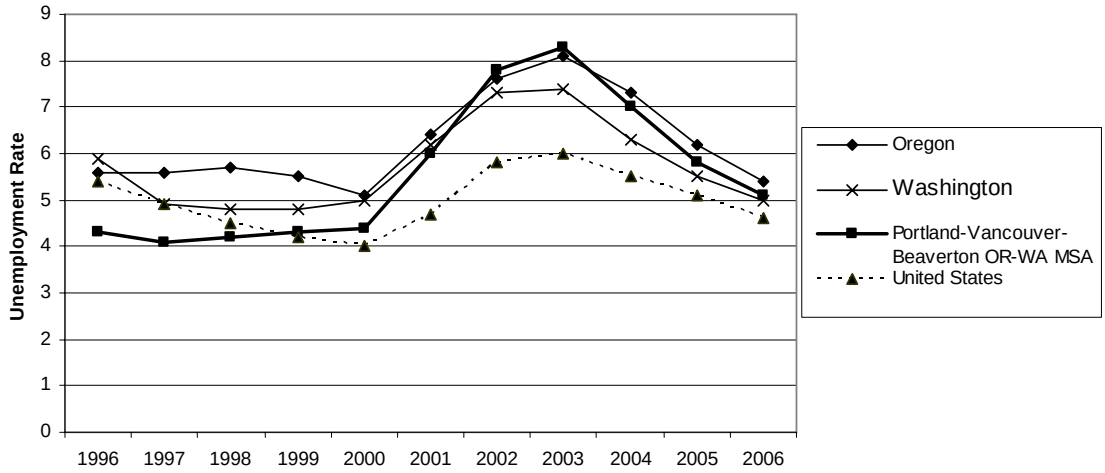
This section describes the historical and forecast conditions of the Portland-Vancouver regional economy.

4.2.1 Unemployment

Exhibit 4-1 presents unemployment rates for the Portland-Vancouver MSA, the states of Oregon and Washington, and the United States over a recent ten-year period (1996-2006). From 1996 to 1998, the Portland-Vancouver MSA unemployment rate trended lower than rates overall in Washington, Oregon, and the nation. By 2002, the regional unemployment rate was greater than rates in each state and the nation. The relatively greater increase in the region's unemployment rate was partially caused by the region's reliance on electronic and computer manufacturing, which was greatly impacted by the international economic downturn in those employment sectors. Slow job growth continued through 2003. In 2004 job growth increased, and the Portland-Vancouver-

Beaverton OR-WA MSA unemployment rate dropped below both states averages. This lower unemployment rate continued through 2006, the most recent year for which data are available.

Exhibit 4-1. Unemployment Rate 1996-2006



Source: Bureau of Labor Statistics, 2007.

4.2.2 Employment

Exhibit 4-2 presents the Portland-Vancouver MSA cross-border commute patterns of residents working in Clark and the Oregon PMSA counties. As shown, 82 percent of I-5 bridge commuters are residents living in Clark County and working in the Oregon PMSA counties. Conversely, 18 percent of I-5 bridge commuters are Oregon PMSA residents working in Clark County.

Exhibit 4-2. Portland-Vancouver MSA Cross-Border Commute Patterns

Area	Total	Percent
Oregon PMSA County[a] Residents Working in Clark County	11,532	18%
Clark County Residents Working in Other PMSA Counties	51,255	82%

Source: U.S. Census, 2000.

[a] Clackamas, Columbia, Multnomah, Washington, and Yamhill counties.

The Portland-Vancouver MSA has the larger concentration of Distribution and Logistics business than the West Coast states of California, Oregon, and Washington average. Representing 6 percent of all West Coast employment in Distribution and Logistics, the Portland-Vancouver MSA had an estimated 77,544 employees in the industry in 2001. As shown in Exhibit 4-3, by 2005, employment had declined by an annual average rate of 0.5 percent per year to 76,138 employees. Between 2001 and 2005 the largest decrease in

employment occurred in the Air Transportation industry while the largest increase occurred in the Electronic Markets & Agents & Brokers industry. Over the same time period average annual wages increased at a rate of 3.5 percent from $45,940 to $52,700. The smallest increase in annual wage occurred in the Air Transportation industry while the largest increase occurred in the Merchant Wholesalers, Nondurable Goods industry.

Exhibit 4-3. Distribution and Logistics Employment and Wage Estimates in the Portland-Vancouver MSA

NAICS Code	Industry	2001		2005		Average Annual Growth Rate 2001-2005	
		Employment	Avg Wage	Employment	Avg Wage	Employment	Avg Wage
	Wholesale	**50,409**	**$51,462**	**50,086**	**$57,525**	**49,928**	**$60,086**
423	Merchant Wholesalers, Durable Goods	25,409	$50,267	23,240	$52,055	23,277	$56,605
424	Merchant Wholesalers, Nondurable Goods	18,950	$49,711	20,198	$60,661	19,799	$59,930
425	Electronic Markets & Agents & Brokers	6,050	$61,956	6,648	$67,135	6,852	$72,362
	Transportation	**18,429**	**$38,737**	**17,970**	**$38,720**	**17,675**	**$40,662**
481	Air Transportation	4,694	$39,603	3,681	$38,511	3,470	$40,584
484	Truck Transportation	8,856	$37,922	9,467	$37,780	9,362	$40,656
488	Support Activities for Transportation	4,879	$39,384	4,822	$40,726	4,843	$40,730
	Warehousing, storage & couriers	**8,707**	**$31,283**	**8,329**	**$34,687**	**8,535**	**$34,419**

Source: PDC, 2007.

4.2.3 Major Employers

Exhibit 4-4 lists the largest 25 private sector employers in the Portland-Vancouver MSA. The diversity of the companies on this list is representative of the region's economy. Each of these businesses depends on the region's transportation system to provide reliable movement of goods and services, customers, and employees to and from their business locations. The I-5 corridor is one of the most critical components of the region's transportation network.

Exhibit 4-4. Largest Private Sector Employers in the Portland – Vancouver MSA

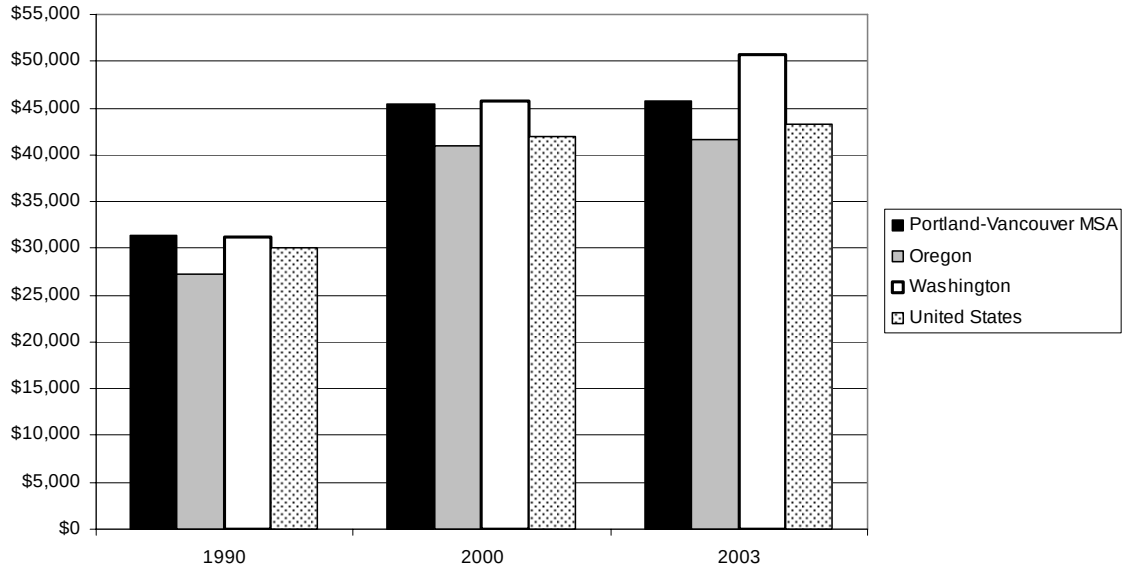
Employer	No. of Employees
Intel Corp	15,500
Providence Health System	14,007
Safeway, Inc.	13,453
OHSU	11,400
Fred Meyer, Inc.	9,663
Legacy Health System	7,900
Nike, Inc.	6,100
Wells Fargo Bank	4,285
Shari's Restaurants	3,725
Hewlett-Packard Co	3,500
Freightliner Corp.	3,500
Albertson's Inc.	3,450
Southwest Washington Medical Center	3,268
United Parcel Service	2,800
Portland General Electric	2,781
Standard Insurance Company	2,066
Tektronix, Inc.	2,030
Xerox Corp	1,783
PacifiCorp	1,762
New Seasons Market	1,222
Merix Corp.	1,201
SEH America	1,100
Mentor Graphics Corp.	1,053
Siltronic	1,050
Adidas America Inc.	1,000

Source: Portland Development Commission, 2006.

4.2.4 Median Household Income

Exhibit 4-5 presents median household incomes for the Portland-Vancouver MSA, the states of Oregon and Washington, and the United States. In 1990, the median household income of the Portland-Vancouver MSA was approximately $31,000 and was relatively close to state and national averages. By 2003, the regional median household income was over $45,000. By comparison, the median 2003 household incomes for Washington, Oregon, and the United States were $51,000, $42,000, and $43,000, respectively.

Exhibit 4-5. Median Household Income 1990-2003



Source: Portland Development Commission, 2006.

4.2.5 Retail Sales

Exhibit 4-6 presents historical annual retail sales growth within the Portland-Vancouver MSA. From 1997 to 2004, retail sales increased by $8.5 billion, from $19.3 billion per year to $27.8 billion per year. Overall, the Portland-Vancouver MSA experienced growth in retail sales of 44 percent over the 7-year period. Vancouver experienced the largest percent increase in retail sales, growing 71 percent from 1997 to 2004. Only Clackamas and Yamhill counties experienced total growth lower than the regional average growth in retail sales. The economic importance of Portland and Vancouver to the region is illustrated by the combined percent of total retail sales that the two communities accounted for (39 percent in 1997 and 42 percent in 2004).

Exhibit 4-6. Portland - Vancouver MSA Taxable Retail Sales (thousands)

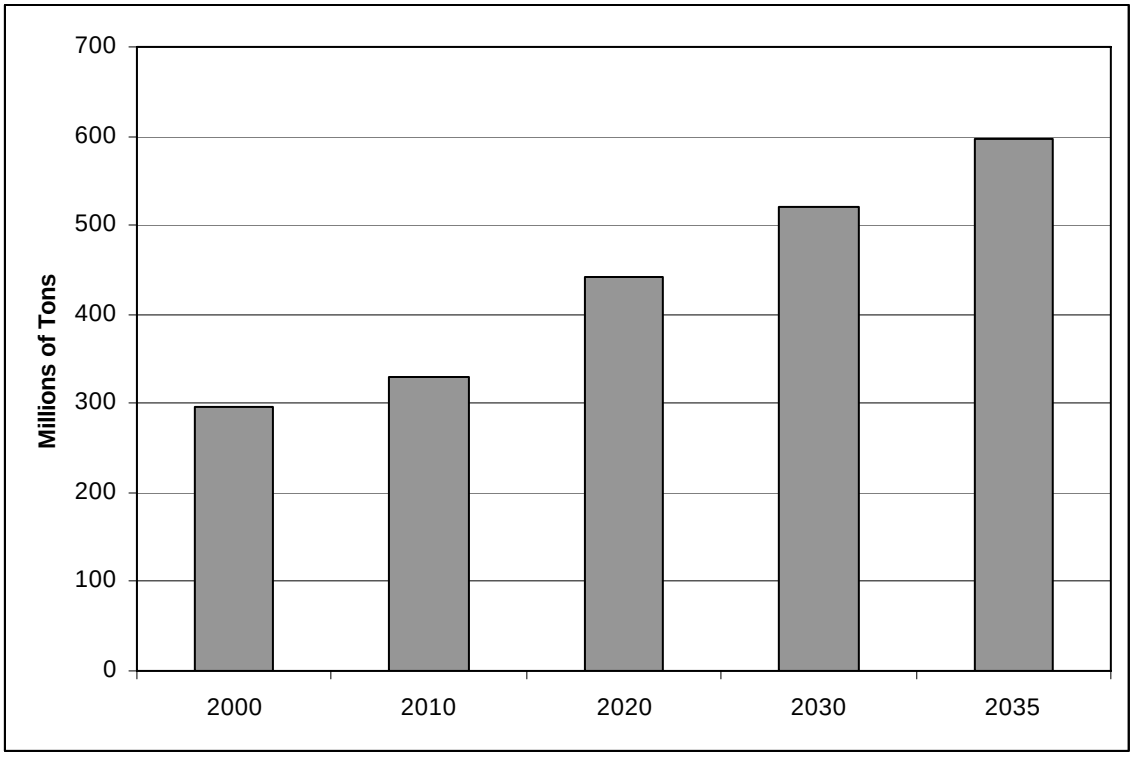
County/City	Retail Sales		% Change
	1997	2004	1997-2004
Multnomah County, OR	$7,334,500	$11,175,548	52%
City of Portland	*$6,190,396*	*$9,513,323*	*54%*
Washington County, OR	$5,453,519	$8,151,371	49%
Clackamas County, OR	$3,448,259	$3,764,003	9%
Clark County, WA	$2,214,708	$3,577,181	62%
City of Vancouver	*$1,298,357*	*$2,224,797*	*71%*
Yamhill County, OR	$627,196	$773,232	23%
Columbia County, OR	$199,808	$326,937	64%
TOTAL	***$19,277,990***	***$27,768,272***	***44%***
Cities of Portland-Vancouver as Percent of Total	39%	42%	

Source: U.S. Bureau of the Census, 2000; Washington State Department of Revenue, 2004 Portland Development Commission, 2005.

4.2.6 Transportation and Freight Mobility

The ports of Portland and Vancouver are critical to the economic growth and prosperity of the region. In order for the ports to remain competitive with other West Coast ports, efficient and cost-effective multimodal transportation systems must be available. Reducing freight travel times by investing in transportation infrastructure improvements that improve access and decrease congestion helps maintain the area's competitiveness. Exhibit 4-7 presents the projected commodity growth for the ports of Portland and Vancouver. The total annual tonnage moving through the two ports is expected to double from approximately 300 million tons in 2000 to almost than 600 million tons in 2035. This growth has implications for the transportation network as products move to and from the regional marketplace.

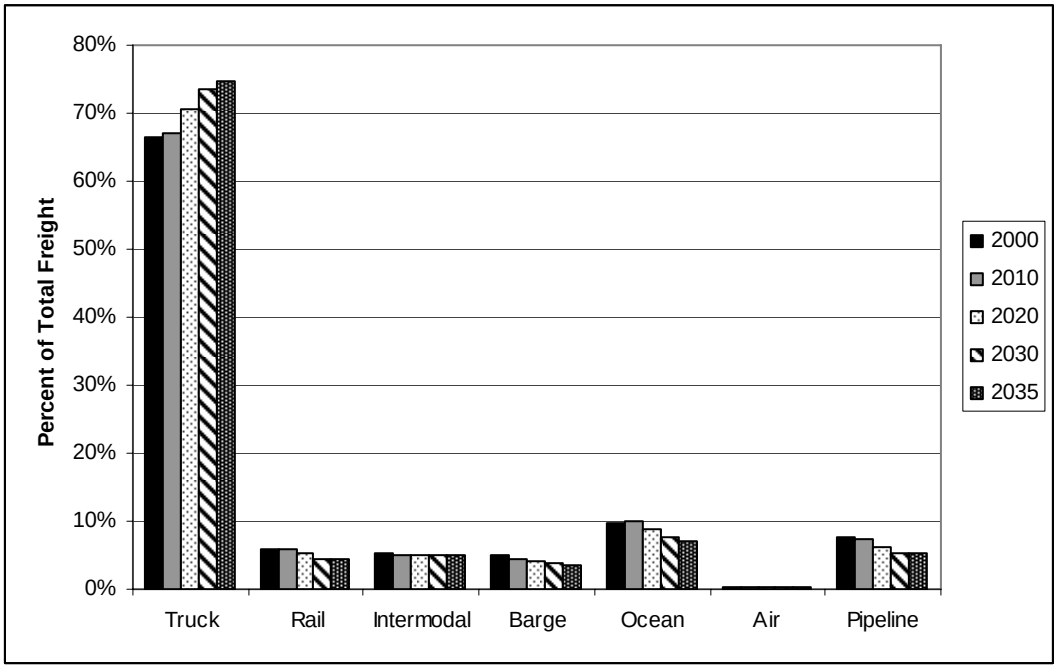
Exhibit 4-7. Ports of Portland-Vancouver Projected Commodity Growth (millions of tons)



Source: Metro, 2006.

Exhibit 4-8 presents the percent of commodities moved through the region by transportation mode. Currently, the largest volume of goods moved in and out of the Portland–Vancouver MSA is via commercial truck. This is not expected to change over the next 25 years. Commodities moved by trucks are expected to grow from 67 percent of total freight in 2000 to 75 percent in 2035. Rail and air cargo are the only other modes that are anticipated to see increases in tonnage moved by 2030, although the tonnage moved by air is relatively small. The projected growth in trucking has implications for the road network, as efficient and safe movement of products to and from the ports will be needed to maintain the ports' competitiveness. The increase in truck traffic will have to compete for highway capacity with the expected increase in passenger travel.

Exhibit 4-8. Ports of Portland-Vancouver Commodity Flow Forecast by Mode



Source: Metro, 2006.

4.3 Local Conditions

Local conditions are reported for the API segments A and B. As described in Section 1 of this report, these segments separate the local API at roughly Mill Plain Boulevard. Segment A is to the south of Mill Plain Boulevard, and Segment B is to the north.

Local population, household, and employment data for the two API segments were calculated based on Traffic Analysis Zone (TAZ) data provided by Metro, the Metropolitan Planning Organization (MPO) for the Portland region. Specific TAZ's were selected if the proposed alignments crossed through that TAZ. TAZ's that would not be impacted directly by the proposed alignments were not used for this analysis.

4.3.1 Population and Households

Exhibit 4-9 presents historical and forecast population data for the two segments, along with total population forecasts for the Portland – Vancouver MSA. Between 2005 and 2030, Metro forecasts that the annual population in Segment A will grow almost 1 percent faster than the Portland metropolitan region and almost 2 percent faster than Segment B.

Exhibit 4-9. Population Forecast

Area	2005	2030	Average Annual Growth Rate
Segment A	5,998	10,928	2.4%
Segment B	10,896	12,309	0.5%
Portland-Vancouver MSA	2,046,777	3,069,782	1.6%

Source: Metro, 2007.

Exhibit 4-10 presents historical and forecast housing data for each segment and the Portland–Vancouver MSA. Between 2000 and 2030, the number of households per year in Segment A is forecast to grow almost 1 percent faster than the Portland metropolitan region and almost 2 percent faster than in Segment B. Housing in both segments and the Portland metropolitan region is forecast to grow similar to population. This means that the number of persons per household will remain the same (assuming no change in housing vacancy rates). This is relevant because travel demand typically correlates more closely to household formation than to population.

Exhibit 4-10. Housing Forecast

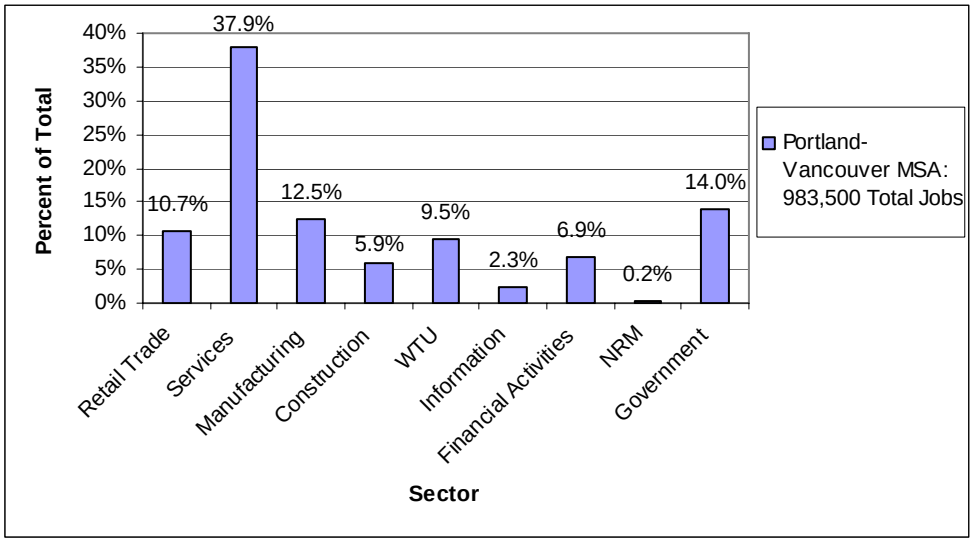
Area	No. of Households		Average Annual Growth Rate
	2005	2030	
Segment A	3,152	6,114	2.7%
Segment B	4,747	5,954	0.9%
Portland-Vancouver MSA	824,985	1,231,561	1.6%

Source: Metro, 2007.

4.3.2 Employment

Exhibit 4-11 presents historical employment by sector, in total, and on a percentage basis, for the Portland–Vancouver MSA for 2000. The sector with the largest share of total employees in 2000 was the "services" sector, which accounted for 38 percent of all jobs in the region. Government, manufacturing, and retail trade had the next largest shares of employees with 14.0, 12.5, and 10.7 percent, respectively.

Exhibit 4-11. Historical (2000) Employment by Sector



Source: Oregon Employment Department, 2007.

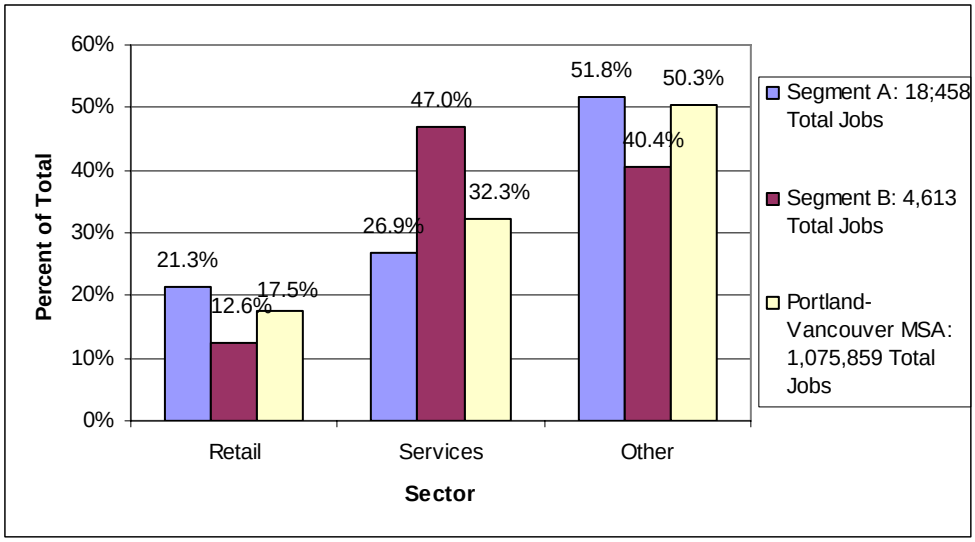
Notes: WTU: Wholesale Trade, Transportation, and Utilities

NRM: Natural Resources and Mining

Exhibits 4-12 and 4-13 present historic and forecast employment by sector, in total, and on a percentage basis, for Segment A, Segment B, and the Portland–Vancouver MSA for 2005 and 2030. Only three employment sectors (Retail, Services, and Other) are presented in each exhibit below because, in general, retail and service businesses generate more trips per employee than other sectors and are more relevant for this analysis. The sector classified as "other" is composed of manufacturing, construction, wholesale trade, transportation, and utilities (WTU), information, financial activities, natural resources and mining (NRM), and government.

In 2005, as presented in Exhibit 4-14, the sector with the largest share of total employees in Segment A and the Portland-Vancouver MSA is classified as Other. As shown in Exhibit 4-13, this sector had the largest share of total employees within Segment A and the Portland-Vancouver MSA, while the Services sector had the largest share in Segment B. Segment A also had the largest share of Retail sector employees; approximately twice as many employees compared to Segment B and the region.

Exhibit 4-12. Percent of Total Employment by Industry for Each Segment and the Region – 2005

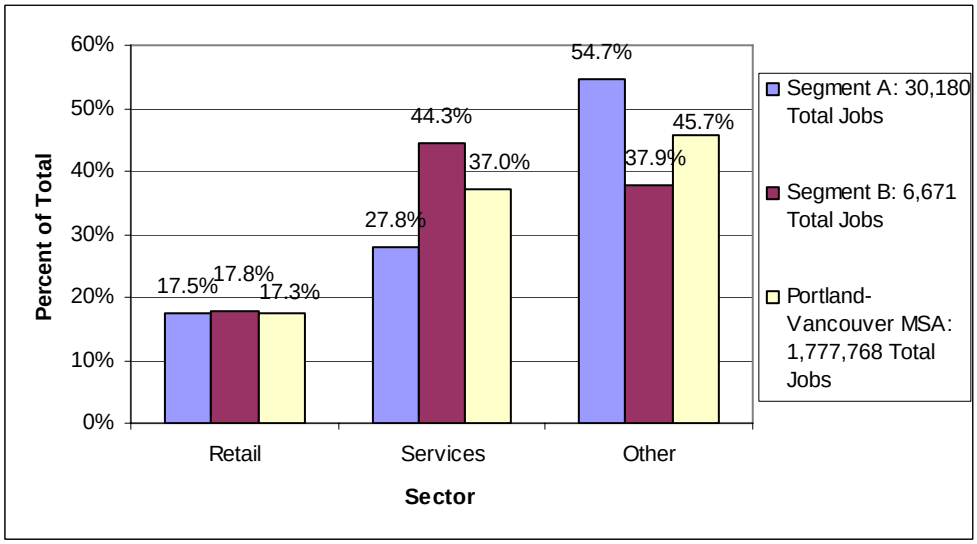


Source: Metro, 2007.

Note: Total jobs for the Portland-Vancouver MSA presented in this exhibit do not match those in Exhibit 4-10 because two different sources were used to gather this information. Each source has its own definition of each sector; therefore, the amount of employment in each sector will be slightly different between each source.

In the services and other sectors, the 2030 share of total employees within segments and the region should continue trends from 2005. However, by 2030, the share of employees in the Retail sector is forecast to be similar across segments and the region, rather than differing as it does currently (Exhibit 4-13).

Exhibit 4-13. Percent of Total Employment by Industry for Each Segment and the Region – 2030

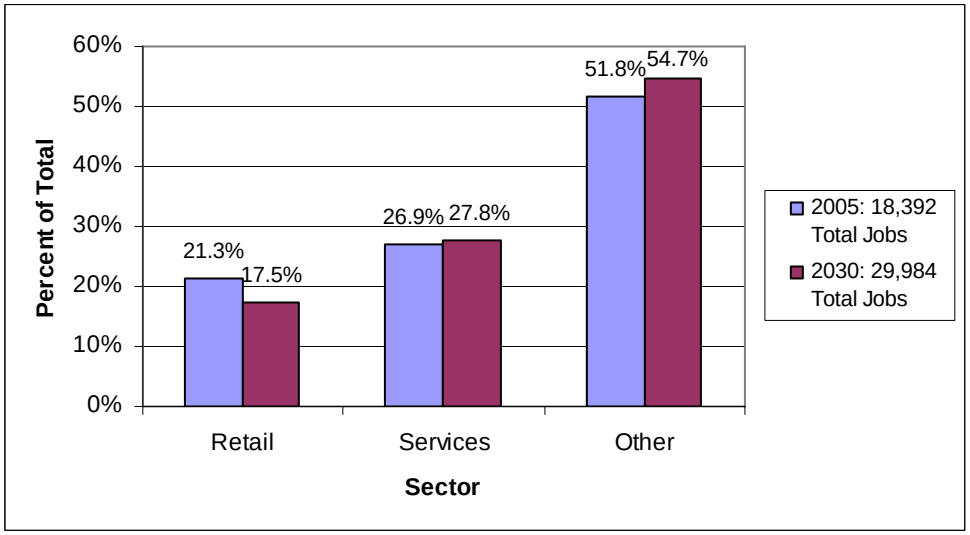


Source: Metro, 2007.

Exhibits 4-14 and 4-15 present historic and forecast employment by sector, in total, and on a percentage basis, for Segment A and B for years 2005 and 2030.

As presented in Exhibit 4-14, the sector with the largest share of total employees in Segment A is Other. In 2005, the Other sector accounted for 51.8 percent of all jobs in Segment A. Metro forecasts that the percent of total jobs in the Retail sector in Segment A in 2030 will decline and the percent of total jobs in the Services and Other sectors will increase.

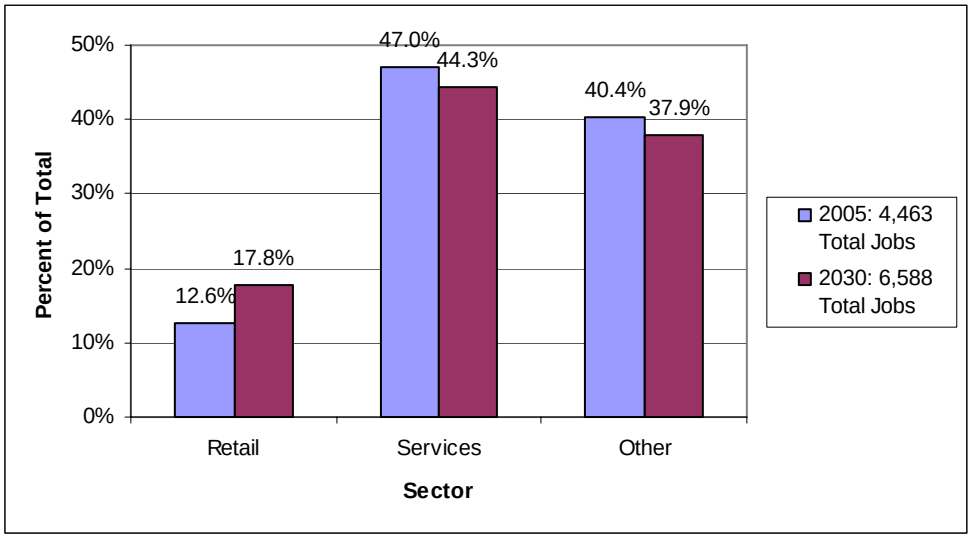
Exhibit 4-14. Percent of Total Employment by Industry – Segment A



Source: Metro, 2007.

As presented in Exhibit 4-15, Segment B differs from Sector A in that the largest share of total employees in that segment is the Services sector, which accounted for 47 percent of all jobs in 2005. Unlike Segment A, Metro forecasts that the percent of total jobs in the Retail sector in Segment B in 2030 will increase and the percent of total jobs in the Services and Other sectors will decrease.

Exhibit 4-15. Percent of Total Employment by Industry – Segment B



Source: Metro, 2007.

4.3.3 Revenue Sources

Both the City of Portland and the City of Vancouver rely heavily on tax revenues to fund general services to their respective jurisdictions.

Portland and Vancouver General Fund revenue sources are presented in Exhibit 4-16 and Exhibit 4-17, respectively. Both Portland and Vancouver's largest source of revenue is property taxes, which account for 36.4 and 31.3 percent, respectively, of each City's total revenues. Total tax revenue to Portland is estimated to account for 78 percent of its total revenues while total tax revenue to Vancouver is estimated to account for almost 40 percent of its total revenues. Revenues collected by each City, other than taxes, consist of funding from state and local sources, internal transfers, and various types of fees collected from government operated facilities and issuing licenses and permits. For the City of Portland, internal revenues consist of overhead billings, other cash transfers, federal grants transfers, and interagency reimbursements. For the City of Vancouver, intergovernmental service revenues mainly consist of payments from Clark County for parks and recreation services provided to Clark County by the City under the provisions of an interlocal agreement.

Exhibit 4-16. City of Portland General Fund Revenue Sources

Source	2006 (Thousands)	2007 Projected (Thousands)
Property Tax	$164,438	$171,509
Lodging Tax	$13,502	$14,659
Licenses & Permits	$98,710	$115,525
Service Charges and Fees	$14,771	$16,598
State Sources	$10,296	$10,780
Local Sources	$15,911	$15,267
Miscellaneous	$9,978	$9,168
Internal Revenues	$124,278	$90,258
Total	**$451,884**	**$443,764**

Source: City of Portland, 2007.

Exhibit 4-17. City of Vancouver General Revenue Sources

Source	2006 (Thousands)	2007 Projected (Thousands)
Property Tax	$34,783	$35,697
Sales Tax	$23,471	$28,739
Business Tax	$18,933	$19,281
Other Tax[a]	$9,492	$9,765
Business Licenses	$1,143	$1,198
Grants & Entitlements	$1,129	$685
State Shared Revenues	$2,621	$2,910
Intergovernmental Service Revenues	$1,460	$1,280
Goods and Services	$13,618	$15,849
District Court	$1,554	$1,276
Miscellaneous	$2,136	$1,993
Operating Transfers	$873	$841
Total	**$111,213**	**$119,514**

Source: City of Vancouver, 2007.

[a] Includes Excise and Gambling Tax.

5. Long-Term Effects

5.1 How is this section organized?

This chapter describes the long-term economic effects that are expected from the project's build and No-Build alternatives and options. Comprehensive descriptions and comparisons of impacts are provided from three perspectives:

- Combination of system-level and segment level choices expressed as four specific build alternatives and a No-Build Alternative. These comprehensive alternatives include highway, transit, bicycle, pedestrian and other components. This discussion focuses on how these alternatives would affect corridor and regional impacts and performance.
- Discrete system-level choices that include various design options at the segment level, for example, comparing the impacts of each alignment option in each segment.
- A more comparative and synthesized summary of the impacts associated with the system-level choices.

This section addresses both direct and indirect long-term effects.

5.2 Impacts from Full Alternatives

This section describes the direct and indirect economic effects from the full build alternatives and the No-Build option. These alternatives being evaluated in this section include combinations of highway, river crossing, transit and pedestrian/bicycle alternatives and options covering all of the CRC segments. They represent the range of system-level choices that most affect overall performance, impacts, and costs.

Analysis of the full alternatives is useful for understanding the regional effects associated with the CRC project.

5.2.1 No-Build Alternative

The No-Build Alternative retains the existing I-5 bridge crossing and makes only minor preservation improvements to the highway within the API. Projects included in the No-Build Alternative are generally consistent with the Metro and the Clark County Regional Transportation Council (RTC) fiscally-constrained Regional Transportation Plans (RTPs). Projects included in the No-Build Alternative are listed in Appendix A.

The No-Build project list includes many projects that improve I-5 access to and from regional centers, local collectors, and arterials. The project list also includes capacity projects along I-5 both north and south of the API. Exhibit 5-1 lists specific projects within or adjacent to the API, and non-highway and transit projects within the API.

Exhibit 5-1. No-Build Projects within or Adjacent to API

Jurisdiction/ Project Type	Project Name	Project Extent	Project Description
Oregon			
Highway	I-205	Airport Way	Redesign interchange
	I-5	Lombard St. to Expo Center	Widen to six lanes
	I-5	Columbia Blvd.	Construct a full interchange
Non-Highway	Various	Portland International Airport to I-205	Capacity and connectivity projects to benefit freight and travelers between PDX and I-205
	Various	Rivergate to I-5	Construct arterial capacity and connectivity projects between Rivergate and I-5
Washington			
Highway	I-5	99th St. to SR 502	Capacity improvements
	I-5	SR 502, Salmon Creek, Pioneer Street/SR 501, 179th Street	New or reconstructed interchanges
	I-205	134th to Padden Pkwy.	Widen to six lanes
	I-205	Mill Plain, SR 14, 28th St., SR 500	Interchange modifications
	I-205	Mill Plain to 28th Street	Build frontage road
	SR 14	NW 6th Avenue to 32nd Street	Capacity improvements
	SR 14	SR 500, 32nd Street	Interchange
Non-Highway	Main St.	6th Street to 15th St. (Mill Plain)	Convert to two-way street
	Columbia Shores	S. of SR 14	Rail trestle, widen portal
	Broadway	6th St. to 15th St.	Reconstruct and convert to two-way street
	Fourth Plain Blvd./ Andresen	Intersection Influence Area	Reconstruct Fourth Plain in vicinity of 65th/66th Ave. to Andresen
	Fourth Plain	I-5 to Railroad Bridge	2 lanes each direction
	Highway 99 South	63rd to Ross St.	Build to 5 Lane principal arterial standard, rebuild rail bridge
	Lincoln St.	Fourth Plain Boulevard to Railroad Avenue	Realign, reconstruct and grade separate
	Lincoln St.	Fourth Plain to 39th St.	Construct new section of road 1 lane each direction
	Jefferson/ Kauffman St.	Mill Plain to 6th St.	Realign offset at 13th St., grade separate from rail at 8th St.
	Railroad Ave.	Columbia to new Lincoln Avenue grade separated facility	New waterfront east/west arterial
Transit	Vancouver transit center	Mall area	Relocate Van Mall transit center to C-TRAN AOM

The Metro RTP includes several capacity and safety projects at Rivergate, and along Columbia Boulevard and Marine Drive west of I-5 that are designed to improve safety and flow for commercial trucks traveling between Rivergate and I-5.

Improvements along Lombard Street and Marine Drive will generally improve conditions for commercial trucks. These improvements will improve travel times along the local arterial network (Platman 2007), but travel times once on I-5 are expected to increase under the No-Build. Similarly, travel times for commercial trucks traveling along I-5 are expected to improve under the No-Build due to capacity projects north of Vancouver and south of Expo Center. However, these benefits will be tempered by worsened conditions within the API. Making no improvements to the highway itself would increase the severity of the existing bottleneck at the CRC bridge, lengthening the periods of congestion (spreading the peak). Increased congestion is assumed to also increase potential for crashes. It is assumed that some truck through-trips will take advantage of improvements to I-205 and shift to that route. This would temper improvements along that highway by adding more vehicles than had been assumed (Cervero 2001).

Under the No-Build Alternative, no businesses within Segment A would be displaced by right-of-way acquisition and there would be no resulting decrease in property or sales tax revenues or jobs lost. There would be no additional employment or added sales tax associated with project construction. Economic development planned for this area may occur more slowly as business owners may be more reluctant to locate in an area with poor access and mobility for employees and customers. Customers may elect to shop in other areas with easier access and mobility.

5.2.2 Replacement Crossing with LRT and I-5 Standard Toll (Alternative 3)

This scenario explores system-wide impacts of a new, 10-lane[1] replacement I-5 bridge crossing of the Columbia River, with a variable tolling structure and light rail transit that runs west of the bridge structure between the Expo Center and south downtown Vancouver. This base case scenario assumes the replacement bridge alignment. The transit alignment for this alternative is the I-5 alignment, operating to the west of the highway between the Expo Center and south downtown Vancouver (offset alignment on Hayden Island), two-way operations along Washington Street through the core of downtown Vancouver, and then easterly along McLoughlin Boulevard to the east of I-5. Transit in this scenario then operates north along the east side of I-5 between Clark College and the Kiggins Bowl Park and Ride.

5.2.2.1 Business Displacements

As shown in Exhibit 5-2, Alternative 3, assessed at the corridor level, would require the relocation of 51 businesses employing approximately 615 employees, and annual sales of approximately $116 million. Business decisions to relocate depend on availability of vacant land of similar size, zoning, and proximity to the local and regional transportation network. ODOT and WSDOT would provide relocation assistance to displaced businesses.

The Marine Drive interchange has three potential alignments: Standard, Southern, and Diagonal. The Southern Marine Drive realignment would displace an additional three

[1] This alternative could be restriped as a 12-lane facility.

businesses, a total of 85 employees, and $14.8 million in annual sales. The Diagonal Marine Drive interchange would not have any additional business displacements.

Exhibit 5-2. Overall Business Displacements Associated with Alternative 3

Component/Segment	No. Businesses Impacted	No. Employees Impacted	Affected Sales (Millions)
Highway Component/Segment A	41-44	565	$112
Highway Component/Segment B	0	0	$0
Unique Transit Component/Segment A1	0*	0*	$0*
Transit Component/Segment A2	1	5	<$1
Transit Component/Segment B	9	45	$3
TOTAL	**51**	**615**	**$116**

*Although a total of five businesses, with approximately 25 employees and $3.2 million in annual sales are acquired with the replacement offset alignment.

Source: CRC Acquisitions Technical Report and InfoUSA, 2007.

5.2.2.2 Specific Parking and Access Impacts

5.2.2.2.1 On-Street Parking

The majority of on-street parking impacts associated with Alternative 3 are located along Washington Street in downtown Vancouver and along McLoughlin Boulevard between Washington Street and I-5. As identified above, the LRT alignment along McLoughlin Boulevard and Washington Street would eliminate all on-street parking along those corridors, both at station and non-station blocks.

Access

This section describes specific access impacts associated with Alternative 3.

Segment A1

There are three potential Marine Drive interchange design options, all with unique impacts. Under the Standard Marine Drive design, the driveway of one sand and gravel business, in the immediate vicinity of the interchange, directly accesses Marine Drive within the ramp taper area. Access to this business would be difficult to retain in its current location, and redesigning the access to a lower-volume street would require trucks to travel to the opposite side of the interchange to gain access to it. The southern and diagonal Marine Drive interchange options would not have these access impacts.

Several driveways to businesses on Hayden Island are located within 0.25 mile of the interchange ramp tapers. According to the Oregon Administrative Rules, public and private accesses within 0.25 mile of interchange areas must be controlled according to Division 51 guidelines (OAR 2007). Accesses not meeting spacing standards would either be closed or relocated, or a deviation justification must be prepared.

Segment A2

Washington Street is currently one-way southbound. Under Alternative 3, Washington Street would be converted to two-directional travel. Because transit would operate in the median of the roadway, left turns would not be allowed from Washington in either direction, for station blocks or for non-station blocks. This means that vehicles trying to access businesses on the left side of the street would need to turn off of Washington and go around the block to access the business.

Businesses along Washington Street include restaurants, cafes, banks, office buildings, and surface parking areas. These businesses do not rely heavily on drive-by traffic. Any access impacts associated with no left turns would be offset somewhat or completely by increased visibility and ease of right-hand turn access afforded by two-way travel.

In the Mill Plain area, the two-way Broadway and Broadway/Main connections impact two driveway accesses for a bank in the vicinity of Broadway and 16th Street. The Broadway/Main option also impacts a driveway access for an auto parts store.

Segment B

Throughout much of Segment B, the transit alignment would run along an exclusive guideway at the same grade of elevation as existing roads and businesses. Left turn access to and from businesses across the tracks would be allowed at non-station blocks. However, left-turn access would not be allowed on station blocks, or while a transit vehicle was in the area. Although temporary delays in waiting for a transit vehicle to clear the block before making a left turn are not expected to impact businesses in Segment B, the no left-turn access at station blocks could impact somewhat those businesses that rely on good roadway access to attract customers. This impact may be offset somewhat by expected increased pedestrian activity at station areas.

5.2.2.3 Changes in Travel Patterns and Volumes

Vehicle demands and speed profiles reported in the Traffic Analysis Technical Report (CRC 2007) were used to determine effects to the overall I-5 corridor, defined as Pioneer Street to Marquam Bridge, a 23-mile corridor. The replacement alternatives would result in increased vehicle demands for southbound I-5 north of SR 14 during the morning peak period. Between SR 14 and Columbia Boulevard, I-5 would show minimal decreases in vehicle demands, less than 3 percent compared to No-Build conditions, because of the tolling of the bridge and downstream congestion near the I-405/Alberta bottleneck. South of Columbia Boulevard to the Marquam Bridge, I-5 would show minimal increases and decreases (plus or minus five percent compared to the No-Build Alternative).

The increased vehicle demands north of SR 14 reflect improvements included north of the Interstate Bridge in the build alternatives, which are expected to benefit access to the Port of Vancouver, downtown Vancouver, and businesses along Officers Row. Speeds on the I-5 segment between Pioneer Street and Main Street during the morning peak would generally be greater than 50 mph; however, downstream bottlenecks would continue to cause congestion for points upstream to Main Street and key freight corridors, such as Columbia Boulevard.

Based on the Traffic Technical Report, Section 7, using the vehicle demand figures and speed profiles, northbound I-5 travel demands along the 23-mile I-5 corridor are forecast to increase during the afternoon peak period for the replacement alternatives compared to the No-Build Alternative. In spite of the toll on I-5, capacity improvements identified in this alternative combined with forecast congestion along I-205 would result in vehicle demand growth on I-5 and decreases on I-205, resulting in a net overall decrease in northbound cross river traffic demands compared to the No-Build Alternative. The growth in demand on I-5 is evidence that I-5 would be the preferred river crossing for most. The relatively good travel speeds in the northbound direction during the afternoon peak, generally speeds 40 mph or better north of I-405, would be beneficial to freight compared to the No-Build Alternative, which results in congested conditions south of the bridge during the same period.

Segment A1 Major shifts in traffic patterns between the No-Build and replacement alternatives would occur on northbound/southbound routes that intersect the Columbia Slough, Interstate Avenue, and MLK/99E. During the morning peak, in the northbound direction, 10 percent of the traffic on local arterials would shift to I-5, which would leave these local arterials less congested and more accessible for freight related activity.

At the Marine Drive and I-5 interchange, intersection level-of-service (LOS) would improve from F for the No-Build Alternative to B for the replacement alternatives, indicating an improvement in access to this freight and employment corridor during the morning peak.

Segment A2

Major shifts in traffic patterns between the No-Build and the replacement alternatives would occur in downtown Vancouver. At the North 15th Street screenline during the afternoon peak, 15 percent of northbound traffic, or 250 vehicles, would divert from local arterials to I-5, which may result in a modest impact to downtown businesses that benefit from drive-by traffic in the evenings.

Conversely in the morning peak, an additional 15 percent of vehicle volume in the northbound direction would divert to local streets in the replacement alternatives compared to the No-Build; however only equaling 100 vehicles. These additional vehicles have the potential to make morning deliveries to businesses more difficult, but overall are not expected to have significant impacts.

Segment B

In the morning, the dominant flow of traffic is in the southbound direction, and at the 15th Street screenline, 19 percent of vehicles would switch from local streets in the No-Build Alternative to I-5 in replacement alternatives, which equals 500 vehicles. The local streets affected are primarily in downtown Vancouver, and the lower volumes are expected to benefit area businesses in the morning if they rely on morning deliveries.

During the morning peak, at the Fourth Plain Boulevard screenline, 31 percent of the vehicle volumes would divert from local streets to I-5 under the replacement alternatives, equaling 850 vehicles. Less congestion in the morning peak would benefit local

businesses that rely on morning deliveries; however businesses that rely on drive-by traffic would likely be negatively impacted by this change. Similarly, 32 percent of southbound local street traffic at the 39th street screenline would divert to I-5 under the replacement alternatives, or a total of 500 vehicles. Any effects are negated to a degree because 22 percent of northbound traffic at the Fourth Plain screenline would divert from I-5 to local streets (100 vehicles), and at the 39th Street screenline, 14 percent of northbound vehicles would divert to local streets, equaling 400 vehicles.

In the afternoon peak, the dominant flow of traffic would be in the northbound direction. At the Fourth Plain screenline, 28 percent of vehicles would divert from local streets to I-5, equaling 250 vehicles, which would be beneficial for downtown Vancouver circulation, but may reduce the exposure downtown businesses have to drive-by traffic. Similarly, 17 percent of northbound traffic, or 200 vehicles, would divert from local streets in the No-Build Alternative to I-5 in the replacement alternatives.

5.2.2.4 Impacts to Regional Economic Sectors

Alternative 3 is expected to improve economic development conditions for businesses in both Oregon and Washington. General findings are described in this section - additional information is provided in Section 5.6.

The I-5 corridor is the backbone of a series of roads that provide access to the greater Vancouver and Portland regional areas for freight, employees, and personal trips. A recent trade capacity analysis (Global Insight et al. 2006) forecasts an increase in commodities transported by truck in the Portland-Vancouver region from 197.2 million tons in 2000 to 390.0 million tons in 2030, nearly doubling in 30 years. The Oregon Commodity Flow Forecast (Global Insight, 2005) projects an 81 percent increase in tonnage moving to, from, and through the state by 2030. The trade capacity analysis study concluded further that while all modes are important, the roadway system links all of the others and links land uses critical to business. Roadway congestion increases the cost of doing business for those activities that are transportation dependent.

As noted in a recent study about the cost of congestion to the local economy (EDR Group 2005), the Portland-Vancouver region is more susceptible to long-term economic losses from congestion than other areas of the country because its economy is relatively highly dependent on manufacturing, transportation/port distribution, and services that serve broader regional, national and global markets. These firms bring new money into the region by selling their products and services nationally and internationally. They could locate elsewhere, but choose the Portland-Vancouver region for its attractiveness and competitiveness for their operations. These industries are particularly vulnerable to costs imposed by increased congestion and have the option of moving their operations elsewhere if transportation conditions compromise the viability of the region as a base for their operations. A conclusion of this study was that an inadequate transportation system would negatively impact regional competitiveness, if not addressed.

According to a study of the regional economic effects of transportation choke points (Cambridge Systematics et al. 2003), five industries are particularly sensitive to road and rail congestion in the Portland-Vancouver region (mainly in the I-5 and I-205 corridors);

lumber/wood/paper, distribution/wholesale trade, transportation equipment/steel, farm and food products, and high-tech (electronics and scientific instruments). These five industries account for approximately 70 percent of commodity tonnages crossing the I-5 and I-205 bridges by large truck, and accounted for 31 percent of Oregon and Washington's gross regional output in 2000. Thus, these industries are particularly vulnerable to delay and decreased travel time reliability resulting from roadway congestion in the I-5 corridor. According to a study of the regional economic effects of transportation choke points (Cambridge Systematics et al. 2003), congestion at the I-5 bridge will increase the cost of delay to trucks by 140 percent, from $14 million in 2000 to $34 million in 2020. The build alternatives would result in user benefits to the trucking industry by reducing labor costs, improving safety, potentially improving vehicle operating costs, and reducing scheduling uncertainty.

The main sources of regional truck traffic are the Port of Portland, the Columbia Corridor, the Port of Vancouver, and the Columbia Industrial Park in Washington. Existing conditions analysis in the Traffic Technical Report (CRC 2007) states the highest truck demands occur in the vicinity of Columbia Boulevard and Marine Drive. In Washington, the important regional truck movements occur east-west from SR 14 to Mill Plain Boulevard via I-5. On I-5, the truck volume peak hour is between noon and 1 p.m. in both the northbound and southbound direction.

In the No-Build Alternative, I-5 in the southbound direction at Columbia Boulevard would be congested between noon and 1 p.m., meaning speeds are 30 miles per hour (mph) or less for the majority of the hour. Congested conditions at I-405 would cause congestion at upstream interchanges up to Interstate Avenue, but Marine Drive is forecasted to have un-congested conditions for the majority of the peak truck hour, noon to 1 p.m., because it is further upstream from I-405. All other intersections of truck routes identified in the previous paragraph with I-5 would have speeds at 50 mph or greater for the majority of the hour in both directions.

Under the replacement alternatives, Columbia Boulevard in the southbound direction would have speeds of 50 mph or greater for the majority of the noon to 1 p.m. hour, which would be a benefit to businesses along the Columbia Corridor.

Improved access resulting from Alternative 3 would reinforce economic growth and development that is already occurring in both regions, based on the many factors that drive growth. The build alternatives would support this growth by reducing the roadway congestion experienced by freight and other vehicles going to and from the two cities. Additionally, transit connections would improve travel time accessibility and broaden the pool of labor available to downtown firms within a given commute time.

5.2.3 Replacement Crossing with LRT and No Toll

This alternative is similar to the alternative discussed in the previous section (5.2.2) except it explores how conditions would be different for the replacement crossing with LRT when the toll is removed.

Variable tolls provide a financial incentive for motorists to use the roadway during less congested periods, which would result in peak period traffic flowing more freely. Without a toll, there would be less incentive for motorists to avoid peak travel times. The 'triple convergence theory' states that major highway infrastructure investment in a congested corridor would be expected to attract trips from alternate corridors, from alternate modes, and from the non-peak period – filling the newly available road capacity (Downs 1992). Thus, this alternative would result in more congestion than what would be observed under the Replacement Crossing with LRT and I-5 Standard Toll.

Overall, economic development is expected to occur along paths similar to existing conditions, where less congested corridors with good access to interstate highways are most attractive to new development. However, development would slow because of increased costs to businesses, employees, and customers from increased congestion levels.

5.2.4 Replacement Crossing with BRT and I-5 Standard Toll (Alternative 2)

This alternative is similar to the alternative discussed in Section 5.2.2 except it explores how conditions would be different for the replacement crossing with BRT, instead of LRT.

According to the CRC Transit Technical Report (CRC 2007), both BRT and LRT are effective transit modes to serve bi-state travel and both would greatly improve transit service compared to the No-Build Alternative. However, between the two modes, LRT would have higher daily and annual transit passenger trips, faster travel speeds, a higher combined vehicle capacity (requiring fewer transit vehicles in the guideway), lower operating and maintenance costs, and a higher cost effectiveness as measured by the annual cost to operate the system per passenger. LRT would have a higher capital cost than BRT.

5.2.4.1 Direct Economic Impacts

The direct economic impacts of the BRT alignment are very similar to the LRT alignment. Driveway and left-turn access would be identical. The BRT alignment would acquire one additional business in Segment A2, an auto repair business with approximately 10 employees and $0.8 million in annual sales. BRT along Washington Street between Sixth and 15th Streets, would impact 100 percent of on-street parking stalls. Access impacts would be similar to those for Alternative 3.

5.2.4.2 Indirect Economic Impacts

Section 5.5 discusses the effect of mode (LRT vs. BRT) on the likelihood for economic development around transit stations.

According to the Transit Analysis Report (CRC, 2007), both BRT and LRT would increase substantially the number of daily and annual transit passenger trips. Alternative 3 would have 24 percent more daily transit passengers than Alternative 2. With the Increased transit system in the supplemental alternatives, LRT would have just over 15 percent more daily transit passengers than BRT (Alternative 4).

System-wide, whether LRT or BRT is the HCT mode, the total daily boardings would be practically the same. This is because with BRT as the HCT mode passengers traveling between Clark County and downtown Portland must transfer at the Expo Center station to the existing MAX Yellow Line or TriMet local bus line. Therefore, trips that would take one boarding with LRT alternatives, would require two boardings (one on a standard bus or BRT to one on LRT). In addition, in the BRT scenario the daily I-5 and I-205 express bus boardings would be somewhat higher than with LRT, as would the TriMet North Portland local bus boardings. With LRT as the HCT mode, the daily C-TRAN local bus boardings would be somewhat higher and the total TriMet Yellow Line boardings would be about one-third higher than with BRT.

5.2.5 Supplemental Crossing with LRT and I-5 Higher Toll (Alternative 5)

This scenario explores economic effects of a supplemental crossing, with a higher toll on I-5. There are four key elements that differentiate the supplemental crossing from the replacement crossing. These are: direct business displacements, marine commerce on the Columbia River, the closure of Sixth Street in downtown Vancouver, and the capacity of the bridge.

5.2.5.1 Direct Business Displacements

Overall, the replacement crossing would require relocation of more businesses and employees than the supplemental crossing. This is illustrated in Exhibit 5-6. Affected sales from the supplemental alternatives would be lower than in the replacement alternatives.

Exhibit 5-3. Business Displacements Comparison between Replacement and Supplemental Alternatives (entire corridor)

Alternative	No. Businesses Impacted	No. Employees Impacted	Affected Sales (Millions)
Replacement	51	615	$116
Supplemental	34	480	$68

Source: CRC Acquisitions Technical Report and InfoUSA, 2007.

The replacement alternatives would impact more individual businesses, employees, and revenues than the supplemental alternatives.

5.2.5.2 Marine Commerce on the Columbia River

The supplemental alternatives would have a negative economic effect to marine commerce on the Columbia River in contrast to the replacement alternatives, which would have a positive effect. The basis for this conclusion follows.

The existing I-5 bridge structures each have nine piers which result in navigation "channels" between the piers. Three such channels are used for navigation: a wide span with approximately 60 feet mid-span vertical clearance, a high span with approximately

70 feet of mid-span vertical clearance, and a lift span with approximately 40 feet mid-span vertical clearance when closed and 180 feet when open. The wide span is the main channel used for navigation, but during high water many barges need to use the high span, or require bridge lifts at the lift span. In 2004, there were 604 bridge openings. The replacement bridge would be high enough to allow the vast majority of vessels to pass without bridge openings. Currently, bridge openings are restricted to non-peak roadway commute hours. Thus, the new spans would provide more flexibility in operating schedules for marine commerce.

The supplemental bridge would retain the existing I-5 bridge for northbound I-5 traffic. It is possible that there would be fewer time restrictions on bridge lifts once vehicular, but that is not assured. Thus, this benefit may not occur for the supplemental alternatives.

The replacement alternatives would result in fewer piers than exist on the current bridges, thus widening the horizontal clearance of navigation channels. A bridge span length of approximately 500 feet is being considered, which would be an increase over the width of the "main channel" of 178 feet and the "barge channel" of 231 feet. The longer span lengths will provide more room for boat captains to maneuver between the piers and improve the inherent safety of marine navigation. The elimination of the lift span under the replacement alternatives would provide much greater flexibility for marine traffic.

In the supplemental alternatives, the existing I-5 piers would be retained and the piers for the supplemental bridge would introduce more obstacles that must be maneuvered around. The piers for the new bridge would encroach on the alternate barge channel, thus diminishing its functionality. Thus, the inherent safety of marine navigation would be diminished somewhat.

5.2.5.3 Closure of Sixth Street at Washington Street

As described in Section 5.3.2 below, the touchdown point for the HCT structure on the north side of the Columbia River would be farther north for the supplemental alternatives than it would be for the replacement alternatives. The five percent maximum grade to which transit structures can be designed means that HCT would meet the existing street grade in Vancouver immediately north of Sixth Street. Under the supplemental alternatives, Sixth Street would be closed at its intersection with Washington Street, and a retaining wall would be constructed between Fifth and Sixth Streets.

Sixth Street is classified as a minor arterial and is used by local and regional traffic accessing businesses throughout downtown. The location of this street closure could be of issue for the economic vitality of several businesses in downtown Vancouver. Currently, Sixth Street provides the best connectivity in southern downtown. The street connects with east Vancouver via SR 14, with Portland and points north via the I-5 interchange, with important north-south arterials such as C Street and Washington Street, and crosses the BNSF railroad tracks on the western side of downtown. Streets south of Sixth Street have limited connectivity because of the railroad tracks and I-5. The street to the north (Seventh Street) is closed to automobile traffic west of Washington because of office buildings, Esther Short Park, and condominium developments. Developments

along Sixth Street include the south end of the existing transit mall, the Vancouver Convention Center, and Esther Short Park.

5.2.5.4 Capacity of Bridge Crossing

The capacity of the supplemental bridge would be lower than that of the replacement bridge, with one fewer travel lane in each direction. However, highway service levels are not expected to substantially differ because variable tolls and, to some extent, higher levels of transit service would mitigate congestion. On balance, travel times are expected to be similar in the build alternatives.

During peak periods, the supplemental alternatives would result in lower vehicle throughput than the replacement alternatives. The higher toll and more frequent transit service could reduce the number of vehicles crossing the bridge, because some travelers would shift from vehicle to transit modes. Comparing person throughput, LRT person transit service would be higher compared to the replacement alternatives, indicating that people would shift to transit with more vehicle congestion. BRT person transit service would be slightly lower under the supplemental relative to the replacement alternatives. Despite this shift to transit under the supplemental alternatives, the replacement crossing would serve between 11 and 20 percent more person-trips during peak periods compared to the supplemental crossing; however the supplemental crossing would serve 11 to 16 percent more person-trips compared to the no build alternative (CRC, 2007).

Current bridge users may choose to avoid the higher toll and do business outside the API (retail businesses would be more sensitive to the higher toll). The resulting effect could be a dampening of regional mobility and economic activity within the API versus elsewhere in the region. Vehicle throughput on I-205 is forecast to be the same between the replacement and supplemental alternatives, indicating that trips would not divert to I-205, but instead people may avoid the trip altogether, switch to another mode such as transit or carpool, or travel during another time of day.

5.2.5.5 Higher Toll

The intent of the higher toll is to reduce congestion to the extent that demand on the bridge could be adequately served by the eight-lane supplemental crossing. The potential implications of a higher toll include:

- Increased telecommuting and job growth in Vancouver, as residents of Clark County would be less willing to commute to Portland.
- Increased transit ridership, as out-of-pocket and travel time costs of the higher toll structure would be higher than monthly transit passes and travel time costs for some commuters.
- Reduced home-based shopping trips from Clark County to points in northern Oregon, such as Hayden Island and Airport Way.
- Shifts to I-205 from I-5 for through trips (travelers with neither an origin nor a destination in either metropolitan area) and for travelers wishing to avoid the toll (those for whom travel time differentials between the I-5 and I-205 corridors are

low, or with lower travel time costs). Depending on the severity of this shift, increased congestion on I-205 could result.

5.2.6 Supplemental Crossing with BRT and I-5 Higher Toll (Alternative 4)

The economic effects of a supplemental crossing alternative with BRT and a higher toll are the same as those addressed in Sections 5.2.4 and 5.2.5.

5.2.7 Supplemental Crossing with LRT and I-5 Higher Toll (Alternative 5)

The economic effects of a supplemental crossing alternative with LRT and a higher toll are nearly the same as those addressed in Sections 5.2.4 and 5.2.5.

5.3 Impacts from Segment-level Options

This section describes and compares the impacts associated with specific highway alignment and interchange options and specific transit alignments and options. They are organized by Segment, including:

- Segment A: Delta Park to Mill Plain District
- Segment B: Mill Plain District to North Vancouver

For transit options, Segment A is divided into two sub-segments, each with a discrete set of transit choices:

- Sub-segment A1: Delta Park to South Vancouver
- Sub-segment A2: South Vancouver to Mill Plain District

Impacts from highway options are described separately from impacts from transit options. The purpose of this organization is to present the information according to the choices to be made. Where the traffic and transit choices would have a substantial effect on each other, this is considered.

Each of the subsections below contains a quantitative analysis of business displacements, property tax impacts to the cities of Portland and Vancouver, and estimated parking losses associated with the alignments.

The project would acquire additional rights-of-way from taxable property within each city to construct any of the highway alignments. This taxable property would be removed from each city's tax base, with the potential for decreasing property tax revenues or requiring a tax rate increase for a given level of revenue. The estimated property tax impact includes partial encroachments. The tax effect of the partial encroachments was calculated by multiplying the actual 2006 property tax collected for the parcel by an estimate of the percentage of the parcel taken for the project.

This section also includes an assessment of the economic effects of changes in the availability of parking, changes in traffic volumes and travel patterns, and access.

Note that each table presents only a partial picture of potential long-term impacts. For some alternatives, indirect economic impacts may result from the acquisition of local businesses if neighboring businesses that remain find it difficult to attract or retain customers because part of a complementary group of businesses (agglomeration economies) no longer exists. The long-term magnitude of this impact would depend on the potential to relocate acquired businesses in the same neighborhood and the extent and types of infill and redevelopment that takes place in those areas. This in turn depends on a number of factors such as regional economic trends and market conditions, the willingness of businesses to relocate, available building space for lease during the relocation process, and community and city support for redevelopment.

5.3.1 Highway Alternatives

In addition to impacts that can be predicted now, in the long term each of the build alternatives would improve overall traffic circulation and access and reduce congestion in the API. This would somewhat increase the geographic scope of customers likely to use local businesses, and shorten the commute time for potential employees of businesses within the project area and each city. This would be likely to improve the economic prospects of some businesses in the corridor. If this results in local sales that would not otherwise occur, sales tax revenues would increase. However, the overall effect would likely be small.

Acquisitions would cause the relocation of a number of businesses and the associated employees and sales. They would also remove small amounts of taxable property from the tax base of the cities of Portland and Vancouver. This would result in either a short-term reduction in property tax revenue or increased tax rates to maintain a given level of revenue. In the long term, any such losses may be offset by an increase in property tax revenues associated with increased property values. This could be expected because roadway improvements, by improving access and reducing congestion, have the potential to contribute to an increase in property values within the corridor. Overall market forces would determine property values along with: local zoning and land use regulations, local development trends, and other social and economic factors.

5.3.1.1 Segment A: Delta Park to Mill Plain District

A comparison of employment, annual sales, and property tax impacts of acquisitions to each of the highway alternatives in Segment A follows. Exhibit 5-4 provides an estimate of the number of businesses, employees, and annual sales located on properties that would be acquired by the alignments in Segment A.

Exhibit 5-4. Highway Alignment Business Displacements (Segment A)

Alternative	No. Businesses Impacted	No. Employees Impacted	Affected Annual Sales (Millions)
Replacement	41	565	$112
Supplemental	34	480	$68

Source: CRC Acquisitions Technical Report and InfoUSA, 2007.

Exhibit 5-5 presents the estimated property tax impacts associated with the roadway alternatives in Segment A for the cities of Portland and Vancouver.

Exhibit 5-5. Estimated Property Tax Impacts from Roadway Alternative Acquisitions (Segment A)

Alternative	Estimated Assessed Value of Right-of-Way (Millions)	Property Tax Impact (Thousands)	% of Budgeted 2006 Property Tax Revenues
Replacement			
Portland	$48	$220	0.13%
Vancouver	$8	$20	0.06%
Supplemental			
Portland	$45	$205	0.13%
Vancouver	$0.75	$10	<0.01%

Sources: CRC Right-of-way Acquisitions Dataset, Multnomah County Tax Assessor Records, Clark County Tax Assessor Records (June 2007).

The following sections describe the unique impacts that would occur in the No-Build, the replacement alternative, and the supplemental alternatives.

5.3.1.1.1 No-Build

The No-Build Alternative for Segment A consists of any roadway improvements listed in regional planning efforts, fiscally constrained system. There are several projects applicable for this area, as summarized in Exhibit 5-6 below.

Exhibit 5-6. Roadway No-Build Project List (Segment A)

Project Name (Facility)	Project Location	Project Description
I-5 North Improvements	Lombard St. to Expo Center/Delta Park	Widen to six lanes
I-5/Columbia Blvd. Improvement	I-5/Columbia Blvd. interchange	Construct full direction access interchange based on recommendations from I-5 North Trade Corridor Study
I-5 Trade Corridor Study and Tier 1 DEIS	I-405 (OR) to I-205 (WA)	Plan improvements to I-5 to benefit freight traffic
N Lombard Improvements	Lombard St. from Rivergate Boulevard (Purdy) to south of Columbia Slough bridge	Widen street to three lanes
N Lombard Overcrossing	South Rivergate	Construct overpass from Columbia/Lombard intersection into South Rivergate entrance to separate rail and vehicular traffic. Project includes motor vehicle lanes, bike lanes, and sidewalks.
Leadbetter St. Extension and Grade Separation	to Marine Dr.	Extend street and construct grade separation
Terminal 4 Driveway Consolidation	Lombard St. at Terminal 4	Consolidate two signalized driveways at Terminal 4
SR 14	NW 6th Ave. to SR 500/Union	2 lanes each direction with interchange
Columbia Shores	South of SR 14	Rail trestle, widen portal

Project Name (Facility)	Project Location	Project Description
Esther St.	At railroad tracks	Railroad Undercrossing
Fourth Plain Blvd.	I-5 to railroad bridge	2 lanes each direction
Lincoln St.	Fourth Plain Blvd. to Railroad Ave.	Realign, reconstruct and grade separate
Railroad Ave.	Columbia to new Lincoln Ave. grade separated facility	New waterfront east/west arterial

Some level of business displacements could result from the construction of some of the projects in the No-Build Alternative. Because these individual projects are at different stages of planning or project development, acquisitions have not been fully identified and are not included in this report.

Parking impacts associated with the No-Build Alternative have not been identified. Access along the local street network is expected to improve, whereas access to and from the highway is expected to worsen as congestion worsens over time on the highway and at its various interchanges. Based on the Traffic Technical Report (CRC 2007), congestion (travel speeds less than 30 mph) in the southbound direction is expected to increase from two hours in 2005 to 6.25 hours in the No-Build Alternative or 3.5 hours in the replacement alternatives.

In the northbound direction, congested hours would grow from 4 hours in 2005 to 12.75 hours for the No-Build Alternative versus no congestion for the replacement alternatives. Almost half of the increased congestion would occur during the morning, indicating the development of reverse commute congestion.

Northbound congestion near the I-405/Rose Quarter weaving area would increase from over 2 hours to over 7 hours under No-Build conditions. Half of the increased congestion (3.5 hours) would occur during the morning, identifying reverse commute congestion.

Consistent with the increased congestion, travel times would increase in the No-Build Alternative relative to existing conditions. Existing travel times between I-84 and 179th Street are 38 minutes. In the No-Build Alternative, travel time for the same segment would be 44 minutes compared to 26 minutes for the replacement alternatives (Traffic Analysis Report, 2007).

Increased hours of congestion are expected to result in negative economic impacts due to increased travel times, lower travel time reliability, and reduced ability to access individual businesses in the API and beyond. In areas where congestion is severe, business can be expected to decrease because some customers would be no longer willing to endure congestion to reach a given business and would take their business elsewhere. Freight movement would benefit from improvements made to the Rivergate and Airport Industrial Districts, along Marine Drive, along Columbia Boulevard in Oregon, to the I-5 network north and south of the CRC project area, and to Fourth Plain Boulevard.

5.3.1.1.2 Replacement Crossing Alternative

The replacement option would arc downstream as it crosses the Columbia River and curve back to match the existing alignment at SR 14. The SR 14 interchange would be

configured to afford direct access for all movements between I-5 and SR 14. A traditional configuration would use looped ramps on both sides of the mainline to connect I-5 and SR 14. A less traditional design could reduce the right-of-way by utilizing a left-loop over the I-5 mainline to connect I-5 northbound to SR 14 eastbound.

The replacement alternative would require the relocation of 41 businesses employing between 470 and 565 employees and estimated annual sales of between $72 and $112 million. Relocated businesses include retail, commercial, and government businesses. Business decisions to relocate depend on availability of vacant land of similar size, zoning, and proximity to the local and regional transportation network. ODOT and WSDOT would provide relocation assistance to displaced businesses. More detail is provided in the sections below.

The replacement bridge would require a small amount of additional right-of-way to construct either alignment within Segment A. The City of Portland would experience the largest property tax impact, although the impact would be relatively small and consistent across each alternative. The City of Vancouver would experience a slightly larger impact under the I-5 replacement alternatives than the I-5 supplemental alternatives, but the tax impact in both alternatives would be minimal.

Marine Drive Interchange Area

Land uses in the vicinity of the Marine Drive interchange are primarily industrial and marine related. There are three potential interchange options at Marine Drive: Standard, Southern, and Diagonal. The Standard alignment would acquire five marine-related businesses, with an estimated 20 employees in total and $7 million in annual sales. The Southern alignment would acquire three businesses, with an estimated 85 employees, and $14.8 million in annual sales. The diagonal alignment would not displace any businesses.

Hayden Island Interchange Area

Land uses in the vicinity of the Hayden Island interchange are primarily retail. The replacement alignment would acquire 29 businesses. With the exception of an ODOT permit center, each of the businesses is retail in nature. The replacement alignment would result in an estimated relocation of 430 employees and $56 million in annual sales. The acquisitions include the island's only grocery store, a shopping complex with small, local retail businesses, and multiple restaurants. The options also both acquire a former hotel, now vacant, immediately west of the highway at the north end of Hayden Island. Efforts should be made during the design process to avoid or minimize impacts, and potential exists to do this for the grocery store. In addition, a high-turnover sit-down restaurant in the same vicinity and a gas station between the highway and Jantzen Drive would need to be relocated.

Between SR 14 and Mill Plain Interchange Areas

The replacement alignment would result in the acquisition of seven businesses with an estimated 115 employees and $48 million in annual sales. These acquisitions consist of four small businesses at Third Street and Washington Street, an engineering business on Columbia Street, a firm on Evergreen Boulevard, and a car dealership on C Street.

Some impacts would be experienced by individual businesses within Segment A, including loss of parking, traffic circulation changes, and restricted access. See below.

Specific parking and access changes associated with the upstream replacement alignment are described below:

- The Expo Center is located southwest of the Marine Drive interchange. The interchange access would impact a short-term parking area by removing access and approximately 40 parking spaces.
- An industrial business has a direct access to Marine Drive near the interchange access ramp. Retaining access may be difficult, as the ramp taper appears to extend beyond the driveway location. Access may be relocated to Pier 99 Drive. If access cannot be relocated to Pier 99 Drive, removal of access from Marine Drive may render the business inoperable.
- An equipment services company on Vancouver Way would experience potential parking and circulation impacts as part of new connector road between Marine Drive and Martin Luther King Way. The site is used for semi-trucks and trailer parking. Impacts would be minor and limited to the west end of the site.
- Two businesses east of N Jantzen Drive on Hayden Island would lose some on-street parking. One business, a hotel, would lose approximately 10 parking stalls (out of a total 185 stalls). The other business, a fast-food restaurant, would lose approximately 10 stalls (out of a total of 45 stalls)One high-turnover sit-down restaurant located between the highway and Center Drive would lose visibility because of the proximity of the highway overhead and might lose some parking and experience some circulation impacts , it.

Changes in travel patterns and intersection performance under the replacement alternatives are summarized below based on the Traffic Technical Report (CRC 2007).

Marine Drive Interchange

Under the replacement alternatives, the Marine Drive Interchange area would consist of the following three intersections, one of which would be a new intersection:

- Marine Drive ramp terminal (ODOT)
- Union Court at Vancouver Way (Portland)
- MLK Jr. Boulevard on- and off-ramps at Vancouver Way (Portland)

Under No-Build conditions, the Union Court at Vancouver Way intersection would operate at LOS F during the afternoon peak. In the replacement alternatives, all intersections would operate at an acceptable level-of-service, except for the minor, stopped-controlled movement at Union Court at Vancouver Way, which would operate at LOS F during the afternoon peak and at an acceptable level-of-service during the morning peak. The effects to businesses because of these differences between the No-Build and replacement alternatives are minor.

Under the No-Build Alternative, there would be extensive queuing along Marine Drive and Martin Luther King Jr. Boulevard, and at Union Court and Vancouver Way. In the replacement alternatives, none of the intersections would experience vehicular queuing except for the Union Court at Vancouver Way intersection, which would experience queues that exceed the northbound right-turn lane and the westbound left-turn lane during the morning peak. However, the intersection experiences an acceptable operating LOS C. The improved queuing at Marine Drive would benefit freight traffic.

Hayden Island Interchange Area

Under the replacement alternatives, the Hayden Island interchange area would consist of the following ten intersections, with all ten of these being new intersections:

- North ramp terminals (ODOT)
- South ramp terminals (ODOT)
- Hayden Island Drive at Jantzen Drive (Portland)
- Hayden Island Drive at N Jantzen Drive (Portland)
- Hayden Island Drive at Center Ave (Portland)
- Hayden Island Drive at Jantzen Beach Center (Portland)
- Tomahawk Island Drive at Jantzen Ave (Portland)
- Jantzen Beach Center at Jantzen Dr (Portland)
- Center Ave at Jantzen Ave (Portland)
- Center Ave at New Central Road (Portland)

Under the No-Build Alternative, these intersections would not exist. Thus, the replacement alternatives would provide much better access to Hayden Island. Under the No-Build Alternative, the existing northbound ramp would operate at LOS E during the afternoon peak. Under the replacement alternatives, all new intersections on Hayden Island would perform at acceptable levels-of-service. None of the intersections would experience vehicular queues that exceed available storage lengths or affect the operations at upstream intersections.

Between SR 14/City Center and Mill Plain Boulevard Interchange Areas

Under the replacement alternatives, the following intersections or movements would be added that are not included in the No-Build Alternative:

- SR 14 and Main Street
- Fifth Street and Main Street
- Mill Plain Boulevard at I-5 on/off ramps

The SR 14/City Center interchange area consists of 34 study intersections. Under the replacement alternatives, during the afternoon peak, intersections would generally operate acceptably with improved, similar or slightly degraded conditions compared to

the No-Build Alternative. The Fifth Street at Columbia Street and the Fifth Street at Washington Street intersections would degrade from acceptable operations under the No-Build alternative to unacceptable operations under the replacement alternatives. During the afternoon peak, 17 intersections would operate with acceptable vehicle queuing compared to the No-Build Alternative. However, 15 would experience queues extending past turn-lane storage capacities or to upstream intersections, which would not occur in the No-Build Alternative. This could have a negative affect on area businesses that rely on drive-by traffic if potential customers begin to avoid these intersections.

The Mill Plain Boulevard interchange area consists of 17 intersections, of which three would be new intersections that do not currently exist. During the afternoon peak, 12 intersections would operate acceptably with improved, similar or slightly degraded conditions compared to the No-Build Alternative. Two of the three new intersections would degrade from acceptable or unacceptable operations under the No-Build Alternative to unacceptable operations under the replacement alternatives. Although five intersections would operate with acceptable vehicle queuing compared to the No-Build Alternative, 12 would experience queues extending past turn-lane storage capacities or to upstream intersections, which would not result under the No-Build alternative. Like impacts anticipated in the SR 14 interchange area, area businesses that rely on drive-by traffic could be negatively affected if potential customers begin to avoid the area.

In most areas, the build alternatives are expected to improve conditions for businesses that remain, by reducing congestion, improving safety, and improving access.

Industrial businesses that remain would largely experience positive impacts as a result of the project. The Marine Drive interchange would improve travel patterns for commercial vehicles moving to and from Rivergate by changing from a signalized to a free-flow condition. East of the highway, access would be shifted from Marine Drive to Martin Luther King Jr. (MLK) Boulevard consistent with City of Portland Office of Transportation roadway classifications and freight routing.

Access and circulation impacts would be substantial and positive for businesses near Marine Drive, as the new interchange design is expected to reduce travel time and improve travel time reliability for commercial vehicles. This is true both for businesses in the direct vicinity of the interchange and for businesses in the Rivergate area who would benefit from improvements along Marine Drive and I-5.

Access and circulation impacts would depend on the findings of the Hayden Island Master Plan and IAMP, currently in development (Gillam 2007, Kevlin 2007). The Master Plan will recommend redevelopment efforts and circulation on the island. The IAMP will either recommend changes in driveway access or provide justification for existing accesses. Parking impacts from the replacement bridge alignment is expected to be low to moderate. While several businesses would lose parking, the percentage lost would be small compared to the available supply.

There would be business driveways located within 0.25 mile of the interchange ramp tapers. According to the Oregon Administrative Rules, public and private accesses within 0.25 mile of interchange areas must be controlled according with Division 51 guidelines

(State of Oregon 2007). Accesses not meeting spacing standards must be closed or a deviation justification must be prepared.

The construction of the replacement bridge can be expected to substantially change the pattern of development on Hayden Island. Because residential development on the island is limited by the Portland International Airport noise overlay zone, most future development is likely to be non-residential. Improved access to and from the highway, planned investments in the local transportation network by the City, and single ownership of large contiguous parcels are conditions expected to be attractive to developers. The location at the north edge of Oregon would remain attractive to out-of-state residents looking to make large purchases without paying sales tax. In summary, Hayden Island is expected to see the largest indirect impacts from the project, and the project is expected to spur economic development in the area.

5.3.1.1.3 Supplemental Crossing

The supplemental alternatives would use both existing I-5 bridge structures for northbound Interstate traffic, bicycles, and pedestrians and a new downstream crossing for southbound Interstate traffic and HCT.

The supplemental alternatives would require the relocation of an estimated 480 employees at 34 businesses with estimated annual sales of $68 million. The affected businesses are engaged in retail, commercial, and government activity.

Marine Drive Interchange Area

Supplemental alternative impacts would be the same as under Replacement. There are three potential interchange options at Marine Drive: Standard, Southern, and Diagonal. The Standard alignment would acquire five marine-related businesses, with an estimated 20 employees in total and $7 million in annual sales. The Southern alignment would acquire three businesses, with an estimated 85 employees, and $14.8 million in annual sales. The diagonal alignment would not displace any businesses.

Hayden Island Interchange Area

Business displacements are similar to those of replacement alignments. Differences are described as follows. The supplemental alternative would acquire a sit-down restaurant, a retail mailing supply store, and a tobacco store between Jantzen Street and Center Avenue, and another high-turnover sit-down restaurant between I-5 and Center Avenue. On the east side of I-5, the supplemental alternatives would acquire a gas station and a fast-food restaurant between the highway and Jantzen Drive, and a hotel east of Jantzen Drive.

The supplemental alternatives would avoid acquisition of a restaurant, a dry cleaner, and a shopping complex to the north of Hayden Island Drive that would be acquired in the replacement alternatives.

Between SR 14 and Mill Plain Interchange Areas

Overall, these impacts would be similar to the replacement alternatives in the vicinity of Marine Drive and Hayden Island. Displacements are similar as the replacement alternatives with the exception of two businesses that would be displaced under the replacement alternative, but are not displaced under the supplemental alternative, a car dealership and a consulting firm. Access for businesses in the vicinity of Officers Row and Pearson Field would be similar to the replacement alternatives. In general, the highway alternatives are expected to improve conditions for businesses that remain, by reducing congestion, improving safety, and improving access. However, some negative parking and circulation impacts would be experienced.

The supplemental alternatives would have impacts similar to the replacement alternatives on local streets in Vancouver. All interchanges would have similar configurations with a few minor differences near SR 14's connections to downtown. By retaining the existing bridges, the connection at Main Street with SR 14 eastbound would not be possible. In addition, the alignment of Columbia Way would be slightly different, but would not impact travel patterns in the downtown area.

All inbound connections from SR 14 would still be possible under the supplemental alternatives. As a result, traffic operations during the morning peak would be similar to those of the replacement bridge alternatives. Afternoon peak travel patterns would be expected to change by losing the intersection at SR 14 and Main Street.

With the supplemental alternatives, all traffic that would be heading eastbound on SR 14 would be required to access the highway through the Columbia Street and SR 14 intersection. In addition, traffic going to or from Columbia Way to downtown through the Main Street connection would be required to use Columbia Way. During the afternoon peak, this would shift an additional 600 vehicles southbound and 220 vehicles northbound to Columbia Way. This would double the number of vehicles making a southbound left at the intersection of Columbia Street at SR 14.

The supplemental alternatives would not allow for a connection between Vancouver's downtown and waterfront as planned by the City of Vancouver in the Vancouver City Center Vision and Subarea Plan (2006). Industrial businesses that remain would largely experience positive impacts as a result of the project. The Marine Drive interchange would change the travel patterns for commercial vehicles moving to and from Rivergate from a signalized to a free-flow condition. East of the highway, access would shift from Marine Drive to Martin Luther King Jr. Boulevard consistent with City of Portland Office of Transportation roadway classifications and freight routing.

Although economic development spurred indirectly from the project is expected to follow a similar pattern to the replacement alternatives, development would be tempered by reduced capacity for the supplemental crossing. Improved access (reduced travel times, reduced delay, and improved reliability) to and from the highway is expected to be a driving force for additional economic activity on the island. All of these elements are expected to be reduced for the eight-lane supplemental crossing.

5.3.1.2 Segment B: Mill Plain District to North Vancouver

This section describes positive and negative impacts associated with each of the highway alternatives in Segment B. Exhibit 5-7 provides an estimate of the number of businesses and employees within Segment B that would be acquired by the alignments being studied, as well as the amount of sales that would be lost under each alternative.

Exhibit 5-7. Highway Alignment Business Displacements (Segment B)

Alternative	No. Businesses Impacted	No. Employees Impacted	Affected Annual Sales (Millions)
Replacement	0	0	$0
Supplemental	0	0	$0

Source: CRC Acquisitions Technical Report and InfoUSA, 2007.

The following sections describe the unique impacts that would occur in the No-Build and each full build alternative.

Exhibit 5-8 presents estimated property tax impacts for the City of Vancouver. The project would acquire additional right-of-way needed to construct any of the highway alignments within Segment B from taxable property within the city. As shown, the property tax impacts are expected to be small.

Exhibit 5-8. Estimated Property Tax Impacts from Roadway Acquisitions (Segment B)

	City of Vancouver		
Alternative	Estimated Assessed Value of ROW (M$)	Property Tax Impact	% of Budgeted 2006 Property Tax Revenues
Replacement	$0.1	<$1,000	<0.01%
Supplemental	$0.3	<$1,000	<0.01%

Source: CRC Right-of-Way Acquisitions Dataset, Clark County Tax Assessor Records (June 2007)

5.3.1.2.1 No-Build

Under the No-Build Alternative, only those roadway improvements in Metro's and Southwest Washington Regional Transportation Council's (RTC) regional transportation plans would be constructed. No businesses within Segment B would be displaced by right-of-way acquisition and there would be no resulting decrease in jobs or revenues from property or sales tax. There would be no new employment or added sales associated with project construction. Economic development planned for this area might occur more slowly as business owners may be more reluctant to locate in an area with poor access and mobility for employees and customers, and customers may elect to shop in other areas with easier access and mobility.

The No-Build project list includes many projects from the RTC that improve access between I-5 and regional centers in the North Vancouver area, and along local collectors and arterials. These projects are assumed to increase demand on the highway system and increase the number of hours spent in congested conditions within Segment B. Times for commercial trucks traveling along I-5 are expected to improve under the No-Build north of Vancouver and south of Expo Center. However, these benefits would be tempered by worsened conditions within the API.

5.3.1.2.2 I-5 Replacement Bridge

Property acquisitions for the I-5 replacement alternative would not result in any business displacements in Segment B.

The replacement alternative would require a small amount of additional right-of-way to construct the alignment within Segment B. The assessed value of the additional right-of-way required would be less than $100,000. The amount of lost tax revenue in each alternative would be small.

5.3.1.2.3 I-5 Supplemental Bridge

The supplemental alternatives would not relocate any businesses or employees, nor would it impact annual sales. The one relocation would include a government building. Opportunities to relocate within the same vicinity or to another location within the city are high. In addition, these alternatives are not anticipated to have any substantial adverse access, parking, or circulation impacts.

The I-5 supplemental bridge would require additional right-of-way within Segment B. The assessed value of the additional right-of-way required is approximately $300,000. The taxable property within the right-of-way is small. The amount of lost tax revenue with in each alternative would be small.

5.3.2 Transit Alternatives

This section presents the analysis of segment-level options for transit alternatives. They are presented for a series of alignments and options within three segments:

- Segment A1: Delta Park to South Vancouver
  - I-5 adjacent
  - I-5 offset
- Segment A2: South Vancouver to Mill Plain District
  - Two-way Washington Street
  - Washington-Broadway
- Segment B: Mill Plain District to North Vancouver, Vancouver alignment
  - Two-way Broadway
  - Broadway-Main couplet
- Segment B: Mill Plain District to North Vancouver, I-5 alignment

- 16th Street
- McLoughlin Boulevard

All alignments and options would accommodate Efficient or Increased transit operations.

The HCT alignment begins at the Expo Center, where it integrates with the existing TriMet MAX Yellow Line terminus. Extending north from Expo Center, the new alignment would operate on an elevated structure between the Expo Center and the south end of downtown Vancouver. Through downtown Vancouver it would then operate along an exclusive guideway at the same grade as existing roads and businesses. Specific HCT cross sections, including allowed vehicle circulation and parking, depend on the specific alignment option. HCT alternatives are described in more detail in Section 1.

Each alignment analyzed uses either LRT or BRT, and Efficient or Increased transit operations. This analysis assumes that LRT alternatives would have a headway of 7.5 minutes during peak periods. The analysis also assumes that BRT has three lines with 10-minute headways and staggered schedules. For riders south of Mill Plain Boulevard, this equates to approximately 3-minute headways during the peak period. With either transit mode choice, the supplemental alternatives would have Increased transit operations and a shorter headway than the Efficient operations associated with the replacement alternatives. The headways for each service would be cut in half, for approximately 4-minute headways for LRT and 1.5-minute headways for BRT south of Mill Plain Boulevard. It is anticipated that LRT would have signal priority, whereas BRT would not.

5.3.2.1 Segment A1: Delta Park to South Vancouver

This section analyzes the potential impacts on local businesses within Segment A1 from operation of the adjacent and offset transit alignment options.

HCT would start at the south end of the project area at the existing Expo Center light rail station, rise northward over North Portland Harbor to an elevated station on Hayden Island and then travel over the Columbia River into downtown Vancouver.

Two general alignment options on Hayden Island have been analyzed. The adjacent HCT guideway would locate HCT immediately next to the west side of I-5. The offset HCT guideway would separate the HCT approximately 450 to 650 feet west of I-5. The Hayden Island station could be located on the north side of the island near N Hayden Island Drive, in the center, or on the south side at N Jantzen Avenue. The station would be an elevated structure between 25 and 38 feet above grade.

HCT would continue on an exclusive guideway across the Columbia River on a separate bridge immediately west of the Interstate bridges and touch down in Vancouver between Sixth and Seventh Streets on Washington Street.

Exhibit 5-9 provides an overview of total transit ridership from the no build and build alternatives, at the point of the Columbia River crossing.

Exhibit 5-9. Total Transit Ridership (at Columbia River Crossing)

Alternative	Total Transit Ridership (Bus + HCT, riders/day)
Alternative 1: No Build	11,200
Alternative 2: Replacement Bridge with BRT	18,800
Alternative 3: Replacement Bridge with LRT	22,700
Alternative 4: Supplemental Bridge with BRT	21,900
Alternative 5: Supplemental Bridge with LRT	25,200

Exhibit 5-10 summarizes impacts from property acquisitions that would result from each of the potential alignments. Impacts in this segment are focused on Hayden Island. Few business displacements were uniquely associated with the transit alignments in Segment A1; most were already affected by the highway alignments.

Exhibit 5-10. Segment A1: Business Displacements

Option	No. Businesses Impacted	No. Employees Impacted	Affected Annual Sales (Millions)
I-5 Adjacent			
Replacement	17	215	$15
Supplemental	7	165	$17
I-5 Offset			
Replacement	5	25	$3
Supplemental	5	50	$7

NOTE: Impacts are the Same for BRT and LRT options.

Source: CRC Acquisitions Technical Report and InfoUSA, 2007.

The unique business displacements associated with transit in Segment A1 differ slightly depending on the specific alignment. The replacement offset and supplemental offset transit alignments would uniquely impact a strip mall type development with two restaurants and two retail shops. These four businesses employ approximately 50 people and have annual sales of approximately $6.4 million. The supplemental adjacent alignment would displace one business unique to transit; a restaurant in the parking lot of the Jantzen Beach Mall with approximately 125 employees and annual sales of approximately $5 million.

Exhibit 5-11 presents the estimated property tax impact associated with the transit alignment options in Segment A1 for the cities of Portland and Vancouver. The project would acquire additional right-of-way needed to construct any of the alignments from taxable property within each city. This taxable property would be removed from each City's tax base, with the potential for decreasing property tax revenues.

Exhibit 5-11. Segment A1: Estimated Property Tax Impacts from Acquisitions

Option	Estimated Assessed Value of Right-of-Way (Millions)	Property Tax Impact (Thousands)	% of Budgeted 2006 Property Tax Revenues
Replacement Adjacent			
Portland	$15	$15	0.01%
Vancouver	<$1	$0	<0.01%
Replacement Offset			
Portland	$15	$140	0.09%
Vancouver	<$1	$0	<0.01%
Supplemental Adjacent BRT			
Portland	$29	$65	0.04%
Vancouver	<$1	$0	<0.01%
Supplemental Adjacent LRT			
Portland	$29	$65	0.04%
Vancouver	<$1	$0	<0.01%
Supplemental Offset BRT			
Portland	<$1	$130	0.08%
Vancouver	<$1	$0	<0.01%
Supplemental Offset LRT			
Portland	$29	$135	0.08%
Vancouver	<$1	$0	<0.01%

NOTE: Impacts are the Same for BRT and LRT options

Source: CRC Right-of-Way Acquisitions Dataset, Multnomah County Tax Assessor Records, Clark County Tax Assessor Records (June 2007)

Metro's 2040 Growth Plan identifies West Hayden Island for future industrial use. This plan and the City of Portland TSP both reference development of a potential container port terminal by the Port of Portland west of I-5. For these development plans to be realized, good access between this facility and the highway is necessary. The transit alignment and station on Hayden Island would be elevated, creating minimal to no disruptions to circulation. However, if TOD potential were realized access and congestion could remain critical issues. The City of Portland has imposed a moratorium on any development on Hayden Island that would increase automobile trips to and from the highway. An IAMP currently underway will assess mobility, access, and circulation issues related to existing and planned transportation facilities and land development.

5.3.2.1.1 No-Build

Under the No-Build Alternative, only those transit services and facilities that can be reasonably anticipated for funding and construction by the transit service providers and in Metro's and Southwest Washington RTC regional transportation plans would be constructed. The fiscally-constrained regional transportation plans do not include any specific transit projects at the Expo Center or on Hayden Island. The Delta Park/Vanport Transit Center and Park and Ride would continue to be served by the C-TRAN routes 4, 4x, 114, and 173. The Expo Center Station would continue to be the terminus for TriMet

Yellow Line MAX service. TriMet route #6 and C-TRAN route #4 would continue to serve Hayden Island.

No businesses would be acquired by right-of-way acquisition and there would be no resulting decrease in property or sales tax revenues or jobs lost in Segment A1 under the No-Build Transit Alternative.

The No-Build Alternative would not result in any changes in access or parking from existing conditions in the vicinity of the Delta Park/Vanport transit center, Expo Center, or the Jantzen Beach Shopping Center areas. Some changes in access and parking may result from the recommendations from the City of Portland's Hayden Island Master Plan (ongoing), but specific recommendations are unknown at this time.

Transit ridership under the No-Build Alternative is approximately 11,000 passengers/day across the Columbia River. C-TRAN Route #4 and TriMet Route #6 share travel lanes with general-purpose traffic on I-5, and are expected to experience the same delays associated with the No-Build Alternative. This could result in lower ridership for customers to the Jantzen Beach Shopping Center or other businesses on Hayden Island, though this impact is not expected to be high as the majority of customers to these businesses arrive by automobile.

5.3.2.1.2 Adjacent Alignment (LRT or BRT)

Under the I-5 adjacent alignment, the HCT guideway across Hayden Island would locate HCT immediately next to the west side of I-5. The Hayden Island station could be located on the north side of the island near N Hayden Island Drive, in the center, or on the south side at N Jantzen Avenue. The station would be an elevated structure between 25 and 38 feet above grade. Impacts from property acquisitions that would result from the I-5 adjacent alignment are shown in Exhibit 5-12, and are described in the paragraphs that follow.

The replacement adjacent alignment would impact more employees and annual sales. The supplemental adjacent alignment, though impacting fewer businesses, would affect roughly the same amount in annual sales as the replacement adjacent alignment, but more employees.

According to the CRC Transit Technical Report (CRC 2007) and as seen in Exhibit 5-12, daily and annual transit trips would increase substantially all the build alternatives, when compared to the No-Build Alternative. The replacement LRT alternative (adjacent or offset) would have double the ridership over the Columbia River (22,700 riders/day) than the No-Build, and 24 percent more passengers trips than the BRT replacement bridge alternative. With the supplemental LRT alternative, ridership would grow to 25,200 riders/day, with a smaller (15 percent) net difference between LRT and BRT ridership.

The I-5 adjacent alignment would require a small amount of additional right-of-way to construct. As shown in Exhibit 5-14, the City of Portland would experience the largest impact to property tax revenues, although they would be relatively small and consistent across each alternative. The City of Vancouver would experience small and consistent property tax impacts across each alternative.

Across Hayden Island and the Columbia River, the BRT guideway would be two feet wider than the LRT guideway to allow for a median buffer to pass vehicles in the event one breaks down. The BRT station areas would be 20-feet wider than the LRT stations to allow for a bypass lane because BRT would have several buses arriving and departing the platforms in a short period of time.

Replacement Adjacent Alignment

The replacement adjacent alignment would require acquisition of an estimated 17 businesses, impacting 215 employees and $15 million in annual sales. Acquisition impacts are shown in Exhibit 5-13. Acquisitions would include a shopping complex located between the highway and N Center Avenue containing several fast food and sit-down restaurants, a liquor store, an ODOT permit station, and two retail businesses between N Center Avenue and N Jantzen Avenue. A maintenance business in Vancouver would also be impacted.

Supplemental Adjacent Alignment

The adjacent supplemental transit alignment would require acquisition of an estimated seven existing businesses, impacting 165 employees and $15 million in annual retail sales. Impacts would be similar to the replacement adjacent alignment, with the exception that the shopping complex located between the highway and N Center Avenue would not be impacted. A sit-down restaurant located on the Jantzen Beach Mall property would be acquired under this alignment.

Transit would be between 25 and 38 feet above grade on Hayden Island. Construction would be in conjunction with highway improvements, and no specific changes in access would result from the transit improvements. Elevation would be high enough to allow parking beneath the structure, except in the location of the structure supports. The transit alignment would have to acquire businesses beneath it on Hayden Island. It would not impact parking at the Expo Center or within Segment A1 in Vancouver.

5.3.2.1.3 I-5 Offset Alignment (LRT or BRT)

The offset HCT alignment would be located to the west of the adjacent alignment, approximately 450 to 650 feet west of I-5. As with the adjacent alignment, the Hayden Island station could be located on the north side of the island near N Hayden Island Drive, in the center, or on the south side at N Jantzen Avenue. The station would be an elevated structure between 25 and 38 feet above grade.

The replacement and supplemental offset alignments impact the same number of existing businesses, though the supplemental offset impacts more employees and potential annual sales. Property tax impacts are shown in Exhibit 5-14 and discussed above.

Replacement Offset

The replacement offset alignment would require acquisition of an estimate of one business currently in operation, impacting one employee and approximately $200,000 in annual sales. Although the offset alignment requires the acquisition of a former hotel

west of the highway, this is not currently an operating business. In addition, it would require acquisition of an estimated four existing businesses located in a shopping complex north of Hayden Island Drive. This alignment would impact approximately 25 employees and approximately $3 million in annual sales.

Supplemental Offset

Business displacements associated with the supplemental offset alignment would be identical to the replacement offset alignment described above.

Transit would be between 25 and 38 feet above grade on Hayden Island. Construction would be done in conjunction with highway improvements, and no specific changes in access would result from the transit improvements within Segment A1. The guideway would be high enough to allow parking beneath the structure, except in the vicinity of the structure supports.

For the offset alignment, most of the parking impacts would be to the shopping center, which would lose between 50 and 75 parking stalls during construction. The remainder of businesses under the transit offset alignment on Hayden Island would be acquired by the project. The alignment would not impact parking at the Expo Center. In Vancouver, approximately 25 parking stalls would be removed at the Red Lion Inn, and similar parking losses may result from structural supports at a bank and financial planning business located west of the SR 14 interchange, near the transit touchdown location.

The offset transit alignment would not affect transit ridership or circulation.

5.3.2.2 Segment A2: South Vancouver to Mill Plain District

This section analyzes the potential economic impacts in Segment A2 from operation of the HCT alignments. There are two alignment options for HCT in downtown Vancouver – a two-way guideway on Washington Street or a couplet on Washington Street and Broadway. Both options would have stations at Seventh Street, 12th Street and at the Mill Plain transit center between 15th and 16th Streets.

Two-way HCT on Washington Street would place the transit vehicles in the median of the road. On station blocks, a single platform would be located in the center of the guideway. This option would allow for two-way traffic. The Washington Street/Broadway couplet alignment would operate in the northbound direction of travel along the east side of Broadway and in the southbound direction of travel along the west side of Washington Street. This option would change the direction of automobile travel to be one-way northbound on Broadway and one-way southbound on Washington.

Near Mill Plain, transit vehicles would transition from the core of downtown to their uptown Vancouver or highway alignments. There are four options north of 15th Street – a two-way Broadway alignment, a Broadway/Main couplet, an I-5/16th Street alignment, and an I-5/McLoughlin alignment. While majority of the discussion of the northern alignments is in Segment B, there would be different business access and parking impacts in the Mill Plain depending on which northern alignment is selected. The Access and

Parking sections below separate impacts downtown between Fifth and 15th Streets from the Mill Plain impacts.

The quantifiable impacts of Segment A2 are shown in Exhibits 5-12 through 5-15. Exhibit 5-12 shows the impact from business displacements and Exhibit 5-13 shows property tax impacts. Parking and access impacts are shown in Exhibit 5-14 and 15.

Discussion of impacts for the No-Build, the two-way Washington Street alignment, and Washington-Broadway couplet alignment follows.

Exhibit 5-12. Segment A2: Business Displacements

Option	No. Businesses Impacted	No. Employees Impacted	Affected Annual Sales (Millions)
Two-Way Washington Street			
Two-Way Broadway	1	5	<$1
Broadway/Main Couplet	0	0	$0
16th St.	0	0	$0
McLoughlin Blvd.	1	5	<$1
Washington-Broadway Couplet			
Two-Way Broadway LRT[a]	1	30	<$1
Broadway/Main Couplet	0	0	$0
16th St.	0	0	$0

Source: CRC Inventory of Existing Parking in Downtown Vancouver.

Exhibit 5-13. Segment A2: Estimated Property Tax Impacts from Acquisitions

Option	Estimated Assessed Value of Right-of-Way (Thousands)	Property Tax Impact (Thousands)	% of Budgeted 2006 Property Tax Revenues
Two-Way Washington			
Two-Way Broadway with Replacement Bridge	$427	$1	<0.01%
Broadway-Main with Replacement Bridge	$325	$0.8	<0.01%
Two-Way Broadway with Supplemental Bridge	$66	$0.2	<0.01%
Washington-Broadway Couplet	$370	$0.9	<0.01%
Two-Way Broadway with Supplemental Bridge	$66	$0.2	<0.01%

Source: CRC Right-of-Way Acquisitions Dataset, Clark County Tax Assessor Records (June 2007)

Parking and Access

Downtown Vancouver is planned to become, and is becoming, a vibrant, high density mixed use center. To achieve such a goal requires robust planning, investment in infrastructure, incentives, and public-private partnerships. It is possible to undermine

such goals by having significant impacts to parking and property access. The estimates in Exhibit 5-13 and 5-14, below, allow for some comparative assessment of the alternatives. Balanced against this is the additional access provided by proximity to HCT.

The two-way Washington Street option would remove all on-street parking and five loading zones along Washington Street between Fifth Street and Mill Plain Boulevard. The existing access points would remain, but drivers would be prohibited from making left turns across the high-capacity transit guideway, except at signalized intersections. This option would not require the removal of disabled parking. The removal of all on-street parking along Washington Street would impact the ease of auto accessibility to these properties. Potential mitigation may be required to improve auto access for the disabled. When combined with the impacts on 16th and/or McLoughlin, the impacts are considerably higher as shown in the table below.

The Washington-Broadway couplet option would remove 70 on-street parking spaces and one loading zone along Washington and Broadway Streets between Sixth Street and Mill Plain Boulevard. This option would also remove 20 access points along these streets. When combined with the impacts on 16th and/or McLoughlin, the impacts are considerably higher as shown in the table below.

Exhibit 5-14. Segment A2, Parking and Access Impacts

	2-way Washington to 2-way 16th	2-way Washington to 2-way McLoughlin	Washington-Broadway to 2-way 16th	Washington-Broadway to 2-way McLoughlin
Parking				
Total	205	237	310	342
Parking Lost	151	197	123	169
Percent	74%	83%	40%	49%
Access Points				
Total	46	51	61	66
Points Lost	11	0	31	20
Percent	24%	0%	51%	30%
Loading Zones				
Total	5	5	2	2
Loading Zones Lost	0	0	1	1

The parking and access related impacts for the downtown alignments alone (not matched with east-west HCT corridors) are shown in Exhibit 5-15, below. These include the additional impacts associated with the Mil Plain terminal park and ride.

Exhibit 5-15. Mill Plain MOS Parking and Access Impacts

	Washington-Broadway Couplet	2-way Washington
Parking		
Total	**281**	**150**
Parking Lost	**109**	**119**
Percent	**39%**	**79%**
Access Points		
Total	**44**	**27**
Points Lost	**26**	**4**
Percent	**59%**	**15%**
Loading Zones		
Total	**4**	**5**
Zones Lost	**1**	**0**

5.3.2.2.1 No-Build

Under the No-Build Alternative, only those transit services and facilities that can be reasonably anticipated for funding and construction by the transit service providers and in Metro's and Southwest Washington RTC regional transportation plans would be constructed. The No-Build Alternative includes four projects from fiscally-constrained regional plans that are relevant for the transit discussion in this section.

1. Convert Main Street from one-way northbound to two-way between Sixth Street and Mill Plain Boulevard.
2. Construct a railroad undercrossing to connect Esther Street to the waterfront.
3. Reconstruct Broadway from one-way southbound to two-way between Sixth Street and 15th Street.
4. Relocate the Vancouver transit center from its current location along Main Street to the C-TRAN Administration Operations and Maintenance (AOM) base.

No businesses would be acquired by right-of-way under the No-Build Alternative. There would be no resulting decrease in property or sales tax revenues or jobs lost. The No-Build Alternative would not change access or parking. The three roadway projects included in the No-Build Alternative would improve connectivity in downtown Vancouver, and increase visibility for businesses along Main Street and Broadway. Relocation of the transit mall from downtown Vancouver could decrease the number of pedestrians downtown. Economic development planned for this area would tend to be more auto-oriented and would be less likely to concentrate around proposed station areas.

Transit ridership is expected to increase under the No-Build Alternative, due to related C-TRAN projects. However, ridership grows at a substantially slower rate than under any of the build alternatives

5.3.2.2.2 Two-Way Washington Street Alignment (LRT and BRT)

There would be no business displacements between Sixth Street and 15th Street in the core of downtown Vancouver. At the north end of Segment A2, this alignment could connect with any of four options. Two of these options (two-way Washington/ McLoughlin Boulevard and two-way Washington/two-way Broadway) would acquire an auto parts store.

The two-way Washington alignments would impact both on-street and off-street parking, as illustrated in Exhibits 5-14 and 5-15. Under both the LRT and BRT options, parking along Washington Street would not be allowed on either side of the street. This would result in a loss of all of the 106 on-street parking spaces along Washington Street between Sixth and 15th Streets. Although parking would be available on side streets and parallel streets, this has the potential to negatively affect sales for businesses along Washington Street. Further analysis of this potential impact would require a parking utilization study to assess current utilization and the availability of off-street and side-street parking areas. This impact would be mitigated to some extent by providing improved transit service, as some drivers could be reasonably expected to switch modes from driving to transit.

The proposed BRT alternative would operate every three minutes through Segment A2. This is twice as often as LRT, which would operate every 7.5 minutes. BRT would not operate with signal pre-emption due to concerns over potential disruptions to cross-movement auto traffic from the frequent service. The shorter headways of BRT could affect visibility of adjacent businesses for drivers, while increasing the visibility of these adjacent businesses for transit riders. Visibility impacts are expected to be negligible.

North of 15th Street, impacts would be concentrated in the Mill Plain area (Exhibit 5-18). Under all options, one block between 15th Street and 16th Street and Washington and Main would be acquired where the future Mill Plain transit station bisects the block. Currently this area is used as a paid surface parking lot with capacity for about 150 (unstriped) parking stalls. According to the City of Vancouver, this usage is not allowed and will be ending soon. Because this is use is not allowed, loss of this parking area due to the Project is not considered an impact. The two-way Broadway and the Broadway/Main connections would impact the parking lot of a bank near Broadway and McLoughlin Boulevard. These options are expected to remove approximately 10 parking spaces.

Washington Street is currently one-way southbound. Under the two-way Washington alignment, the street would be converted to two-directional travel. Because LRT and BRT would operate in the median of the roadway, left turns would not be allowed from Washington in either direction, for station blocks and for non-station blocks. This means that vehicles trying to access businesses on the left side of the street would need to turn off of Washington and go around the block to access the business. Businesses along

Washington Street include restaurants, cafes, banks, office buildings, and surface parking areas. These businesses do not rely highly on drive-by traffic. Any access impacts associated with no left turns would tend to be offset somewhat by increased visibility from the change to two-way travel.

In the Mill Plain area, the two-way Broadway and Broadway/Main connections would impact two driveway access points for a bank near Broadway and 16th Street. The Broadway/Main option would also impact driveway access for an auto parts store. As shown in Exhibit 5-15, the two-way Washington Street alignment would require a small amount of additional right-of-way in Segment A2. The amount of lost tax revenue in this alternative would be small.

Within Segment A2 the transit options would have different effects depending on if BRT or LRT is the HCT mode. With the two-way on Washington Street option BRT would have to operate in contra-flow so that all transit vehicles in the guideway could access the center platforms, while LRT would have normal circulation. In addition, LRT travel speeds would be somewhat faster (because of differences in dwell times, driver variability, and vehicle acceleration rates).

BRT and LRT would increase the average HCT vehicle speed and the average transit vehicle speed in downtown Vancouver. However, average BRT travel speeds within the guideway would be slower than LRT because BRT vehicles would not have signal priority, there would be more variation in operator performance, dwell times would be slightly longer, and acceleration would be slower. Signal priority would not be possible for BRT because high service frequencies would significantly disrupt cross traffic flow. In addition, LRT could carry more passengers across the river with fewer vehicles.

5.3.2.2.3 Washington/Broadway Couplet Alignment (LRT and BRT)

Under the Washington/Broadway couplet alignment, there would be no business displacements between Sixth Street and 15th Street in the core of downtown Vancouver.

At the north end of Segment A2, this alignment could connect with any one of four options. Two of these options (Washington/Broadway/Two-Way Broadway and Washington/Broadway/McLoughlin Boulevard alignments) would require acquisition of a bank. This acquisition would occur for LRT only – BRT would not require it (Exhibit 5-15).

The Washington/Broadway couplet alignment would impact both on-street and off-street parking, as illustrated in Exhibits 5-14 and 5-15. On-street parking impacts would be identical for the LRT and BRT alignments. Parking on both sides of Washington Street and Broadway would be removed. Depending on the alignment, the Washington Broadway couplet would remove between 151 and 197 parking spaces (from 74 to 83 percent of the total existing). Though parking would be available on side streets and parallel streets, this is expected to result in large impacts for businesses along Washington and Broadway. Further insight about the potential impact would require a parking utilization study to assess current utilization and the availability of off-street and side-street parking areas. Any impact would be mitigated to some extent through

provision of improved transit service, as some drivers could be reasonably expected to switch modes from driving to transit.

The proposed BRT alternative would operate every 3 minutes through Segment A2. This is twice as often as LRT, which would operate every 7.5 minutes. BRT would not operate with signal pre-emption due to concerns over potential disruptions to cross-movement auto traffic from the frequent service. The shorter headways of BRT could affect visibility of adjacent businesses for drivers, while increasing the visibility of these adjacent businesses for transit riders. Visibility impacts are expected to be negligible.

Under all options, one block between 15th and 16th Streets and Washington and Main would be acquired where the future Mill Plain transit station bisects the block. Currently this area is used as a paid surface parking lot with capacity for about 150 (unstriped) parking stalls. According to the City of Vancouver, this usage is not allowed and will be ended soon. Loss of this parking area due to the Project is therefore, not considered an impact to employees or businesses in the vicinity of the new station.

The two-way Broadway and the McLoughlin Boulevard connections would also require the acquisition of an area bank, as described above. The LRT design of the Broadway/Main connection would impact the parking lot of this bank, removing approximately 30 parking stalls, and would eliminate a small number of parking stalls (approximately five) of an auto parts store.

Washington Street currently operates as a one-way street in the southbound direction between Fifth and 15th Streets. Broadway is two-way north of Sixth Street. Under the Washington/Broadway couplet alignment, Broadway would be converted to one-way northbound, and HCT would operate in the same direction as vehicle travel. Washington Street would continue to operate as a one-way southbound. LRT would operate along the east side of Washington Street and along the west side of Broadway. BRT only has doors on the right side of the vehicle, while LRT has doors on both. The BRT guideway therefore must hug the right side of the street, operating on the west side of Washington and the east side of Broadway. Left turns would continue to be allowed at intersections, under both BRT and LRT. Circulation impacts would be low with the HCT on Washington Street and Broadway. Broadway may see a decrease in drive-by business because of the conversion from two-way to one-way travel. Washington Street would retain one-way directional travel, no differences in business visibility were identified.

The Washington-Broadway couplet would impact more overall access points (26) than the two-way Washington (4). However, when combined with a 16th Street alignment, the 2-way Washington alignment will eliminate 11 access points. In the Mill Plain area, the Broadway/Main connection would impact two driveway accesses for a bank in the vicinity of Broadway and 16th Street, and one driveway access for an auto parts store in the vicinity of Broadway and McLoughlin Boulevard.

5.3.2.3 Segment B: Mill Plain District to North Vancouver, Vancouver alignments

This section analyzes the potential impacts to local businesses within Segment B from operation of the Vancouver alignments. Throughout much of Segment B, the transit

alignment would run along an exclusive guideway at the same grade as existing roads and businesses. Left turn access to and from businesses across the tracks would be allowed at non-station blocks. However, left-turn access would not be allowed on station blocks, or while a transit vehicle was in the area. Although temporary delays in waiting for a transit vehicle to clear the block before making a left turn are not expected to impact business in Segment B, the no left-turn access at station blocks could impact those businesses that rely on good roadway access to attract customers. Within the vicinity of station areas, this impact may be tempered by expected increased pedestrian activity at station areas.

The quantifiable impacts of the Vancouver alignments of Segment B are shown in Exhibits 5-16 through 5-18. Exhibit 5-16 shows the impact from business displacements and Exhibit 5-17 shows property tax impacts. Parking impacts are shown in Exhibit 5-18.

Exhibit 5-16. Segment B, Vancouver alignments: Business Displacements

Option	No. Businesses Impacted	No. Employees Impacted	Affected Sales (Millions)
Two-Way Broadway			
With Two-Way Washington	24	125	$15
With Washington/Broadway Couplet	18	55	$8
Broadway/Main Couplet	17	50	$7

Source: CRC Right-of-Way Acquisitions Dataset, InfoUSA (July 2007)

Exhibit 5-17. Segment B, Vancouver alignments: Estimated Property Tax Impacts from Acquisitions

	City of Vancouver		
Option	Estimated Assessed Value of ROW (M$)	Property Tax Impact (Thousands)	% of Budgeted 2006 Property Tax Revenues
Two-Way Broadway			
Replacement Bridge	$2	$5	0.01%
Supplemental Bridge	$3	$5	0.01%
Broadway/Main Couplet	$2	$7	0.02%

Source: CRC Right-of-Way Acquisitions Dataset, Clark County Tax Assessor Records (June 2007)

Parking and Access

As shown in Exhibit 5-18, the two-way Broadway option would remove 83 (about 51 percent) on-street parking spaces along Broadway between Mill Plain Boulevard and 29th Street; none of these are disabled parking spaces or loading zones. North of 29th Street there is no on-street parking, so all impacts would be to access. This option, from Mill Plain Boulevard to 40th Street, would remove 13 (22 percent) access points.

The Broadway-Main alignment has the greatest impact to parking spaces. The Broadway-Main Street couplet option would remove 206 (about 80 percent) on-street parking spaces along Broadway Street between Mill Plain Boulevard and 29th Street, but no loading

zones. This option, from Mill Plain Boulevard to 40th Street, would remove 38 (46 percent) access points along these streets.

In north Vancouver, the City of Vancouver has found on-street parking to be underutilized. A recent study conducted in the north Vancouver area (bound by 15th Street, 28th Street, Columbia Street and D Street) found that on-street parking had a 44.5 percent utilization in the weekday peak hour at 11 a.m. This parking space utilization was even lower in the weekend peak hour at 1 p.m. with 28.7 percent of spaces occupied.

All options assume the construction of an angled high-capacity transit station north of 15th Street (bound by 15th Street, 16th Street, Washington Street and Main Street). Currently, this block is undeveloped and used by area employees for long-term off-street parking. This alignment would remove the existing off-street parking without providing alternate facilities at this location.

Exhibit 5-18. Segment B, Parking and Access Impacts

	I-5 Alignment		
	McLoughlin Blvd Alignment Option		
	with Two-way Washington	with Washington-Broadway Couplet	16th Street Alignment Option
Parking Spaces Removed	82	82	43
	Vancouver Alignment		
	Two-Way Broadway Alignment Option		
	With Two-Way Washington	With Washington-Broadway Couplet	Broadway-Main Couplet Alignment Option
Parking Spaces Removed	83	83	206

5.3.2.3.1 No-Build

Under the No-Build Alternative, only those transit services and facilities that can be reasonably anticipated for funding and construction by the transit service providers and in Metro's and Southwest Washington RTC regional transportation plans would be constructed. No businesses would be displaced by right-of-way acquisition and there would be no resulting decrease in property or sales tax revenues or jobs lost. Economic development planned for this area would tend to be more auto-oriented and would be less likely to concentrate around proposed station areas. Currently, no transit improvements under the No-Build Alternative are planned within Segment B.

5.3.2.3.2 Two-Way Broadway (LRT or BRT)

In Segment B, impacts related to the two-way Broadway alignments with any combination of LRT or BRT and Efficient or Increased transit operations are similar. These impacts are described in detail below.

Currently, between 16th Avenue and Fourth Plain Boulevard Broadway is a two-way street. During operation of the Broadway two-way alignment this section of Broadway would become a northbound one-way street. As a result, drive-by traffic along Broadway would be eliminated in one direction, potentially resulting in impacts from reduced visibility and access for businesses that rely on drive-by sales. The majority of businesses along this section of Broadway are professional and service-oriented businesses that do not rely on drive-by sales; therefore, this impact is expected to be small. Total traffic volumes and speeds are likely to remain similar, thus lessening any potential impact. North of Fourth Plain Boulevard, Broadway and Main Street would continue to be two-way roads with little or no potential access, circulation, or parking impacts anticipated.

Because of differences in the operating environments the I-5 alignment would have an average travel speed 3.5 mph faster than the Vancouver alignment. However, because the Vancouver alignments would be shorter, the average travel times of the two alignments would be similar. The person throughput across the river in the I-5 corridor would be essentially the same - 20,800 daily passenger trips with the Vancouver alignments and 21,100 riders with the I-5 alignment (a difference of less than two percent, which is well within the modeling margin of error).

In addition to the minor differences in transit performance discussed above, Segment B transit alignment options would have design differences, such as the number of park and ride spaces provided. The Vancouver alignments would have 1,800 park and ride spaces on the guideway at the Lincoln Park and Ride and 610 spaces in two satellite lots (460 spaces at the proposed Clark College Park and Ride and 150 spaces at the Kiggins Bowl Park and Ride). The I-5 alignment would have 2,500 park and ride spaces on the guideway, with 1,100 spaces at the proposed Clark College Park and Ride and 1,400 spaces at the Kiggins Bowl Park and Ride. The I-5 alignment would also require shifting the crown of the highway 20-feet west to accommodate the transit guideway within the existing highway right-of-way to the greatest extent possible. The I-5 alignment would require building an extensive retaining wall alongside I-5 and an aerial structure over SR 500 and I-5 to access the Kiggins Bowl Park and Ride. In contrast, the guideway with the Vancouver alignments would be more integrated into the streetscape and would not include elevated structures.

As shown in Exhibit 5-19, the two-way Washington option of the Vancouver alignment would require the relocation of an estimated 125 employees at 24 businesses with an estimated $15 million in annual sales. The Washington-Broadway couplet option would have a slightly smaller negative impact with the loss of 55 employees at 18 businesses with an estimated $8 million in annual sales. Relocated businesses would include office, retail, service, and commercial businesses.

As shown in Exhibit 5-20, property tax impacts would be relatively minor in this alignment. As shown in Exhibit 5-22, the number of existing on-street parking stalls under these two alternatives is estimated at 96 stalls each. Each alternative would remove approximately 56 percent of those stalls with 42 remaining. Of the total removed stalls under each alternative, 22 are stalls located along station blocks and 32 are located along non-station blocks. These on-street spaces are often used as customer parking; thus, the loss of on-street parking is likely to have a negative impact to businesses in the area.

The 24th Street station would be located along Broadway between 24th and 25th Streets. Currently, Broadway at this station is a two-way street with on-street parking and no driveway access to local businesses. At this station, the Broadway two-way alignment would remove 22 on-street parking stalls, with 11 remaining. These on-street spaces are often used as customer parking; thus, the loss of on-street parking is likely to have a negative impact to some businesses in the area.

The northbound 33rd Street station would be located along Main Street between 33rd and 34th Streets, and the southbound station would be located along Main Street between 33rd and 32nd Streets. Currently, Main Street at this location is a two-way street with driveway access to local businesses and no on-street parking. Under the Broadway two-way alignment, access to a business at the northbound station and a business at the southbound station would be removed. This is not likely to have a substantial negative impact on these businesses because alternate access is available via side streets, and the businesses are office and service businesses that are not likely to be substantially affected by the loss of more direct access (Exhibit 5-18).

As shown in Exhibit 5-18, the two-way Broadway option would remove 83 on-street parking spaces along Broadway between Mill Plain Boulevard and 29th Street; none of these are disabled parking spaces or loading zones. North of 29th Street there is no on-street parking, so all impacts would be to access. This option, from Mill Plain Boulevard to 40th Street, would remove 13 access points.

5.3.2.3.3 Broadway/Main Couplet Alignment (LRT or BRT)

Impacts related to the Broadway/Main couplet alignment with any combination of LRT or BRT would be similar within Segment B. These impacts are described in detail below.

Currently, Broadway between 16th and 29th Avenues is a two-way street. During operation of the Broadway two-way alignment this section of Broadway would become a northbound one-way street. As a result, traffic along Broadway would be eliminated in one direction, resulting in impacts from reduced visibility and access for businesses that rely on drive-by sales. The majority of businesses along this section of Broadway are professional and service oriented businesses that do not rely on drive-by sales; therefore, this impact is expected to be small. This may result in a negative impact. Total traffic volumes and speeds are likely to remain similar, thus lessening any potential impact. North of 29th Avenue, Main Street would remain a two-way road with negligible potential access, circulation, or parking impacts anticipated.

As shown in Exhibit 5-19, the Broadway/Main couplet alignment would require the relocation of an estimated 50 employees at 17 businesses with approximately $7 million in annual sales. Relocated businesses would include office, retail, service, and commercial businesses. As shown in Exhibit 5-20, property tax impacts of this alignment would be relatively small.

The Broadway-Main alignment has the greatest impact to parking spaces. The Broadway-Main Street couplet option would remove 206 (about 80 percent) on-street parking spaces along Broadway Street between Mill Plain Boulevard and 29th Street, but no loading zones. This option, from Mill Plain Boulevard to 40th Street, would remove 38 (46 percent) access points along these streets.

The southbound 24th Street station would be located along Main Street between Fourth Plain and 25th Street. Currently, Main Street at this location is a two-way street with driveway access to local businesses and no on-street parking. Under the Broadway-Main/two-way Washington and the Broadway-Main/Washington-Broadway alignments access to two businesses would be removed. One of these businesses relies somewhat on drive-by customers and, therefore, would be affected negatively by this loss of access. Alternate access is available via Broadway (Exhibit 5-23).

5.3.2.4 Segment B: Mill Plain District to North Vancouver, I-5 Alignments

This section analyzes the potential impacts to local businesses within Segment B from operation of the I-5 alignments. The quantifiable impacts of the I-5 alignments of Segment B are shown in Exhibits 5-19 through 5-20. Exhibit 5-19 shows the impact from business displacements and Exhibit 5-20 shows property tax impacts. Parking impacts on 16th Street and McLoughlin can be seen in Exhibit 5018.

Exhibit 5-19. Segment B, I-5 Alignment: Business Displacements

Option	No. Businesses Impacted	No. Employees Impacted	Affected Annual Sales (Millions)
16th Street	2	10	<$1
McLoughlin Boulevard			
Two-Way Washington	9	45	$3
Washington/Broadway Couplet	8	30	$3

Source: CRC Right-of-Way Acquisitions report and InfoUSA, 2007.

Exhibit 5-20. Segment B, I-5 Alignment: Estimated Property Tax Impacts from Acquisitions

Option	City of Vancouver		
	Estimated Assessed Value of ROW (thousands)	Property Tax Impact (Thousands)	% of Budgeted 2006 Property Tax Revenues
16th Street	$600	$1	<0.01%
McLoughlin Boulevard			
Two-Way Washington with Replacement Bridge	$965	$2	0.01%
Washington/Broadway Couplet with Replacement Bridge	$31	$2	0.01%
Two-Way Washington with Supplemental Bridge	$904	$8	0.02%

Source: CRC Right-of-Way Acquisitions Dataset, Clark County Tax Assessor Records (June 2007)

5.3.2.4.1 No-Build

The impacts associated with the No-Build Alternative for the I-5 alignment of Segment B would be as discussed above for the Vancouver alignments of Segment B.

5.3.2.4.2 16th Street Alignment (LRT or BRT)

Currently, 16th Street between Washington and E Streets is a two-way street with on-street parking. During operation of this alignment, this section of 16th Street would become a westbound one-way street with parking on the north side of 16th Street only. As a result, the access, visibility, and parking availability for businesses along 16th Street would decrease, potentially resulting in reduced sales for businesses that rely on drive-by sales and convenient parking. The majority of businesses along this section of 16th Street are professional and service oriented businesses that do not rely on drive-by sales; therefore, this impact is expected to be small. East of E Street, 16th Street would remain as a two-way road with little or no potential access, circulation, or parking impacts anticipated. North of 16th Street, no substantial access, circulation, or parking impacts are anticipated at non-station areas.

As shown in Exhibit 5-24, the 16th Street alignment would require relocation of an estimated 10 employees at two businesses with well less than $1 million in annual sales. Relocated businesses would include office and retail.

As shown in Exhibit 5-25, the 16th Street alignment would require purchasing rights-of-way of approximately $600,000. The taxable property within each right-of-way is small.

The 16th Street option would remove 54 on-street parking spaces along 16th Street between Mill Plain Boulevard and G Street; two of these are disabled parking spaces, and none of them are loading zones. It would also eliminate 11 (39 percent) access points in this segment.

As shown in Exhibit 5-27, access points would be removed from 11 of 25 locations under the 16th Street alignment. No loading zones would be affected.

5.3.2.4.3 McLoughlin Boulevard Alignment (LRT or BRT)

As shown in Exhibit 5-24, the two-way Washington Street alignment would require relocation of an estimated 45 employees at nine businesses with approximately $3 million in annual sales. The Washington/Broadway couplet alignment would require relocation of an estimated 30 employees at eight businesses with approximately $3 million in annual sales. Relocated businesses would include office and retail.

As shown in Exhibit 5-25, both replacement and supplemental alternatives would require additional right-of-way within Segment B. While property tax impacts would be highest for the two-way Washington with supplemental bridge, impacts would still be relatively small at about $8,000. The impacts of the other alternatives are similar and smaller.

Currently, McLoughlin Boulevard is a two-way street with on-street parking. During operation of this alignment, McLoughlin Boulevard would remain a two-way street but would only have on-street parking where feasible. The McLoughlin Boulevard option would remove 100 (about 71 percent) on-street parking spaces along McLoughlin Boulevard between Mill Plain Boulevard and G Street; none of these are disabled parking spaces or loading zones. None of the mid-block driveways would be lost but drivers would be prohibited from making left turns across the guideway, except at signalized intersections.

The McLoughlin/two-way Washington and McLoughlin/Washington-Broadway alignments consist of two stations and two park and rides. With the exception of the parking impacts discussed above that would affect the McLoughlin Station, impacts associated with the stations and park and rides are small.

As shown in Exhibit 5-27, access points would be removed from 13 of 16 locations under the McLoughlin Boulevard alignment. No loading zones would be affected.

5.3.3 Transit-Oriented Development Potential

The CRC project will exert influence on regional and local land use and development patterns. This section includes a summary of what is known about the links between transit stations and economic development, and describes the potential for transit-oriented development (TOD) for each transit option by segment and station. Station areas were rated according to the likelihood of each station causing such changes to prevailing land use and development patterns. Those changes may include pressure for increased rents and concentrating new housing, commercial, and office development nearer to stations.

5.3.3.1 Effects of Transit Stations on Economic Development

A universal definition for TOD does not currently exist, reflecting the highly complex and specific nature of economic development climates in individual areas. However, the Transportation Research Board (TRB) provides several definitions of TOD that emphasize high-quality walking environments, mixed land uses, and high-density

developments linked to transit (TCRP 2004). Generally, transit agencies agree that what constitutes a TOD is a pattern of dense, diverse, pedestrian-friendly land uses, near transit nodes, that under the right conditions translate into higher transit patronage (TCRP 2004).

A number of factors affect and influence private development, including local and regional market conditions and trends, zoning and other land use regulations, accessibility of credit, and interest rates. Experience around the United States, however, indicates that development of new transit facilities has often occurred concurrent with major changes in development near station areas (typically within a quarter-mile of the station) (TCRP 1996). It has been shown that jurisdictions with supportive policies, land use controls, and direct incentives can substantially increase the amount of development occurring near transit stations.

In such circumstances, the type of development in a station area tends to be more intense, mixed-use development that supports high-density residential uses and commercial employment. In a number of cases, transit station areas have provided an opportunity for local jurisdictions to focus redevelopment activities. Concentrations of mixed-uses connected by high quality transit services can result in further shifts away from car use (particularly single-occupant vehicles) and towards use of transit, walking and bicycling. The success of such development depends to a considerable degree on supportive policies designed to make areas around transit stations more attractive for development.

TOD generally occurs under three conditions:

1. When stations are located in prime regional and community nodes of activity attractive to typical market forces.

2. When regional and local real estate markets are active.

3. When public policies and regulations permit or encourage intensive development in station areas.

In addition to these conditions, case study research indicates that other elements usually are in place when transit-oriented development occurs, including:

- A strong statewide and regional land use vision, such as is expressed in the State of Oregon's Transportation Planning Rule (State of Oregon, 2005), Metro's 2040 Growth Concept (Metro 1995), and the RTC's Metropolitan Transportation Plan (Clark County RTC 2002)
- Political leadership, such as that provided by the Bi-State Coordination Committee (Portland-Vancouver Transportation and Trade Partnership 2001)
- Adequate development sites
- Strong local and regional economies (i.e., residential and job growth)
- Supportive local land use and development policies such as the Vancouver City Center Vision Plan 2006.

The experience of other U.S. communities demonstrates that although light rail will not by itself create new development, with supportive plans and policies in place it can influence where development goes and what it looks like. Not all communities have had success with development around light rail stations, however. In areas where TOD has succeeded, a number of market conditions and policy tools were first present. In those cases, benefits of successful TOD included improved mobility, access and environmental conditions; increased supplies of affordable housing; increased income to transit agencies; more efficient urban form; and urban redevelopment (City of Seattle 1998).

A number of implementation tools have been successfully used to foster TOD. These include: comprehensive station area planning; provision of pedestrian amenities and access; infrastructure improvements, including drainage, water systems, and undergrounding of utilities and lighting; shared parking or parking management; expedited permits and reviews; zoning; land assembly; direct public investment; and local transit service design. Additional tools may be needed to foster development in areas where weak market conditions exist.

5.3.3.2 TOD Potential by Station

This section, organized by transit segments, evaluates the TOD potential for each station listed in the build alternatives (both I-5 and Vancouver alignments).

TOD potential was estimated by analyzing policies and land uses within a 0.25 mile radius of each station area. The following elements were considered as part of this assessment:

- Zoning and comprehensive plan designations (including percentage of dominant zones)
- Existence of transit-oriented overlay zones
- Existing land uses
- Ownership (private vs. public ownership and/or ownership of multiple parcels)
- Ratio of building value to total value
- Percentage of station area considered vacant (apart from roads or parks)

The ratings shown indicate the extent to which the HCT system is likely to cause indirect land use changes within 0.25-mile of station areas under existing plans and policies. The indirect land use and development impacts of the project have been characterized by ratings of high, moderate, or low.

In general, stations with commercial or medium-to high-density residential dominated zones were considered to have higher TOD potential, as were areas with multiple vacant parcels. Station areas with a lower building value/total value ratio relative to the range of building value/total value ratios for all station areas were considered to have higher TOD potential. The range of building value/total value ratios are 48 percent to 84 percent, with 65 percent generally considered at the lower end of the range, and therefore having a higher TOD potential. Station areas where multiple parcels were owned by one agency or

individual were seen as higher potential for TOD except when the ownership was geared towards a specific land use (e.g., medical office). Both the City of Vancouver and the City of Portland have a transit overlay zone in effect for areas within 0.25 mile of a station, so this was not seen as a differentiator in TOD potential.

Exhibit 5-21 provides a rating of the potential for TOD within 0.25 mile of station areas, characterized as low, moderate or high. The ratings are not an assessment of indirect economic impacts, but rather reflect an opinion about the likelihood of TOD in the vicinity of station areas under existing plans and policies. In general, TOD would be relatively more likely to occur when:

- Plans and policies are in place that support compact development
- Existing densities are relatively high
- HCT is a sufficiently attractive amenity to improve rental rates in a proposed new development

TOD would be relatively less likely to occur when:

- A station area has a strong auto-orientation and poor pedestrian links
- Much or most of the land around the station is owned by a single institution (although this is not always the case: universities, for example, could support TOD development)
- Few vacant or underused sites are available for development
- Parcel assembly for development is difficult

Exhibit 5-21. Transit Oriented Development Potential by Transit Alternative Segment and Station

Segment/Station	TOD Potential Rating
Segment A: Delta Park to Mill Plain District	
Sub-segment A1: Delta Park to South Vancouver	
Expo Center Station	Low
Hayden Island Station	Moderate to High
Sub-segment A2: South Vancouver to Mill Plain District	
7th Street Station	Moderate
12th Street Station	Moderate to High
Mill Plain Station	High
Segment B: Mill Plain District to North Vancouver	
Vancouver alignments	
24th Street Station	Moderate
33rd Street Station	Low
Lincoln Park and Ride	Low to Moderate
Kiggins Bowl Park and Ride	Low

Segment/Station	TOD Potential Rating
I-5 Alignments	
Clark College Station	Low
33rd Street Station	Low
Kiggins Bowl Park and Ride	Low

5.3.3.3 Rationale for TOD Potential Ratings

This section briefly describes the current land uses, zoning, and relevant policies that led to the TOD ratings listed in Exhibit 5-28 above. This section is organized by Segment and by station.

5.3.3.3.1 Sub-segment A1: Delta Park to South Vancouver

Exposition Center Station. The area in the vicinity of the Expo Center station is largely zoned industrial, and much of the land in the direct vicinity of the station is city or state right-of-way for the I-5 highway and local road network, Expo Center parking, or wetlands. The existing land uses and zoning do not suggest TOD potential.

Hayden Island Station. Depending on the recommendations of the Hayden Island Master Plan (adoption expected summer 2008), the potential for TOD at the Hayden Island station could be moderate to high. Currently much of the area near the station is used for parking. Depending on the development climate, redevelopment could occur to bring stores closer to the station, with parking in the rear or in a structure. Zoning (predominantly general commercial) is conducive to TOD. Residential development may be constrained by a Portland International Airport (PDX) noise overlay zone (the station area is under a PDX flight path), though some plans being considered as part of the Hayden Island Master Plan consider mixed-use development and part of the south end of the island is outside the overlay zone that limits residential development. If realized TOD on Hayden Island is high, it could impact travel reliability for planned industrial development. Mobility, access, and circulation on the Island will be assessed in the Hayden Island IAMP, underway.

5.3.3.3.2 Sub-segment A2: South Vancouver to Mill Plain District

Seventh Street Station. The area in the immediate vicinity of the Seventh Street station is already built up with high-quality, high-density infill development comprised of a mixture of condominiums, apartments, offices, and retail. The station area includes Esther Short Park, the Vancouver Convention Center, and I-5. Towards the outer limit of the 0.25 mile radius from the proposed station, zoning is low-rise commercial. There are pockets of vacant land and in the northern quadrant of the station buffer and are around 15 parcels dedicated to surface and garage parking that could be developed into high rise, mixed-use developments. The existing uses suggest very high transit ridership potential, and TOD development potential in this station area is considered medium. Although development potential is high, the economic climate in downtown Vancouver is such that some development would likely occur prior to constructing the Seventh Street Station,

regardless of decisions about HCT in downtown Vancouver. HCT could help support higher density, mixed use development than what currently exists at the site.

12th Street Station. The 11th to 12th Street area is given a TOD potential rating of moderate to high. Several factors led to this rating. The City of Vancouver and C-TRAN own several vacant parcels within a within 0.25 mile of the station. The dominant zoning category CX (City Center) is conducive to infill and redevelopment. Current development is lower density than what is allowed under zoning. Public ownership could be supportive of development or redevelopment into TODs in the future.

Mill Plain Station. The zoning surrounding the Mill Plain station is very conducive to TOD. Mixed use, commercial (predominant land use), and high density residential developments already exist in the vicinity of the station. There is a relatively high percentage of vacant parcel square footage to overall square footage, and the building value/total value ratio is relatively low. The immediate vicinity of the station is used informally as a surface parking lot.

5.3.3.3.3 Segment B: Mill Plain District to North Vancouver

Vancouver alignment

24th Street Station. The area surrounding the 24th Street station was given a moderate rating for TOD potential. Established businesses create a "Main street" along the arterials. There is a mixture of commercial and high density residential zoning. More than 10 percent of the surrounding area is vacant, and built value comprises a lower percentage of total value relative to several other stations areas, indicating that land values may prompt redevelopment. An historic overlay zone exists for Main Street which would constrain demolition and redevelopment in that area, but redevelopment of existing structures would be possible.

33rd Street Station. The area surrounding the 33rd Street station was given a TOD potential rating of low. A single commercial zoning area on 33rd Street east of I-5 has potential for TOD development, though it is currently residential. The dominant zoning and use at these stations is low density residential. Two schools are also located nearby. Some parcels in the immediate vicinity of the station are oriented toward medical use and are under one ownership. Although the area has a high concentration of employees (employed by the medical facilities) that may lead to transit use, development potential is limited due to the predominance of medical use and single ownership.

Lincoln Park and Ride. The dominant zoning at this park and ride is low-density residential, with limited commercial and medium-density residential zones. The neighborhood in the immediate vicinity of the station is well established. Development is expected to be limited to medium-density residential or commercial properties. For these reasons, the station was projected to have low to moderate TOD potential.

I-5 Alignment

Clark College Station. The Clark College Park and Ride would be located adjacent to I-5 at the southwest edge of Clark College. Currently, no businesses are located around the

proposed park and ride. The dominant zoning is low-density residential and the highway and the college are major uses within 0.25 mile. For these reasons, the station was projected to have low TOD potential.

Rosemere Station. The dominant zone in this station area is low-density residential (covering 99 percent of the parcels within the station area). Only a small area is currently vacant and there is a high building value / total value ratio. The highway comprises a large land use on the west side of the park and ride lot. Only one parcel within the 0.25 mile station area is zoned for commercial use and the existing use on this parcel is residential. For these reasons, the station was projected to have a low TOD potential.

Kiggins Bowl Park and Ride. The area surrounding the potential Kiggins Bowl Park and Ride is given a low potential TOD rating. The area is zoned commercial and high density residential, however many of those areas would be acquired for the park and ride or are on the east side of I-5 and would be inaccessible to transit users. The high percentage of vacant square footage (more than 40 percent) would either be acquired by the park and ride or be located in an established single-family neighborhood and is unlikely to develop as a TOD at this time.

5.4 Impacts from Other Project Elements

This section analyzes positive and negative economic impacts associated with other project elements not specifically associated with the four build alternatives. There are two project elements to be discussed – the minimum operable transit segment (terminating at Clark College or Mill Plain) and the proposed transit maintenance base locations.

5.4.1 Minimum Operable Segments

The Clark College minimum operable transit segment (MOS) would mimic the I-5 transit alignment between the Expo Center and either the 16th Street or McLoughlin Boulevard alignments. The MOS would then operate along either the McLoughlin Boulevard or 16th Street alignment to the east side of I-5 and end Clark College Park and Ride, just north of McLoughlin Boulevard. The length of the MOS is 2.70 miles, compared to 4.22 miles for the full I-5 alignment and 3.41 miles for the Vancouver alignment. The Clark College Park and Ride would have 1,100 parking spots in a three-level parking structure. In addition to the Clack College MOS, a second MOS is evaluated, the Mill Plain MOS, which would have a terminal station between 15th and 16th Streets. Generally, impacts are the same under both MOS options; however impacts related to the Clark College MOS north of Mill Plain would not occur under the Mill Plain MOS.

Direct economic impacts of the MOS reflect the I-5 transit alignment, which in terms of business displacements, parking and access, and tax revenue impacts, vary by specific alignment through downtown (two-way Washington vs. Washington/Broadway couplet) and from downtown to the park and ride (16th Street vs. McLoughlin Boulevard). Section 5.3.2 has a detailed discussion of direct economic impacts of these alignments.

Although the full I-5 transit alignment would require multiple property acquisitions north of Clark College, the majority of these are to residences, not businesses, and therefore are

not considered an economic impact. Compared to the full I-5 alignment, the MOS would, however, acquire two fewer businesses from Segment B, affecting 40 employees and approximately $1 million in sales. The lessened impact results from avoiding acquisitions near the original alignment terminus at Kiggins Bowl.

Selecting the Clark College MOS would effectually determine the overall transit alignment, selecting the I-5 over the Vancouver alignment. For more detail refer to Section 5.5.4 I-5 vs. Vancouver Transit Alignment.

The main differences in the Mill Plain MOS, compared to the full-length alignments and Clark College MOS, is the avoidance of the majority of acquisitions in Segment B and the inclusion of additional park and rides in downtown Vancouver. Differences in economic impacts are described. There are no acquisitions associated with the transit line in Segment A2 or Segment B, aside from the Mill Plain MOS terminal station and the park and ride facilities. Seven park-and-ride structures are proposed as part of the Mill Plain MOS, three of which are proposed under other transit alignments: Kiggins Bowl and Lincoln are common to the full-length transit alignment, and a third, Clark College park and ride is common to the full-length alignments, as well as the Clack College MOS. As a result, four additional, unique park and rides are proposed under the Mill Plain MOS, which are described below. Please refer to figures 5-14 and 5-15 for parking, and access related impacts associated with the Minimal Operable segments.

Exhibit 5-22. Unique Acquisitions associated with Mill Plain MOS Park and Ride Facilities

No.	Park and Ride Facility	No. of Businesses Displaced	No. of Employees Impacted	Annual Sales Revenue Impacted ($M)	Type of Use
1	Joint Use Structure (Columbia & 5th)	4	25	$15	Auto sales, offices
2	BNSF (3rd and Washington)	4	65	$8	1 car repair business, electronics businesses, arbor company
3	Loop (SR 14 interchange)	0	0	0	
4	Joint Use (17th & McLoughlin)	1	30	$0	Bank building and parking.
Sub-segment A2: South Vancouver to Mill Plain District					

5.4.2 Transit Maintenance Base Options

Two transit maintenance base options are considered by the project. All LRT alternatives would require an expansion of the existing Ruby Junction Maintenance Base in Gresham. All BRT alternatives would require an expansion of C-TRAN's existing Administration Operations and Maintenance (AOM) base in Vancouver. Economic impacts associated with these two maintenance base options are summarized in Exhibit 5-23, and described in the sections below.

Exhibit 5-223. Maintenance Base Business Displacements

	No. Businesses Impacted	No. Employees Impacted	Affected Sales (Millions)
Maintenance Base Option			
LRT Maintenance Base Option (Expansion of Ruby Junction Facility)	6	60	$17.4
BRT Maintenance Base Option (Expansion of AOM Facility)	1	5	$1.2

Source: InfoUSA, 2007, CRC Right-of-Way Acquisitions Dataset

5.4.2.1 LRT Maintenance Base Options

Although an expansion of the Ruby Junction maintenance facility would occur under both the build and No-Build alternatives, the LRT alternatives would require a larger expansion of the facility than would be necessary for the No-Build Alternative (8.7 vs. 3.5 acres). This is because only 50 percent of the impacts associated with LRT Maintenance Base expansion at Ruby Junction are attributable to the CRC project. Other impacts are attributable to other regional needs.

The LRT maintenance base expansion would require full acquisition of 14 parcels in the vicinity of NW Eleven Mile Lane in Gresham, six of which contain existing businesses employing an estimated 60 people, with estimated annual sales of approximately $17.4 million. The business uses are a mixture of service and industrial.

5.4.2.2 BRT Maintenance Base Options

The BRT alternatives would include an expansion of C-TRAN's existing AOM facility in east Vancouver. This is located in the vicinity of Andreson Road, between Mill Plain and Fourth Plain Boulevards, and is big enough to accommodate 27 BRT vehicles.

The expansion would require acquisition of five parcels, including one business employing approximately five employees and with annual sales of approximately $1 million. The business is a heavy-construction excavation contractor, and has been located on this site for more than 20 years.

5.5 Impacts from System-Level Choices

This section describes differences between the various Build and No-Build Alternatives and design options for six system-level choices: supplemental vs. replacement bridge crossings; transit technology (BRT vs. LRT); highway investments vs. transit investments; the major transit alignment (Vancouver vs. I-5); and tolling.

5.5.1 River Crossing Type and Capacity: How does the supplemental 8-lane crossing compare to the replacement 10-lane[2] crossing?

There are four key elements that differentiate the replacement bridge (Alternatives 2 and 3) from the supplemental bridge (Alternatives 4 and 5). These are: direct business displacements, marine commerce on the Columbia River, the closure of Sixth Street in downtown Vancouver, and the capacity of the bridge crossing.

5.5.1.1 Direct Business Displacements

Overall, the supplemental bridge would require relocation of fewer businesses than the replacement bridge. This is illustrated in Exhibit 5-24 below. Affected sales from the supplemental alternative would be lower than the replacement alternatives.

Exhibit 5-24. Overall Business Displacements Associated with Highway Alternatives (Segments A and B)

Alternative	No. Businesses Impacted	No. Employees Impacted	Affected Sales (Millions)
Replacement	41	565	$112
Supplemental	34	480	$68

Source: InfoUSA, 2007, CRC Right-of-Way Acquisitions Dataset.

The supplemental alternatives would impact relatively fewer businesses, employees and sales than the replacement alternative

5.5.1.2 Marine Commerce on the Columbia River

The Columbia River is an important transportation route for marine freight. Data from the U.S. Army Corps of Engineers (COE 2005) indicate that nearly 10 million tons of freight in over 9,500 shipments passed under the I-5 bridges in 2005 (2005). This section discusses the economic effects of the alternatives on this transportation sector.

The replacement alternatives would result in positive economic effects to marine commerce on the Columbia River, and the supplemental alternatives would have a negative effect. Based on likely features of the bridges that were provided in a recent project fact sheet, a discussion of those effects follows.

The existing I-5 bridge structures each have nine piers, which result in navigation channels between the piers. Three such channels are used for navigation: a wide span with approximately 60 feet mid-span vertical clearance, a high span with approximately 70 feet of mid-span vertical clearance, and a lift span with approximately 40 feet mid-span vertical clearance when closed and 180 feet when open. The wide span is the main channel used for navigation, but during high water many barges need to use the high

[2] The 10-lane replacement crossing could be restriped in the future to accommodate 12 travel lanes.

span, or require bridge lifts at the lift span. In 2004, there were 604 bridge openings. The replacement bridge would be high enough to allow the vast majority of vessels to pass without bridge openings. Currently, bridge openings are restricted to non-peak roadway commute hours. Thus, the new spans would provide more flexibility in operating schedules for marine commerce.

The supplemental alternatives would retain the existing I-5 bridge. It is possible that there would be fewer time restrictions on bridge lifts, but that is not assured. Thus, this benefit may not occur for the supplemental alternatives.

The replacement bridge would result in fewer piers than exist on the current bridges, thus widening the horizontal clearance of some navigation channels. A bridge span length of approximately 500 feet is being considered, which would be an increase over the width of the "primary channel" of 178 feet and slightly narrower than the current barge channel of 531 feet. The longer span lengths provided for the main channel will provide more room for boat captains to maneuver between the piers and improve the inherent safety of marine navigation. The elimination of the lift span bridges under the replacement alternatives also would provide much greater flexibility for marine commercial traffic.

In the supplemental alternatives, the existing I-5 piers would be retained and the piers for the supplemental bridge would introduce more obstacles that must be maneuvered around. The piers for the new bridge would encroach on the alternate barge channel, thus diminishing its functionality. Thus, the inherent safety of marine navigation would be diminished somewhat.

5.5.1.3 Closure of Sixth Street at Washington Street

As described in Section 5.3.2, the touchdown point for the HCT structure on the north side of the Columbia River would be farther north for the supplemental alternatives than it would be for the replacement alternatives. HCT would meet the existing street grade in Vancouver immediately north of Sixth Street. Under the supplemental alternatives, Sixth Street would be closed at its intersection with Washington Street, and a retaining wall would be constructed between Fifth and Sixth Streets. This would be likely to impact circulation and access to businesses substantially in the southern section of downtown Vancouver.

Sixth Street is classified as a minor arterial and used by local and regional traffic accessing businesses throughout downtown. The location of this street closure would be an issue for the economic vitality of several businesses in downtown Vancouver. Currently, Sixth Street provides the best connectivity in southern downtown. Developments along Sixth Street include the south end of the existing transit mall, the Vancouver Convention Center, and Esther Short Park. Travelers accessing these and other businesses use Sixth Street. The street connects with east Vancouver via SR 14, with Portland and points north via the I-5 interchange, with important north-south arterials such as C Street and Washington Street, and crosses the BNSF railroad tracks on the western side of downtown. Streets south of Sixth Street have limited connectivity because of the railroad tracks and I-5. The street to the north (Seventh Street) is closed to automobile traffic west of Washington because of office buildings, Esther Short Park, and

condominium developments. Closure if this street without a circulation plan or improvements to parallel streets would impact businesses in the southern portion of downtown Vancouver.

5.5.1.4 Capacity of Bridge Crossing

The capacity of the supplemental bridge would be lower than that of the replacement bridge, with one fewer travel lane in each direction. However, highway service levels are not expected to substantially differ because variable tolls and to some extent higher levels of transit service would mitigate congestion. On balance, travel times are expected to be similar in the build alternatives.

During peak periods, the supplemental alternatives would result in lower vehicle throughput than the replacement alternatives. The higher toll and more frequent transit service could reduce the number of vehicles crossing the bridge, because some travelers would shift from vehicle to transit modes. Comparing person throughput, under the supplemental alternatives, LRT person transit service would higher compared to the replacement alternatives, indicating that people would shift to transit. BRT person transit service is slightly lower under the supplemental alternatives relative to the replacement. Despite this shift to transit under the supplemental alternatives, the replacement bridge would serve between 11 and 20 percent more person-trips during peak periods compared to the supplemental alternatives.

Some bridge users may choose to avoid the higher toll and do business outside the API (retail businesses would be more sensitive to the higher toll). The resulting effect could be a dampening of regional mobility and economic activity within the API versus elsewhere in the region. Vehicle throughput on I-205 is forecasted to be the same between the replacement and supplemental alternatives, indicating that trips would not divert to I-205, but instead people may avoid the trip altogether, switch to another mode such as transit or carpool, or travel during another time of day. It is unlikely that there would be a noticeable difference in total regional economic activity in the build alternatives.

5.5.2 The Connection between Transit and Development

Transit options, such as BRT and LRT can have a significant impact on both the urban landscape and the economy. Case studies of transit projects in the United States reveal that transit may increase both residential and commercial property values and attract development. Increased pedestrian activity near transit stations can also improve economic vitality within transit corridors.

5.5.2.1 Local Experiences

Since the 1997 alignment of the first modern streetcar's path in Portland, over $2 billion has been invested within two blocks of the Portland Streetcar line (Portland Office of Transportation 2006). According to figures published by TriMet (TriMet 2006), Portland's MAX light rail system has been associated with over $6 billion in development within walking distance of rail lines since 1978; construction of the Yellow

Line, completed in 2004, attracted more than 50 new businesses to the area; and the Eastside Blue Line was a catalyst for $4.7 billion in development and revitalization, especially in the City Center and Lloyd District. These local results indicate that at a minimum, rail investments have helped shape development in Portland.

5.5.3 Transit Mode: How would differences in transit technology (i.e., BRT versus LRT) influence the potential for economic development around station areas?

The Federal Transit Administration (FTA) defines BRT as a flexible, rubber-tired form of rapid transit that combines stations, vehicles, services, guideways, and Intelligent Transportation system elements (TCRP 2007). Many studies evaluating development around BRT lines vary in definition. The HCT alignment for both LRT and BRT has been thus far designed on a guideway, which is one of the elements included in the FTA's definition of BRT. This section focuses on comparing LRT with bus systems routed on a guideway.

Published analysis of transit projects in the United States reveal that transit has the potential to be a catalyst for future development, but the likelihood of economic development depends on many factors beyond the existence of transit stations, such as the existing market, zoning, and development regulations (ECONorthwest 1998, Seskin 1996, and Cervero 2004, 1993). Because of these factors, the potential for economic development or transit-oriented development varies substantially from one station to another, and from one city to another.

In general, the development impacts of a transportation investment are the result of three factors—the characteristics of the infrastructure itself, the nature of land use and development policies in the vicinity, and the strength of markets. In this analysis, the long-term nature of the analysis makes assessing market conditions problematic. Development policies are generally highly supportive near the proposed service. So the difference in the development potential of LRT and BRT would depend fundamentally on the inherent qualities of the service each offers. This includes the effects of each on the accessibility of specific locations, the overall levels of boardings at stations, and other factors that affect the attractiveness of the service.

Various studies document development around LRT and BRT stations (see the Land Use Technical Report for some examples). Because there are many more LRT systems in operation than BRT systems, particularly in the U.S., there is much more documentation about development around LRT stations. However, there are many examples of development around BRT stations in cities such as Adelaide and Brisbane, Australia; Ottawa, Canada; Curitiba, Brazil; as well as Boston and Pittsburgh (Levinson 2003).

No studies have been identified that attempt to estimate the relative contribution of mode to that development. Thus a direct comparison of BRT and LRT's development impacts is not available, and comparisons must be qualitative, and carefully qualified. The analysis that follows is an attempt to report a balanced view of the issue. In general, evidence suggests that both BRT and LRT can be catalysts for economic development. There is evidence that LRT has a wider catchment area than BRT, which suggests that LRT stations are more likely to develop more intensely. In addition, LRT is perceived as

a more attractive mode of travel, but the development consequence of this perception is difficult to determine, especially without reference to ridership forecasts.

5.5.3.1 Evidence and Opinions from Literature

One recent study (Currie 2006) reported on a review of relevant literature and assessed the strengths and challenges of BRT (and local buses) compared to LRT in relation to transit-oriented development. One difference between the modes is that rail is generally associated with high-density/large-scale development and bus with low-density/small-development. Some factors identified as challenges or weaknesses of BRT compared to LRT for TOD potential:

- Industry TOD capabilities: there is some evidence that implementing successful bus transit-oriented development (BTOD) is more difficult than rail transit-oriented development (RTOD); Cervero et al. (2004) found that only three percent of transit agencies engaged in BTOD had full-time staff to run BTOD programs versus 42 percent of rail agencies.
- Pedestrian access: high-quality, grade-separated direct walking access is generally considered to be more difficult to achieve for BRT than for LRT. Quality pedestrian access is desirable part of successful TODs, but not necessarily essential.
- Noise and air pollution: unless alternative fuels are used, diesel buses result in more noise and air pollution than electric rail systems, which makes it more difficult for diesel-based BRT systems to result in a place where people want to live and work. The CRC Noise Technical Report finds that, in general BRT alternatives have greater noise impacts than LRT, and in some cases, nearly double noise impacts along the alignment; however, indoor noise impacts can be mitigated with sound insulation and in some cases, sound walls.
- Track record: BTOD does not have as many successful examples as RTOD and little is known about the impacts of BTOD. According to a recent survey, only 8 percent of U.S. TODs were BTOD (Cervero 2004). Objective independent assessment of BTOD programs is rare, which could result in caution for potential developers.

Some factors identified as strengths of BRT compared to LRT for TOD potential:

- Flexibility: BRT can better mimic the many-to-many nature of suburban trip patterns better than rail and may be an attractive option where communities don't want high densities.
- Service frequency: BRT typically results in more frequent service than LRT.
- Transfers: BRT lines that run to the suburbs then down a dedicated "trunk" busway can result in fewer passengers needing to transfer from one vehicle to another. This would apply to three BRT limited bus lines that would travel from the Salmon Creek Park and Ride, the Vancouver Mall, and Fisher's Landing transit centers to and from downtown Vancouver. However this would not apply

to riders continuing to Portland; they would need to transfer onto LRT at the Expo Center in Portland.

In summary, the article found that BRT had some significant weaknesses compared to LRT, but can provide an important complementary function in supporting RTOD and in providing TOD benefits on a more comprehensive scale.

Another article by an author that has authored reports for the U.S. Department of Transportation promoting development of both LRT and BRT modes provides the following conclusions about the two modes (Vuchic 2005).

- The impact on land use and city livability is rated as "strong" for LRT and "some" for BRT.
- The BRT concept can lead to upgrading a complex network of low-image bus lines into a distinct network of frequent, reliable lines attractive to all classes of riders. BRT tends to be more appropriate for small-to-medium size cities which do not justify introduction of a different technology.
- For heavy passenger volumes, LRT is usually superior to BRT. LRT has been described as the central element of urban economic development, environmental upgrading and enhancement of human-oriented urban ambiance: with its stimulus for urban physical upgrading and economic development, LRT exerts long-term positive impacts on livability of city.

TCRP (2007) reported on the results of a survey of Boston area developers which revealed that developers have seen a benefit in the connections to downtown provided by the city's new BRT Silver Line; however, some developers expressed a preference for rail because they had concerns about the transit agency's long-term commitment to BRT and its ability to link BRT to the entire system.

Philadelphia and Ottawa each conducted surveys about the relative differences between LRT and BRT, including public preference for mode.

Philadelphia. Under the auspices of the Delaware Valley Citizens Council for Clean Air, with funding contributed by various private and public organizations, a survey was conducted in June and July of 1991. The survey titled, "Survey of SEPTA light rail/bus rider behavior & perceptions: preliminary report of onboard survey secondary results," was an onboard survey of riders of selected bus and light rail transit (LRT, or trolley) routes operated by Southern Pennsylvania Transportation Authority (SEPTA) in the Philadelphia metropolitan area.

The routes were selected because of the relative homogeneity of their demographic areas and similarity of their types of service; features which present a rarely experienced opportunity to focus on mode-specific behavior and perceptions. All three lines extend from SEPTA's 69th Street terminal into suburban communities, using a variety of alignments on public thoroughfares, reservations, and exclusive guideways.

The study found that LRT tends to attract a greater proportion of non-work trips than bus for these generally equivalent types of transit service. It also found that bike and

pedestrian access times to and from LRT stations are significantly greater than those for bus for these similar types of service. This finding suggests that LRT patrons tend to be willing to walk (and possibly to bike) further to and from LRT services than is the case for bus, in this instance by a difference of nearly 3 minutes. This translates into the likelihood that development intensities and economic benefits for light rail would extend further from each transit stations.

There are also findings regarding the qualitative appeal of LRT. The study found that LRT was found to project a more positive image to its passengers than in the case of similar bus service. LRT passengers found the LRT routes more understandable, more reliable regarding their schedules, more spacious, and more comfortable overall (producing less odors, fumes, and noise).

Ottawa. Ottawa, Ontario's Bus Rapid Transit (BRT) system has, for more than a decade, held the status of a model for BRT in North America. According to a City of Ottawa document, it appears that the Ottawa Transitway's status as a showcase for BRT is questioned by the City's officials and planners. Their Rapid Transit Expansion Study (Feb 2003) includes a section "Comparing Bus and Rail Technologies." In this section, Ottawa planners note some general comparative features between LRT and BRT.

Public sentiment, as reported in the City of Ottawa document, seems to favor LRT technology. In addition to its BRT system, Ottawa's transit agency has been operating a short self-powered light railway (called the O-Train), on a somewhat "experimental" basis since the fall of 2001. The public and stakeholder opinion included a perception that LRT will be more effective in achieving the smart growth objectives of intensification and redevelopment due to its sense of permanency and service reliability.

5.5.3.2 Effects of BRT and LRT Headways

BRT would have more frequent headways than LRT. For example, the proposed BRT alternative would have headways of 3 minutes in portions of Segment A2: South Vancouver to Mill Plain District; whereas LRT will have headways of 7.5 minutes. Given the short headways for BRT in Segment A2, which includes the Vancouver Central Business District, BRT would not have signal priority because signal priority would substantially interrupt cross-movement auto traffic. The "Increased transit service" operations which are associated with the supplemental bridge option assumptions would reduce all of those headways for LRT and BRT by half (e.g., 1.5 min for BRT in some sections of A2, and headways of 3.5-4 minutes for LRT)).

Shorter headways are often associated with higher ridership. However, according to the CRC Transit Technical Report (CRC, 2007) this is only partially realized. Exhibit 5-12 summarizes projected transit ridership for LRT and BRT alternatives, for both replacement and supplemental bridges. Although the Increased transit service aligned with the supplemental alternatives does lead to higher overall ridership numbers at the location of the bridge crossing, ridership is lower for BRT than it is for LRT. This is at least partially resulting from lower travel time reliability on BRT as a result of vehicle "bunching" and no signal priority within Segment A2.

The shorter headways of BRT could result in auto traffic circulation difficulties and affect visibility of adjacent businesses for drivers, while increasing the visibility of adjacent businesses for transit riders. The issue of transit headways and effects to businesses are in addition to transit effects on parking and access, particularly any restriction of left turns. Access and circulation effects, including the effects of headways are discussed above. But the difference in headways is not likely to result in noticeable differences in the potential for economic development between BRT and LRT.

5.5.4 Balance of Transit vs. Highway Investment: Increased Transit System Operations with Aggressive TDM/TSM Measures, and Efficient Transit System Operations with Standard TDM/TSM Measures

The goal of the aggressive Transportation Demand Management (TDM)/Transportation System Management (TSM) measures, described in Section 1, is to encourage users of the bridge crossing to shift their hours of travel to outside the peak congestion periods, and to shift from single-occupant vehicle travel to other modes (including carpool/ vanpools, transit, bicycling, and walking). Aggressive measures include additional funds for public outreach, greater vanpooling incentives, additional bicycle/pedestrian connection points, higher tolls, funds for employer programs encouraging transit, and the creation of additional Transportation Management Associations (TMAs) within the API.

Because very aggressive TDM/TSM measures are associated with the supplemental alternatives, traffic analysis for the supplemental alternatives is used to determine potential economic effects associated with very aggressive TDM/TSM measures. Comparing person throughput, under the supplemental alternatives, LRT person transit service is higher compared to the replacement bridge alternatives, indicating that people shift to transit. BRT person transit service is slightly lower under the supplemental alternatives relative to the replacement bridge alternatives. Despite the shift to transit under the supplemental alternatives, the replacement alternatives would serve between 11 and 20 percent more person-trips during peak periods compared to the supplemental alternatives.

Economic development impacts would occur if TDM/TSM investments greatly improved overall travel speeds within the API; however, they do not. Travel times are similar under the supplemental alternatives as they are under the replacement bridge alternatives, and the duration of congestion is substantially greater under the supplemental alternatives, which would not benefit travel time reliability for freight.

5.5.5 Major Transit Alignment: How does the Vancouver alignment compare to the I-5 alignment?

5.5.5.1 Relocation and Impacts

The Vancouver alignment options would have greater relocation impacts to businesses than the I-5 alignment options. As shown in Exhibit 5-31 below, the Vancouver alignment would require estimated relocation of between 17-25 businesses, impacting between 85 and 130 employees and between $8 and $16 million of annual sales. By contrast, the I-5 alignment would require estimated relocation of between 2 and 10

businesses, impacting between 10 and 60 employees and annual sales between less than $1 million and $5 million. Ranges represent the difference between various alignment options in Segments A2 and B. Additional information is provided in Section 5.3.2.

Exhibit 5-23. Comparison of Business Displacements among Potential Main Street and I-5 Alignments (Segments A2 and B)

Alternative	No. Businesses Impacted	No. Employees Impacted	Affected Sales (Millions)
Vancouver alignments			
Broadway/Main Couplet Option	17	50	$8
Two-Way Broadway Option	19-25	85-130	$9-$16
I-5 Alignments			
16th Street Option	2	10	< $1
McLoughlin Boulevard Option	9-10	50-60	$4-$5

Source: InfoUSA, 2007, CRC Right-of-Way Acquisitions Dataset

The largest amount of on-street parking removed would be along the Broadway/Main couplet option. The largest percent of on-street parking removed would be along McLoughlin Boulevard, which would lose 100 percent of its parking stalls. Many of the businesses along these corridors have additional customer and employee parking in off-street lots, along alleys in back of the business, or along side streets off the main corridor. More of these options were observed along Broadway than the other corridors. A parking utilization study could provide more detailed information about parking needs, utilization, and turnover.

Mid-block driveways range between 14 and 29 in Segment B. Mid-block driveway access would be allowed for each of the transit alternatives under consideration. Therefore, access was not a differentiating factor among the Vancouver and I-5 alignments. However, the Broadway/Main couplet alignment would change the direction of travel along both the Broadway and Main Street corridors from two-way to one-way travel. This could reduce storefront exposure of businesses along both Broadway and Main for those not traveling these corridors on a regular basis (Walker et al. 2000, Barron 2006). This is considered especially important to the number of small businesses along Uptown Village. Although increased speeds often associated with one-way couplets is expected to be mitigated by the presence of HCT (which would slow vehicle traffic), the reduced on-street parking and reduced exposure associated with this alignment could negatively impact small businesses located along Main Street.

Noise impacts do not help to differentiate between Vancouver and I-5 alignments. An I-5 alignment, when paired with the BRT mode, does result in a greater number and severity of noise impacts, though indoor impacts can be mitigated through sound insulation. Noise related impacts to businesses are not expected to be significant.

Relocation impacts to businesses along the I-5 alignment would be lower than along the Vancouver alignment. In general, the I-5 alignment would impact one-third the number of businesses, one-half the number of employees, and one-third the annual sales of the Vancouver alignments. Furthermore, impacts along 16th Street would be lower than

along McLoughlin Boulevard. The 16th Street alignment would impact two businesses, with 10 employees and less than $1 million in annual sales, compared with 9-10 businesses impacted along McLoughlin Boulevard with 50-60 employees and $4-5 million in annual sales.

All alignment options would result in a substantial reduction in on-street parking.

5.5.5.2 Transit-Oriented Development Potential

Transit-oriented economic development potential is higher under the Vancouver alignment. This is because the Vancouver alignments contain more vacant or underdeveloped parcels that are zoned for commercial or for higher density residential within 0.25 mile of the potential station areas. Station areas along the I-5 alignment are more likely to be characterized by low-density residential, and are constrained by the existence of the highway itself. Because the historic overlay along Main Street proper would increase redevelopment costs and constrain economic development potential along that street, TOD potential is assumed to be higher under the two-way Broadway alignment. A more detailed discussion of TOD potential is provided as Section 5.3.3.

5.5.6 Tolling: How do the tolling options compare (no toll, standard or higher toll on I-5, Toll on both I-5 and I-205)?

The application of a variable toll pricing scheme to the I-5 bridge would add an out-of-pocket cost to trips over the bridge, and would result in an overall reduction of bridge crossings compared to the replacement alternatives with no toll and the No-Build Alternative. The Traffic Technical Report (CRC 2007e) provides a comparison of tolling effects on total bridge crossings.

Compared to No-Build conditions, provision of a non-tolled replacement bridge (including improvements on I-5 and HCT improvements, but without tolling), would increase I-5 vehicle traffic demands by 26,000 vehicles per day and decrease I-205 traffic by 10,000 vehicles per day, resulting in a net increase of 16,000 vehicles per day crossing the Columbia River via I-5 and I-205 (CRC 2007e).

With a toll, compared to a non-tolled replacement bridge condition, overall river crossings would decrease by 19,000 vehicles per day, with I-5 traffic volumes decreasing by 32,000 vehicles but I-205 volumes increasing by 13,000 vehicles (CRC, 2007).

With a replacement bridge and tolls on both I-5 and I-205, compared to a non-tolled replacement bridge overall river crossings would decrease by 44,000 vehicles per day, with I-5 volumes decreasing by 14,000 vehicles and I-205 volumes decreasing by 30,000 vehicles (CRC, 2007).

Due to the supplemental bridge's assumed higher toll, less available highway capacity, and Increased transit system, daily I-5 vehicle crossings would be 13,000 vehicles per day lower compared to the replacement bridge, while I-205's crossings would increase by 6,000 vehicles per day. Overall, there would be 7,000 fewer vehicle crossings of the Columbia River via I-5 and I-205 (CRC, 2007).

Travel times for these alternatives have not yet been forecasted, but presumably a toll on I-5 would reduce travel times and improve travel time reliability (Metro 2000), as some potential vehicle travelers would avoid making a river crossing or switch to transit instead. If I-5 and I-205 are both tolled, travel times and reliability are expected to improve compared to tolling I-5 alone for the same reasons. For many, the value of time saved from reduced congestion would be greater than the out-of-pocket cost of the toll, creating a user benefit which would translate into greater efficiency and increased business productivity. Increased business productivity can make a location more attractive for business and residential development, and improve opportunities for trade (Clower and Weinstein 2005).

The proposed toll options, would have a variable toll structure, charging different toll amounts for the peak and the non-peak periods. Variable priced tolling schemes have the potential to reduce overall congestion and regulate traffic flows. This is because, in part, persons with greater schedule flexibility and more sensitivity to out-of-pocket costs will choose to travel during the non-peak period to pay a lower toll, and persons with less flexible schedules, carrying valuable or time-sensitive goods, would be less sensitive to the out-of-pocket cost of the toll and would travel during whatever period dictated by their schedules. Depending on specific tolling schemes and transit fare structures, some persons most sensitive to out-of-pocket costs may shift to transit.

Variable tolls are likely to be beneficial for freight-dependent businesses and businesses that rely on just in time deliveries, because the predictability of travel would also increase. However, the greater the variable toll, the higher the operating costs for truck movements during peak-charge periods, although the peak truck hour is the noon hour. Truck volumes are highest between the hours of 9 a.m. and 3 p.m.; 42 percent of daily truck traffic on the bridge occurs during this period, because truck drivers prefer to travel during uncongested conditions.

5.5.6.1 No Toll

Variable tolls provide a financial incentive for motorists to use the roadway during less congested periods, which would result in peak period traffic flowing more freely during peak times. Without a toll, there is less incentive for motorists to avoid peak travel times; therefore, creating more congestion than would be experienced under a tolling structure. In addition, freight movement could be less expensive if the cost of waiting in the congested traffic is less than the toll being charged. Overall, economic development would be expected to occur along paths similar to existing conditions, where less congested corridors with good access to interstate highways are most attractive to new development, yet development would be slowed due to increased costs associated with increased congestion levels.

5.5.6.2 Standard vs. High Toll

The standard toll would apply to the replacement bridge and the higher toll would apply to the supplemental bridge. The intent of the higher toll is to reduce congestion to the extent that demand on the bridge crossing could be adequately served by the eight-lane supplemental bridge structure.

The potential implications of a higher toll include:

- Increased telecommuting and job growth in Vancouver, as residents of Clark County would be less willing to commute to Portland.
- Increased transit ridership, as out-of-pocket and travel time costs of the higher toll structure would be higher than monthly transit passes and travel time costs for some commuters.
- Reduced home-based shopping trips from Clark County to points in northern Oregon, such as Hayden Island and Airport Way.
- Shifts to I-205 from I-5 for through trips (travelers with neither an origin nor a destination in either metropolitan area) and for travelers wishing to avoid the toll (those for whom travel time differentials between the I-5 and I-205 corridors are low, or with lower travel time costs). The Traffic Technical Report projects a significant shift in traffic under the supplemental alternatives from I-5 to I-205, with 165,000 average daily traffic on 1-5 compared to 219,000 average daily traffic on I-205, a difference of 33 percent more traffic on I-205. The traffic shift could result in an increase in traffic congestion on I-205.

5.5.6.3 Toll on I-5 and I-205

Applying a variable toll structure on both I-5 and I-205 would likely shift more trips onto I-5. Assuming equal levels of congestion and similar toll structures, more through trips would select the I-5 corridor because it is more direct and has a lower travel time. Population and employment centers are higher along the I-5 corridor, which means that this path would be closer and more direct for more drivers than I-205. Freight businesses located along I-205 would experience greater out-of-pocket costs associated with the toll, but would also enjoy the benefits of greater travel time reliability and reduced congestion. Application of tolls along both corridors could be expected to improve economic development along both corridors along similar patterns to the no toll scenario (development most attractive along the corridor considered less congested), though expedited due to reduced congestion and improved travel time reliability.

5.6 Other Economic Development Perspectives

This section discusses how the alternatives and system options would affect economic development, from a variety of perspectives identified by stakeholders as important considerations for this report and not analyzed elsewhere. Those perspectives include:

- Downtown Vancouver and downtown Portland;
- Economic sectors such as wholesale trade, office, retail, and manufacturing;
- The Ports of Vancouver and Portland;
- The relative competitiveness of the two states;
- Changes in user benefits to trucking industry; and
- Marine commerce on the Columbia River.

As reported in a recent study (NCHRP 2001a), there are five specific factors or mechanisms that lead to economic development effects from transportation projects:

1. **Business travel costs.** Transportation projects can reduce direct costs for freight shipping, thereby reducing business costs of acquiring materials and delivering products. They can also reduce direct costs for business-related passenger travel, thereby reducing delivery costs and employee compensation due to fewer hours worked.

2. **Business market reach**. Besides affecting travel costs, transportation improvements can increase access and expand the breadth of markets for business suppliers, customers, and workers. These changes may bring further business productivity through economies of scale or facilitating just-in-time production and delivery processes that were not previously feasible. Some types of transportation changes can shift traffic patterns and change local access patterns that reduce pass-by traffic markets for some businesses, so that some places gain and others lose business activity.

3. **Personal travel costs**. Transportation system improvements can reduce household out of pocket costs for personal travel, thereby increasing disposable personal income. The result is increased living standards and consumer spending, which can then support additional retail and consumer business activity.

4. **Job access**. Even when transportation system improvements do not increase local business activity, they can sometimes increase the employment and incomes of local residents by increasing their access to outside business locations.

5. **Quality of life**. Transportation system changes can affect an area's visual quality, air quality, level of traffic noise, and accessibility to important destinations, which are all factors affecting the attractiveness of an area as a place to live or do business. These factors can ultimately affect the area's ability to attract new businesses and encourage them to stay and grow; in the process, local property values may rise.

5.6.1 Effects of Alternatives and Options on Downtown Vancouver and Downtown Portland

The I-5 corridor is the backbone of a series of roads that provide access to the Vancouver and Portland downtown areas for freight, employees, and personal trips. Both downtowns would benefit from the build alternatives. The improved access will reinforce the economic growth and development in both downtown areas that is already occurring, based on the many factors that drive growth cited above.

The Traffic Technical Report indicates that travel times between SR 500 and Columbia Boulevard southbound during the morning peak are forecast to be slightly greater for the replacement alternatives than in the No-Build Alternative. In the No-Build Alternative, two bottlenecks would exist, one at the I-5 bridge and one at the connection to I-405. During the morning peak, drivers would be able to temporarily speed up after the first bottleneck until reaching the second bottleneck at I-405, resulting in a slightly better travel time compared to the replacement alternatives. In the replacement alternatives, one

bottleneck would remain at I-405, and resulting congestion would slow speeds further upstream than in No-Build Alternative. During the afternoon peak, travel times between Columbia Boulevard and SR 500 northbound are forecast to be 8 minutes less in the replacement alternatives than in the No-Build Alternative. Thus, the replacement alternatives would result in a slower morning commute and a better afternoon commute compared to the No-Build Alternative.

In summary, the replacement alternatives would provide modest positive access and resulting economic development benefits for the cities of Vancouver and Portland, but the effect is likely to be relatively minor.

5.6.1.1 Downtown Vancouver

Chapter 5 of the City of Vancouver's Comprehensive Plan (Public Services) identifies improved access and mobility that benefit freight and work-related travel to be key features of any major transportation investment. Chapter 2 (Economic Development) also outlines economic development goals to reduce the number of daily commute trips across the Columbia River by increasing the number of jobs in Clark County.

Near downtown Vancouver (at the SR 14 interchange), there would be a total of 1,500 fewer vehicles forecast during the morning peak in the replacement alternatives than in the No-Build alternative. During the Afternoon peak there would be a total of 4,500 more vehicles forecast in the replacement alternatives than in the No-Build Alternative.

Compared to the No-Build Alternative, the replacement alternatives would accommodate about 10 percent more east-west traffic during the peak period on major arterials West of I-5 in the City of Vancouver during both the morning and afternoon peaks. East of I-5, the opposite is true: the replacement alternatives would accommodate about 10 percent less traffic volume during the peak periods than the No-Build Alternative. In the north-south direction, the replacement alternatives would accommodate about 10 percent less traffic volume during peak periods on major arterials in the City of Vancouver during both the morning and afternoon peaks.

Under all build alternatives, intersections generally would operate acceptably with improved, similar or slightly degraded conditions as compared to the No-Build Alternative. However, in the SR 14 interchange area, 15 of the 34 intersections would experience queuing extending past turn lane storage capacities or to upstream intersections, which would not occur in the No-Build Alternative. This could have a negative affect on area businesses that rely on drive-by traffic for customers if drivers avoid these intersections. Mitigation measures are to be determined.

Any of the build alternatives would improve access and mobility to downtown Vancouver, and improve travel conditions for commercial trucks traveling between the Port of Vancouver and I-5. Furthermore, the introduction of HCT to downtown Vancouver could increase the attractiveness of the area to visitors and area residents, who may wish to travel along the transit route to shop in downtown Vancouver. Improved transit connections would increase accessibility and broaden the pool of labor available to downtown firms. The exclusive guideway of either HCT technology (BRT or LRT)

would equate to substantial travel time reliability for transit riders. This reliable commute time into downtown Vancouver would be attractive to potential employees, and thus to area employers. Finally, neither the highway alternatives nor the transit alternatives require substantial business displacements in the downtown core (defined as being bound by SR 14, 13th Street, Washington Street, and I-5).

The introduction of either HCT alternative would remove a substantial percentage of on-street parking from the downtown area, which could make it difficult for potential customers of retail establishments to find parking near their desired destination. Although on-street parallel parking can not be reserved for customer use, it is a common perception among owners of certain types of businesses (e.g., retail, restaurant) that on-street or off-street parking directly in front or in back of their business is critical for economic viability. Left turns would not be allowed under the two-way Washington alignment, either at station blocks or at non-station blocks. This may make access to specific businesses more difficult for potential customers. Circulation may shift with the HCT alternatives as well. This is described in detail in Section 5.3. The extent to which businesses would be impacted can not be determined without a current parking inventory and utilization. The City of Vancouver has plans for a utilization study in the near term (2008/09) but one is not available at the time of this report publication (Jacobs 2007).

5.6.1.2 Downtown Portland

As discussed above, travel times on I-5 would improve in the replacement alternatives compared to the No-Build alternative. While downtown Portland is outside the API, the project would benefit the downtown area in two main ways: First, by reducing the congestion experienced by freight and other vehicles north of the central business district. Alternatives that provide the most long-term congestion relief will be most beneficial for economic development. Although the project would not address I-5 congestion in the Rose Quarter area, the improved reliability north of this area equates to better on-time deliveries for freight from less variable congestion outside the peak travel periods. Although this may not be sufficient to locate additional businesses in downtown Portland, it would be expected to decrease the likelihood of businesses in downtown Portland relocating elsewhere because of chronic congestion.

Second, improved transit connections would increase accessibility and broaden the pool of labor available to downtown firms. The exclusive guideway of either HCT technology (BRT or LRT) equates to substantial travel time reliability for transit riders. This reliable commute time into downtown Portland would be attractive to potential employees, and thus to area employers.

In the Portland section of the I-5 corridor, east-west traffic volumes would be similar for the No-Build and replacement alternatives. North-south volumes would be about 4 percent greater under the No-Build Alternative than in the replacement alternative.

In Portland, substantial new access is provided for Hayden Island. Otherwise in Portland, delay at intersections is mixed under the replacement alternative: some would perform better than the No-Build Alternative, but nearly as many would perform worse.

5.6.2 Effects of Alternatives and Options on Economic Sectors such as Wholesale Trade, Office, Retail, and Manufacturing

Various types of businesses differ in their sensitivity to congestion. This sensitivity to congestion is attributable to a particular industry sector's reliance on skilled labor, specialized inputs, or a large transportation-based market area to obtain those inputs. Congestion effectively contracts the market area, bidding up costs, thus increasing production costs (NCHRP 2001c).

Statistical modeling presented in a recent study (NCHRP 2001c) suggests the following:

- Industries with broader worker requirements and higher levels of truck shipping absorb higher costs associated with congestion. They also benefit the most from congestion reduction.
- Firms with lower-skilled labor requirements or nonspecialized (commodity) input requirements tend to be hurt less by congestion (and benefit less from congestion reduction) than those with requirements for highly skilled labor or highly specialized material inputs.

5.6.2.1 The Importance of Transportation to Industry Sectors in the Regional Economy

In this context, the Regional Economy is defined as the Portland-Vancouver PMSA. A recent trade capacity analysis (Global Insight et al., 2006) forecasts an increase in commodities transported by truck in the Portland-Vancouver region from 197.2 million tons in 2000 to 390.0 million tons in 2030, nearly doubling in 30 years. The Oregon Commodity Flow Forecast (Global Insight 2005) projects an 81 percent increase in tonnage moving to, from, and through the state by 2030. The trade capacity analysis study concluded that while all modes are important, the roadway system links all of the others and links land uses critical to business. As discussed above, roadway congestion increases the cost of doing business for those activities that are transportation dependent.

According to a study of the regional economic effects of transportation choke points (Cambridge Systematics et al. 2003), five industries are particularly sensitive to road and rail congestion in the Portland-Vancouver region (mainly in the I-5 and I-205 corridors); lumber/wood/paper, distribution/wholesale trade, transportation equipment/steel, farm and food products, and high-tech (electronics and scientific instruments). These five industries account for approximately 70 percent of commodity tonnages crossing the I-5 and I-205 bridges by large truck, 31 percent of Oregon and Washington's gross regional output in 2000. Thus, these industries are particularly vulnerable to delay and decreased travel time reliability resulting from roadway congestion in the I-5 corridor.

One recent study (Martin Associates 2006) provides insight into the relative importance of congestion as a constraint to economic development. The distribution industry (warehousing, trucking, transloading, labeling) is important to the local economy because of the income and jobs it generates, and as a catalyst for trade-related regional economic activity. The study reported the economic impacts of these firms to the Portland region, and summarized the advantages and disadvantages of the Portland region.

Of the estimated $810 million in regional wages and salaries generated by distribution sectors, 17.2 percent was from sectors that cited congestion in the I-5 corridor, overall congestion, and highway access as major disadvantages. The remaining sectors did not mention congestion or access as a major disadvantage to doing business in the Portland metro region. Thus, while lessening congestion is beneficial for all transport-oriented businesses, other regional issues such as limited container services, labor costs, real estate costs, taxes were viewed as more important issues for the distribution firms interviewed.

5.6.3 Effects of Alternatives and Segments on Economic Sectors

The alternatives and options would affect businesses throughout the region, but primarily the trade-dependent sectors identified above. According to the Traffic Technical Report, under the replacement alternatives, travel time from I-84 to 179th street would be 18 minutes less during the 2-hour afternoon peak in the northbound direction and 4 minutes less in the 2-hour morning peak in the southbound direction than it would be in the No-Build Alternative. The relatively good travel speeds northbound during the afternoon peak, generally speeds 40 mph or better north of I-405, would benefit freight compared to the No-Build Alternative, which results in congested conditions south of the I-5 bridge during the same period. This congestion relief would be the main effect of the project on wholesale trade, office, retail, and manufacturing sectors.

As discussed in Section 5.2.2.3, the replacement alternatives would result in more vehicle trips in the I-5 corridor relative to the I-205 corridor, thus benefiting businesses in the I-5 corridor relative to those in the I-205 corridor.

The improved accessibility provided by transit alternatives can also benefit office and retail sectors, when coupled with supportive land use policies, broader economic trends, and other factors that support transit oriented development in the vicinity of stations.

5.6.4 Effects of Alternatives and Options on the Ports of Vancouver and Portland

Because of the anticipated growth in the movement of goods via truck to and from the ports of Portland and Vancouver, maintaining and enhancing the efficiency of the multimodal transportation system is paramount if each of the ports is to stay competitive with other West Coast ports.

5.6.4.1 Port of Vancouver

The Port of Vancouver is an important part of the regional economy. A recent economic impact study reported that Port of Vancouver operations provide $1.6 billion in regional economic value, 15,560 jobs, and $81.8 million in total state and local tax revenue (Martin Associates 2006). The Port is currently engaged in a series of transportation and development projects including the West Vancouver Freight Access project that will result in an increased need for good access to and from I-5 and along the I-5 corridor.

The replacement bridge would provide better connectivity between I-5 and Port properties than the supplemental bridge for two main reasons. First, the replacement bridge would provide three auxiliary lanes at the Mill Plain interchange, whereas the supplemental bridge would provide only two lanes. Second, the replacement bridge

would provide one more auxiliary lane in each direction than would the supplemental bridge between the Mill Plain and Fourth Plain interchanges.

The replacement bridge would place structures much closer to a large Port property currently under consideration for development (Brooks 2007a). According to the Vancouver City Center Vision and Subarea Plan (City of Vancouver, 2006), this development could include 450,000 square feet (sf) of office space, 125,000 sf of retail, more than 3,000 residential units, a hotel, and 100,000 sf of light industrial space. Because the design of the bridge is not yet known, the level of this impact on the economic vitality of this development is uncertain. Views of the river would remain to the west and south. Views to the east would be obstructed by any of the alternatives, though the bridge would be closer to the foreground for the replacement alignment.

The Traffic Technical Report reports that on I-5 near the Mill Plain and Fourth Plain interchanges, southbound traffic congestion (speeds less than 30 mph) would occur for 4 hours in the No-Build Alternative compared to 2.5 hours in the build alternatives. At this location, no congestion is forecast for any alternative in the northbound direction.

In the Mill Plain Boulevard interchange area, 12 of 17 intersections would operate acceptably with improved, similar or slightly degraded conditions as compared to the No-Build Alternative. Two of the three new intersections would degrade from acceptable or unacceptable operations under the No-Build Alternative to unacceptable operations under the replacement alternatives. Although five intersections would operate with acceptable vehicle queuing when compared to the No-Build Alternative, 12 intersections would experience queuing extending past turn lane storage capacities or to upstream intersections, which would not result under the No-Build Alternative. Long queues could negatively impact traffic to and from the Port of Vancouver. Mitigation measures to improve the intersections are to be determined.

5.6.4.2 Port of Portland

Like the Port of Vancouver, the Port of Portland is an important part of the regional economy. A recent economic impact study reported that existing Port of Portland harbor and aviation activities provide approximately $6.0 billion in regional economic value, 78,000 jobs, $317 million in total state and local tax revenue, and $224 million in federal aviation-specific tax revenue (Martin Associates 2007). As noted above, freight volumes in the region are expected to nearly double in the next 30 years. This growth will dramatically impact Port properties and require substantial investment in local and regional transportation infrastructure (McCaffrey 2007).

The replacement bridge would provide better connectivity between I-5 and Port properties than the supplemental bridge, particularly for traffic coming to or from the north and getting on and off Marine Drive, or traveling between Marine Drive, Hayden Island, and SR 14. Auxiliary lanes would connect Marine Drive, Hayden Island, and SR 14 and allow travel between these points without merging into mainline Interstate traffic. A replacement bridge would afford three auxiliary lanes in each direction between these destinations, where a supplemental bridge would only provide one or two lanes.

This difference in capacity would be more pronounced if the Port embarks on its plans to develop a new terminal on west Hayden Island. Successful development would require a series of transportation improvements, one of which is improving access to I-5 on Hayden Island.

All of the build alternatives include improved interchanges at Hayden Island, and substantial improvements to the Marine Drive interchange, including a series of improvements to adjacent surface streets. These improvements would benefit the Port and overall regional freight mobility. At the Marine Drive on/off ramps to I-5, the Traffic Technical Report projects that the level of service (LOS) would be F in the No-Build Alternative and B in the replacement alternatives.

On I-5 in the vicinity of the Marine Drive interchange, congestion would occur for 4.75 hours southbound and 10.15 hours northbound in the No-Build Alternative versus 6 hours southbound and not at all northbound in the replacement alternatives.

The magnitude and application of tolls would affect the Port and its customers. Variable tolls are likely to benefit freight-dependent businesses and businesses, because the predictability of travel would increase as more travelers choose to avoid the higher tolls by traveling outside the peak periods. Although higher tolls increase operating costs for truck movements, it is expected that user benefits from reduced trip times and greater reliability would outweigh these operating cost increases. The greater the toll, the higher the operating costs for truck movements in and out of the Port.

5.6.5 Effects of Alternatives and Options on the Relative Competitiveness of the Two States

The build alternatives do not represent an inherent advantage for one state over the other. The project would result in an increase in the competitiveness of both states. Whether one state will benefit relative to the other will depend on the extent to which each region and state is able to effect policies that will allow them to capitalize on the transportation-related benefits of the project. An analysis of factors affecting employment growth in southwest Washington (Parsons Brinkerhoff 1999) reported that transportation infrastructure was one of many factors that affect the relative attractiveness of doing business between the two states. Others include state and local business taxes, development costs, zoning issues, and labor force education levels and availability.

What exactly would occur once capacity on I-5 is improved is unclear. The capacity improvement represents an opportunity for businesses, and the extent to which one state could gain at the expense of another would depend on other factors that are central to business location decisions.

5.6.6 Effects of Alternatives and Options on Changes in User Benefits to Trucking Industry

According to a study of the regional economic effects of transportation choke points (Cambridge Systematics et al. 2003), congestion at the I-5 bridge will increase the cost of delay to trucks by 140 percent, from $14 million in 2000 to $34 million in 2020. The build alternatives would result in user benefits to the trucking industry by reducing labor

costs, improving safety, potentially improving vehicle operating costs, and reducing scheduling uncertainty.

Truck volumes are anticipated to grow at a higher rate than general-purpose traffic (2.3 vs. 2.0 percent per year). While commuters can be served by alternative modes of travel (e.g., bus, rail), truck traffic generally cannot.

The replacement alternatives would improve geometrics such as uphill ramp grades, super-elevation, and merge distances. Truck speeds at interchanges and the merge points with I-5 would be higher than for the No-Build Alternative, resulting in improved truck travel speeds and less congestion from slow moving trucks.

The replacement alternatives are forecast to result in approximately 3.5 hours of congestion in the southbound direction and two hours in the northbound direction. This is substantially less than forecast congestion under the No-Build Alternative of 7.25 hours in the southbound direction and 12.75 hours of congestion in the northbound direction.

The reduced congestion will result in user benefits to the trucking industry and freight customers by reducing the cost of labor, fuel, and other operating costs. Safety improvements will lessen the likelihood of accidents, thus lessening their direct and indirect costs. Congestion relief and safety improvements are likely to result in improved reliability for goods shipped by truck. Improved reliability increases the value to shippers of trucking versus other modes of freight, providing benefits to the trucking industry.

Data from the Traffic Technical Report were used to prepare a rough estimate of truck user cost savings from the build alternative. As shown in Exhibit 5-33, it is estimated that the annual truck user cost savings from travel time reductions on I-5 from the replacement alternatives compared to the No-Build Alternative would be approximately $8 million (2007$) in 2030. A more in-depth analysis of truck user benefits would likely result in benefits greater than this amount for several reasons:

- This estimate includes only travel on I-5: substantial time savings is likely at improved interchanges and arterials leading to and from I-5.
- The estimate does not include truck user benefits other than travel time such as those from reduced crashes and reduced operating costs. A more in-depth analysis would probably result in added truck user savings from these potential benefits.

Exhibit 5-24. Annual Truck Travel Time User Cost Savings (2007$) on I-5 and I-205

	No. Trucks (4-hour peak)[a]	No. Trucks (2-hour peak)[b]	Time Saved/ Truck (min)[c]	Time Saved/ Day (hours) Peak Period	Time Saved/ Year (hours) Peak Period	Expansion factor = 3[d]
Trucks on I-5 Bridge						
No build						
Southbound AM	1,140	570				
Northbound PM	1,635	818				

	No. Trucks (4-hour peak)[a]	No. Trucks (2-hour peak)[b]	Time Saved/ Truck (min)[c]	Time Saved/ Day (hours) Peak Period	Time Saved/ Year (hours) Peak Period	Expansion factor = 3[d]
Build-replacement bridge						
Southbound AM	1,275	638	4	43	11,050	**33,150**
Northbound PM	1,895	948	18	284	73,905	**221,715**
Trucks on I-205 Bridge						
No build						
Southbound AM	840	420				
Northbound PM	575	288				
Build-replacement bridge						
Southbound AM	840	420	2	14	3,640	**10,920**
Northbound PM	575	288	0	0	0	**0**
Estimated 2030 Hours of Truck Travel Savings (hours)						**265,785**
Estimated 2030 Hours of Truck Travel Savings (dollars at $30/hour[e])						**$8,000,000**

[a] From the CRC Transportation Technical Report, Exhibits 4-14 Truck Throughput on I-5 Bridge (Year 2030), 4-16 Truck Throughput on I-205 Bridge (Year 2030), and 6-10 Peak Period 2030 Truck Volume – 2030 No Build.

[b] Assumes 2-hour peak trucks are 50% of 4-hour peak.

[c] From Exhibits 7-14 to 7-17. Assumes all trucks travel through entire corridor.

[d] Assumes travel time savings outside of 2-hour peak is two times the travel time savings during 2-hour peak.

[e] The Value of Travel-Time: Estimates of the Hourly Value of Time for Vehicles in Oregon 2005", ODOT, 2005, estimates heavy truck value of time at $29.50 in 2005 including inventory effects. http://www.oregon.gov/ODOT/TD/TP/docs/publications/ValueTravelTime2005.pdf

5.7 Regional Indirect Impacts of Added Capacity

This section addresses the potential for the proposed project to cause regional indirect economic impacts (segment indirect impacts are discussed in Section 5.3). Indirect effects from added transit and highway projects could occur throughout the region. In particular, where new or greatly improved interchanges are constructed, there may be pressure to allow a greater intensity of development than previously planned, or to allow commercialization where it was not previously planned. If access is enhanced due to additional highway capacity, businesses may choose to locate further from the urban core than otherwise assumed.

The CRC project addresses the growing travel demand and congestion in the I-5 corridor. Existing travel demand exceeds capacity in the Columbia River crossing area and interchanges upstream and downstream. This corridor experiences heavy congestion and long delays during afternoon peak travel periods and when crashes, vehicle breakdowns, or bridge-lifts occur. To avoid congestion in the I-5 corridor, some users take the sometimes longer, out-of-direction alternative, I-205 route to cross the Columbia River. Traffic also spills over onto arterials parallel to I-5 north and south of the crossing, such as Martin Luther King Boulevard and Intestate Avenue in Oregon, and Main Street, and Columbia Street in Washington. This behavior increases local congestion.

This section addresses the potential for induced growth as a result of increased highway capacity and transit capacity, and draws from findings presented in the Land Use Technical Report (CRC, 2007g).

5.7.1 Indirect Impacts of Added Highway Capacity

The potential for increased highway capacity to impact employment location decisions is sometimes referred to as induced growth. The Portland/ Vancouver area has a reputation for growth management and vibrant urban centers. Many local and regional decision-makers have listed sprawl as a significant public policy issue. The following sections present relevant published studies on induced growth and previous regional land use and transportation modeling results.

5.7.1.1 Literature Review

The Governor's Task Force for the I-5 Transportation and Trade Partnership appointed a Regional Land Use Assessment Committee in January 2001. The Committee worked with the larger Partnership in addressing the potential for induced growth.

Generally, the review found that communities at the edge of an urban area are most often affected by expansions of transportation infrastructure. The review also found that, as regions grow, each additional transportation investment has less impact on accessibility and therefore has less impact on development. Rather than opening up areas to new development, most current transportation investment projects provide only small accessibility enhancements in the context of the larger regional transportation system. Transportation projects have an incremental effect, but are unlikely to change *what* development occurs, instead facilitating development that *is already* allowed. The study concludes that local comprehensive plans and overall economic conditions have a more significant impact on land uses than capacity changes resulting from highway widening projects (CRC, 2007g).

Findings from published literature suggest that adding additional vehicular capacity within a well-planned urban area that has had, for decades, the full range of services and infrastructure is unlikely to have significant land use effects.

Studies published since 2001 were reviewed and are discussed below. Studies presented in this section do not represent an exhaustive literature review on land use effects, but are excerpt for their relevance to economic effects.

Economic Growth from Transportation Investments: Does it or doesn't it?

Weiss (2005) evaluated past research linking transportation investments with economic development. A 1970 FHWA report was referenced that showed more job growth from 1958 to 1963 in high density urban areas serviced by highways compared with job growth in similar areas without highway service. Other studies featured showed a link between poverty in Appalachian communities and distance from metropolitan areas and/or lack of improved highways. Despite findings that some studies have linked economic development with the existence of highway infrastructure, the report concluded that little conclusive evidence exists linking the existence of highway infrastructure with

particular types of economic development, or whether transportation investments also produce negative consequences as well. The significant impacts from highway construction were in areas previously unserved or greatly underserved by highway facilities. This is not the case in the CRC API.

Influence of Transportation Access on Individual Firm Location Decisions

Targa et al (2006) analyzed the relationship between transportation investments, business cost structure, and the decisions by firms on where to locate. The study used a firm-level econometric model to analyze data collected from web-based survey about individual firms in a four-county region of Maryland. It found that having access to major highways contributed to firms remaining at their present locations, and further extrapolated that land along primary highways is more attractive to firms when making location decisions.

The Cost of Congestion to the Economy of the Portland Region

The Economic Development Research Group (2005) prepared a study of congestion in the Portland area for the Portland Business Alliance, Metro, the Port of Portland, and ODOT. The study's findings conclude:

- Congestion currently threatens economic growth in the Portland region.
- Congestion problems are already reducing profits for local businesses.
- Failure to invest in the region's transportation system could create an $844 million annual value loss.

According to this study, increasing regional investment in transportation would create a $2 benefit for every dollar spent. Interviews conducted for this report found that local businesses have shifted their work shifts and deliveries to the early morning to avoid congestion, but as the period of congestion increases, businesses are left with an ever decreasing early morning window. Some businesses have increased their internal inventories to reduce disruption from missed deliveries. Still others have passed transportation cost increases to the consumer. Additionally, some have chosen to relocate outside of the region.

Many other regions are addressing the need to reduce congestion. The study recommends addressing congestion and mitigating future congestion growth to keep Portland competitive.

Washington SR 520 Indirect and Cumulative Effects Discipline Report

The Washington State Route 520 Bridge Replacement and HOV Project Draft EIS Indirect and Cumulative Effects Discipline Report, using a land use/transportation model called Dram/EMPAL, showed minor differences in the distribution of population and employment for the no build alternative relative to the build alternatives. The differences ranged from an increase of less than one percent to a decrease of less than 0.5 percent. The alternatives did show a slight difference in where population and employment growth may occur under both scenarios; however, the differences were minor. The report concluded that the forecasted distribution of population and employment growth without

the project would not be noticeably different from the distribution of population and employment growth that could occur under either of the build alternatives. There are similarities in the SR 520 project and the proposed CRC alternatives, and these findings appear applicable to the CRC alternatives.

5.7.1.2 Metroscope Modeling

The Governor's Task Force for the I-5 Transportation and Trade Partnership appointed a Regional Land Use Assessment Committee in January 2001. The Committee used the Metroscope, iterative land use/transportation model to evaluate the land use impacts of capacity and transit improvements in the I-5 corridor.

Metroscope modeling showed that population and employment growth in the region would be expected to develop in a more dispersed pattern than anticipated in current adopted plans even under a no-build scenario. High levels of congestion on the bridge would impede the region from functioning as a single economy. Development continues on the fringe of the Vancouver urban growth area, and the model shows transit has lower ridership as a consequence of the more dispersed development patterns.

Travel time savings with investments in the corridor were shown in the model to strengthen job growth along I-5. The study found that the investment of adding light rail (the only HCT mode studied at the time) and one additional through lane resulted in a 25 percent reduction in travel time between the key regional centers of downtown Vancouver and downtown Portland. The travel time savings studied in 2001 were found to redistribute one percent of regional employment to the I-5 corridor. This equates to 4,000 jobs for North Portland and 1,000 for Clark County. To a lesser extent, the investment was also found to increase job growth in the Portland City Center (CRC, 2007). However, VISSUM traffic modeling conducted in 2007 for the Traffic Technical Report concluded that lower travel time savings can be expected, with the replacement bridge projected to experience southbound travel times roughly the same as the no build scenario (CRC, 2007e).

The Metroscope modeling study estimated that land values near improved interchanges would rise. Other limitations arise from local plans and other factors such as protected air zones associated with Pearson Air Park and potential restrictions on building height placed by Portland International Airport. Subsequently, the airport serves to limit development intensities within the API.

The study concluded that adding light rail and an additional lane in each direction would not, without other regional policy and development changes, lead to sprawling land use patterns. According to Metroscope model results, approximately eight percent of new residential development would occur outside of established urban growth boundaries or without the investments in the I-5 corridor. Some of these areas projected for development have now been brought into the urban growth area.

The addition of capacity is unlikely to significantly induce growth within the region as the travel time savings of this improvement are a very small part of overall savings necessary to significantly shorten trip times between employment centers within the

urban fringe or beyond. Even in cases where I-5 corridor travel times may be reduced due to added capacity, the total commute time (e.g. from Clark County, Battle Ground, etc. to the Rose Quarter or Portland City Center) would be longer than an hour. It is possible that travel time savings could influence location decisions; however, as reported in published literature, growth management plans, zoning, and economic conditions are more likely to influence development.

6. Temporary Effects

6.1 Introduction

This section considers the positive and negative economic impacts that may occur during construction of the project. Construction of any of the build alternatives has the potential to cause economic impacts by blocking visibility and access to businesses, causing traffic delays, and rerouting traffic on detours that increase travel times and make access to some locations difficult. Specific staging plans would not be developed until an alternative is selected and the details of the alternative receive further engineering and planning. The Construction Methods report (CRC 2007a) describes how each alternative is likely to be constructed in concept, and the likely impacts of this construction.

Construction of any of the build alternatives could result in increased employment and spending in the project area during construction. The extent of these effects depends on the source of project funding and the makeup of work crews used during project construction. Funds from local or regional sources are transfers, which could be spent by residents and businesses on other economic activities. Federal or state funds that are new to a region can have a measurable economic effect on employment and income gains resulting from project construction. The federal government and the states of Oregon and Washington would provide the funds for the CRC project, thus, resulting in some income and job benefits in the region that would otherwise not occur (and during operations, tolls from out-of-region users would help repay bonds). Project construction is anticipated to take between six and nine years. During construction, some construction products would be purchased locally and some local firms and workers would be involved in construction. However, firms located outside the API would provide most of the workers and supplies, thus lessening the beneficial effects in the API compared to what would occur if those inputs were provided locally.

6.2 Potential Positive Economic Impacts from Construction

Input-output analysis was used to measure the economic impacts associated with construction of the build alternatives on the six-county regional economy using 2006 data files purchased from the Minnesota IMPLAN Group. IMPLAN multipliers for the six-county area and 2007 project construction cost estimates were used to estimate direct, indirect, and induced effects. Input-output analysis is an analytical framework that allows an analyst to quantify the multiple economic effects that result from a change in final demand for a particular product or service. Note that this framework does not provide an analysis of user costs and benefits, economic development, or other perspectives that could be taken when considering the economics of the project.

Expenditures on construction result in demand for construction materials and jobs. These expenditures are referred to as direct impacts. Direct impacts lead to indirect impacts as the output of firms in other industries increases to supply the demand for inputs to the

construction industry. Finally, wages paid to workers in construction trades or supporting industries are spent on other goods and services; these are referred to as induced impacts. The sum of direct, indirect, and induced impacts represents the total economic impact of the project to the region.

Not all of the spending on the project will result in benefits over and above what would have occurred without the project. In impact analyses it is generally assumed that only project activities funded by out-of-region sources (net expenditures) will result in new expenditures and employment. As funds are raised from regional sources to pay for the project, residents and businesses have that much less income to spend on other goods and services in the regional economy. Such expenditures do not represent new economic activity, but rather a shift in the local economy's product mix. For the purposes of this project, it is assumed that net economic benefits will result only from the assumed inflow of federal and state funds that would have otherwise not been spent in the region.

6.2.1 Value Added from Project Construction

Exhibit 6-1 presents total direct expenditures for the project, and an estimate of the positive regional economic impacts that would result from those expenditures. In order to estimate within-region benefits, total direct expenditures are multiplied by an estimated 70 percent of transit construction and 100 percent of right-of-way and road construction that would accrue to businesses and workers within the 6-county region (Multnomah, Washington, Clackamas, Yamhill, and Columbia and Clark counties). Current estimates show that the CRC project would be provided with federal and state grant funding for 67 percent of the direct expenditures in the 6-county region. As a result, estimated net direct expenditures in the 6-county region are approximately $1.62 billion for the replacement alternatives and $1.47 billion for the supplemental alternatives.

The total direct, indirect, and induced impacts of project construction are then calculated by multiplying net direct expenditures by input-output multipliers (Type SAM) for the 6-county region. Type SAM multipliers are the total production requirements of all industries within a given region to meet demands triggered by $1 of consumption of the goods and/or services produced by a specified industry. The result of the analysis is estimated value added impacts (i.e., payments made by industry to workers, interest, profits, and indirect business taxes) to the regional economy of $2.74 billion for the replacement alternatives and $2.49 billion for the supplemental alternatives.

Note that these impacts would occur over the 11 to 12-year period required for planning, design, and construction of the replacement and supplemental alternatives, respectively.

Exhibit 6-1. Regional Economic Impacts of Project Construction

Alternative	Total Direct Expenditures (Billion 2007$) [1]	% in 6-County[1]	6-County Direct Expenditures (Billion 2007$)	% Federal Funding[1]	Net Direct Expenditures (Billion 2007$)
Right-of-Way	$0.12	100%	$0.12	0%	$0.00
Road Construction	$1.92	100%	$1.92	67%	$1.28
Transit Construction	$0.73	70%	$0.51	67%	$0.34
Total	**$2.77**		**$2.55**		**$1.62**
Supplemental Bridge					
Right-of-Way	$0.14	100%	$0.14	0%	$0.00
Road Construction	$1.80	100%	$1.80	67%	$1.20
Transit Construction	$0.58	70%	$0.40	67%	$0.27
Total	**$2.51**		**$2.34**		**$1.47**

	Type SAM Value Added Multiplier[2]	Total Indirect and Induced Impacts (Billion 2007$)	Total Impacts to Regional Economy (Billion 2007$)
Replacement Bridge			
Right-of-Way	N/A	$0.00	$0.00
Road Construction	1.72	$0.92	$2.21
Transit Construction	1.59	$0.20	$0.54
Total		**$1.12**	**$2.74**
Supplemental Bridge			
Right-of-Way	N/A	$0.00	$0.00
Road Construction	1.72	$0.86	$2.06
Transit Construction	1.59	$0.16	$0.43
Total		**$1.02**	**$2.49**

[1] CRC, 2007.

[2] Minnesota IMPLAN Group, Inc, 2007.

6.2.2 Employment Impacts

Estimated employment impacts due to project expenditures are shown in Exhibit 6-2. Approximately 19,800 direct total person-year jobs are expected for design and construction of the replacement alternatives and almost 18,000 for the supplemental alternatives. These estimates are based on 2007 CRC cost estimates and expenditure per employee estimates from FHWA (2003) and CH2M HILL (2007).

As presented in Exhibit 6-2, it is assumed that 70 percent of transit construction and all road construction and right-of-way employees would be provided within the 6-county region. The estimated percent of construction and vehicle assembly workers hired from the region was provided by the CRC project team.

The total regional employment impact (net new jobs) was calculated by multiplying the 6-county direct employment impact by a 67 percent share of federal funding (for road and transit construction) and by Type SAM employment multipliers. The result is an

estimated 21,152 annual person-year jobs (1,923 annually) in the 6-county region for the replacement alternatives and 18,984 new jobs (1,582 annually) for the supplemental alternatives.

Exhibit 6-2. Employment Impacts of Project Construction

	Total Direct Employment (person-year jobs) [1]	% in 6-County [1]	6-County Direct Employment (person-year jobs)	% Federal Funding [2]	Net Direct Employment (person-year jobs)
Replacement Bridge					
Right-of-Way	530	100%	530	0%	0
Road Construction	13,949	100%	13,949	67%	9,299
Transit Construction	5,353	70%	3,747	67%	2,498
Total	**19,832**		**18,226**		**11,797**
Supplemental Bridge					
Right-of-Way	611	100%	611	0%	0
Road Construction	13,036	100%	13,036	67%	8,690
Transit Construction	4,267	70%	2,987	67%	1,991
Total	**17,914**		**16,633**		**10,682**

	Type SAM Employment Multiplier[3]	Total Indirect and Induced Employment (person-year jobs)	Total Regional Employment (person-year jobs)	Annual Regional Employment
Replacement Bridge				
Right-of-Way	N/A	0	0	0
Road Construction	1.66	6,152	15,451	1,405
Transit Construction	2.28	3,203	5,701	518
Total		**9,354**	**21,152**	**1,923**
Supplemental Bridge				
Right-of-Way	N/A	0	0	0
Road Construction	1.66	5,749	14,439	1,203
Transit Construction	2.28	2,553	4,545	379
Total		**8,302**	**18,984**	**1,582**

[1] CH2M HILL, 2007; FHWA, 2003.

[2] CRC, 2007.

[3] Minnesota IMPLAN Group, Inc.

6.3 Temporary Effects to Marine Commerce

The Construction Methods report and other CRC documents discuss the potential effects that construction of the crossing structures may have on marine commerce. As noted in Section 5, nearly 10 million tons of freight in over 9,500 movements passed under the I-5 bridge in 2005. Construction of the crossing is expected to occur over a six to nine year period. Construction barges would be anchored in the river, and support barges traveling to and from supply points would potentially create conflicts with freight. Some likely effects to marine commerce follow:

- The duration of in-water construction is projected to be nearly 6 years for the replacement alignment. The supplemental alternatives should result in less in-water time than either of the other alternatives, perhaps as short as 3 years.
- The lift span channel would close for a 2-month period under all alternatives. This channel is one of three channels available to marine commerce and during construction efforts will be made to keep at least one channel open at all times.
- The 300-foot channel is expected to close for a 3-month period; after this there could be room for selected river traffic, but it would be on a case by case basis and require coordination to maintain safe and effective working conditions. This channel is one of three channels available to marine commerce and during construction efforts will be made to keep at least one channel open at all times.
- Marine commerce may need an extra tow to help maneuvering during construction, which will carry an extra cost.
- Temporary river travel restrictions are anticipated in all alternatives as barges are used to ferry materials to and from work sites.

Successful maintenance of marine commerce would require close coordination between boat captains, shipping companies, and project construction managers.

6.4 Segment A: Delta Park to Mill Plain District

6.4.1 Impacts Common to All Alternatives

Construction of any of the build alternatives has the potential to cause economic impacts by blocking visibility and access to businesses, causing traffic delays, and rerouting traffic on detours that increase travel times; negatively affecting travel time reliability, and making access to some locations difficult. More specific staging plans would not be developed until an alternative is selected and the details of the alternative receive further engineering and planning. Likely economic effects are drawn from the Construction Methods Technical Report.

Final staging plans will provide for the following, to the greatest extent practicable:

- Minimizing traffic delays and disruptions by scheduling lane and road closures during the evening and weekend periods.
- Providing continued access to properties during construction.
- Constructing new elements outside of the existing road system to minimize closures and disruptions.
- Minimizing construction-related impacts such as traffic, noise, and decreased air quality on neighborhoods.

Most potential impacts would be common to all alternatives. Impacts that would be isolated to one area are summarized by location: Marine Drive Area, Hayden Island, and South downtown Vancouver. Preliminary design is nascent, and specific mitigation measures for each area of impact cannot be defined. Tradeoffs between extending

construction work to complete an item of work sooner, versus a longer and potentially more disruptive timeline to perform the work during restricted night hours would influence mitigation decisions and procedures.

Traffic congestion is already a common occurrence within the corridor during peak hours and adjacent construction activities and temporary alignments would extend the peak duration, negatively impacting businesses whose employees commute using Segment A. Likewise, freight, goods, and services travel would be negatively affected. If construction activities make travel times more difficult to determine, many freight shippers and businesses that rely on just-in-time delivery would be negatively affected. Because most motorists during the peak are commuters, many of them would be able to adapt quickly to announced changes in travel routes or construction activities. Other motorists, who travel the corridor infrequently or on a part-time basis, would have more difficulty adapting. Through effective communication strategies and advanced signing, motorists would be warned about delays and some may avoid the API entirely, which could negatively affect patronage of local businesses.

Apart from periods of lane closures, I-5 would have three travel lanes in the north and southbound directions. However, lanes would be narrowed to 11 feet with only 1 to 2 feet of clearance from barriers in certain staging scenarios. Vertical and horizontal alignments may need to be compromised from desirable standards at various stages as well. Replicating present conditions for merging traffic at the interchanges would be the goal; although in several instances it is anticipated that shorter merges and deletion of add or drop lanes would be required. All of these construction impacts would worsen congestion, and make travel more difficult, especially freight or larger vehicles that already have a difficult time with weaving distances under existing conditions.

Ramps within the interchange areas would be the most affected, with less than desirable horizontal and vertical alignment during the construction phase. This would worsen off-peak congestion and would further slow speeds as motorists react to the changed alignments. Designing detours for higher speeds by increasing super-elevations may not be practical as the peak traffic would be operating under stop and go conditions. Trucks carrying any loads may be subject to overturning if super-elevations are designed for higher speed traffic on tight radii. This could present additional dangers for area commuters and residents, especially if trucks were carrying hazardous material. This would increase travel times for all roadway users, most affecting freight. Details of the design speed will be addressed during the design phase.

Major events proposed for Portland International Raceway, the Expo Center, the Fort Vancouver Fireworks Show, and other community celebrations would require substantial communication and could require certain restrictions to work periods. Nonetheless, congestion and alignment changes could be discouraging enough to some potential patrons that they may avoid the event, depressing attendance. Restrictions to work periods may not be practical in all cases, as weekend work may be necessary to keep the project on a tight timeline. CRC project managers and local agencies and event planners could devise individual strategies to lower the impacts to such events by advance communication of schedules.

Economic impacts to businesses located in the Marine Drive area, Hayden Island, and South downtown Vancouver may occur in varying degrees. Access restrictions or difficulties may divert customers and clients and hamper deliveries. Most traffic movements would remain open for any alternative throughout the construction stages. Those movements that would be closed are noted in the sections pertaining to that area.

Removing the existing I-5 bridge structures must be done in sections to accommodate staging needs, protect active traffic lanes, and minimize the time a lane or movement is closed. All movements would be subject to total closure during removal operations. Ideally at least one lane in each direction of I-5 would be open at all times, though there may be rolling stops or slowdowns. However, for safety considerations or for completion of a removal phase, it may be necessary to close I-5. Weekends would be prioritized for such situations, but an extended weekend timeframe may be necessary. In the event that I-5 is closed, it would have substantial impacts to area businesses whose employees depend on I-5 to commute to work; and to national, regional, and local businesses that use I-5 to transport goods and services. Traffic would divert to the local network and I-205, which would cause substantial congestion and out-of-direction travel. The necessity to close I-5 would not be known until final alignments and plans are developed.

Traffic control setup and takedown is time consuming. The 55-hour work period on weekends (10 p.m. Friday to 5 a.m. Monday) and the reduced efficiency of night work would in some cases not provide enough time to accomplish necessary work. Safety and productivity increase immensely when contractors are afforded extended periods, to an extent that cannot be overstated. The ability to close lanes and ramps on an extended basis would have a positive effect on construction timelines, but would negatively impact businesses whose employees commute on weekdays to work, other users of the roadway, and would affect retail patronage, freight travel, and services delivery.

6.4.1.1 Marine Drive Area

The interchange area of Marine Drive has enough room to stage a substantial portion of construction activities. The area under and adjacent to the existing I-5 alignment between Marine Drive and North Portland Harbor would be needed for detour and staging needs. Access would be eliminated for those parcels west of I-5 in this vicinity, including a sand and gravel operation, a boat builder, and parking for moorage tenants. The loss of this access could be substantial for these businesses, as alternate access does not currently exist. As plans are refined, the provision of alternate access would mitigate impact to these businesses. Outreach to the businesses to determine access and site circulation needs would be important. Without the provision of alternate access, loss of access to Marine Drive may prevent the firms from doing business.

West of the I-5, the Expo Center parking lot may also provide opportunity for staging sites. However, use of the Expo Center site may be limited due to parking needs of the center and needs of the transit station. The center would be impacted due to a detour for the west end of Marine Drive through the Expo Center parking lot, which would result in a loss of available parking. No structures would be affected by the detour. Parcels east of I-5 would have access and are not anticipated to require acquisition.

Property owned by the Port of Portland has river access on the south side of North Portland Harbor west of I-5, and has potential to be used for a casting yard and material storage. For marine work, property near Kelley Point Park is probably the most suitable.

Marine Drive east and west and Martin Luther King Jr. Boulevard north and south serve as the major corridors in and out of the construction areas. North Portland is home to a large number of manufacturers on both sides of I-5, particularly in the Rivergate and Airport industrial districts. Marine Drive is a key commercial and industrial route. Routing construction traffic on the major corridors, and having construction related detours on Marine Drive would make operations of these businesses more difficult.

6.4.1.2 Hayden Island

Hayden Island provides staging opportunities in areas of new right-of-way or easements that would be required for the facilities. Right-of-way acquisitions would in some cases result in the complete purchase of a parcel of land, not all of which would be used for physical highway or transit improvements. Excess land could be used as staging areas. Therefore, permanently impacted areas could be used for short-term needs, limiting temporary effects due to construction. In some cases, construction easements would need to be obtained for staging purposes. At this time, the grocery store east of I-5 is anticipated to be a complete acquisition under any build alternative and could be used as a staging area; however this grocery store is important to the local community and efforts would be made during the design process to avoid or minimize this impact. West of I-5, parking lots for the Jantzen Beach Mall may provide staging areas if the parking areas are not needed to serve mall stores or for redevelopment of the mall itself. Hotel properties east and west of I-5 at the north end of Hayden Island provide opportunities for staging, which would primarily impact parking areas. During site visits, project staff observed that parking for these hotels was underutilized, meaning that all of the parking areas may not be needed to serve the hotels.

Construction of the project would require nearby sites with river access for a casting yard and material storage. On Hayden Island, west of the railroad tracks and adjoining the Columbia River is a potential site, owned by the Port of Portland. The Port has used the site as a heavy equipment training area.

6.4.1.3 South Downtown Vancouver

Any build alternative would at times require detours from I-5 into downtown Vancouver from the south and east at the SR 14 interchange. A concerted effort to provide informative and timely signing along with advanced communication and publicity would help alleviate impacts to businesses in downtown Vancouver. Community outreach that involves the individual businesses on a partnership basis would help to define the nature and work hours of the businesses and allow construction activities to be scheduled with the least impact to peak business hours or seasonal activities and major events. Nonetheless, businesses depending on customers, clients, goods and employees from the south and east may experience less patronage, and could lose sales during construction activities that prohibit access or make it more difficult.

SR 14 has suitable room to stage a substantial portion of construction activities, which would limit impacts to adjacent parcels. Staging areas providing access from the north

side of the river would be desirable. For the replacement alignment, the current motel/restaurant property west of I-5 may be redeveloped and construction easements may be obtainable.

The old Vancouver Shipyards, approximately 1.5 miles upstream from the project, provides potential opportunity for a casting yard and material storage with river access. However, most of this site is occupied by a business park, which may preclude its use. Opportunities also exist 3.5 and 4.5 miles downstream from the I-5 corridor in the Port of Vancouver and Vanaclo properties. A closer site, once occupied by Boise Cascade, should be considered, but redevelopment plans are being finalized and the property may not be available at the time of construction.

Most current directional movements would be accommodated in the staging scenarios. However, some movements may need to be closed for durations of a week to a month in order to complete a phase of construction. SR 14 into and out of downtown Vancouver would need to be closed, and traffic would be rerouted (most likely to Columbia Way) for much of this interchange construction duration.

SR 14 eastbound and Columbia Way would serve as the major corridors into and out of construction areas. Columbia Way would become the main access into an industrial area that could be used for staging purposes. As such, Columbia Way could become a heavily used haul route, more so than other local roadways. Since Columbia Way may also be used as a detour route, the combination would contribute to congestion on this route and may make access to adjacent parcels more difficult. Adjacent businesses on Columbia Way would be negatively affected by the congestion and difficulty in access. These businesses include restaurants and a motel/restaurant that may be redeveloping at the time of construction.

Outreach to businesses affected by construction and assistance programs could help mitigate potential negative construction related effects. Programs to help affected businesses could include business planning assistance, low-interest loans, marketing and retail consulting, business-oriented workshops, and special promotions to generate patronage in construction areas.

The City of Vancouver is planning to establish a Growth and Transportation Efficiency Center (GTEC). The GTEC could develop a construction communication plan to tell drivers, transit riders, cyclists, and pedestrians about detours, road closures, and direct them to downtown businesses.

6.4.2 Impacts Unique to Transit Alternatives and Options

This section discusses impacts unique to the transit options in Segment A. The most substantial difference between the alternatives would be duration of the construction period. The replacement alignment would allow all three river crossing structures to be constructed simultaneously. Under the replacement alignment, HCT systems could be operational within about three years. For the supplemental crossing, transit could be operational within about three and-a-half years. Thus, negative construction related effects would continue for a longer duration in the supplemental alternative.

Construction methods and schedules for the transit guideway, stations, and park and rides would depend upon location, major alignment, and choice of transit mode. Even with

these variables, the transit guideway on land could be completed prior to finishing the transit bridge, allowing full transit operation upon bridge completion.

LRT construction not only takes longer, but would have more impacts than BRT. Utilities (water, sewer, stormwater, electrical, and communications) underneath the roadway would need to be relocated before building the road surface and track to support the weight of a two-car train. Utility relocation could cause negative impacts for businesses beyond LRT routes alone. Additionally, LRT would require construction of overhead wires to provide electrical power to trains.

Transit construction methods are not yet determined, and will be designed during later phases of the project after a HCT mode (BRT or LRT) and an alignment are chosen. The following general activities are likely, but actual construction methods and sequencing will not be known until more design is completed. Because the project spans different urban settings, construction of the transit guideway would vary throughout the project area, and would depend upon the major alignment choice and mode.

The BRT replacement bridge option is estimated to take 5 years for the Vancouver alignment and 6 years for the I-5 alignment. LRT replacement option is estimated to take 7 years for the Vancouver alignment, and 6.5 years for the I-5 alignment. Since LRT construction would take longer than BRT construction, negative construction related effects are expected to be greater for the LRT mode.

It may be feasible with either alignment option to build portions of the high-capacity Transit infrastructure as a first phase of work. The structure could be used for HCT or for vehicles during the construction sequences, which could be determined as more detailed plans are developed. An additional advantage would be to provide pedestrian and bicycle movement between the states and island, while keeping them out of the construction zone. These are positive effects of staging HCT early in the process.

There are three proposed stages of construction. Temporary impacts of the various alternatives are discussed below in terms of these stages. Stage 1 would entail work compatible with existing features or needed before construction of one direction of the new I-5 bridge structure. Stage 2 would entail constructing one direction of I-5 and work needed before construction of the opposite I-5 direction. Stage 3 would entail constructing the remaining I-5 direction and completing work in that area.

6.4.2.1 Vancouver HCT Alignment Construction

Construction in downtown Vancouver and on northern Vancouver streets would affect access to local businesses, and has the potential to result in proximity effects (noise, dust, visual). In response, construction methods would need to be sensitive to the area's active urban environment. Multiple small work zones could focus construction activity and reduce the duration of disturbance to adjacent businesses and residents. Streets would be open to traffic and pedestrians when possible, but would likely need to close during some construction activities. The construction sequencing of the new MAX tracks being built in downtown Portland is a good example of how construction could occur in this area, though the BRT option would be less disruptive and generally require less time.

6.4.2.2 I-5 HCT Alignment Construction

The I-5 transit alignment would likely include a different construction approach, and require different activities than construction on local streets. North of the Clark college Park and Ride the transit guideway would tunnel under the Fourth Plain interchange. This tunnel would likely be dug as a trench, replacing dirt and other cover after construction of the tunnel. North of Fourth Plain Boulevard, the transit guideway would be in existing I-5 right-of-way, allowing more freedom to construct it, with less potential to obstruct traffic or disturb businesses and residents. An elevated structure would be built to carry HCT over the SR 500 interchange and across I-5 to the Kiggins Bowl Park and Ride. This transit alignment would require additional highway construction on I-5 to shift the roadway alignment slightly west. Compared to impacts from the Vancouver HCT alignment, the I-5 HCT construction would not have as much effect on local businesses, but it would result in greater negative effects on a regional scale, because impacted areas are higher volume arterials and highways.

6.4.2.3 Replacement

Replacement bridge construction staging is anticipated to be substantially shorter in duration than the supplemental options, because the replacement alignment would allow all three river crossing structures to be constructed simultaneously. With the replacement alignment, the HCT bridge would be usable after approximately 18 months. The northbound Interstate Bridge would be usable after about 30 months, and the southbound Interstate bridge would be available after approximately 53 months (4.5 years). In Stage 1, the HCT structure and approaches would be constructed, which could be used initially for vehicles, transit, or pedestrian and bicycle access as a construction mitigation measure. Stage 1 construction would include HCT infrastructure across Hayden Island and North Portland Harbor. Construction would be disruptive to businesses, especially in the downtown Vancouver area. For the replacement alignment, HCT could be operational within about three years, and the highway and interchange projects would be completed within about five years.

6.4.2.4 Supplemental

For the supplemental crossing, transit could be operational within about three and a half years. The southbound highway crossing would be complete in about two and a half years, and the northbound crossing retrofits and all interchange construction would be finished in about six years. This alternative would also prolong the user costs of lengthened travel times from reduced roadway capacity and detours during construction, which would increase vehicle operating costs and air pollution. The longer construction period would cause greater overall costs to users and would delay capacity related user benefits compared to the replacement alternative.

6.4.3 Impacts Unique to Highway Alternatives and Options

The most substantial difference between the alternatives would be duration of the construction period. The replacement alignment would allow construction of all three bridge structures simultaneously.

6.4.3.1 Replacement

Existing right-of-way would provide staging areas for the replacement alignment, which would lessen construction related impacts.

6.4.3.1.1 Columbia River Structures

The Columbia River structures for the replacement alignment are anticipated to be constructed in Stage 1. Stage 1 would include constructing northbound and southbound structures. The new structures would open to I-5 traffic to the extent allowed by construction on the adjacent, existing bridge. The ability to construct simultaneously the bridge structures, rapid transit structures (which could be used temporarily for vehicular traffic), and approaches would substantially reduce negative regional and local construction related impacts. More rapid completion would minimize impacts to commuters, freight travel, motorists traveling through the I-5 corridor for shopping or entertainment, and other regional or long-distance travel.

The existing I-5 southbound structure would be demolished in Stage 2. All I-5 traffic would be directed to the new I-5 southbound structure, except for the I-5 northbound to SR 14 eastbound movement, which would remain on the existing I-5 structure until the new structure is completed. Commuters traveling this corridor daily would be able to quickly adjust to these changes, but increased congestion is expected because the number of lanes in each direction would be reduced, and congestion is already experienced under existing conditions. Travel time reliability for freight and services would be negatively affected both because of increased congestion and periodic changes to alignments resulting from construction on the adjacent structure.

In Stage 3, the new northbound structure would be completed and the existing I-5 northbound structure would be demolished, allowing the I-5 northbound to SR 14 eastbound movement on the new northbound structure.

6.4.3.1.2 SR 14

Construction on SR 14 could affect downtown Vancouver as well as access east of downtown Vancouver. Negative effects on businesses would results from increased congestion on adjacent roadways, access difficulties from detours and congestion, and negative effects from noise and vibration that would disrupt daily activities or make them difficult. Effective communication strategies and advanced signing would alert motorists about delays, but may cause motorists to avoid the area entirely.

In Stage 1, the Evergreen Boulevard structure would be built, which would affect Officers Row, a registered historic district that has many service related businesses such as real estate brokerages and dentist offices. Access to these businesses may be more difficult because of construction activities. The Construction Methods report states that in Stage 1, the I-5 northbound to C Street interchange, which currently provides access to downtown Vancouver, would be closed and removed. It is understood from the project team that access to downtown Vancouver from I-5 will be retained through construction. This access would be important to downtown Vancouver businesses. Likewise the Washington Street to SR 14 eastbound interchange would be closed, which currently provides access from downtown Vancouver to areas in east Vancouver and Camas. The

provision of some detour access from downtown Vancouver to SR 14 or a parallel eastbound route would minimize construction related impacts to downtown Vancouver employers, retailers, and other businesses.

Other Stage 1 elements would include connecting SR 14 westbound to I-5 northbound to allow retention of that movement, which is important to regional travel. The I-5 northbound to SR 14 eastbound interchange would be partially constructed, and retaining this movement would be critical to commuting employees, as points east of SR 14 are largely residential and points south of I-5 in Vancouver are employment destinations. The movement of SR 14 westbound to I-5 southbound, critical to businesses with employees who commute via I-5, would be retained using a newly constructed tunnel. Construction would be accelerated as practicable to minimize closure of the I-5 southbound to SR 14 eastbound movement, which is important to commuters and good and services delivery to eastern Vancouver and Camas.

In Stage 2, the C Street to I-5 southbound interchange would be constructed. Temporary construction related activities would impact local businesses by making access more difficult, but opening this movement as quickly as possible would benefit local downtown businesses in the long run.

In Stage 3, all I-5 traffic would move to the new southbound alignment, except that I-5 northbound to SR 14 eastbound would be kept on the existing I-5 northbound segment. In Stage 3, the bridge structures would be completed, and remaining ramp structures and roadways would be built and opened.

6.4.3.1.3 Hayden Island Interchange

Construction of the Hayden Island Interchange would affect Jantzen Beach Mall, which is home to many large retailers and restaurants (west of I-5), and retailers, restaurants, and grocers east of I-5. In Stage 1, southbound collector-distributors from I-5 to Tomahawk Drive, and from Tomahawk Drive across North Portland Harbor would be constructed. Tomahawk Drive provides access to many restaurants, bars, a hotel, and businesses such as a copy shop and a car wash. Constructing a collector-distributor would disrupt businesses, but retaining access to Tomahawk Drive during the construction of Hayden Island Interchange would be critical to these businesses. A detour would be provided to Hayden Island Drive, which is important to retaining access to retail businesses in Jantzen Beach Mall. In general, reducing the number of lanes and lane widths would slow travel speeds, and increase travel times and variability, which would be especially difficult for larger vehicles such as freight trucks.

In Stage 2, I-5 traffic would shift to North Portland Harbor structure with three 11-foot lanes southbound, and four 11-foot lanes northbound. Later in Stage 2, I-5 traffic would be diverted to the new I-5 southbound structure, and detours would be constructed to accommodate movements to Hayden Island and Marine Drive. Shifting I-5 traffic to the new I-5 southbound structure would require 11 foot lanes.

In Stage 3, Jantzen Drive connections and detours of I-5 northbound on and off Hayden Island would be constructed. Retaining full access to businesses east and west of I-5 on Hayden Island is critical to the function of these businesses.

6.4.3.1.4 Marine Drive Interchange

Throughout construction, maintaining access would be critical to minimizing business impacts to the Expo Center, industrial and maritime uses in North Portland Harbor area, hotels, restaurants, and industrial uses east of I-5. In Stage 1, the Marine Drive west side detour would be constructed, which would require a construction easement in the Expo Center parking lot. The loss of parking may negatively affect the Expo Center in the event that parking demand exceeds available parking. Often, the Expo Center has a parking surplus. A detour from Martin Luther King Boulevard to Marine Drive would be constructed, which may negatively affect commercial and retail businesses on Martin Luther King Boulevard in terms of access and noise effects.

Retaining access would be important to industrial facilities in the area that use Marine Drive to access I-5. Construction sequencing could maintain this connection through the use of detours and shifting traffic to newly built structures. In Stage 2, I-5 northbound to Marine Drive structures would be completed and opened, which would benefit industrial traffic In Stage 3, Marine Drive eastbound and westbound to I-5 northbound would open.

6.4.3.2 Supplemental

Under the supplemental alternatives, the southbound highway crossing would be complete in about two and a half years, and the northbound crossing retrofits and all interchange construction would be finished in about six years. The interchange designs created by the vertical disparity between existing and new I-5 structure would extend construction at SR 14 and on Hayden Island. This would lengthen the construction period of supplemental alternatives approximately six years, similar to the downstream replacement crossing, which has a construction duration of a little more than five years.

This alternative would also prolong the user costs of lengthened travel times from reduced roadway capacity and detours during construction (which would increase vehicle operating costs and air pollution).

6.5 Segment B: Mill Plain District to North Vancouver

6.5.1 Impacts Common to All Alternatives

Research conducted by Siethoff and Kockelman suggests that “construction-associated impacts can reduce [property] values in the short term” (2002). During construction of this project, noise levels could negatively affect property values of a small number of residences and businesses. However, because construction would not be concentrated in one area for an extended period of time, these effects would not be lengthy in duration. In the short term, although property values could be lower than what they would have been without construction, they are likely to recover shortly after completion of the build alternative (Siethoff and Kockelman 2002).

6.5.2 Impacts Unique to Transit Alternative and Options

Transit construction is not yet determined because methods will be designed during later phases of the project after a mode (BRT or LRT) and alignment is chosen. The following general activities are likely, but actual construction methods and sequencing will not be

known without further design refinement. Because the project spans different urban settings, construction of the transit guideway would vary throughout the project area.

Construction on Vancouver streets would need to be sensitive to the complex active urban environment of this area. Multiple small work zones, each spanning short segments of the alignment, could focus construction activity and reduce the duration of disturbance to adjacent businesses and residents. Traffic and pedestrians would be allowed on streets when possible, but would likely need to be rerouted during some construction activities. As a result, customers may decide to patronize businesses in another area, resulting in decreased sales to those businesses.

The I-5 alignment would likely include a different construction approach, and require different activities, than construction on local streets. North of the Clark College Park and Ride the HCT guideway would tunnel underneath the Fourth Plain interchange. This tunnel would likely be dug as a trench, replacing dirt and other cover after constructing the tunnel. As a result, customers may decide to patronize businesses in another area, resulting in decreased sales to those businesses.

North of Fourth Plain Boulevard, the HCT alignment would be in existing I-5 right-of-way, allowing more freedom to construct the guideway with less potential for obstructing traffic or disturbing businesses and residents. An elevated structure would be built to carry HCT over the SR 500 interchange and across I-5 to the Kiggins Bowl Park and ride. The impacts in this area are expected to be minor as the area is mainly residential.

LRT would require more construction than BRT, and as a result, would likely have a greater short-term impact. Underground utilities (water, sewer, stormwater, electrical, and communications) would need to be relocated before rebuilding the road surface to support the weight of a two-car train. Additionally, LRT would require construction of a track and overhead catenary wires to provide electrical power to the trains. While every effort would be made to maintain access and parking during construction within Segment B, it is possible that parking and access to some businesses in the vicinity of construction activities would be impeded. Effective communication strategies and advanced signing would be provided to alert motorists about delays and reduced access.

6.5.3 Impacts Unique to Highway Alternatives and Options

Construction of each alternative would be similar within Segment B. Construction impacts would temporarily increase congestion, which could change access for businesses and residents in the vicinity of construction activities. Most congestion impacts related to construction within Segment B would occur at the Mill Plain interchange, McLoughlin Boulevard over-crossing, Fourth Plain interchange, and the SR 500 and 39th Street interchange. Access to and from I-5 within those areas may be difficult and time consuming. Although specific types of disruptions and detours have not yet been determined, customers may decide to patronize businesses in another area, resulting in decreased sales to those businesses. While every effort will be made to maintain access and parking during construction, it is possible that parking and access to some businesses near construction activities would be impeded. Effective communication strategies and advanced signing would be provided to alert motorists about delays and reduced access.

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7. Mitigation for Long-Term Effects

7.1 Introduction

The build alternatives would result in positive economic impacts in the API by reducing congestion on I-5 and facilitating the movement of traffic, particularly freight truck traffic, between the Marine Drive corridor and I-5. The bulk of potential negative economic impacts identified in this report result from business displacements, losses in parking, or changes in access to businesses. This section identifies several measures that could be considered to avoid or mitigate the potential impacts.

7.2 Mitigation Common to All Build Alternatives

Business displacements from right-of-way, losses in parking, and changes in access identified in this report are based on preliminary design for the build alternatives. More detailed design for any of the alternatives will seek to reduce the amount of land that must be acquired for right-of-way and to avoid acquiring businesses where possible.

For those businesses displaced by the project, ODOT and WSDOT will provide a relocation assistance program. The federal "Uniform Relocation Assistance and Real Property Acquisition Polices Act of 1970" and the "Uniform Relocation Assistance Amendments of 1987" ensure the fair and equitable relocation and reestablishment of persons, businesses, farms and nonprofit organizations displaced as a result of federal or federally assisted programs. This is done so that displaced persons will not suffer disproportionate injuries as a result of projects designed for the benefit of the public as a whole.

7.3 Mitigation in Segment A: Delta Park to Mill Plain District

The project team will coordinate with the City of Portland Office of Transportation, Bureau of Planning, the PDC, and business owners on Hayden Island (through the development of the Hayden Island Master Plan and Interchange Area Management Plan), to identify an adequate local circulation system, access spacing, and land use policies to manage demand on the interchange. Coordination is expected to occur around provision of adequate businesses to serve needs of residents on the island.

A downtown parking utilization study will be conducted to identify whether the reduction in on-street parking along Washington Street or along Washington and Broadway between Sixth and 15th Streets can be absorbed by existing on-street parking and off-street surface parking lots or structures. Between 105 and 115 stalls are expected to be removed, depending on the specific downtown transit alignment. This could be a construction impact as well as a permanent impact.

If a supplemental alternative is selected, the project would work with Convention Center and downtown businesses to develop a circulation plan that would reduce impacts of this alignment's closure of Sixth Street at Washington Street for the transit touchdown point, and identify alternate opportunities to connect downtown Vancouver with the riverfront.

7.4 Mitigation in Segment B: Mill Plain District to North Vancouver

If the Broadway/Main couplet or McLoughlin alignments are selected, off-street shared parking areas for local business customers and employees would be identified. This could be a construction impact as well as a permanent impact.

If the two-way Broadway or 16th Street alignments are selected, a parking utilization study would be conducted to identify whether existing side street and off-street parking areas are adequate to absorb parking losses along these two streets. This could be a construction impact as well as a permanent impact.

8. Mitigation for Temporary Effects

8.1 Introduction

This section identifies potential mitigation strategies to be employed by ODOT, WSDOT, or its contractors to reduce impacts to businesses experienced during construction.

8.2 Mitigation Common to All Build Alternatives

Construction of any of the build alternatives would be carefully planned to phase construction of project components in a way that reduces or avoids complete closure of affected roadways and access points to nearby businesses.

To the extent that detours are necessary, these detours would be carefully routed to reduce travel times and signed to reduce confusion.

To the extent that construction occurs in front of business access points, construction would be planned to keep these access points open as much as possible and would provide signage to identify the location of these access points and the businesses served.

Outreach to businesses affected by construction and assistance programs could help mitigate potential negative construction related effects. Programs to help affected businesses could include business planning assistance, low-interest loans, marketing and retail consulting, business-oriented workshops, and special promotions to generate patronage in construction areas.

The City of Vancouver is planning to establish a Growth and Transportation Efficiency Center (GTEC), a voluntary program sponsored by WSDOT for communities wanting to improve transportation efficiency in order to meet their targets for future growth and economic development. The GTEC could develop a construction communication plan to tell drivers, transit riders, cyclists, and pedestrians about detours, road closures, and direct them to downtown businesses.

8.3 Mitigation in Segment A: Delta Park to Mill Plain District

Coordination with the Port of Portland and businesses located in the Rivergate and Airport industrial areas would be conducted to identify ways to minimize delays for commercial freight vehicles during construction.

Signs would be posted to encourage commercial freight vehicles not serving the Portland-Vancouver region to shift from I-5 onto I-205 during construction.

Temporary loss of access to businesses in the vicinity of the Marine Drive interchange could be substantial, as alternate access does not already exist. As plans are refined, the provision of alternate access would mitigate impact to these businesses. Out reach to the

businesses to determine access and site circulation needs would be helpful. Without the provision of alternate access, loss of access to Marine Drive may prevent the firms from doing business.

A downtown parking utilization study would be conducted to identify whether on-street construction-related parking losses along Washington Street or along the Washington/Broadway couplet between Sixth and 15th Streets can be absorbed by existing on-street parking, off-street surface parking lots, or existing parking structures.

8.4 Mitigation in Segment B: Mill Plain District to North Vancouver

Signs would be posted to encourage commercial freight vehicles not serving the Portland-Vancouver region to shift from I-5 onto I-205 during construction.

If the Broadway/Main couplet or McLoughlin alignments are selected, off-street shared parking areas would be identified for local business customers and employees during construction of transit alignment.

If the two-way Broadway or 16th Street alignments are selected, a parking utilization study would be conducted to identify whether existing side street and off-street parking areas are adequate to absorb construction-related parking impacts along these two streets.

9. Permits and Approvals

9.1 Federal

No federal permits due to economic impacts are anticipated.

9.2 State

No state permits due to economic impacts are anticipated.

9.3 Local

No local permits due to economic impacts are anticipated.

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